May 8, 1962 J. L. REIMERS ETAL 3,032,943

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Fig. 1

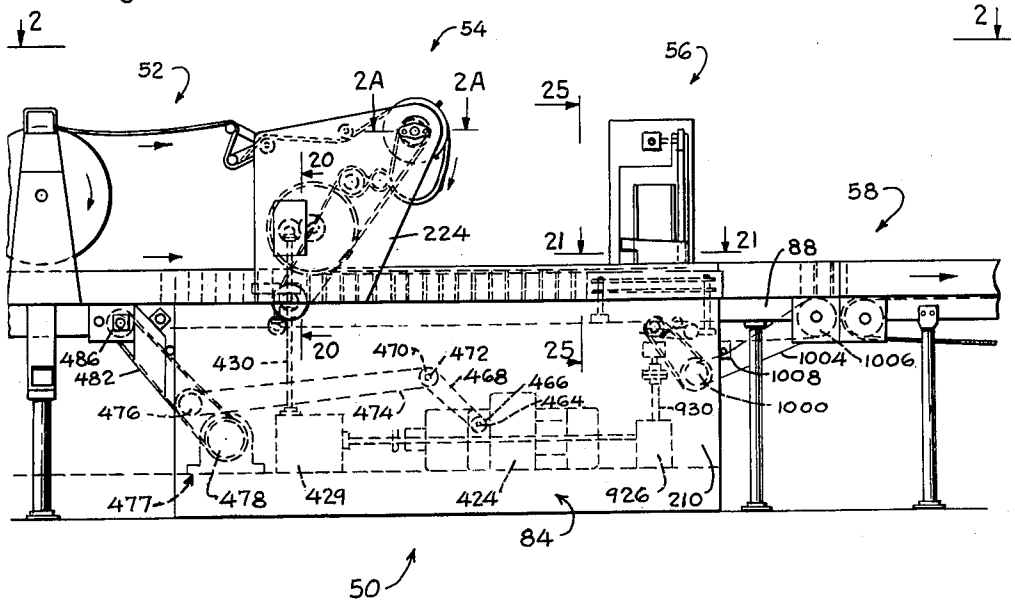



Fig. 2

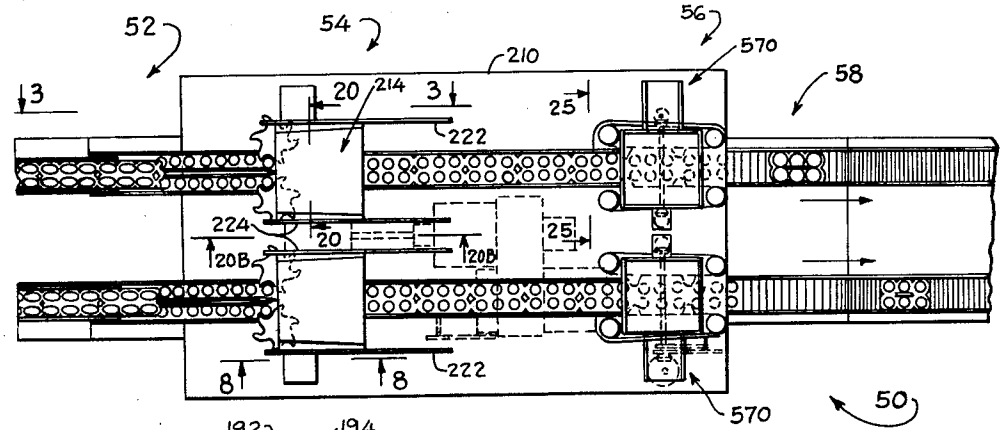
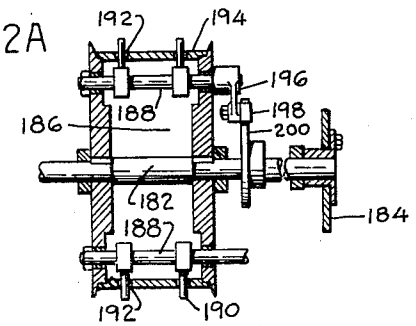



Fig. 2A




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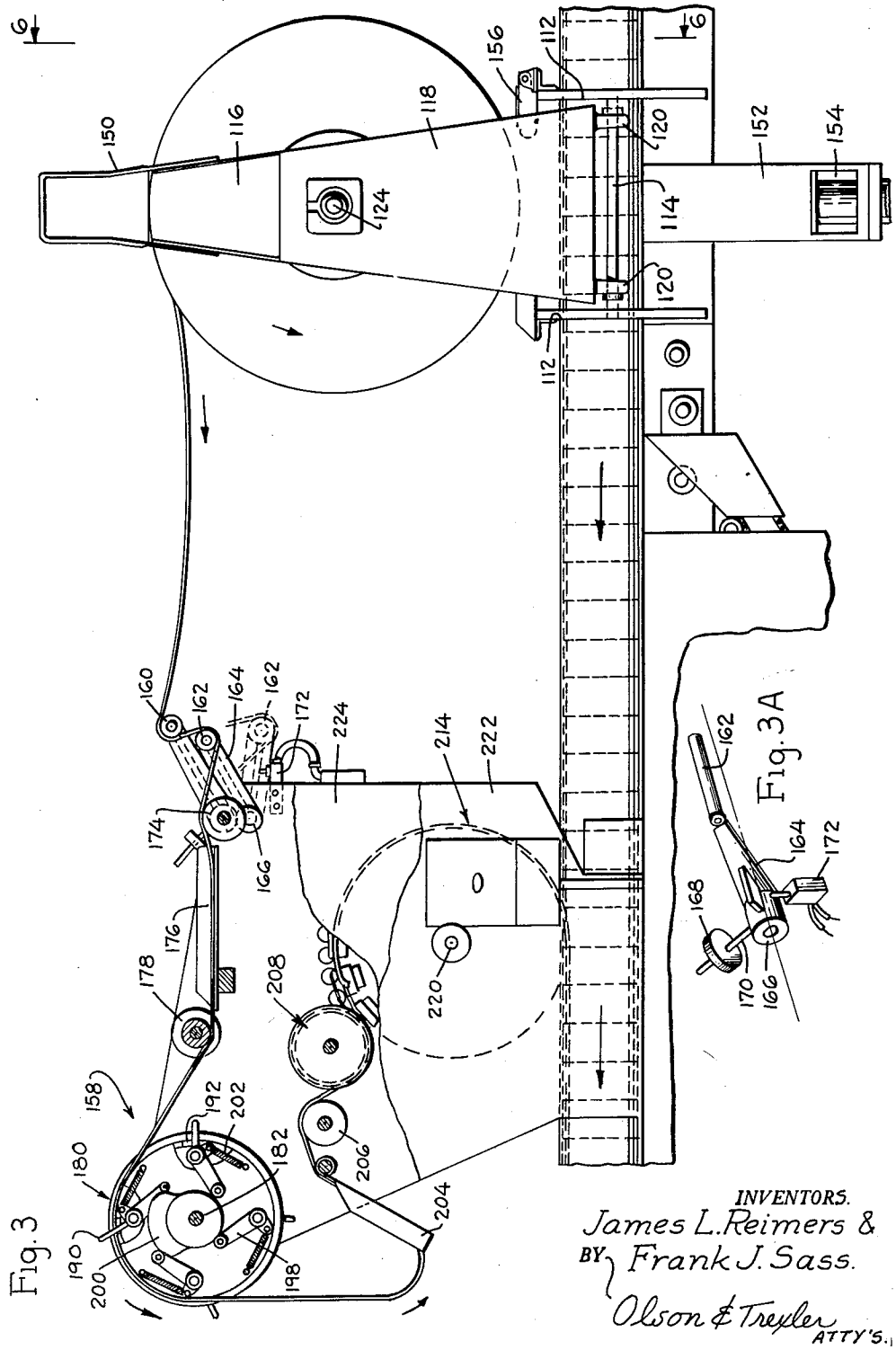



Fig. 3




Fig. 3A

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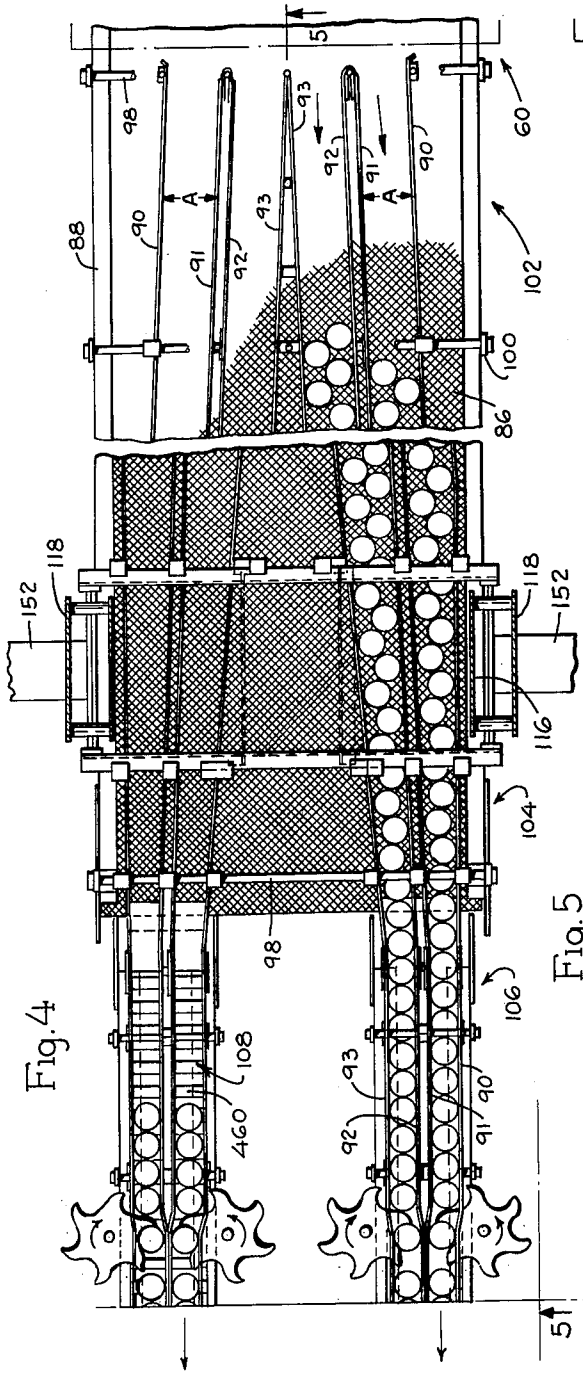



Fig. 4

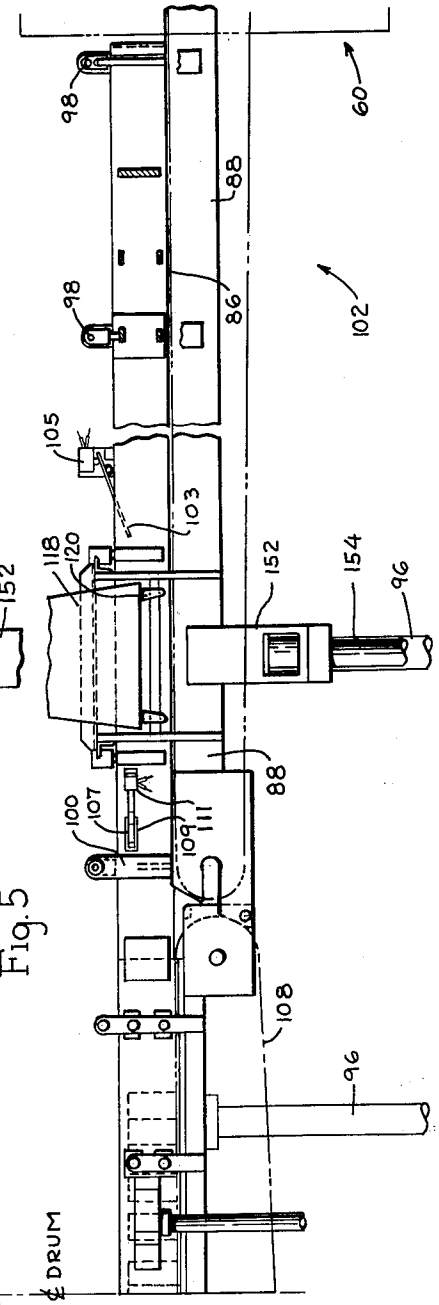


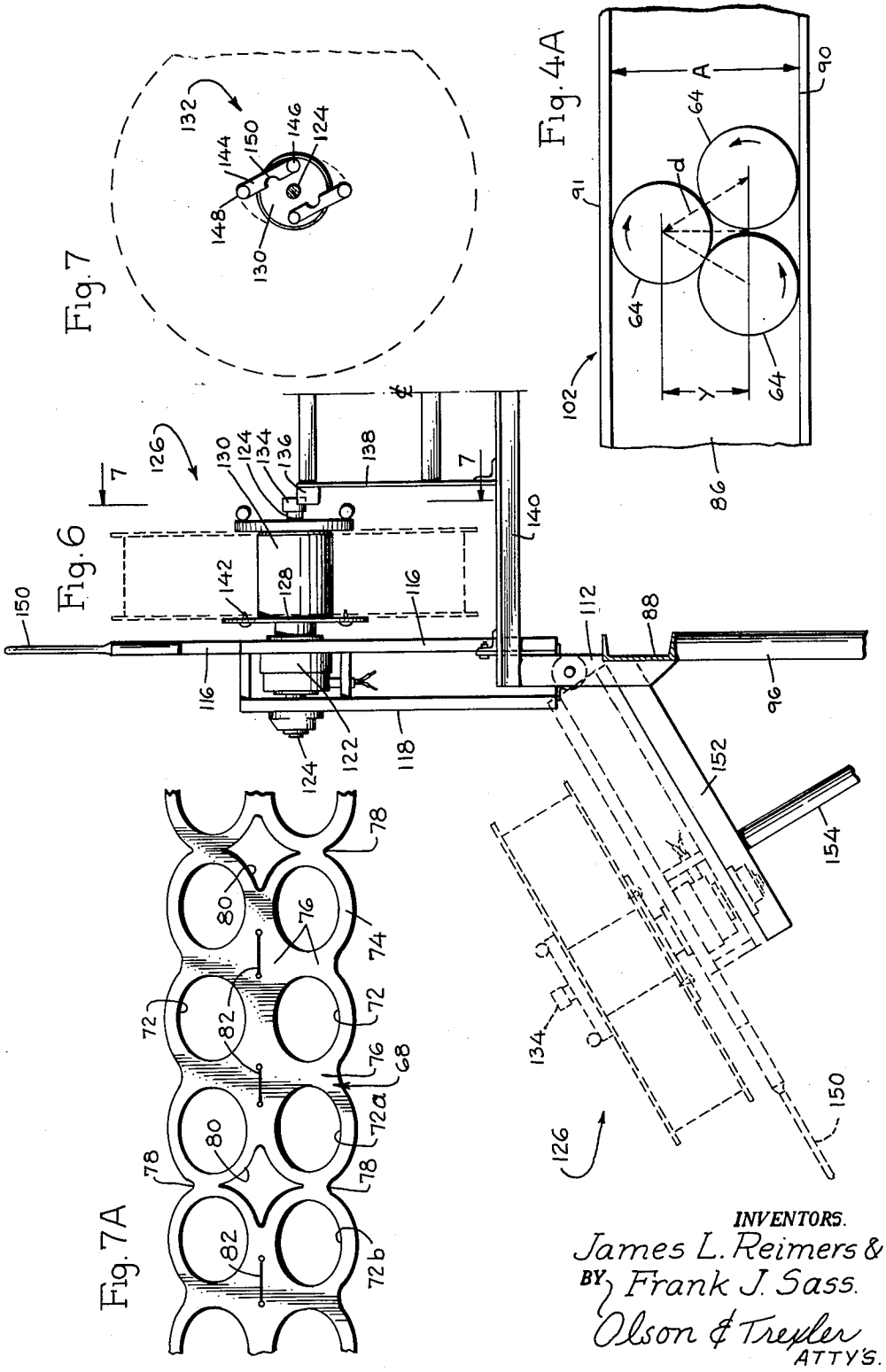

Fig. 5

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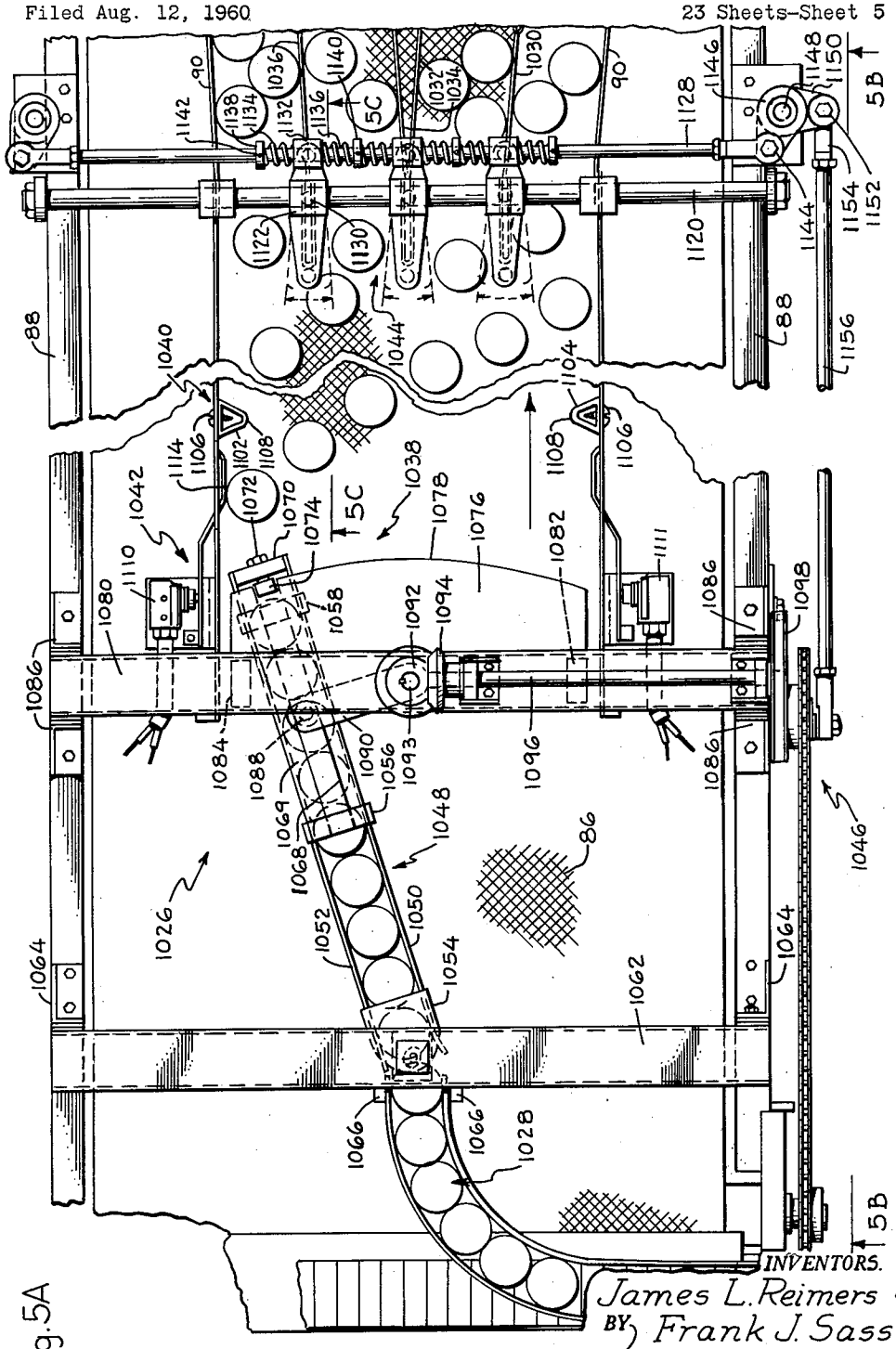



Fig. 5A

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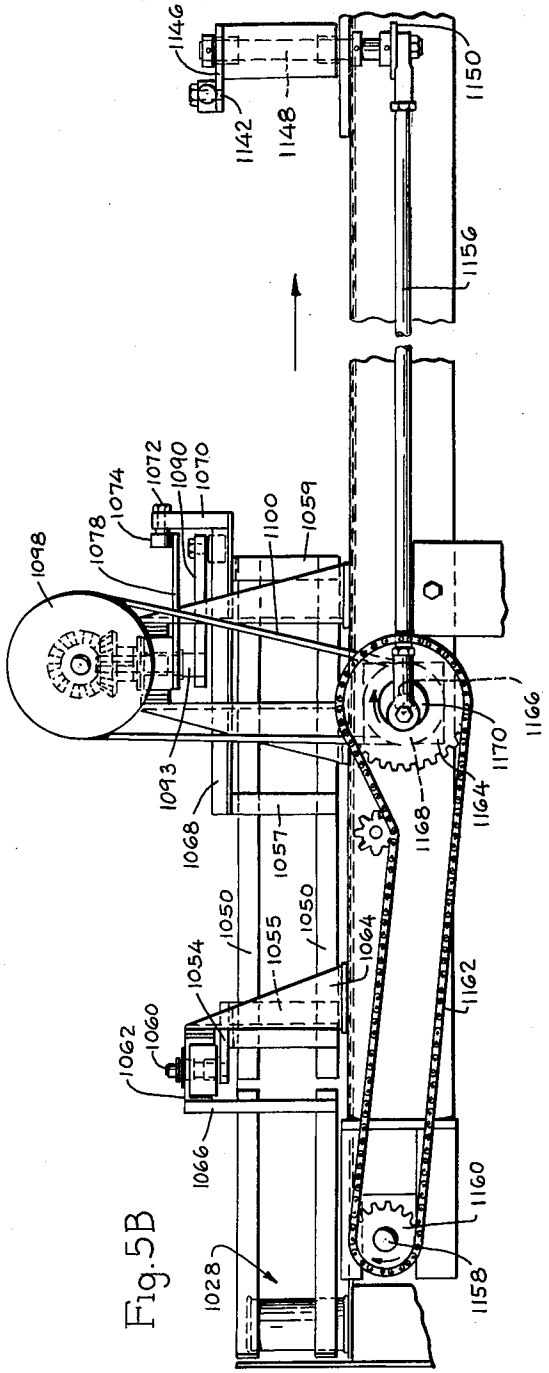



Fig. 5B

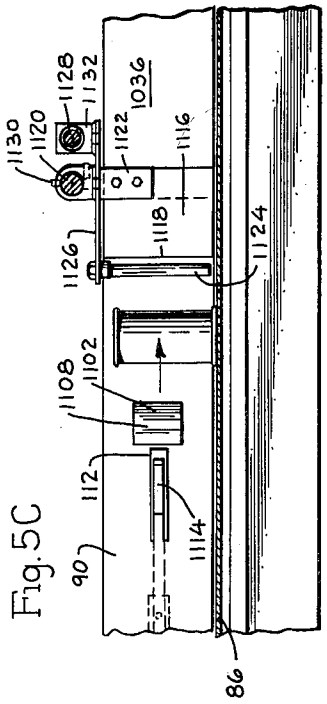



Fig. 5C

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Fig. 8

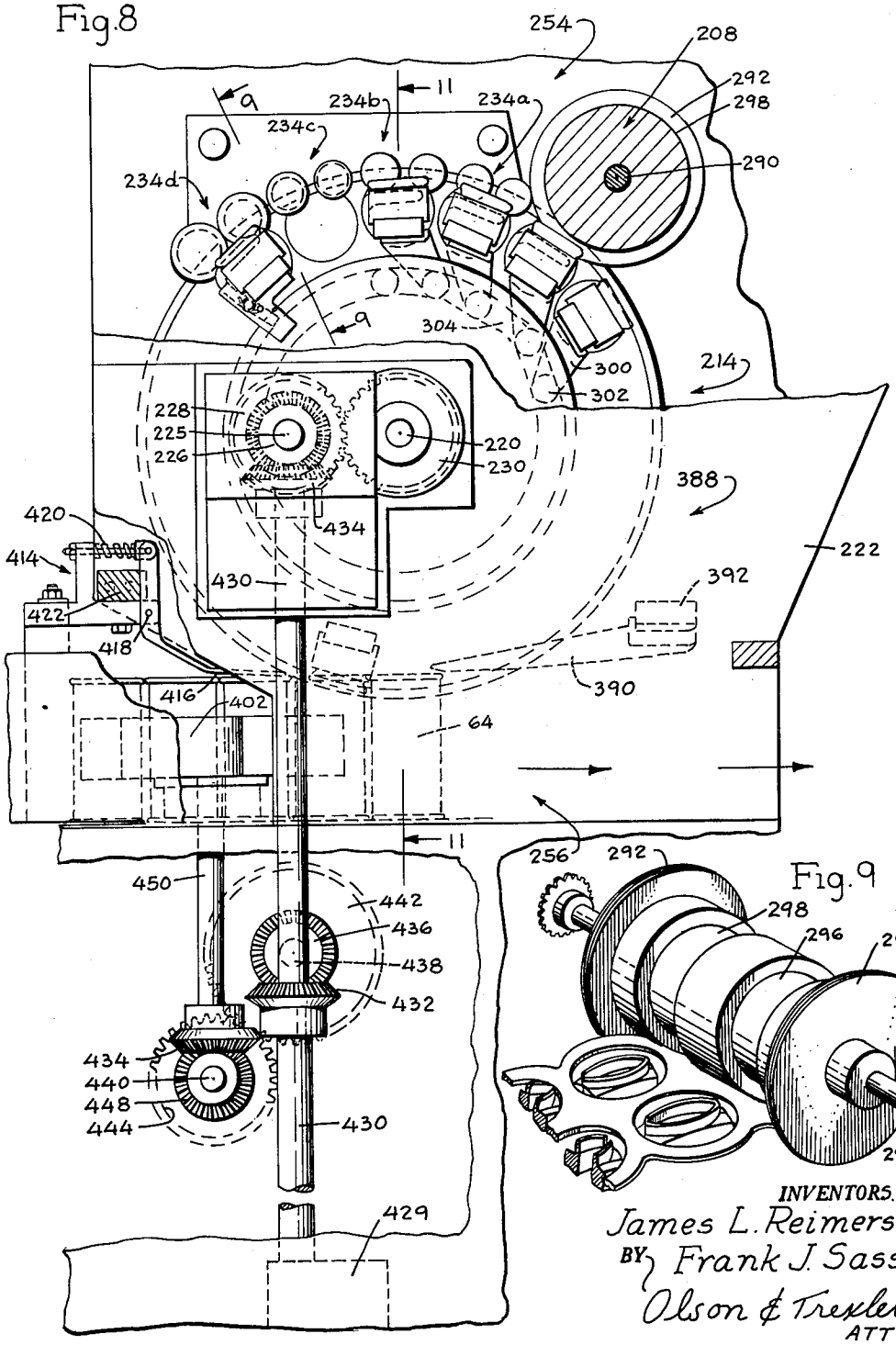



Fig. 9




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Fig. 10

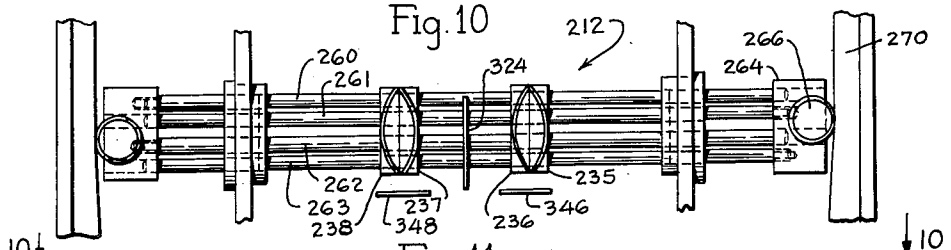
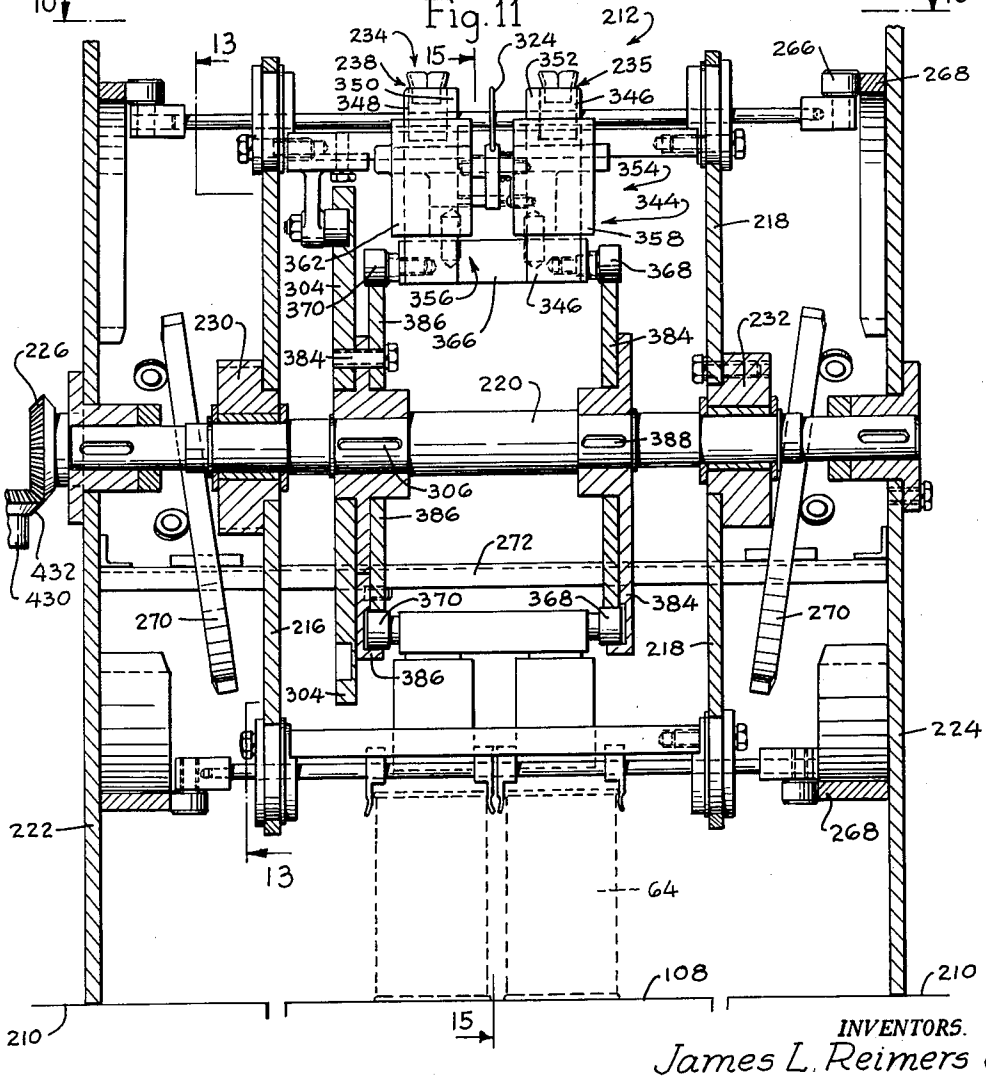



Fig. 11




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Fig. 12

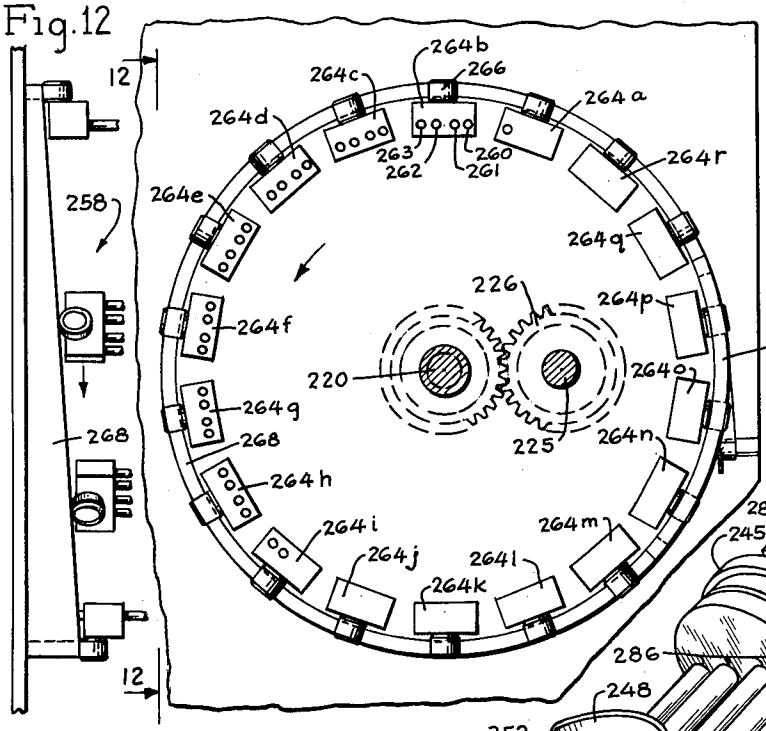
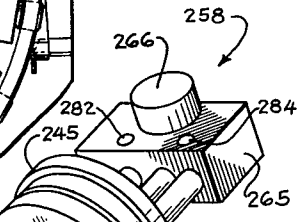



Fig. 13



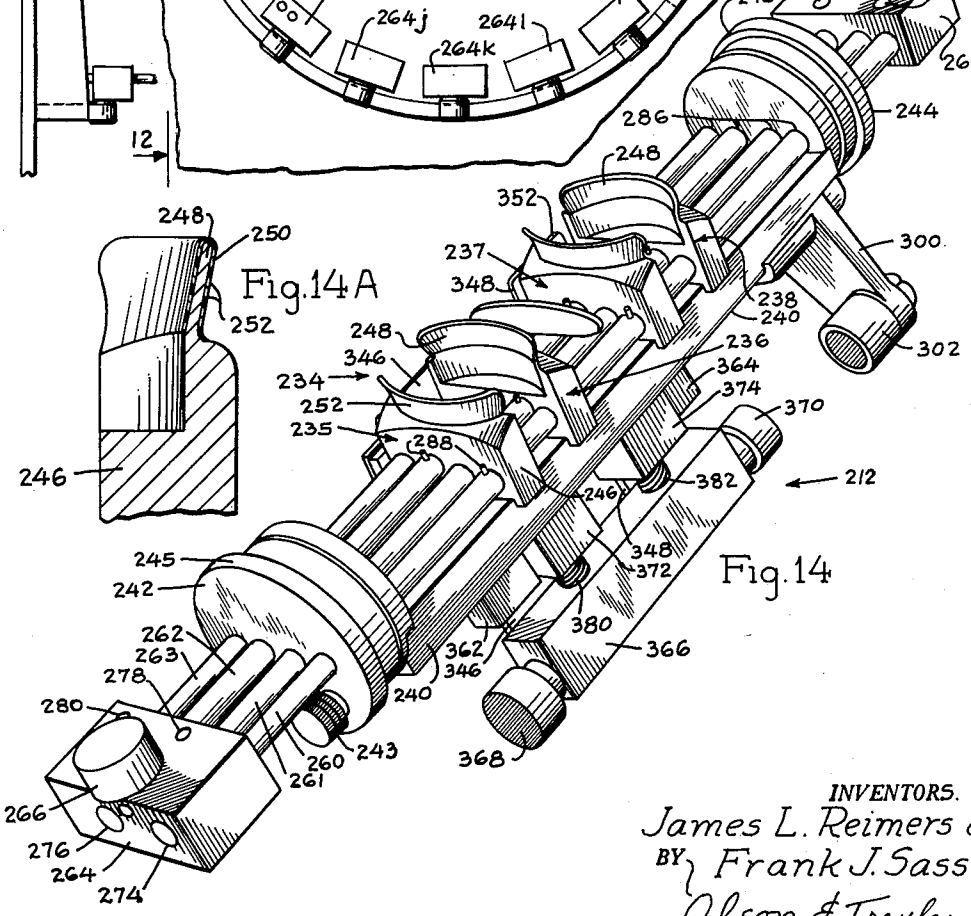




Fig. 14A




Fig. 14

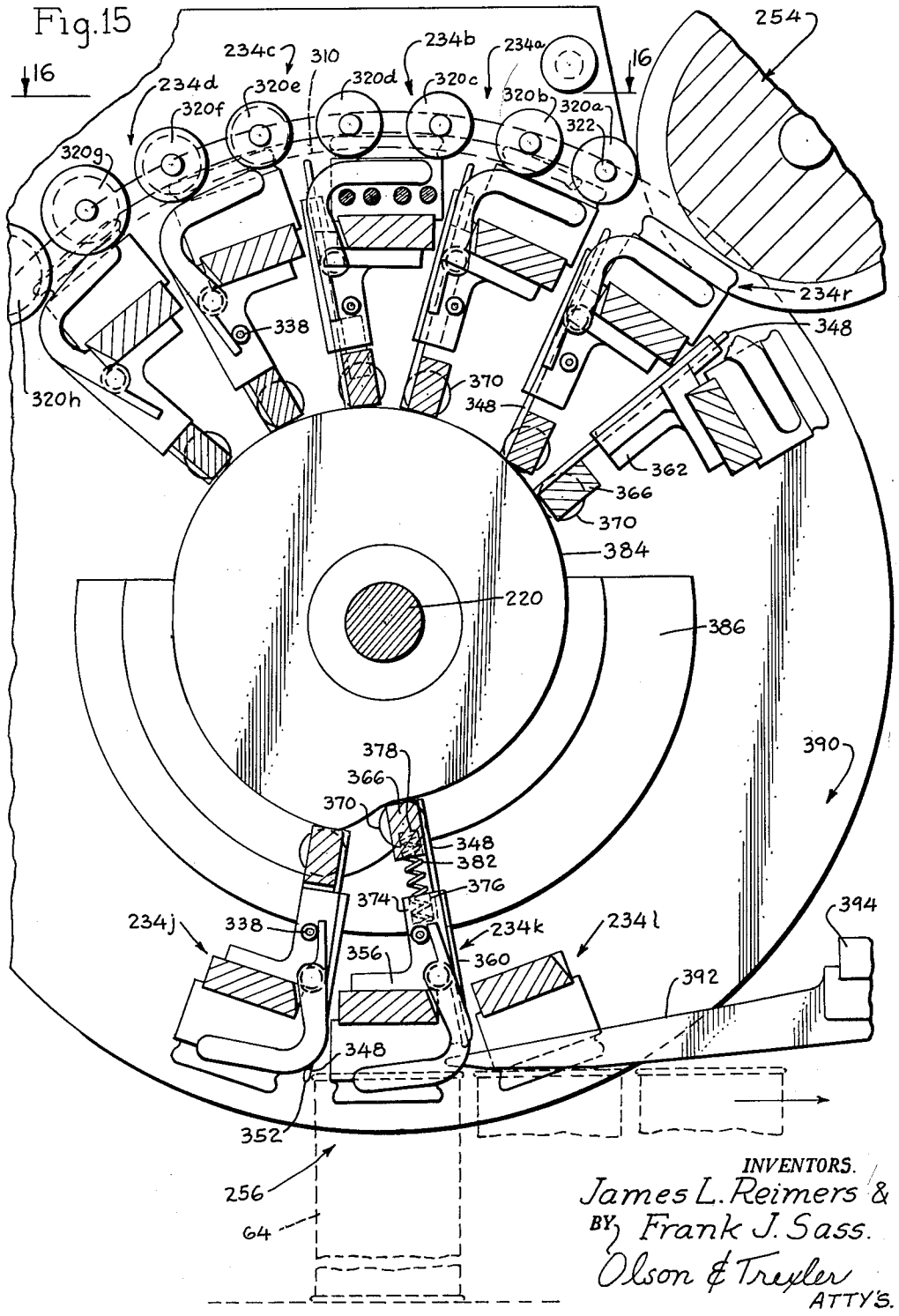
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Fig. 15




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Fig. 16

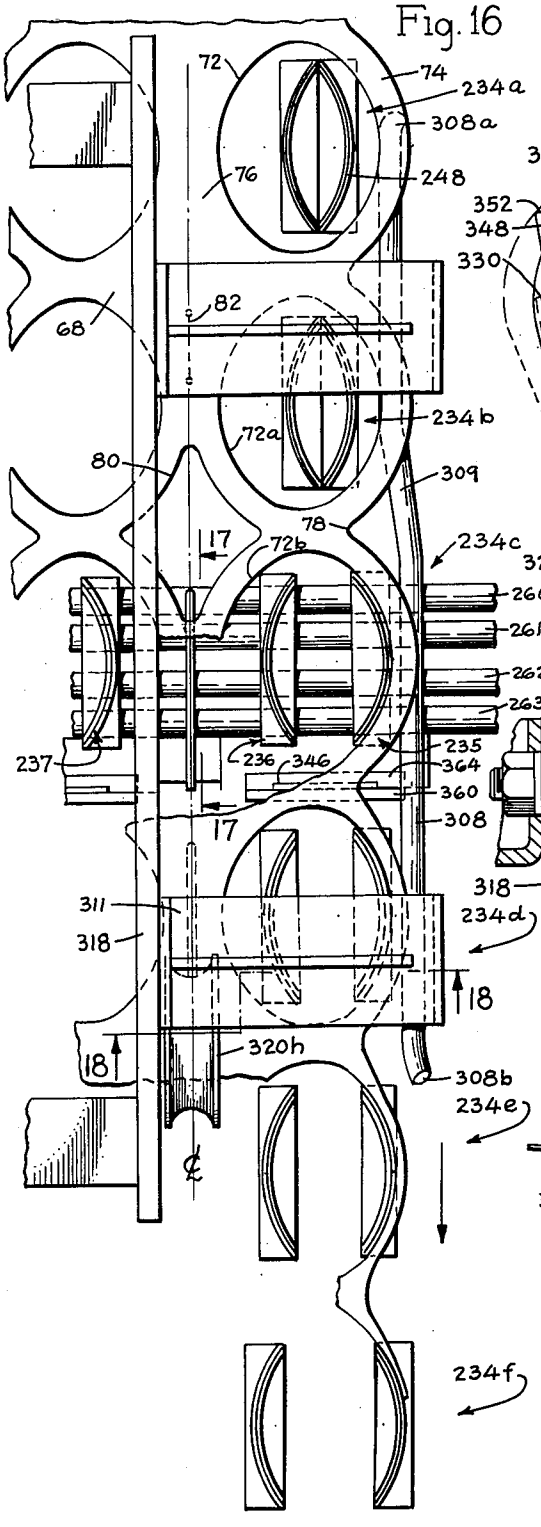



Fig. 17

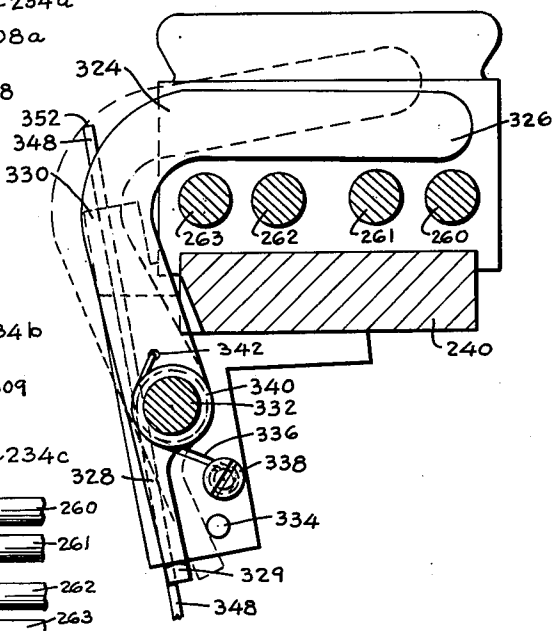
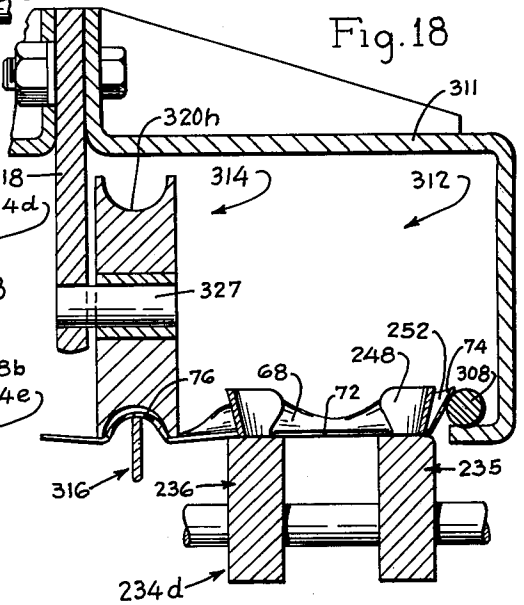



Fig. 18




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Fig. 19A

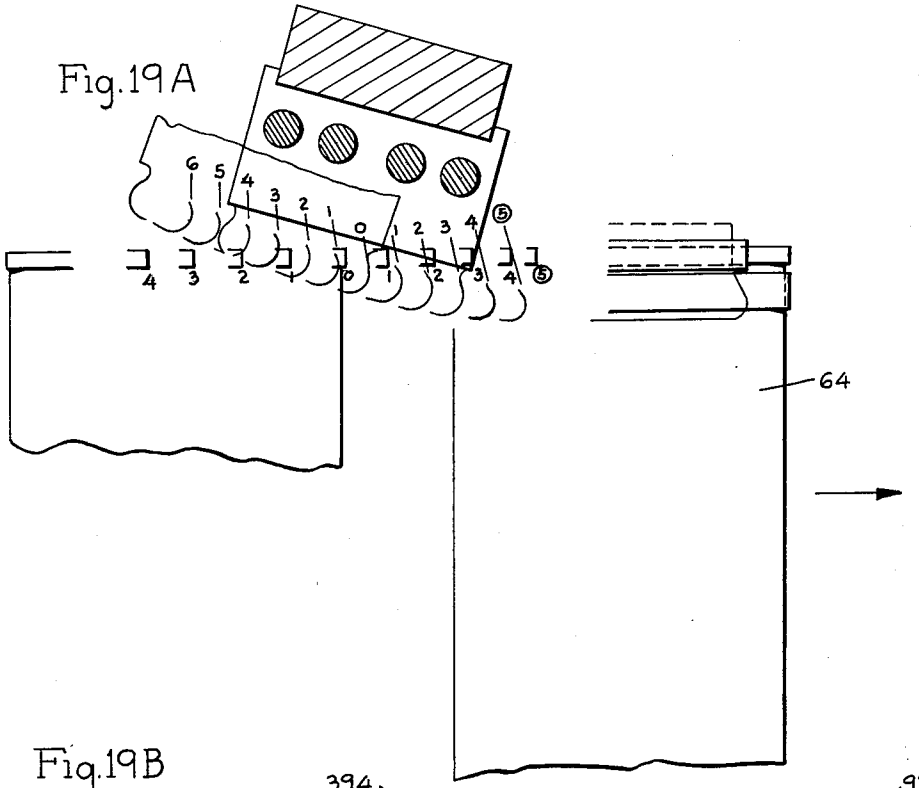
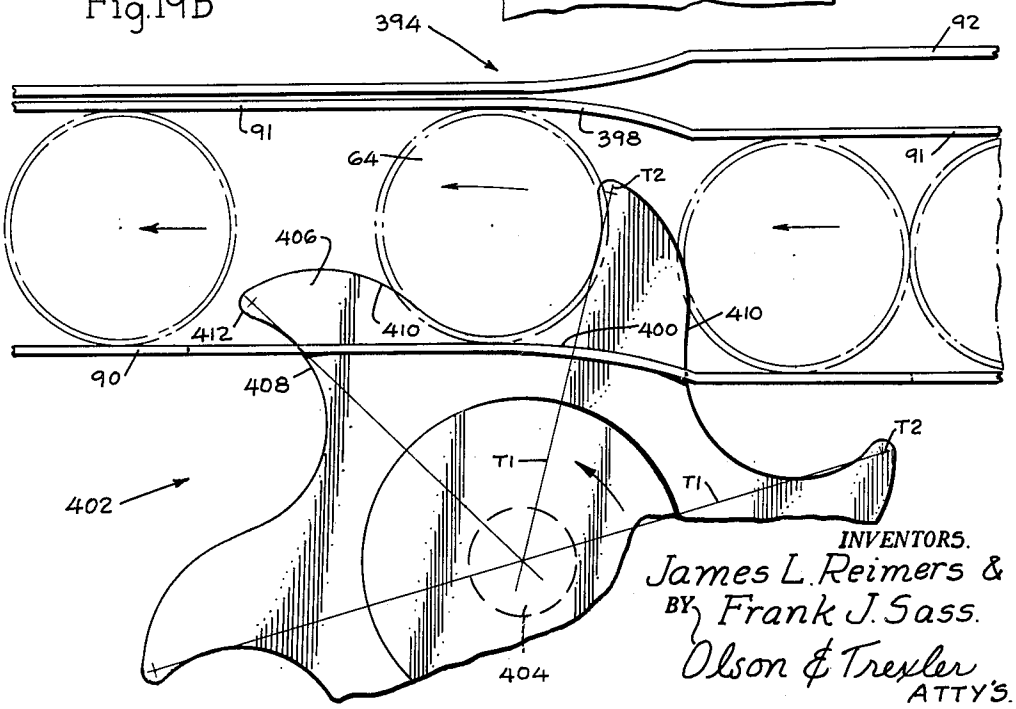



Fig. 19B




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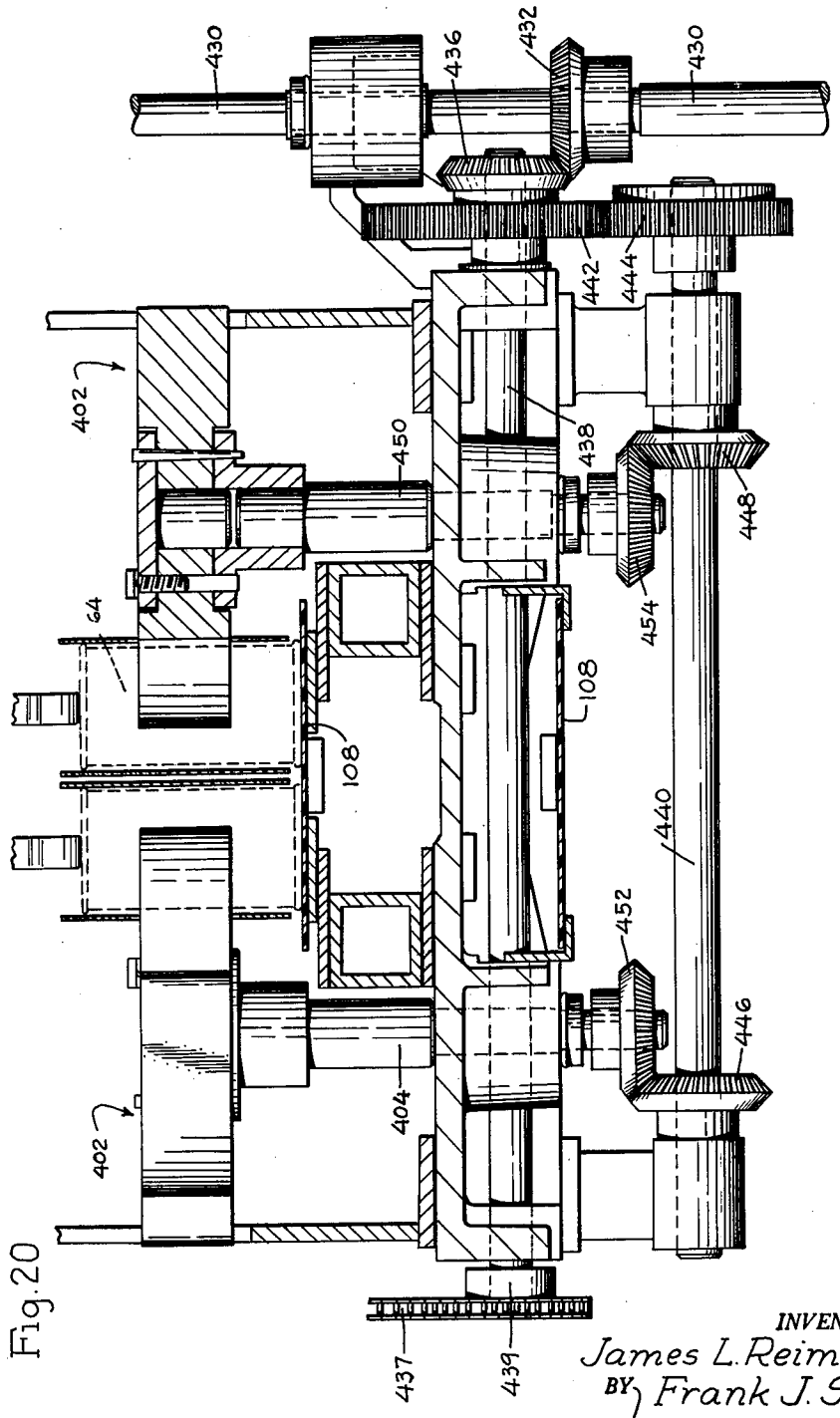



Fig. 20

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Fig. 20A

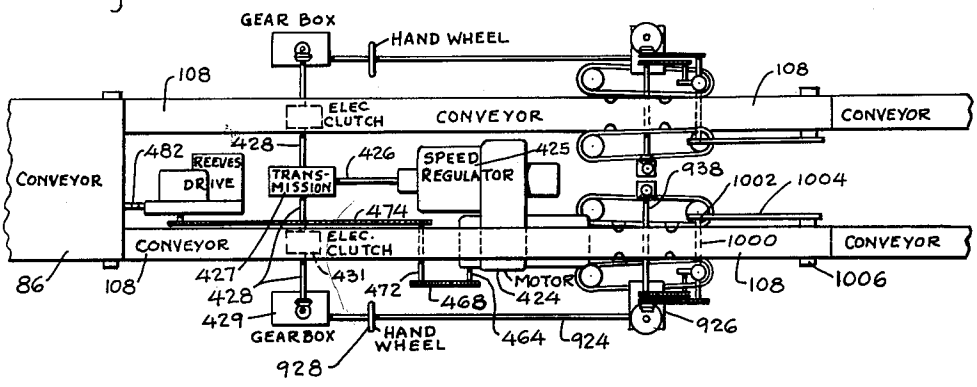
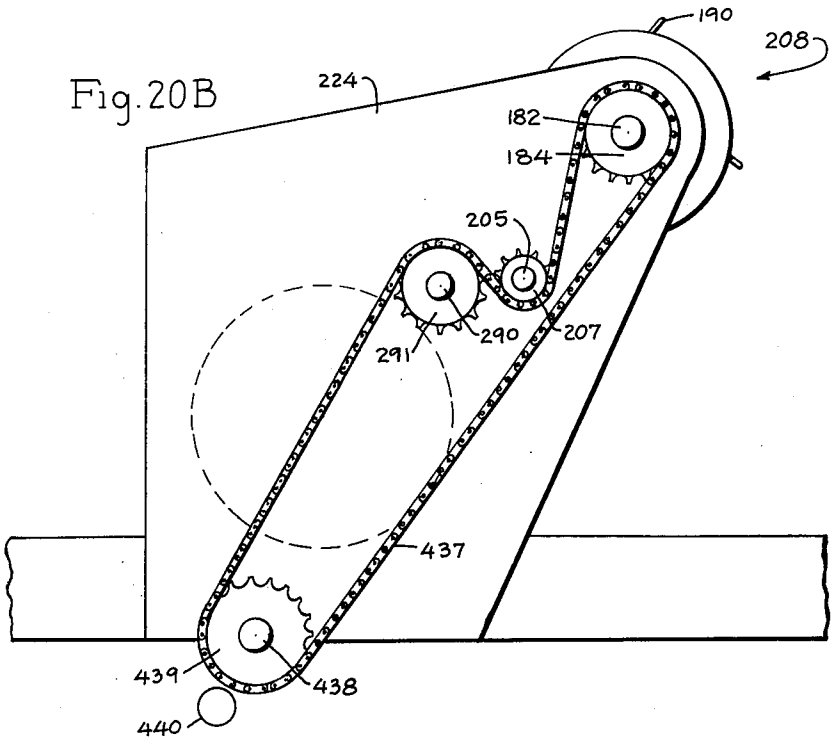



Fig. 20B




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Fig. 21

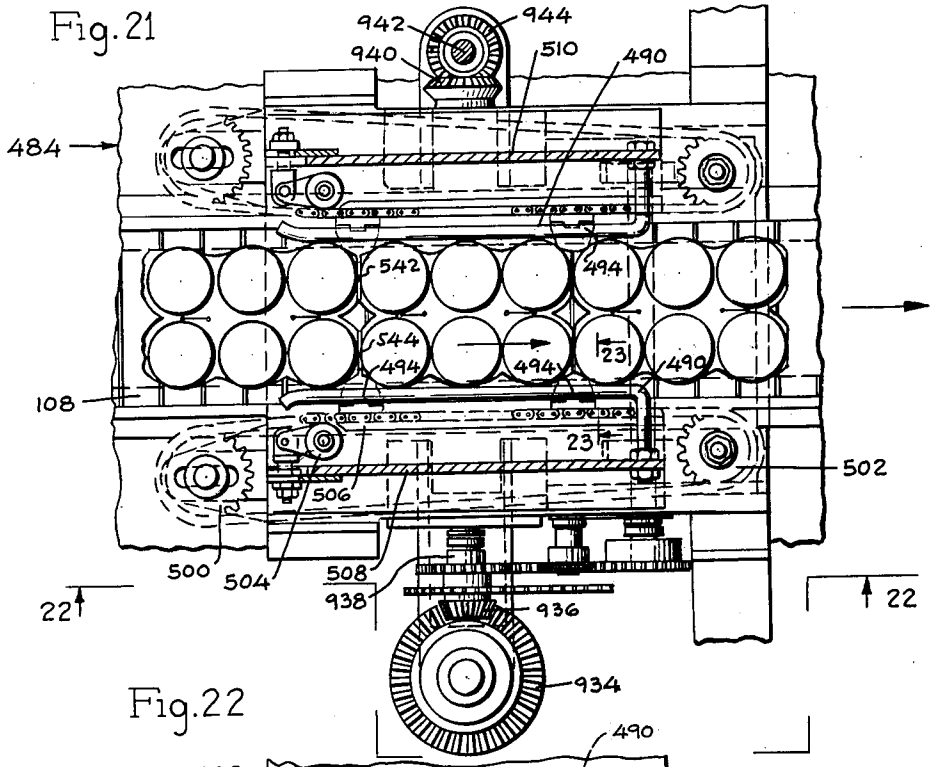



Fig. 22

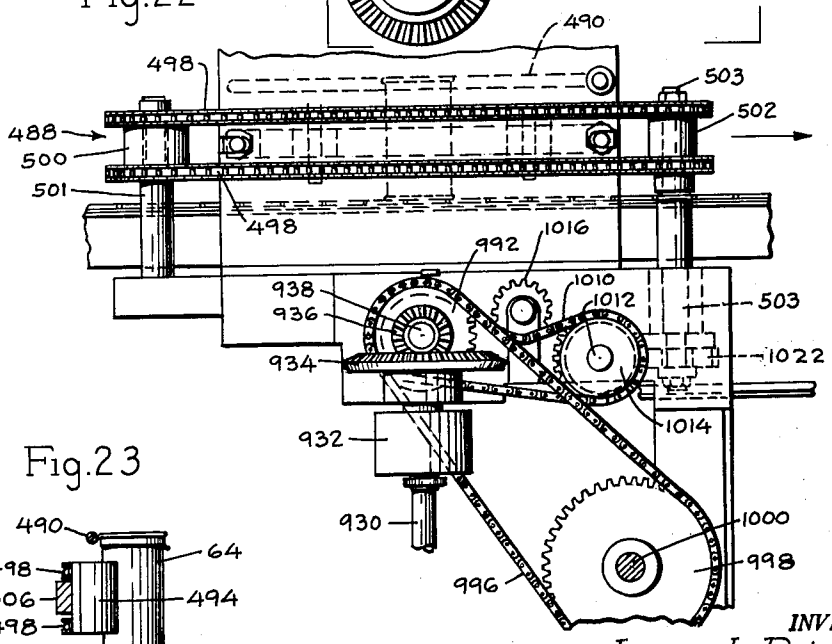



Fig. 23




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Fig. 24

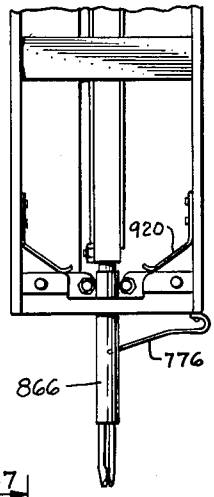



Fig. 25



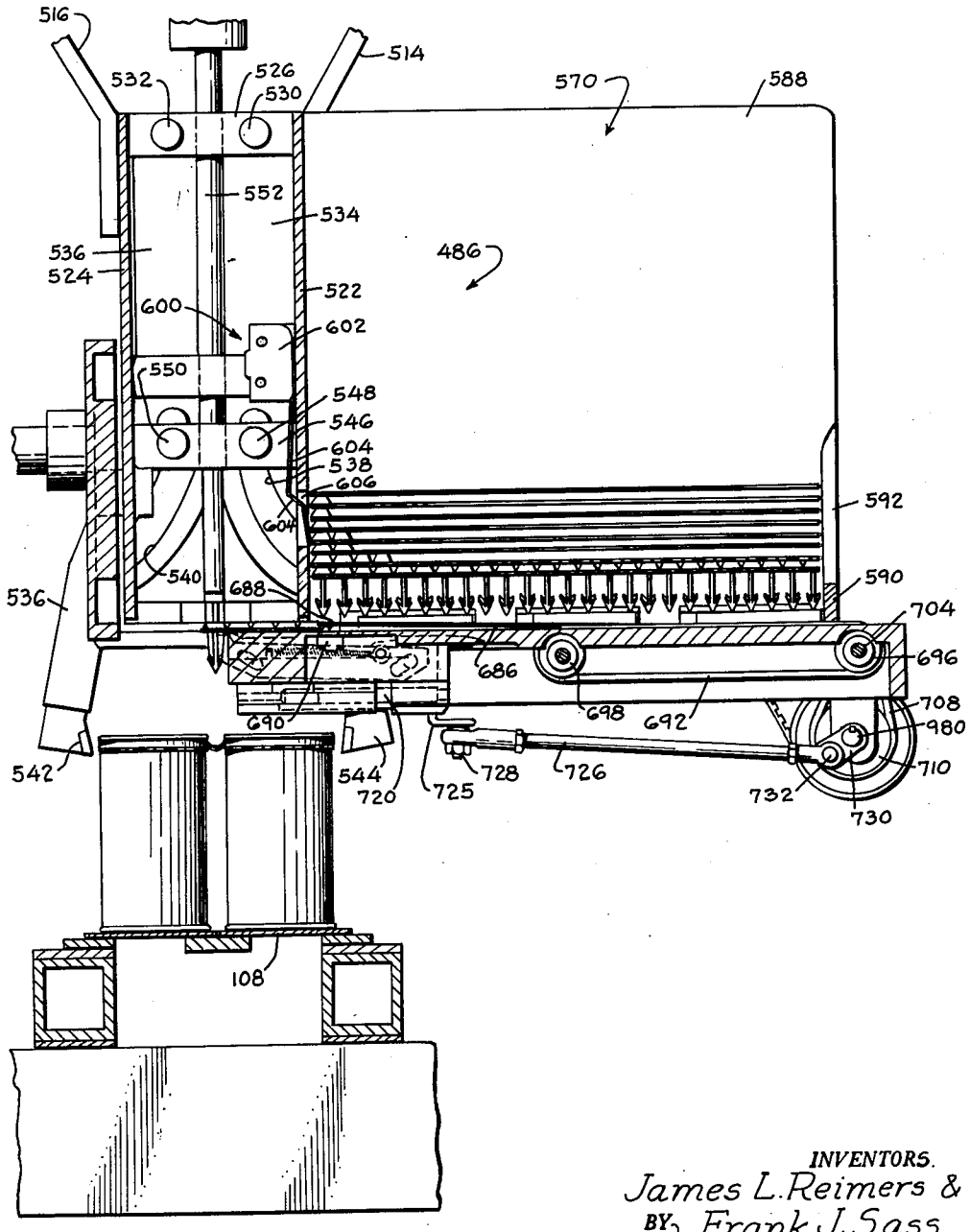

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Fig. 26




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Fig. 27

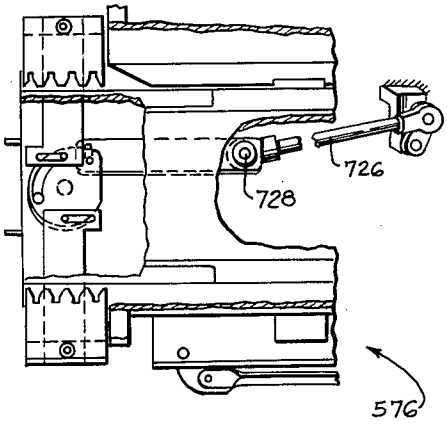



Fig. 28

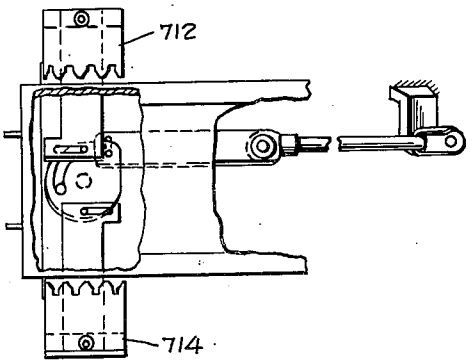



Fig. 29

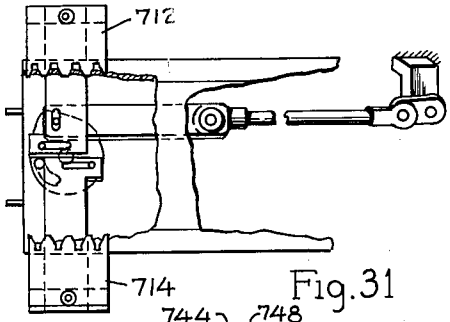



Fig. 30

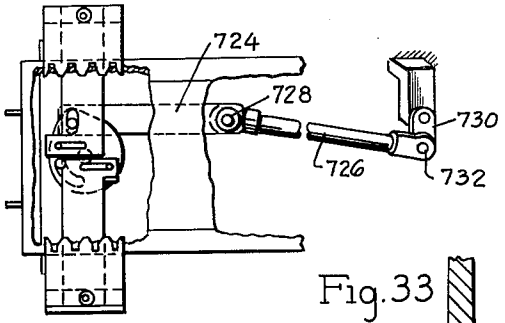



Fig. 31

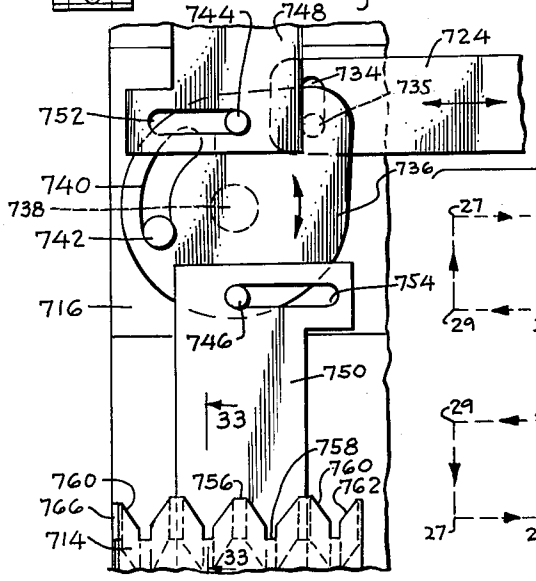
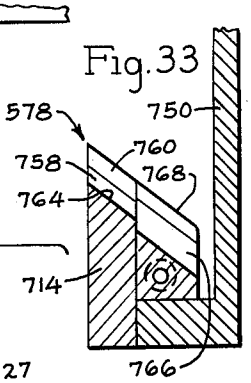



Fig. 32




Fig. 33




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Fig. 34

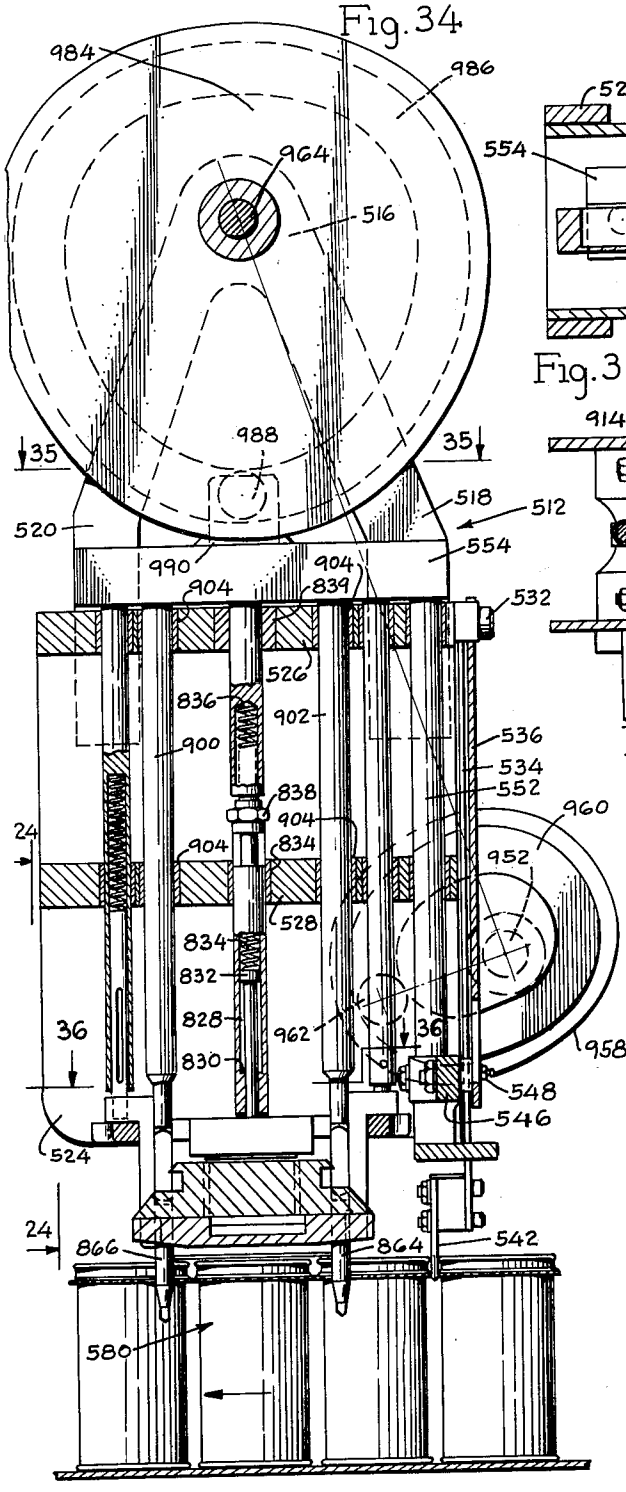



Fig. 35

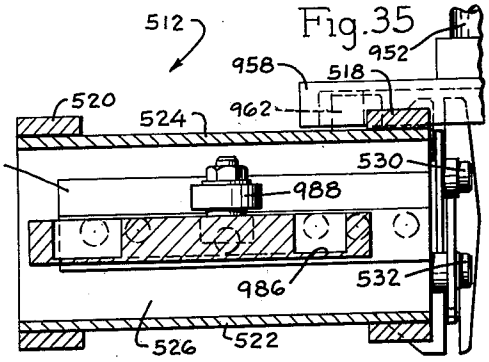



Fig. 36

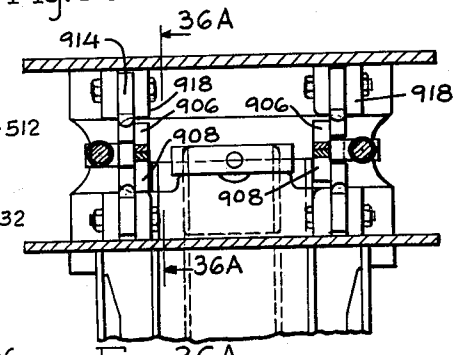
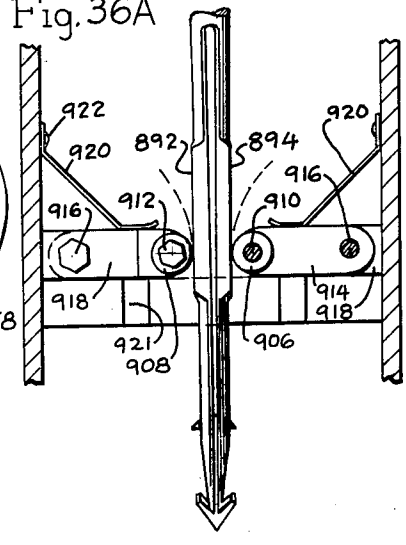



Fig. 36A




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Fig. 34A

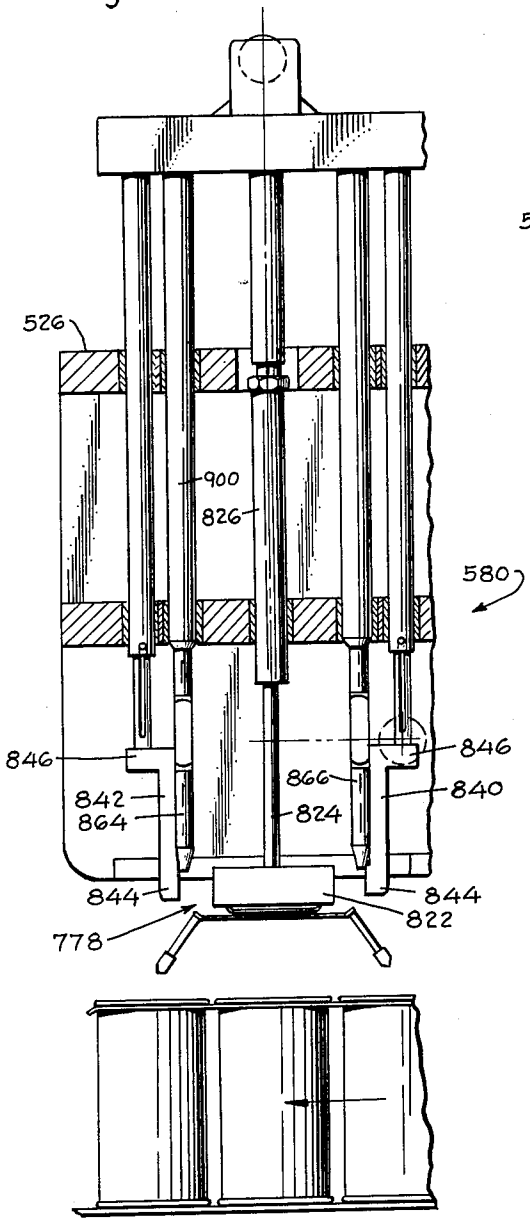
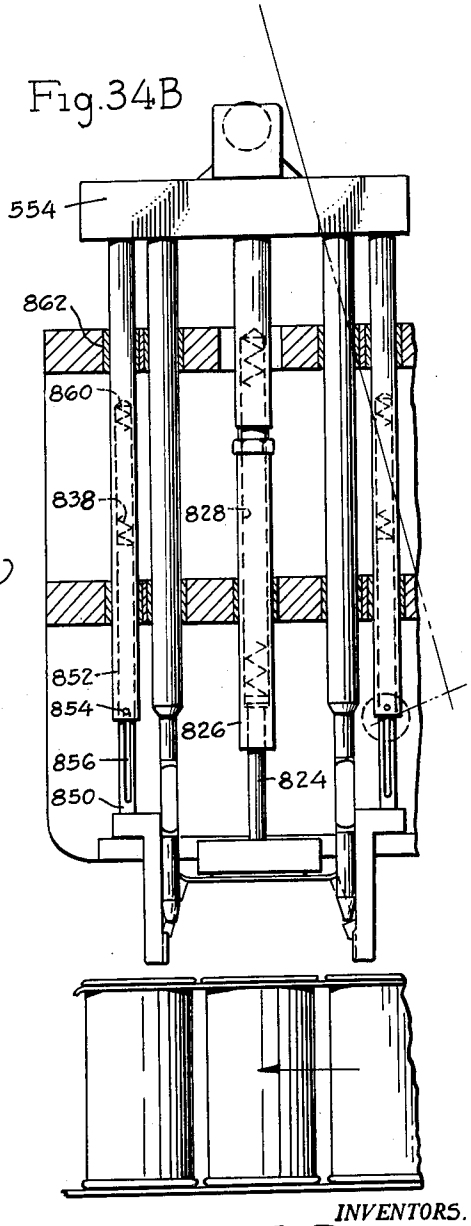



Fig. 34B




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Fig. 37

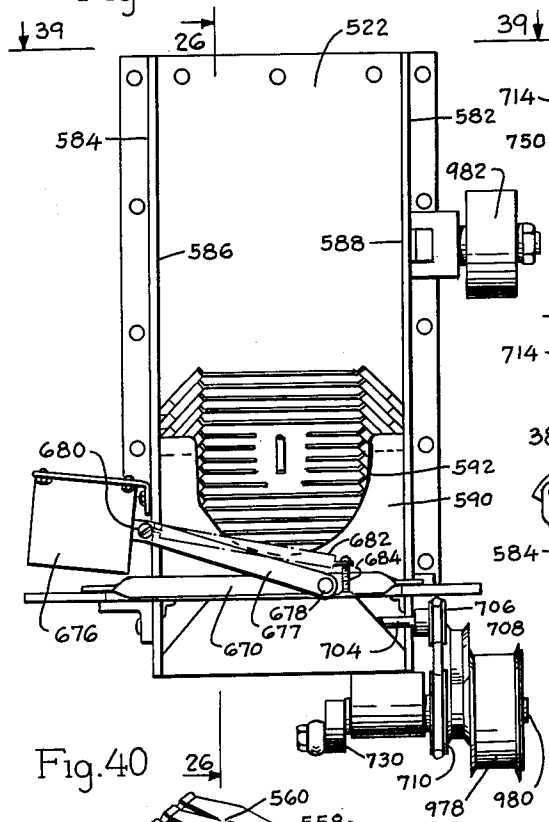



Fig. 38

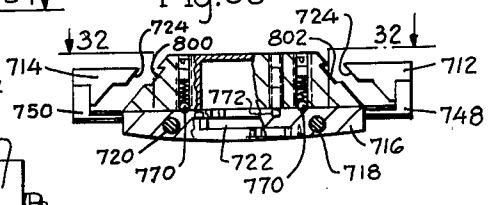



Fig. 39

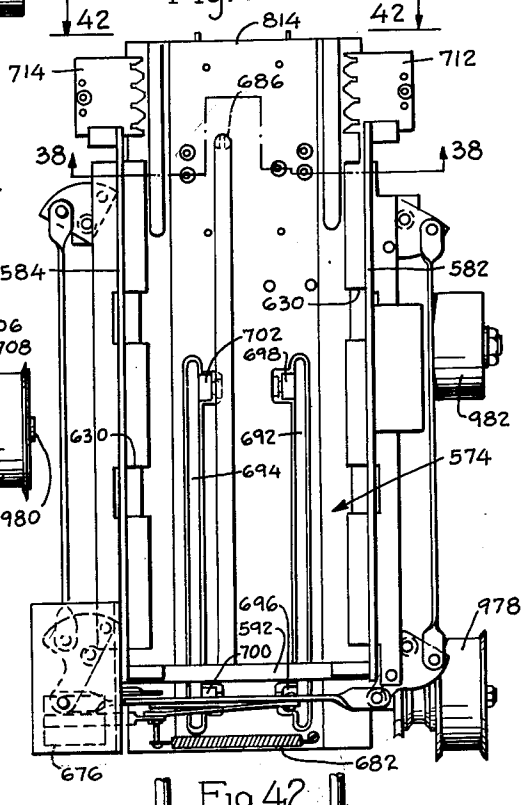



Fig. 40

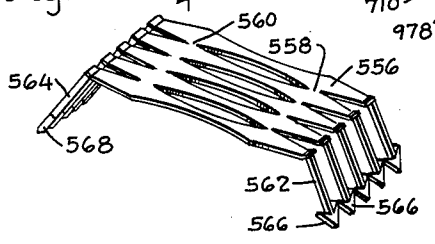



Fig. 41

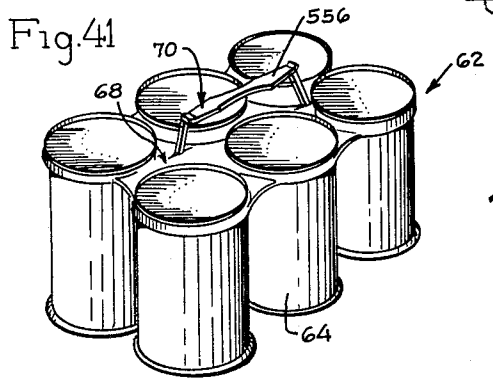
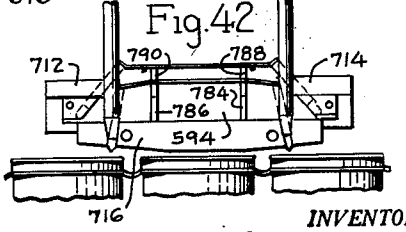



Fig. 42




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Fig. 42A

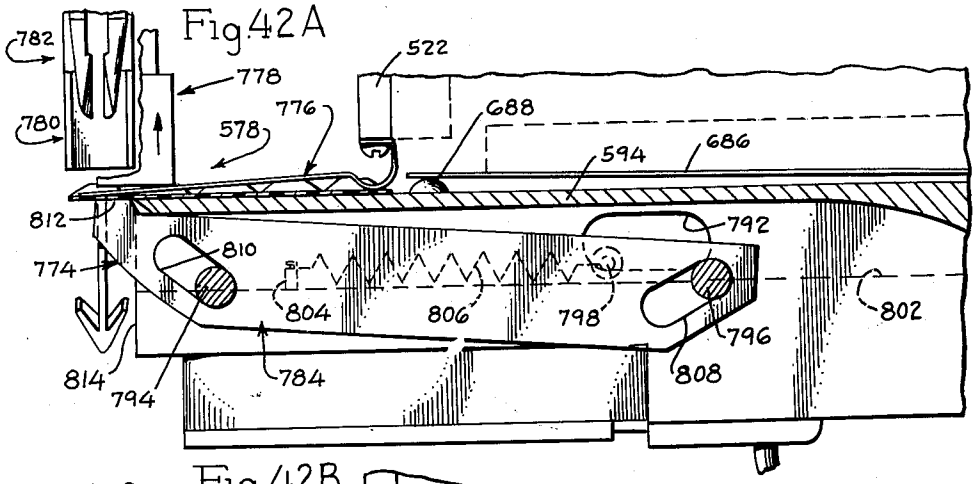



Fig. 42B

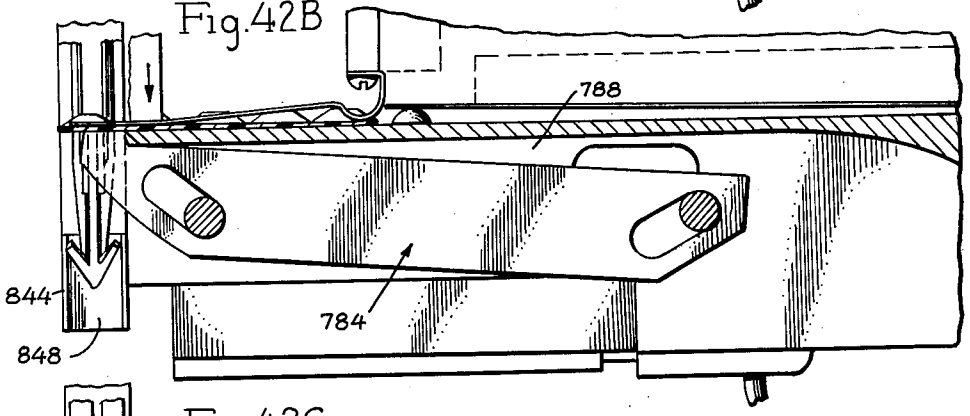
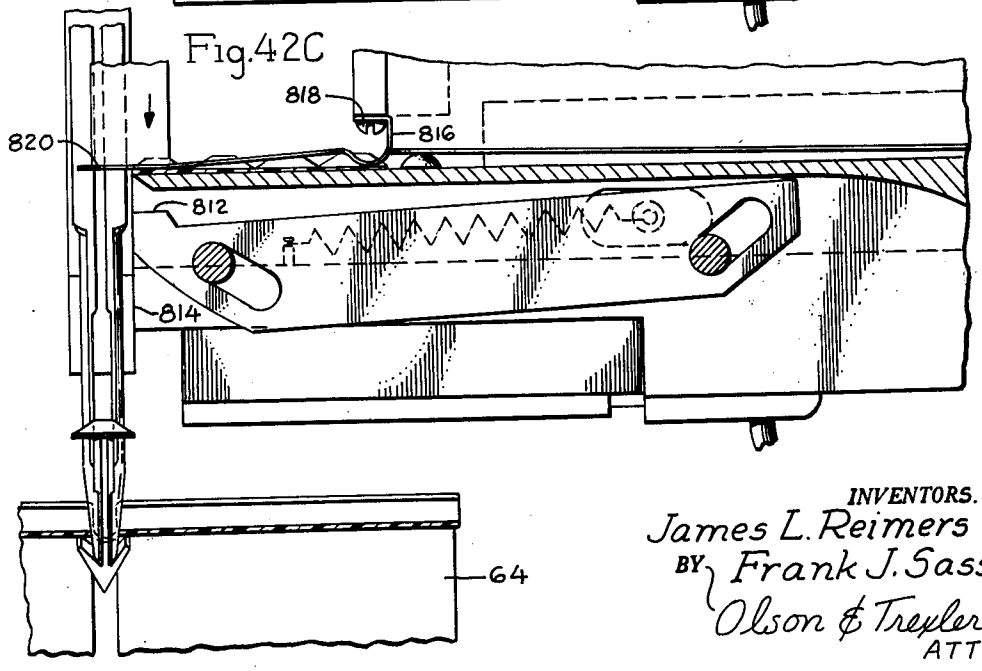



Fig. 42C




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May 8, 1962 J. L. REIMERS ETAL 3,032,943

ASSEMBLY MACHINE

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Fig. 43

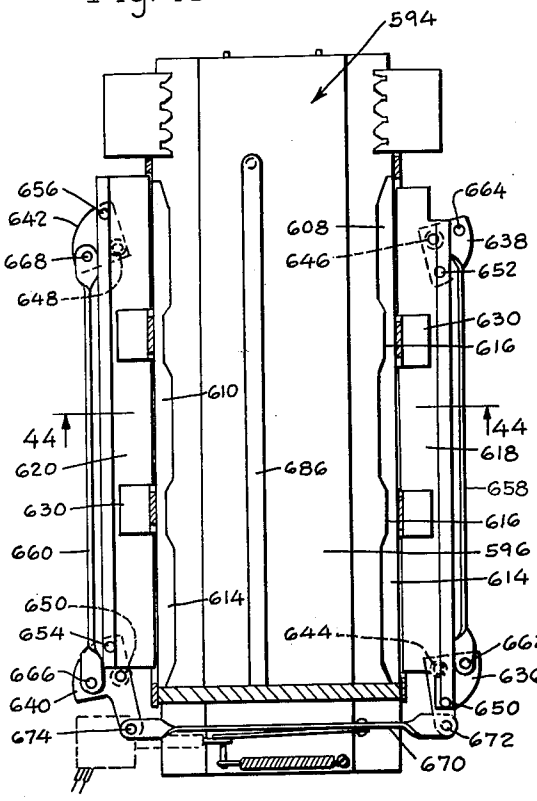



Fig. 44

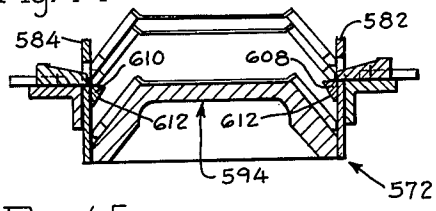



Fig. 45

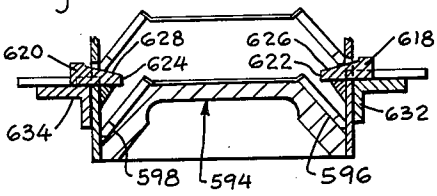



Fig. 48

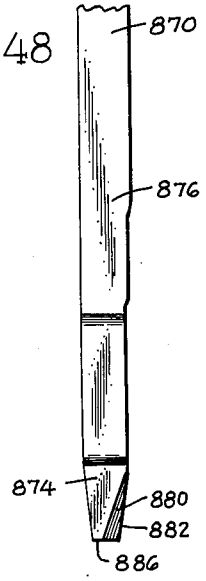



Fig. 46

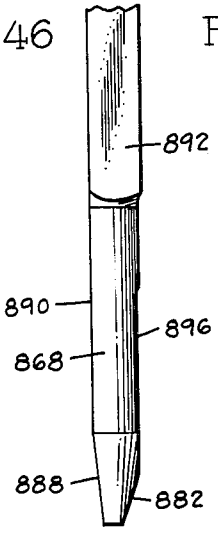
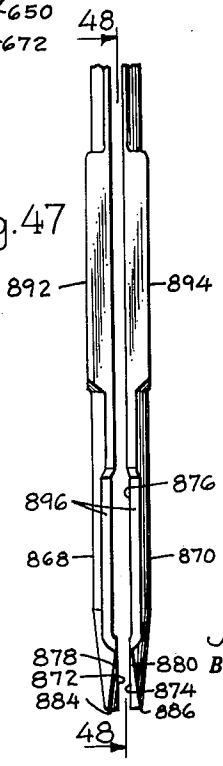



Fig. 47




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United States Patent Office 3,032,943 Patented May 8, 1962



3,032,943

# ASSEMBLY MACHINE

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Filed Aug. 12, 1960, Ser. No. 49,259
100 Claims. (Cl. 53—48)

The present invention relates to a machine for assembling containers and container carriers to form multi-packs of containers which are convenient for carrying. One example of container carriers, of the type which are assembled with containers by the machine provided by this invention, are shown in United States Patent 2,874,835 issued to Ougljesa J. Poupitch, and in other patents and applications disclosing various improvements thereto. One example of containers which can be advantageously assembled into such carriers to form carrying packs, are cylindrical metal containers with beaded ends, commonly referred to as tin cans, which are so extensively used to package food and beverages.

A principal object of the present invention is to provide a new and improved machine for assembling containers and apertured carriers to form assembled packs of containers for carrying.

Another object is to provide an improved container and apertured carrier assembly machine, which is capable of assembling containers and carriers at a high rate of production.

A further object is to provide an automatic container and carrier assembling machine which will operate with great inherent efficiency and speed to assemble containers into apertured and somewhat elastic carriers, which, as such, have a generally flat form in their undistored state.

Another object is to provide mechanism capable of adaptation for use with a high output container filling and closing machine, such as, for example, those used by breweries to produce filled cans of beer, an attachment adapted to receive a continuous procession of containers from the machine, and assemble the containers into a succession of apertured carriers to form multi-packs of containers ready for carrying.

Another object is to provide a new and improved machine in which a procession of containers may be assembled with an interconnected series of apertured and somewhat elastic carriers by means of a rotor bearing, unique, circumferentially arranged means for picking up the interconnected carriers and telescoping the carriers around the containers.

A further object is to provide a unique and fully synchronized machine for rapidly assembling a procession of containers with a successive series of apertured and somewhat elastic carriers to form discrete packages of containers individually fitted with carrying handles by the machine.

Another object of the invention is to provide a novel container and carrier assembling machine, as recited in the above objects, which includes unique and highly efficient means for fitting carrying handles on the individual packs assembled in the machine.

A further and more specific object of the invention is to provide a high speed assembling machine wherein there is an accurate orientation of the plurality of cans, such as beer cans, with an apertured carrier, at least some of said carrier apertures being variably spaced from each other as measured on their center lines.

It is a further object of this invention to provide an assembling machine for assembling containers which have been aligned in a parallel array to an apertured carrier sheet of substantially infinite length, and wherein the carrier sheet moves at a substantially constant speed and the aligned cans of constant size are caused to move at a variable speed relative to the speed of the carrier to provide positive orientation therebetween.



Still another object of the invention is to provide a machine of the above characteristics wherein there is an initial orientation of a series of successive carriers on a rotor or drum member at a loading station, said carrier being previously wound up in a reel for storage, the reel then being placed in a suitable storage area of the machine and fed from the storage area to the loading station in a substantially tension-free condition by a feeding mechanism.

It is also an object of this invention to provide an initial orientation means of the carrier to the drum or rotor which, in addition to the tension-free feeding mechanism, includes means to assure deformation of a substantially flat carrier segment into a configuration assuring easy assembling to the container, said orientation means including means for guiding the longitudinal side edges of the carrier in a desired direction, means for transversely engaging the carrier web, means engaging the center web of the carrier in a longitudinal direction, and means to reduce friction during expansion of the carrier, all for the purpose of assuring an accurate high speed, non-jamming feeding and orientation of the carrier on a drum member for high speed assembly of the carrier onto the cans.

More particularly, it is an object of this invention to provide a container carrier assembling machine, including a drum or rotor member having a plurality of relatively movable jaw members which receive the carrier and stretch same for telescopical assembly to a plurality of containers, said jaws being pivotally mounted to the rotor for tilting relative movement in a substantially circumferential plane, said tilting movement assuring accurate initial orientation of the jaw members to the apertured carrier strip having the aforementioned characteristic of a variable center distance between at least some succeeding apertures, said strip being fed to the rotor in substantially continuous infinite length form.

It is a further object of this invention to provide a quick, easy reel changing mechanism for loading a successive plurality of storage reels of can carriers to the storage area of the assembly apparatus without delay, said quick, easy reel changing mechanism, including means to pivotally drop the loading mechanism below the horizontal plane so that there is minimum of lifting of the rather heavy carrier reels.

Another object of the invention is to provide an automatic stop mechanism with the assembly apparatus to assure the shut "off" of the entire assembling apparatus just prior to the run out of a carrier reel supply, as well as the provision of means for quick, easy attachment of the trailing end of one carrier reel to the beginning of the next carrier reel supply.

It is still another object of the instant invention to provide a can storage area which has non-jamming storage can lanes of highest capacity consistent with non-jamming, said storage area also providing for original orientation of the cans, received in random array from the filling apparatus, into a plurality of parallel arrays for presentation to the assembly area.

Another object of the invention is to provide a distribution means for distributing containers emanating from a single procession source and diverting said procession in a manner to afford even distribution of the containers into a plurality of adjacent container storage areas, said distribution being in timed relation to the movement of the procession of containers.

A further object of this invention is to provide an apparatus which includes an improved mechanism for quick, positive, easy cutoff of the successive carrier units in reel form into discrete multi-pack units for later assembly into a case packer mechanism.

It is a further object of this invention to provide a new and improved handle inserting mechanism which inserts handles to a package "unit" and which is accurate, has a large capacity, is susceptible to high speed operation, has safety features associated therewith which prevents jamming, assures a positive feed of handles, and is otherwise well adapted to high speed assembly and long trouble-free operation.

While this invention will be discussed in terms of the assembly of container carries with beer cans and the like, it is to be expressly noted that this is to be considered illustrative rather than limiting. The novel features that are considered characteristic of this invention are set forth with particularity in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will be best understood by the following description of the specific embodiment when read in connection with the accompanying drawings, in which:

FIG. 1 is a front elevational view of the improved assembly apparatus;

FIG. 2 is a plan view, somewhat semidiagrammatic in nature, of the assembly apparatus shown in FIG. 1 and taken along lines 2—2 of FIG. 1;

FIG. 2A is a fragmentary sectional view along lines 2A of FIG. 1;

FIG. 3 is an enlarged fragmentary view, a portion being in section, taken along lines 3—3 of FIG. 2, said view illustrating the advancing mechanism for tension free feed of a reel of apertured, somewhat elastic, convolutely wound carriers into the loading area of a drum mechanism for later application to the containers in the assembly area;

FIG. 3A is a fragmentary perspective view of the roller mechanism shown in a portion of FIG. 3;

FIG. 4 is an enlarged fragmentary view of the can storage and initial orientation area of the appartus, said view encompassing and being an enlargement of the left hand portion of FIG. 2;

FIG. 4A (Sheet 6) is an enlarged fragmentary view of one of the can lanes in the storage area shown in the right hand portion of FIG. 4;

FIG. 5 is a front elevational view along lines 5—5 of FIG. 4;

FIGS. 5A, 5B, 5C are plan, front elevational and fragmentary sectional views, respectively of anti-jam can lane distribution means for association with the input end of the can lane storage means;

FIG. 6 is a view along lines 6—6 of FIG. 3 showing the carrier reel mechanism, said reel mechanism being shown in its alternate or "loading" position by dotted lines;

FIG. 7 is a fragmentary view along lines 7—7 of FIG. 6;

FIG. 7A is a view of a portion of a carrier strip that may be convolutely wound on the reel mechanism shown in FIGS. 6 and 7;

FIG. 8 is an enlarged fragmentary front elevational view, a portion being in section, along lines 8—8 of FIG. 2, illustrating the driving mechanism and a portion of the cam mechanism for the carrier applying rotor or drum;

FIG. 9 is a fragmentary perspective view of a feed roll adjacent to the loading area of the rotor;

FIG. 10 is a fragmentary view along lines 10—10 of FIG. 11, illustrating, somewhat semidiagrammatically, the general relationship of the parts of a subassembly which makes up an individual carrier applying jaw mechanism and its cooperation with the expansion cams;

FIG. 11 is a sectional view of the rotor or jaw drum mechanism taken along lines 11—11 of FIG. 8, the series of rollers shown at the top of FIG. 8 being omitted for purposes of pictorial clarity, and only two complete subassembly carrier applying jaw mechanisms being shown at the upper and lower extremities of the rotor drum, the



relative position of some other cam roller members coacting with the return cam member being shown semidiagrammatically;

FIG. 12 is a fragmentary elevational view along lines 12—12 of FIG. 13, several subassemblies of carrier applying jaw mechanisms being omitted;

FIG. 13 is a fragmentary sectional view of the jaw drum mechanism along the lines 13—13 of FIG. 11;

FIG. 14 is an enlarged perspective view of the carrier applying expanding jaw subassembly, shown in FIGS. 8 through 13 and FIGS. 15 through 18 inclusive;

FIG. 14A is an enlarged fragmentary section view through a lip of a carrier applying shoe;

FIG. 15 is a vertical sectional view taken along lines 15—15 of FIG. 11, illustrating the cam mechanism for actuating the means for orienting the transverse web of the carrier, and, also, the coaction of the longitudinal carrier web orientation members with a plurality of roller members which, together as a unit, form the center web orientation means in a longitudinal direction of the carrier;

FIG. 16 is an enlarged fragmentary semidiagrammatic view along lines 16—16 of FIG. 15, illustrating the progressive coaction of the carrier applying jaw members, with the relatively flexible carrier member and the orientation thereof on the individual jaw members;

FIG. 17 is an enlarged fragmentary view along lines 17—17 of FIG. 16;

FIG. 18 is an enlarged fragmentary view along lines 18—18 of FIG. 16;

FIG. 19A is an enlarged semidiagrammatic fragmentary view, showing the relative movements of a can and a rotor mounted jaw member for application of the carrier mounted on the jaw member to the can;

FIG. 19B is an enlarged fragmentary view of the starwheels and their coaction with the cans to position them, just immediately prior to the application of the carrier thereto;

FIG. 20 is an enlarged sectional view of the drive mechanism for the starwheels, conveyor belt and rotor, as taken along lines 20—20 of FIG. 2;

FIG. 20A is a semidiagrammatic plan view of the drive mechanism for the apparatus;

FIG. 20B is a view along lines 20B—20B of FIG. 2;

FIG. 21 is an enlarged fragmentary sectional view taken along lines 21—21 of FIGS. 1 and 25, illustrating the mechanism for controlling, segregating and timing discrete units of six packs from a continuous strip, such that the carrier web therebetween is placed under tension to facilitate the cutting thereof, and to orientate and positively control the movement of assembled six pack, relative to the handle inserter mechanism;

FIG. 22 is a fragmentary sectional view of the driving mechanism, shown in FIG. 21 and taken along lines 22—22 of FIG. 21;

FIG. 23 is a fragmentary view along lines 23—23 of FIG. 21, showing the relative relationship between a spreader block and a can and the mechanism to prevent the cans from tilting during the cutoff and handle inserter operation;

FIG. 24 is a fragmentary end elevational view along lines 24—24 of FIG. 36, showing the depending members which are adapted to insert the handle into an assembled carrier and cans;

FIG. 25 is a sectional view along lines 25—25 of FIGS. 1 and 2 illustrating the cutoff and handle inserter mechanism for one of the discharge lanes emanating from the initial assembly area of the machine;

FIG. 26 is a vertical sectional view along lines 26—26 of FIG. 37 showing the magazine for storing the handles, the handle inserter mechanism and a portion of the cutoff knives for cutting off the preassembled cans and carriers into discrete six packs;

FIG. 27 is a semidiagrammatic view of the upper portion of FIG. 39, illustrating the relative position of the

parts of a portion of the handle inserter mechanism, the position of the crank being position 27 in FIG. 32;

FIG. 28, is a view similar to FIG. 27, showing the relative position of the parts when the crank is in position 28, shown in FIG. 32;

FIG. 29 is a view similar to FIGS. 27 and 28, showing the relative position of the parts when the crank is in position 29, shown in FIG. 32;

FIG. 30 is a semidiagrammatic view similar to FIGS. 27 to 29, showing a successive position of the parts as illustrated in FIG. 32, as position 30;

FIG. 31 is an enlarged fragmentary plan view, showing the characteristics of the can mechanism used in the portion of apparatus, shown in FIGS. 27 to 30 inclusive;

FIG. 32 is a semidiagrammatic picture, in line form, illustrating the relative position of the individual jaw members for engaging the handle members, relative to the position of the crank, as shown in FIGS. 27 through 31 inclusive;

FIG. 33 is an enlarged fragmentary view along lines 33—33 of FIG. 31, showing the cutoff knife for positively cutting off the connecting web portion of adjacent arrowheads of a rack of carrier handles;

FIG. 34 is a view along lines 34—34 of FIG. 35, the cam surfaces for actuating the handle inserter mechanism in the cutoff assembly being shown in dash lines;

FIGS. 34A and 34B (next sheet) are sequential views of the parts shown in FIG. 34;

FIG. 35 is a fragmentary sectional view taken along lines 35—35 of FIG. 25;

FIG. 36 is an elevational view of a portion of a handle inserter magazine mechanism, said view along lines 36—36 of FIG. 35;

FIG. 37 is a front elevational view of the handle magazine mechanism, said view being taken along lines 37—37 of FIG. 25;

FIG. 38 is a fragmentary sectional view taken along lines 38—38 of FIG. 39;

FIG. 39 is a top plan view of the magazine mechanism, the handle racks being removed, taken along lines 39—39 of FIG. 37, the mechanism being shown in an actuated position;

FIG. 40 is a fragmentary perspective view of the type of handles, in rack form, that are adapted to be contained within the handle magazine, as shown in FIG. 37, and inserted by the apparatus for association with the carriers to form a package, as shown in FIG. 41;

FIG. 41 is a perspective view of a finished six pack which has been assembled into the completed package relationship shown, the handle having been added thereto by the mechanism shown in FIGS. 21 to 45 of the drawings;

FIG. 42 is a fragmentary sectional view of the handle inserter mechanism, taken along lines 42—42 of FIG. 39;

FIGS. 42A, 42B and 42C are sectional views of the parts shown in FIG. 42 in sequential relationship;

FIG. 43 is a semidiagrammatic plan view, a portion being in section, similar to the view shown in FIG. 39, the parts being positioned in the nonactuated position, and the handles being removed from the magazine;

FIG. 44 is a sectional view through the base of the magazine portion along lines 44—44 of FIG. 43;

FIG. 45 is a fragmentary sectional view taken along lines 45—45 of FIG. 39, showing the relative position of the parts when in an actuated position; and

FIGS. 46, 47 and 48 are enlarged fragmentary views of the handle application needles, used in the handle inserter portion of the apparatus.

Before discussing the entire apparatus 50 in detail, it would appear to be beneficial to discuss the major functions of the apparatus 50 and the products which are assembled thereby. The apparatus basically comprises a means for high-speed assembly of containers, or other articles, to a carrier means, segregating the assembled carriers and containers into units such as six packs, and, when desired, adding transporting means in the form of a handle to the package.

More particularly, the apparatus 50 is inherently well suited to be used as an attachment to a conventional container filling and closing machine, indicated in dot-dash lines on FIGS. 4 and 5 of the drawings, to receive a procession of filled and closed containers 64 and to assemble these containers or cans 64 into a package or packs of six (or any other desired size) 62, as shown in FIG. 41. The apparatus 50, as shown, comprises the following functional areas, namely, a storage and entering area 52 which applies to both the containers 64 and the carriers 68, an assembly area 54 which, in a sense, is downstream of the storage and entering area 52, and a unitizing and handle inserting area 56 where the packages are separated into discrete units and a handle, such as 70, is applied to the package 62. The finished products leave the discharge area 58 of the apparatus 50 and are further assembled into case lots and/or are otherwise taken to market as they "are," whichever is the more suitable and is desired.

As can be seen in FIG. 41, the containers 64 are held together by an apertured carrier 68 which is telescopically mounted on containers 64, the beads 66 of the individual containers preventing removal of the carrier. As shown, each individual pack is provided with a carrying handle 70. It is a well recognized fact that in the retailing of many commodities, which are packaged in containers and sold to consumers who usually buy more than one container at a time, many merchandising advantages are gained by assembling the containers into the packs convenient for carrying. Canned beer is one of the most common examples of a commodity supplied to retailers in multi-packs, ready for carrying. Ordinarily, the individual containers which contain the beer are common "tin cans," cylindrical in form, which have radially protruding beads 66 at opposite ends thereof.

Hence, for the purposes of illustration, it is assumed that the previously mentioned container filling and closing machine 60 is a typical machine, such as that used in a brewery, to produce and discharge a procession of cylindrical, beaded cans 64 filled with beer. However, it is to be recognized that this apparatus 50 is usable with many other containers of diverse natures, configurations and usages, and is not limited to use with only containers of the disclosed form. Hence, the discussion of this apparatus in terms of containers, and, more particularly, in discussing the apparatus in connection with beer cans, is to be considered illustrative only.

The apparatus attachment 50, provided by this invention, is particularly well suited to a very high-speed assembling of the cans 64 (as many as 1,200 cans per minute) issuing from the machine 60 with the apertured elastic carriers 68, previously mentioned, which, as shown, have the general construction illustrated in the Poupitch Patent No. 3,874,835. These individual carriers 68 are formed of a rather thin, tough and somewhat elastic material, such as polyethylene. The particular carriers 68, shown in FIGS. 7A, 16 and 41 and used with a high-speed assembly apparatus 50, are designed to hold together packages of six cans, arranged in adjacent rows of three cans each as shown. For this reason, each individual carrier has a somewhat rectangular over-all form and is apertured to define six container receiving apertures 72, arranged in two rows of three apertures each. It should be noted at this juncture that, while the apertures 72 of each individual carrier 68 as a unit, have the same center line dimension therebetween, the dimension of the last aperture of a carrier unit, relative to the first aperture of the next succeeding carrier unit are spaced apart a greater dimension than the internal apertures of the unit.

Stated another way, the distance between the center line of aperture 72 and 72*a* (of FIG. 7A) and the distance between aperture 72*a* and 72*b* are different, the latter dimension being larger than the former. The reason for this particular structure is set forth with more partic-

ularity in the aforementioned Poupitch patent. However, for the instant purpose, it is sufficient to say that a uniform width of band surrounding the outermost cans of a six pack, is desired and a closer spacing of adjacent cans, within a six pack, is desirable, to make a complete package in an economical manner that has the requisite compactness, qualities and desired mechanical strength.

It will be noted that the individual apertures 72 are somewhat smaller than the cans 64 which they are adapted to receive. As shown, the apertures 72 are somewhat elongated along the length of the carrier.

Each carrier 68 is substantially flat in its undistorted state, as shown in FIG. 7A. The opposite longitudinal edges and the opposite end edges of each carrier 68 (as shown in FIG. 41) are undulated, in the strip form, to leave only a rather narrow flat band of material 74 bounding the side portions of the respective apertures 72. A central web portion 76 of the carrier extends between the adjacent apertures 72 and 72*a*.

Preferably, the carriers 68, as manufactured, are joined together at adjacent ends by connecting webs 78, as shown in FIG. 7A, to form a continuous strip of carriers, which are supplied in roll form, for feeding into the apparatus 50 in a manner to be later described. Actually, the two webs 78, adjoining adjacent ends of adjacent carriers 68, are very narrow and are little more than junctures between the band portion 74 bounding the end apertures such as 72*a* of adjacent carriers. However, this dimension, as aforementioned, is greater than the web portion between adjacent apertures within a single six pack.

The rather short extent of the carrier adjoining webs 78, together with the narrow form of the marginal edge portion 74 of the carrier bounding the end apertures 72*a* defines between the adjoining ends of the adjacent carriers a somewhat diamond opening 80, having concave sides as shown. The pertinence of this opening 80 between adjoining carriers 68 means that only a short portion need be cut from between adjacent carriers of a strip of carriers to form the individual carriers. Also, in certain forms of carriers, where a "tear" strip is desired (not shown), the area of this opening 80 is used for the pull tab of the tear strip.

Two spaced openings 82, usually arranged on the center line of the carrier, in the central web portion 76 of each carrier 68, are adapted to receive opposite ends of a carrying bail or handle means 70, inserted by the apparatus 50 in area 56, as will presently appear.

The interconnected plastic carriers are supplied in rolls for use in the machine or apparatus 50 and the particular machine 50, illustrated in the drawings, is a duplex machine which is symmetrical and, in certain respects, is similar to two single machines placed side by side which are independently operable. It will, thus, be appreciated that, while the following discussion on many occasions will relate to only one-half of the apparatus, the other half of the apparatus is substantially identical except where right hand and left hand considerations apply. The advantages of having dual apparatus includes space considerations, single prime mover, etc., as well as a capacity relationship to the container filling apparatus. It should, also, be recognized that carriers could be provided in stacked form pre-severed, as is shown in O. J. Poupitch's Patent No. 2,929,181.

*Storage and Entering Area*

The storage and entering area 52 of the apparatus 50 provides for the storage of the filled containers emanating from the filling machine 60, the storage being compatible with the capacity necessary for the system. It, also, provides for initial orientation of the cans which are received in random array from can distribution means 1026, so as to present them in generally parallel array to the feeding mechanism which comprises a part of the assembly operation, to be later described. Further, the area includes the mounting means for a reel of carriers adapted for quick changes to new reels when a first reel has been emptied by application to containers by the apparatus. In addition, the storage and entering area has associated therewith means for initial orientation of the carriers, preliminary to assembly on the container in the assembly area. Provided on the mounting means is electrical interlock means for stopping the apparatus when a carrier reel is consumed by the apparatus. Of course, the storage and entering area 52 also provides a means for moving the carriers and the cans toward the assembling area and, thus, has the requisite means for driving the transporting means, so as to accomplish this function.

Turning now, more specifically, to the means for storing, transporting, orientating in a gentle fashion, the cans emanating from a filling and closing machine 60, and transporting same to the assembly area 54, a first conveyor means 86, in the form of an endless metallic mesh or endless plastic belt, is suitably powered by a drive means, to be later discussed, and constantly carries the cans towards the assembly area 54 of the apparatus, which is located downstream from a flow diagram consideration and to the right as viewed in FIGS. 1 and 2. The conveyor belt 86 is suitably mounted on appropriate spaced frame members 88 which supports the driving means and rollers for the belt and members 88 and, also, supports the elevated spaced can lane members 90 to 93 inclusive.

The frame members 88 are in turn mounted in an elevated position, relative to the floor by suitable legs or supports 96, and the space lanes 90—93 are supported in a cantilever manner, slightly above the belt 86, by a plurality of spaced crossrods 98, which, in turn, are mounted on vertical risers 100. The risers 100 are fixedly attached to the frame members 88, by welding or the like, and are rather sturdy in construction.

In order to have continuous operation of the assembly apparatus 50, independent of a momentary shutdown of the filling machine, it is desired that there be a storage area 102 to provide a reservoir for cans coming from the container filling apparatus 60. This handles not only the momentary shutdown of the filling apparatus 60, but is adapted to intermittent can supply sources of various kinds and allows a flexibility of operation of the apparatus 50. The major problem to be considered in this storage area is the movement of the cans rather rapidly into their assembly position from the reservoir 102 and in a manner such that there is never a bridging or jamming relationship of the cans in the reservoir system.

In most instances, it is desirable to have a distribution means 1026 interposed between the filling machine 60 and the entering end of the can storage means or reservoir 102. Most filling machines 60 produce a single line of cans 1028, as shown in FIG. 5A (left hand portion of the drawing). So that high-speed distribution of cans to the various can lanes of the reservoir system may be conveniently accomplished, the distribution means 1026 may be conveniently attached to the entering end of the lanes, and, to this end, the extreme outboard lane members 90 may be extended. Short extensions 1030—1032—1036, are attached to the input ends of the can lanes, shown in FIG. 4. The remainder of the mechanism and its operation will be described after the description of the rest of the apparatus. For the present, suffice it to say, that the distribution means 1026 affords a continual loading of the four can lanes in an even and non-jamming manner, said distribution means being well adapted for high-speed operation.

It has been determined that cylindrical cans will not bridge or jam, even when travelling at relatively high speeds, when the dimension between the two sides defining the can lanes are kept at a predetermined dimension A. (See the right hand portion of FIGS. 4 and 4A.) The dimension A is arrived at by taking three containers 64, placing the containers in an equilateral triangle re-

lationship, and then making sure that the dimension A is always less than the hypotenuse of such an equilateral triangle. Stated in mathematical terms, the dimension A must always be less than 1.866 times the diameter of the can. Reference to FIG. 4A of the drawings will show that the dimension A between can lanes **90** and **91** must be less than the diameter *d* of a can, plus the dimension *y*. This means that A equals less than 1.866*d*, and the dimension A must always be just less than 1.866*d* for greatest capacity, while maintaining a non-jamming relationship of cylindrical containers. If the dimension A is equal to or greater than 1.866*d*, then a rolling action between adjacent cans and the sidewalls becomes impossible, since sliding action has to occur at these dimensions when the containers are in contact with one another. For use with beer cans having a bead diameter of 2.680 inches, an inside dimension of a can lane dimension of exactly five inches will give maximum capacity in the storage area, eliminating all jamming relationships of the cans. The length of the storage area **102** (wherein the dimension A is maintained substantially constant) is a function of the capacity of the storage area desired and may be varied.

On the downstream or outlet side of the storage area **102** of the can lanes, is a tapered lane area **104** in which the sidewalls **90—93**, producing the can lanes, converge to reduce the cans into a single can procession. This occurs just prior to the cans approaching the assembly area **54**, the single lane area being denominated **106**. A "no can" detector mechanism, in the form of a pivotally mounted lever arm **103** (FIG. 5), is positioned in each can lane and is biased, so as to actuate a suitable switch **105** which is operable to shut down the apparatus **50** in the event that no can is available to restrain the lever arm against its bias. The switch **105** is so arranged as to allow the apparatus to start up again, as soon as more cans fill the lane.

A "down can" detector mechanism for each can lane is provided and is in the form of a switch actuator lever arm **107** projecting through a suitable slot **109** in the outboard sidewalls of the can lane members, such as **90** and **93**, for actuation of a switch **111** which is operable to shut down the apparatus **50**. The slot **109** and actuator **107** are disposed so as to be above the conveyor belt **86**, a distance greater than the diameter of a can. It will be appreciated that a can in vertical position will restrain the lever arm **107** against its bias and a "down" can will allow the switch **111** to actuate and then shut down the apparatus **50** until the condition is corrected by the operator. It will be noted that immediately adjacent the output end of the tapered area **104**, a second conveyor means **108**, travelling at a predetermined speed, continues to move the procession of cans **64** toward single lane area **106** and toward the assembly station **256**, the assembly station and the precise positioning means for the individual cans as well as the offset area of the can lanes, to be later described. The first conveyor means **86** is preferably driven at a higher speed than the speed of the second conveyor means **108** to provide a constant bias to the can procession of the single lane area **106**.

Carrier storage means **110**, in the form of a reel assembly, is located above the junction of the can storage lane area **102** and the tapered can lane area **104**, and is suitably mounted on the side frame members **88**, as shall now be described. More particularly, a pair of spaced vertical bracket members **112** are fixedly mounted to the side frame member **88** to mount a pivot shaft crossrod **114**. Mounted on the crossrod are a pair of vertically extending plates **116** (inner) and **118** (outer), which are spaced by a bearing block **120** having depending lugs thereon for pivotally mounting the reel assembly, for purposes to be later described. On the upper end of the plates **116—118** is an electrical clutch assembly **122** which surrounds a through spindle **124**. On the inboard side of the plate **116** (to the right in FIG. 6) is a hub assembly **126**, comprising a reel backing plate **128**, an enlarged cylindrical hub member **130**, and retaining means **132**, for releaseable retention of a reel of carriers, to be described more particularly hereinbelow. The inboard end of the spindle **124** has mounted thereon a cam follower **134**, which is supported in the rest block **136** for rotatable movement therewith. The rest block is in turn supported by suitable vertical support member **138** which, in turn, is mounted on a cross angle iron member **140**, the end of which is attached to vertical riser **112** before discussed.

Returning now to the hub assembly, it will be appreciated that the carriers, as disclosed, are supplied in reels containing thousands of integrally connected carriers. The carriers are conveniently packaged by having two sideplates which keep the reel of carriers in axial alignment. A central aperture in the reel sideplates (cardboard or the like) forming the framework of the reel of carriers, is of sufficient dimension to be easily placed on the large cylindrical hub member **130**. As can be seen in FIG. 6, the backplate **128** is arranged with a plurality of sharp protruding lugs **142** which impinge upon and penetrate the relatively soft cardboard side member of the carrier reel, to prevent relative rotational movement to the hub member **130**.

The retaining means **132**, on the inboard side of hub member **130**, comprises a pair of short block members **144** which are pivoted at one end **146** and having manual knobs **148** on their free ends. Intermediate the length of the blocks **144** is a cutout portion **150** which is slightly larger than the spindle **124** which they surround. When the carrier reel is inserted over the cylindrical member **130**, the blocks **144** are moved to a horizontal and parallel position (see FIG. 7 of the drawings), so as to bring the end portions with the knobs **148** thereon, within the confines of the diameter of the hub **130**. After the reel is mounted on the hub member **130**, the members **144** are pivoted outwardly to engage the cardboard sides of the carrier reel to retain same fixedly engaged with the sharp protuberances or lugs **142** on the backplate **128**. This assures that the carrier reel will be keyed with the movement of the spindle **124**.

It will be noted that the inner panel member **116** has a handle means **150** mounted at the top end thereof, so as to facilitate pivotal action by an operator of the entire carrier reel mechanism to the position shown in dotted line in FIG. 6. An angular rest member **152** is mounted at one end to plate **88** and is supported near its free end by a suitable leg **154**. The member **152** is disposed at an angle of approximately 50 degrees to aid in the handling of the reels of carriers for loading thereon. It will be noted that the plate member **152** has a cutout, near its free end, to receive the bearing end of the spindle **124**. A spring loaded flip lever, or a latch member **156**, shown in FIG. 3 of the drawings, may be used to latch the carrier mechanism in the upright position shown by engagement with the inner panel member **116**. The latch member **156** may be mounted at the top of a riser **112** and on cross member **140**.

As shown in FIGS. 1, 3 and 6 of the drawings, the carrier reel storage means **110** is so arranged on the hub that the carriers are taken off in continuous strip form, preferably from the top of the reel, and are fed to the assembly area **54** through a feed mechanism which will now be described. As will later be apparent, it is important that the carrier strips be fed into the assembly area in substantially "tension free" condition, this being important because of the perforated design of the carriers and the elastic nature of the material from which they are made. Means are provided, also, which automatically senses the end of one reel, so that the machine is not run without carriers being applied to the cans.

The mechanism for advancing the carriers and feeding same into the assembly area is best shown in the upper left hand corner of FIG. 3 and in FIGS. 2A, 8 and 9,

and denominated with the reference numeral **158**. It includes a plurality of rollers and orientation means, as well as an advancing roll member. As the carrier comes off of the top of the reel, it passes over a first roller **160** which is suitably mounted to frame member **224** for rotation about a suitable anchored pivot point. A second roller **162** is mounted directly behind roller **160** on a bellcrank lever **164** which is pivoted at **166**, as is best illustrated in FIGS. 3 and 3A of the drawings. The bellcrank lever arm **164** is counterweighted by a suitable weight **168** which is located on an extension arm **170** which may be threaded or otherwise adapted for adjustable selective movement of the counterweight **168** thereon. The counterweight is so set, relative to the weight of the roller **162**, that the absence of tension on the carrier strip coming from the reel will cause roller **162** to move downwardly so as to impinge upon a switch **172** to shut off the entire apparatus **50**. The roller **162** acts as a means for sensing an insufficient supply of carrier strip on the reel sufficient to give tension to the span between the reel and the advancing means **180**. Thus, automatic means are provided to control operation of the apparatus when the carrier reel is used up, broken, etc.

A third roller **174** is located immediately adjacent the second pivotable roller **162** and serves as an orientation means for the carrier strip to guide the strip onto a substantially flat sheet metal trough **176**, the output end of which is adjacent a spool roller **178**. Rollers **174** and **178** orientate the carrier for the advancing means **180** now to be described and prevent axial misalignment of the strip.

A power driven advancing means **180** for the carrier strip comprises a rotatable shaft **182** which is driven by a sprocket **184** at the end thereof. The sprocket **184** is in turn, powered by the central drive means as shall be later explained. Mounted for movement with the shaft **182** is a drum **186** which has thereon a plurality of spaced pivotally mounted through shafts as shown in FIGS. 2A and 3. The shafts **188** are circumferentially spaced from each other approximately the same dimension as the center line dimensions between any two internal apertures **72** on a carrier unit in its non-distorted condition.

The shafts **188** are pivotally mounted relative to the drum and fixed on each shaft are a plurality of pins **190** (a pair) which extend through spaced slots **192**, which are formed in the cylindrical curvilinear surface **194** of the drum, as shown. A lever arm **196**, in the form of a bellcrank, extends from the ends of each of the shafts **188** and are mounted thereto for moving the latter in response to the spatial position of the shafts **188** on rotating movement of the drum. The bellcranks **196** have on the end, thereof, roller members **198**, in the form of cam followers which engage cam **200** to move cranks **196** and, hence, shafts **188**. The bellcranks **196** are biased into engagement with the fixedly mounted cam **200** by suitable tension springs **202**. Thus, as the shaft **182** is rotated by the sprocket **184**, the drum member **186** rotates therewith and the pins **190** are moved relative to the surface **194** and within the slots **192** for reasons about to be explained.

The drum **186** and, hence, the pin members **190** are rotated in a manner to pull the carrier strip from the carrier reel against the bias of the electric clutch brake **122** or other suitable means for giving the same function. The clutch brake **122** prevents overrun on the carrier reel and, also, keeps a constant tension on the carriers as they are pulled from the reel. The pins **190** have a relative position in the slots **192** and on the periphery of the drum as determined by their relative relationship to the cam **200**. Since the cam **200** is fixed, it will be apparent that the movement of the pins **190** in the slots will be a function of the position of the drum. Thus, when the cam follower **198** is on the smaller part of the cam **200** (for example, the lower half) the pins **190** have an almost radial position with respect to the axis of the drum, and are adjacent to the trailing edge of the slot **192**. It is while in this relationship and at a position of approximately 50 degrees (in a clockwise direction, as shown in FIG. 3) that the pins are inserted within the apertures **72** of the carrier strip which are, thus, trained thereon. As the drum **186** rotates, the pins **190** are advanced relative to the periphery **194** of the drum by the cam and rollers **198** which cause the bellcrank lever to rotate the pins in the direction of movement, so as to increase the distance between the successive pairs of pins **190** as measured peripherally on the drum **186**. The pins **190** on the drum cause the carrier strip to advance for feeding into the loading station **254**, but it is important to note that the major pulling of the carriers from the reel is done by the advancing means **158** in a manner such that the carrier is presented to the assembly area and substantially tension free condition. The relative movement of the pins **190** on the drum assures accurate fast feeding of the carrier strip, independent of the fact that there is a dimensional variation between the center line distances of certain apertures which succeed one another in a strip of interconnected carriers, as aforedescribed.

It will be noted that located immediately below the feed drum **180**, as shown in FIG. 3 of the drawings, is a sheet metal trough member **204** which receives the carrier from the feed means **180**. The trough **204** is canted at an angle to vertical as shown and the carrier strip is trained on the pins **190** of drum **180** in such a manner that a substantial amount of slack between the last pins **190** on the drum that are in contact with the carrier as the drum is rotated and the supply station **254** (the point of application to the carrier strip to the carrier applying elements on the rotor to be later described). As the carrier strips leaves the drum **180**, it passes over a driven roll **206** which orientates it to a grooved driven feed roll **208** having spaced parallel grooves therein to be described later. The driven roller **206** is mounted on shaft **205** having sprocket **207** on the end thereof and by these means, the carrier strip is passed up the trough **204** in a generally tension-free condition, and is correctly aligned by the spool-like grooved roller **208** for orientation, thereof, on the carrier applying elements.

*The Assembly Area*

The assembly area **54** of the apparatus **50** is essentially concerned with the alignment and orientation of carrier strip on the carrier applying means at a loading station **254**, remote from the actual point of assembly to the cans (see FIG. 8); the expansion of the apertures in the carrier strip to a size greater than the cans; the orienting of the cans in a correct position for assembly with the carrier strip, the placing of the carrier apertures in telescoped relation to each of the cans at the assembly station **256**; the removing or stripping of the carrier strip from the carrier applying elements; and the accomplishment of all of the foregoing in a trouble-free, repetitive operation at very high speeds.

As shown in the drawings and as aforediscussed, the cans arrive at the assembly station **256** in parallel groups of two from the lane **106** and are moving toward station **256** on conveyor **108** at a predetermined speed. The precise means and relationships necessary for positioning the cans, relative to the carrier applying elements, will be discussed later. The moving strip of carriers are moved relative to the procession of cans by a succession of carrier applying means **212** in the form of jaw block subassemblies (see perspective view FIG. 14), each one of which are pivotally mounted on a rotor **214** which in turn is rotatably mounted on a fixed shaft **220** on spaced disc members **216—218** (see FIG. 11). As will be later discussed, the carrier applying means **212** are circumferentially spaced from each other about the periphery of the rotor **214** which conforms generally to, but not exactly with the spacing of the apertures in carriers **68**.

As shown in FIGS. 8 and 11, the rotor **214** essen-

tially comprises a pair of axially spaced support discs 216—218 which are mounted for rotation on a fixed shaft 220. The shaft 220 is supported at opposite ends by vertical side frame members 222—224 and is keyed thereto in the conventional manner, as suitable and desired. Means for rotating the discs 216—218 is provided by a short rotatably mounted drive shaft 225, which mounts a suitable gear member 226 on the outboard side of frame member 222 to drive said shaft. Another gear member 228 is mounted on the inboard end of shaft 225 for rotation of gear member 230 which rotatably surmounts shaft 220. The gear 230 is fixed to and drives the disc member 216 which in turn drives the disc member 218 through the mounted successions of jaw subassemblies 212, as will be apparent. It is obvious that a hub member 232, shown in the form of a bearing for disc 218, may be a driven member if desired.

The carrier applying means 212 are successively arranged around the periphery of the discs, as shown in FIG. 13, a single one being shown in perspective view in FIG. 14, and which shall now be described in detail. The carrier applying means or jaw subassembly 212 essentially comprises a set 234 of two pairs of opposed aperture expanding shoes (235—238), each shoe of a pair of shoes being substantially a mirror image of the other shoe in the pair, as shown in FIG. 14. Support means for each set of shoes 234 is provided in the form of a rather husky rectangular block member 240, which serves the various functions of maintaining the discs 216—218 in correctly spaced relation, providing a force transmitting connection for driving disc 218 from disc 216, and, also, serves as a sliding support for the bases 246 of each of its individual shoe members (235 through 238 inclusive) which is movable along the block member 240 in a manner to be hereinafter explained. The support blocks 240 are fixedly mounted to enlarge disc shaped pivot block members 242—244 by suitable threaded members, such as 243, and the pivot block members 242—244 are formed with enlarged flanges 245 and suitable grooves, which serve to pivotally mount the entire jaw subassemblies 212 to the rotor discs 216—218 respectively, for relative movement thereon. The base 246 of each shoe (235–238 inclusive) supports a carrier aperture expanding and deflecting lip portion 248 (see FIG. 14A) which flares radially outwardly and has a generally arcuate shape, as viewed from its radially outward end (see FIG. 16). The lips 248 are relatively thin and the general form of the aperture expanding lips 248 may be aptly described as quadrants of a truncated cone which diverges radially outward.

As shown in FIGS. 16 through 18, each lip 248 defines an external carrier engaging surface 252, formed as a segment of a truncated outwardly diverging cone having a peripheral width (as measured relative to the rotor periphery) less than that of the peripheral portions 74 of the carrier strip apertures 72, as previously described. It will be noted, as shown in FIG. 14A, that each shoe is preferredly covered with an anti-friction means, for example, a very low co-efficient of friction material, such as is sold under the trade name "Teflon" for purposes to be explained .

The two aperture expanding shoes (for example, shoes 237 and 238) of each pair of carrier applying elements, are moved toward each other to permit the associated expanding lips 248 to be inserted into a carrier aperture 72 and are moved away from each other to expand the carrier aperture automatically, as an incident to rotation of the rotor 214, as will presently appear. Thus, each pair of shoes making up a set 234 of shoes are generally separated to their fullest or widest degree as the shoes approach the can and carrier assembly station 256 by a rotary movement of the rotor 214 (see FIGS. 8, 13 and 15). The opposed shoes in a pair are moved back into closest proximate relation to each other, as they are carried from the assembly station 256 (the bottom of the rotor 214, as viewed in the drawings) by movement of the rotor 214 to the carrier supply or feeding station 254 (at the top of the rotor). As shown, the carrier supply, or loading station 254 is spaced circufmerentially around the rotor from the assembly station 256, a distance of more than 180 degrees measured in the direction of rotation of the rotor 214. The mechanism for moving the shoes 235—238 to accomplish the above shall now be described.

Means for expanding the shoes 235—238, upon rotation of the rotor 214 (the bases 246 of said shoes slidingly riding on support block 240), is provided by two pairs of shoe operating rods 260—262 and 261—263, respectively, which are slidably mounted at opposite ends, in the pivotally mounted disc members 242—244. The rods 260 through 263 extend transversely across the rotor 214 in outwardly spaced, parallel relation to the support blocks 240, and extend through the base 246 of each individual shoe 235 through 238, as shown in FIG. 14 of the drawings. The rods each movably extend completely through the discs 242—241 and, thus, beyond sideplate or rotor discs 216—218 to connect with operating blocks 264—265, which mount cam followers 266 for respectively moving the rods 260—263, as shall appear. The cam followers 266 are mounted for individual engagement with fixedly mounted cams 268 and 270, adjacently positioned to each of the disc members 242—244 (see FIGS. 11, 12 and 13). It will be seen that the cams 268—270 are (when considered as a unit) generally annular and surround the rotor 214 in concentric relation at opposite ends thereof, the return cam 270 (FIGS. 11 and 12) serving to move the blocks 264—265 in a diverging relation and expanding cam 268 serving to move the blocks 264—265 in a generally converging relation. Thus, the cams 268—270 are shaped to move the cam followers 266 progressively towards each other as the followers are carried by the rotor 214 from the carrier supply station 254 to the assembly station 256. The return cams 270, as best shown in FIG. 11, are mounted on a transverse base 272 which, in turn, is mounted on members 222—224 and are so arranged so as to positively return the blocks 264—265 to the same position they were in at the assembly station 256 (see FIGS. 11 and 13). Cams 268 may be directly mounted on the respective vertical members 222—224, as shown.

The movement of the followers 266 and, hence, blocks 264—265 toward each other is transmitted through the rods 260—263 to move the two shoes of each associated pair of shoes away from each other and to return them together in appropriate relation to movement of the rotor. For this purpose, the pair of rods 261 and 263 are pinned to block 264 by suitable pins 278 and 280 and rods 260 and 262 are freely movable within through apertures 274 and 276, which extend through the block 264. On the other hand, block 265 is pinned to rods 260 and 262 by suitable pins 284 and 282 and rods 261—263 are freely movable in suitable through apertures in block 265. The individual shoes, such as 235 and 237 are fixed to rods 260 and 262 by suitable means, such as pins 288 for movement therewith, and shoes 236 and 238 are fixed to rods 261 and 263 for movement therewith. Also, rods 260 and 262 pass freely through shoes 236 and 238, whereas rods 261 and 263 pass freely through shoes 235 and 237. Thus, the shoes in each pair move toward and away from each other, in response to movement of the blocks 264—265.

In order to assure high-speed orientation of the carrier strip on the rotor 214, a plurality of orientation means are provided to assure positive and controlled orientation of the carriers on successive sets of shoes. The orientation means includes a special feed roll means 208, means for deflecting the opposite longitudinal side edges of the carrier strip into correctly orientated relationship to the shoes 234, means for assuring that the central portion of the carrier web is correctly orientated on the shoes; means for tilting the individual jaw subassemblies 212, relative to their normal position on the rotor 214, to assure positive entry

of the sets of shoes thereon, within the carrier strip apertures (having variable center lines therebetween); means for assuring that the transversely aligned portion of the carrier web between successive sets of shoes is correctly orientated; and means for reducing friction between the margins of the carrier apertures and the lips of the shoes 235—238.

Turning now to the feed roll means 208, it essentially comprises a rotatable driven spool-like member mounted on shaft 290 having a sprocket 291 on the end thereof. A pair of raised sidewall end portions 292—294, as shown in FIG. 9 of the drawings, contains the carrier strip and prevents misalignment thereof. A pair of spaced grooves 296 and 298 in the central part of the spool have a depth greater than the height of the lip portion 248 of the carrier applying shoes 234, which are adapted to extend so as to have each one of side by side spaced pairs of a set of shoes pass therewithin, as the rotor 214 moves the jaw subassemblies 212 thereby. This relationship is shown in FIGS. 8 and 9 of the drawings.

As aforementioned, the carrier strip has variable center dimension between the end apertures of adjacent carriers and the dimension of the internal apertures of a single carrier. To assure that the successive pairs of shoes will fit within successive apertures of a strip of carriers independent of their orientation along the length of the strip, the shoe sets 234 mounted on the subassemblies 212 are preferredly tilted, relative to a radius of the rotor 214. More particularly, as shown in FIG. 14 and FIG. 11, the spacer blocks 240 have fixedly mounted thereto and at an angle therefrom an arm 300 which mounts on the free end thereof a cam follower 302. The angular relationship of the arm 300 is best seen in FIG. 8 of the drawings. The cam follower 302 is adapted to ride in a cam track 304, which is fixed to shaft 220 by a suitable pin 306 (FIG. 11). Thus, upon rotation of the rotor 214, the carriers applying subassemblies 212 are pivoted on pivot disc members 242—244, relative to rotor side discs 216—218 by the cam followers 302 coaction with the cam track 304. A side view of the cam track 304 is shown in FIG. 8 and the entire carrier applying elements subassembly 212 is tilted so as to, in a sense, recede in a peripheral direction from its normal position on the periphery of the rotor, whereby the shoes 234 thereon are assured of entry within the apertures 72 of the carrier at the loading station 254. The amount of recession, applied to each individual can carrying applying unit 212, is so arranged relative to the size of the apertures 72 and the amount of variation of distances therebetween and the size of the pairs of shoes, that the pairs of shoes will fit within the aperture without touching the margins thereof.

As shown in FIG. 16, the carrier applying shoes (for example 234A as shown in FIG. 15, just subsequent to coming off of the feed roll 208) are disposed within the apertures 72 of the can carrier strip 68. However, at this point, as aforestated, the pairs of shoes are spaced from and do not engage the margins of the aperture 72 due to the aforementioned recession or tilting of the carrier block by cam 304 because of the relative size thereof. The carrier strip is substantially tension-free and is not physically engaged by a carrier applying element until the vicinity of the station identified with the jaw block subassembly having carrier applying shoe sets 234C (approximately 40° beyond the position of shoe sets 234) which is slightly past the center line of the rotor 214, as viewed in FIG. 8.

As viewed in FIG. 16, it will become apparent that the spaced shoe opening cams 268 are so arranged that one shoe of each pair of a set 234 (such as shoes 235 and 238) engages the margin of the outer band 74 of a carrier aperture 72 prior to the other member of the pair (such as shoes 236—237) engaging the inner margin of the band of the same carrier aperture. Thus, the means for actually engaging and pulling that short amount of carrier strip between the carrier advance means 158 and the assembly station 256 is supplied by the outboard shoes of each set of shoes, as viewed in FIG. 16. Means for assuring deflection of the carrier strip side edges radially outwardly relative to the rotor orientation, relative to shoes 235—238, is provided in the form of spaced rod members 308 and 310, which extend for approximately 80 degrees across the top segment of the rotor, as shown. The rods 308 and 310 are deformed at the ends thereof, as shown at 308*a* and 308*b* in FIG. 16. Each rod is arcuate along its elongated dimension, and is offset in the midportion thereof, as shown in FIG. 16, to accomodate and coact with the outboard shoes 235 and 238 of each pair to orientate the carrier band 74, as shown in sectional view FIG. 18. The deflecting rail members 308 and 310 are suitably mounted adjacent the outboard shoe members 235—238, respectively, as shown in FIG. 18, by bracket members 311, the bracket members, in turn, being mounted on a central plate 318, which is suitably supported from the vertical side members 222 and 224.

Central web deflecting means is provided to deflect (upwardly relative to the carrier surface on the rotor) the central or median web portion 76 running along the longitudinal midportion of the carrier strip. The central web deflecting means 312 essentially comprises a set of roller means 314 mounted on central plate 318 and biased plow means 316 mounted on each jaw block subassembly 212 which coact with one another, as shall now be described. As aforestated, the inboard shoe (for example, shoe 236 of a pair of shoes such as 235—236) engages the portion of the carrier adjacent the center web 76 substantially after (in terms of time and distance along the periphery or the rotor) the outboard shoe 235. To assure a correct orientation of the web 76 relative to the adjacently positioned margins of the carrier when the shoes 236—237 engage the margins of the carrier apertures 72 immediately adjacent thereto, the roller means 312 and plow means 316 assure that the carrier is correctly positioned with the marginal edge in a downwardly direction, as shown in FIG. 18. Thus, when shoe 236 and corresponding inboard shoe 237 engages the margins of the apertures 72 (approximately at position 234*f*) the carrier will be correctly positioned on the lip portions of the shoes for transposition to the cans, as will now be discussed.

The plurality of roller means comprise a vertically aligned plate 318, which is located substantially in the midportion of the rotor and extends longitudinally therealong, having an arcuate bottom surface of approximately the same curvature as the periphery of the rotor. The plate 318 serves to rotatably mount a plurality of rollers 320*a* through 320*h* on suitable shafts 322. The individual rollers 320*a* through 320*h* (except for the first 4) vary in O.D. progressively along the length of the segment, reading from right to left as viewed in FIG. 15. The first rollers 320*a* has a substantially smooth face surface across the roller in a transverse direction, and after the first four rollers, the successive rollers (as they progressively are considered as a group), become progressively grooved across the face until the roller 320*h* has a deep groove 321*h* therein, as shown in sectional view FIG. 18. Rollers 320*a* through 320*d* are not grooved, and rollers 320*e*, *f*, *g*, and *h* are progressively grooved, as shown. It will be appreciated that the rollers coact with the plow means 316 and serve to orient the margins of the apertures adjacent each side of the longitudinal central web 76.

Cooperable with the individual rollers 320*a* through 320*h* are plow means 316 in the form of spring loaded angular sheet metal members 324 which are mounted on each jaw subassembly 212, one such member being illustrated in FIG. 17. More particularly, the spring loaded member 324 comprises a blade-like sheet metal member 324, which is elbow-shaped in configuration, having a free end 326, the other end 328 being mounted on a suitable pivot 332 for limited movement against a stop

pin 334. Both the pivot pin 332 and the stop pin 334 are mounted on channel blocks 362—364, which, in turn, are fixed to support blocks 240, as will become apparent. The midportion 330 of member 324 is rounded (at the bend) to assure smooth engagement with the carrier web 76 without tearing same. The entire plow member 324 is biased against pin 334 by a suitable spring 336, which is pinned at one end 338, coiled around shaft 332 at 340, and is attached to the arm 328 to bias the end portion 329 toward engagement with the stop pin 334. FIG. 17 shows the full line position of the plow member 324 when it is cooperating with the individual rollers 320*a* to 320*h*, as shown in FIGS. 16 and 18. Thus, when the rollers 320*a*—320*h* are no longer in opposing relation to an individual plow member 324, it tends to try to assume the position shown in dotted lines until restrained by the pin 334. Thus, the plow means and roller means helps preorientate, subsequently assuring positive orientating of the central web portion 76 of the carrier and the associated margins of the apertures on the inboard shoes 236—237 during the expansion of the carrier. It will be appreciated that the plow 316 will continue to bias the carrier web 76 subsequent to the rotor 214 rotating the individual jaw subassemblies 212 beyond the last roller 320*h*, so that as the carrier aperture margins are stretched and are shifted relative to the shoes, a constant bias being kept on the carrier web to assure correct orientation at all times, until the carrier is assembled on the cans at the assembly station 256.

Means 344, in the form of cam actuated cross web engaging members, provide an orientation of the central web of the carrier that is generally transverse of both the rotor 214 and the carrier strip 68, and, generally, parallel with the axis of the rotor. This means 344 is associated with each jaw subassembly 212 and takes the form of a pair of cross-web engaging members 346—348 which are respectively cooperable with a single pair of shoes 235—236 and 237—238, as illustrated somewhat schematically in FIG. 10, and shown more clearly in elevational view in FIG. 11. As shown in FIGS. 16 and 17, the individual web engaging members 346—348 are operable to engage the cross margins of the apertures in a single row in the carrier between adjacent successive apertures along the longitudinal length of the carrier strip. The end portions 350—352 of the respective web engaging members 346—348 are conveniently rounded, so that they may engage the web of the carrier and not tear same under the circumstances now to be explained.

Each of the cross-web engaging members 346—348 are slidably mounted in slide blocks 354—356, respectively, each of which are fixed to support block 240 in spaced relation. The slide blocks comprise a plate member 358—360, which are fixedly mounted on channel blocks 362—364, the latter being grooved to receive the sliding members 346—348. It will be noted that the channel blocks 362—364 are so configured and are mounted on block 240 so as to be, essentially, located on a radius of the rotor along their long dimension and such that the channel therein and, thus, the cross-web orientating members 346—348 move outwardly in a radial direction. This occurs except for that segment of rotation of the rotor, wherein the entire jaw subassembly 212 is being tilted, as aforementioned.

Mounted on the ends of cross-web engaging members 346—348, opposite to the rounded ends 350—352, is a cross block support member 366, which carries cam followers 368—370 at the ends thereof, the latter being rotatably mounted in the usual fashion. The cross-block member assures simultaneous action of both cross-web engaging members 346—348 in reciprocating radially outwardly and inwardly movement upon rotation of the rotor, as shall become apparent. The cam followers 368—370 are biased into separate engagement with spaced cam track members 384—386, respectively, by suitable springs 380—382, which may be of the compression type, one end of which is seated in a suitable bore such as 376 in the enlarged casting lugs 372—374 on the channel blocks 362—364, respectively. It will be appreciated that each of the cams 384—386 are partially cams and partially cam tracks in conventional fashion. The cam 384 is fixedly mounted to fixed shaft 220 by a suitable pin 388, whereas cam 386 is fixedly mounted to fixed cam track 304 by a suitable pin 389. Thus, in essence, cam track 386 is, also, fixed to fixed shaft 220 through pin 306.

The members 346—348 (shown in FIG. 15) move radially inwardly and outwardly in a radial direction as the rotor 214 rotates. When the individual shoe sets 234 are in the loading position 254, as shown in the upper right hand corner of FIG. 15 (position 234*r*), the transverse web engaging members 346 and 348 are pulled back and are not in engagement with the carrier. Stated another way, the web engaging members 346—348 are recessed below the level of the carrier web at the loading position of the carrier upon the individual pairs of shoes and start to engage the carrier web in approximately position 234*a* and attains their full radially outward position in the vicinity of position 234*b*. The members 346—348 maintain the relative outward position attained at position 234*b* until position 234*j*, immediately adjacent the assembly station 256, whereupon they are rapidly withdrawn by the cam followers 368—370 such that members 346—348 are completely withdrawn, as shown in position 234*k* and, thus, will clear the stripper means 390, to be later described. The major function of the transverse orientating means 344, just described, is to prevent a "wrong way" or reverse "crinkle" in the transverse web of the carrier and, thus, assures along with the other orientating means, the correct orientation of the carrier member on the cans. As shown near the bottom of FIG. 15, the position of the end 352 of the member 348, when the individual shoe sets 234 are in position 234*j* is such that it projects below the top of a can prior to the retraction thereof, and, thus, must be quickly retracted during a very short segment of the rotation of the rotor 214 to prevent the stripping means 390 from physically interfering therewith.

The stripping means 390 essentially comprises a tongue member for each lane or line of a paralleled arrayed procession of cans and is situated immediately adjacent the top of the cans immediately behind the assembly station 256. The stripping means essentially comprises a pair of tongue members 392 for each rotor 214, having a foot portion extending across the tops of the cans with the carriers thereon (shown in FIG. 15) and is fixedly mounted on a transverse support member 394. The stripping means 390 serves to strip the carrier webs and assembled cans off of the shoe sets 234 at the assembly station 256, which will be described in more detail hereinafter.

In recapitulation, it will be noted that the carriers 68 are picked up by the aperture expanding lips of the shoes 235—238 in such a manner that the marginal edges of the carriers defining the apertures 74 are cupped to protrude radially inwardly toward the axis of the rotor 214. Hence, these inwardly protruding carrier edges, upon being telescoped over the cans 64 at the assembly station 256, protrude upwardly at their inner edges toward the can beads 66. As the cans 64 move through the assembly station 256 (yet to be explained) and the carrier applying shoes 234 move upwardly from the assembly station, the upwardly turned edges of the carriers defining the apertures 72 are caught under the upper can beads 66. The horizontal stripper means 390 separates the carriers on the cans issuing from the assembly station in such a manner that the carrier is stripped from the successive sets of the carrier applying shoes. Thus, the carrier with the cans assembled thereabout move underneath the stripper means 390 and the rotor 214 continues up to pick up additional portions of the carrier strip at the loading station 254. It will, thus, be apparent that there is a continuous

operation of the rotor to continuously and successively pick up carriers at the loading station, telescope them over the cans, and be stripped off of the shoes at the assembly station.

Means 396 is provided for positively positioning the cans 64 in timed relationship to the position of the individual can engaging margins of the apertures 72 of the carrier strip mounted on the successive carrier applying elements or shoes 234 at the assembly station 256 and is best shown in FIGS. 8, 19*a*, 19*b* and 20. The means 396 for positively positioning the cans, comprises the angular offset portions 398—400 of the can lanes side members 91—90 (only one lane being described), the second moving belt 108, the can holddown means 414, and the spaced starwheel means 402, there being one starwheel means for each row of cans.

As will be appreciated, on reflection, if there is to be a positive, repetitive, high-speed collision course for individual successive elements in two groups, one group moving on course 1 and a second group moving on course 2, such that the individual elements within each group will meet successively with elements of the second group, and each group is positioned by physical means, there is a possibility of variables in the relative speed of the moving elements of each group within certain finite tolerances. Thus, to accommodate tolerances, it is best to have the component elements of one group accelerate relative to the component elements of the other group of elements, so that there can be positiveness and preciseness, relative to the area in space for the actual meeting or collision of the elements moving in the different paths (the two paths having a blending relationship). Relating to the foregoing to the instant machine, it will be seen that the periphery of the rotor 214 may rotate at a reference speed (plus or minus the tolerances caused by wear of the parts, small dimensional variations in the carrier web, etc.) and the output from the apparatus 50 in form of assembled carrier strip and cans 64 must proceed at the same rate as the delivery rate of the rotor. Further, as a general proposition the cans as a group, move from the supply area toward assembly station 256 at approximately the same rate of speed as the speed of rotation of the periphery of the rotor 214 in order to have a positive meeting of the cans 64 and the carrier at the blending or assembly station 256. It has been determined it is necessary to slow the cans 64 down and then accelerate them rapidly relative to the reference speed of the rotor 214 in the assembly area 256, so as to have the cans in the precisely desired position to accomplish assembly. Stated another way, if there is going to be a blending of two moving paths of carrier and container units with a positive and controlled collision positional relationship of units, it is necessary in one of the paths to successively accelerate one of the units into its desired position to take care of dimensional tolerances in the system. However, since the output is at a fixed speed and there is a necessity for the input to be generally of the same speed, it is necessary that the successive individual units in one of the paths be slowed down first, since they will be later accelerated. Thus, the over-all input-output time interval of each path for the blending thereof will remain the same. The mechanism for affording these functions to the successive cans 64 will now be described.

The second moving belt 108 receives the cans 64 from belt 82 at a slight pressure (caused by a higher lateral speed of the latter) and carries the cans toward the assembly station at approximately the same rate of speed as the capacity of the rotor determined by the speed of rotation of the rotor 214, by a drive means which will be described hereinafter. As the cans 64 move down between the lanes (such as 90—91) in single file, they reach the vicinity of the assembly area of the apparatus where they come under the influence of starwheel means 402 (one for each lane) mounted on spaced rotating shafts 404 and 450 which are driven in timed relation to the rotor as well as to each other, as will presently appear. It will be appreciated that each starwheel means comprises a plurality of teeth 406 each of which has a leading edge 408 and trailing edge 410 which effectively provides, between the successive teeth, a pocket for receipt of the can 64. The effective length of each individual tooth may be denominated as the sum of T–1 and T–2, each of which are the respective lever arm length components, the sum thereof coacting upon the can 64 to accelerate the can.

As shown in FIG. 19B, the tip 412 of each individual tooth is rounded and precedes a major portion of the leading edge 408 in the direction of rotation. The teeth 406 project through a suitable slot in the outboard can lane side members such as 90 and 93 and engage a can 64 located in the lane. The back or trailing edges 410 of the teeth are of a different radius of curvature than the front or leading edges and is configured so as to decelerate the can immediately adjacent and in contact therewith. The front edge 408 along with the tip 412 of each tooth is configured so as to accelerate can 64 associated and in contact therewith as the starwheel is rotated. The centrifugal force asserted against the individual can is eased during the acceleration by the offset portions 398—400 of the can lanes. The offset of the can lanes at the point of acceleration assures a gentler handling of the can and as the can is accelerated, the acceleration being in terms related to the constant speed of moving belt 108.

The constant time speed relationship of the shoes of carrier applying assembly 212 relative to the varying speed of a can coming off of a starwheel means 402 (it being appreciated that FIG. 19A shows a reverse direction of movement of the cans from that of FIG. 19B) is shown in FIG. 19A. The individual cans move into engagement with the margin of carrier apertures stretched across the wide open shoes and as aforestated, the bead 66 of the can 64 hooks over the margins as is shown in the right hand portion of FIG. 19A. As is shown by the sets of numbers showing the relative position of the shoes relative to the positions of a moving can, the can 64 is accelerating in the left hand portion of the figure under the influence of the starwheel, in perfect timed relation with meeting and blending with the front portion of the margin of carrier aperture stretched on a shoe at the precise point where the margin will hook under the bead, this position being denominated by the numbers 3 in the FIGURE 19B of the drawings.

Holddown means 414, in addition to the can lane side members, is provided for preventing the cans from tipping or canting relative to the rest of the apparatus during the time that they are under the control of the starwheel means 402. Can holddown means 414 (shown in FIG. 8) comprises an L-shaped can holddown member which has a can engaging surface 416 at one end and which is pivoted near its other end at 418. The surface 416 is biased lightly into engagement with the tops of the cans by a suitable compression spring 420. In the event that a can should be cocked in a forward or back manner along the can lane, the surface 416 makes sure that it is correctly orientated immediately prior to acceleration by the starwheel means as aforedescribed. The can holddown means 414 is mounted on a transverse cross brace 422 (best shown in FIG. 8).

The drive means for the apparatus and the method by which timed relationship between the various components is obtained is now described. This drive means for the apparatus includes a motor or main drive means 424 which may be electrical or mechanical, as desired. The motor 424 is connected to a speed regulator 425 having an output shaft 426 which connects with a transmission 427. As shown in FIG. 20A a pair of driving shafts 428 are connected to gear boxes 429, an electric clutch 431 being interposed between the transmission 427 and each of the gear boxes 429. From the gear box 429, a vertically rising shaft 430 transmits power to the starwheels and

to the rotor and for this purpose has a gear mounted thereon at 432. Another gear 434 positioned at the end thereof engages gear 226 to drive the rotor. Gear 432 on shaft 430 drives the starwheel means 402, the feed roll means 208, and the roll 206. The advancing means shall now be described.

It will be seen in FIGS. 20, 20A and 20B that shaft 430 (on the right hand side of FIG. 20) through gear 432 engages bevel gear 436 which is mounted on the through drive shaft 438. Drive shaft 438 extends transversely across the apparatus and terminates in a sprocket 439. A chain 437 as shown in FIG. 20B, is mounted to drive sprockets 184, 207 and 291 as sprocket 439 is driven. Another shaft 440 is disposed immediately below shaft 438 in generally parallel axis relationship thereto and by means of a spur gear 442, which is immediately behind (to the left in FIG. 20) the bevel gear 436, drives a mating spur gear 444 mounted on the end of shaft 440. The gear 444 is keyed to shaft 440 in the conventional manner and drives two bevel gears 446 and 448 which are mounted intermediate its ends. The bevel gears 446 and 448 are operable to drive shafts 404 and 450 by complementary bevel gears 452 and 454 to thus rotate the respective starwheel means 402 in timed relationship to the rest of the apparatus.

Means is provided for driving the infeed conveyor or first conveyor 86 comprising a take-off shaft 464 having a sprocket thereon and located on the motor 424 as shown in FIGS. 1 and 20. A chain 468 engages the sprocket 466 and drives a sprocket 470 mounted on shaft 472 which is suitably supported above the motor. Another chain 474 is mounted for rotating the input sprocket 476 of a conventional "Reeves" drive 477 having an output sprocket 478. The "Reeves" drive is a variable speed drive which may be adjusted to drive the output sprocket 478 in timed relation to the input sprocket 476. The output sprocket 478 of the "Reeves" drive is operable to engage and drive infeed conveyor sprocket 480 by means of a chain 482 so as to drive the infeed conveyor at a speed proportionately greater than the speed of the second conveyor belt 108. The reason for driving the first conveyor 86 at a slightly faster speed than the second conveyor belt is to provide a constant bias of the cans against the starwheel means portion of the system to assure that there be a sufficient supply of cans present for continuously loading the starwheel for assembly purposes. The power transmission to the second conveyor belt 108 (yet to be described) is also important relative to the means after assembly used for separating the six packs into discrete packages as well as the means for inserting the handles. The timed operation of these portions of the machine to the rest of the components will be explained after description of the components per se.

*Unitizing and Handle Inserting*

The cans 64 in assembled relation to the interconnected carrier strip 68 are moved by the conveyor 108 from the assembly station 256 toward the severing and handle inserting area 56, as shown in FIG. 1 of the drawings. In the area 56 is located the severing or unitizing means 484 which essentially comprises the following: means for precisely locating, positioning and controlling the movement of discrete units of six packs; means for cutting off or severing into discrete six pack units from the carrier and containers in interconnected strip form assembled relation; and means for accurately timing the cutoff operation, relative to an oriented position of the carrier web and cans assembled therein.

Also, located in area 56 is the handle inserter means 486 which includes: means 484 for precise, positive control of the discrete six pack unit; a storage area for groups of handles; means for advancing handles to a position for assembly to each of the discrete six packs in a substantially continuous, successive manner; means for precisely and positively applying to and assemblying an individual handle relative to a controlled six pack and simultaneously. Also, included in the handle inserter means 486 are various safety interlock functions which provide automatic operation thereof and, also, provides means to sense the absence of handles in the storage area to prevent the operation of the machine in such untoward event.

Returning now to the unitizing means, it essentially comprises a six pack segregator means 488, a rail means 490 and the cutoff knife means 492. Also necessary for this operation is the conveyor 108 and various timing means and interrelationships which shall be explained after the description of the area 56 per se.

The six pack segregator means 488 comprises a plurality of blocks 494 which have a height of approximately one-half the height of a can 64 and are adapted to engage the midportion of two cans 64 in a manner to be described. A plurality of blocks 494 are mounted on a pair of spaced endless chains 498, each block 494 having a rounded or snub nose 496, as best shown in top view FIG. 21. The blocks 494 are spacedly mounted on the chains 498, a distance precisely equal to the length of the pack to be segregated.

The drive mechanism for the segregator 488 comprises an adjustable idler sprocket 500 mounted on shaft 501 and a driven sprocket 502 mounted on driven shaft 503. Shaft 503 is driven by a mechanism to be described later, in timed relation to the other moving parts of the apparatus. It will be noted that the sprocket 500 and 502 are offset one from the other, the idler sprocket 500 being located outboard of the can lanes as compared to sprocket 502. As the chain moves the blocks 494, the relative offset relation of the blocks near sprocket 500 and the position of assembled containers and carrier strip affords a gradual lead-in of the snub nose 496 in the V formed by two cans held together by the carrier web portion 78 to put a tension stress on the portion 78 to afford easier cutting thereof. The actual length of the chains and the number of blocks mounted on the chains, as well as the projection of the blocks into the path of the cans, affords the function of applying tension to web 78 at the moment of cutting, as well as confining and controlling the movement of the six pack subsequent to its being cut and while the handle is being inserted therein. There is a positive wedging and positive control of the individual packages for a sufficient time duration to afford high speed, repetitive trouble-free operation.

To assure that there is sufficient wedging action of the blocks within the V-shaped confines of two adjacent cans immediately below the carrier web portion 78, a lead-in roller 504 is located close to sprocket 500 and a back-up plate 506 is provided to provide reaction force during the wedging action. The roller and back-up plate are shown in FIG. 21 and the back-up plate is shown in the fragmentary view FIG. 23. It will be appreciated that these items are located for coaction with the inboard portion of the endless chain and each are mounted on vertical rising support members such as 508 and 510.

To prevent the cans from tipping or cocking while moving through the area 56, spaced parallel rails 490 are adapted to engage the edges of the beads on the exposed sides of the cans when assembled in the carrier. These rails (shown in FIGS. 21 through 23), it will be noted, are fixedly mounted only at the downstream end thereof which imparts a degree of flexibility to the rails to accommodate a slight "lead-in" tolerance. The rails 490 are L-shaped in plan view and are somewhat longer than the length of the package being fabricated, as shown.

Another essential part in the unitizing of the desired package is the cutoff means 492 aforementioned. The cutoff knife means 492 is intimately associated with the handle inserter mechanism and is actuated by much of the same mechanism, but shall be described separately where possible. In essence, the cutoff knife means is a part of a carriage means 512 which is best shown in

FIGS. 25, 26, and 34 of the drawings. The carriage means 512 is pivotally mounted on a pair of depending yokes 514 and 516, each of said yokes being bifurcated and having arms 518 and 520 thereon as shown in FIGS. 25 and 35. Each yoke 514 and 516 is fixedly mounted to spaced plates 522 and 524 which are fixed relative to each other by suitable apertured spacer blocks 526 and 528 best shown in FIG. 34. The upper spacer blocks 526, on the right hand end thereof as viewed in FIGS. 34 and 35, mounts pivot pins 530 and 532. Mounted on pivot pins 530 and 532 are elongated cutter lever arms 534, 536, the latter being outboard of or to the right of the former, as viewed in FIGS. 34 and 35 and is perhaps best illustrated in FIG. 25.

It will be noted that cutter lever arms 536 and 534 are enlarged in the lower half thereof and are formed with curvilinear slots 538, 540, for purposes which will hereinafter appear. Attached to the lower end of each of the lever arms 534, 536, in offset relation are cutter inserts 542, 544, each of which having the cutting edge in opposed relationship to the other, to provide a scissors-like approach to the web portion 78 of the carrier strip. It will be appreciated that knives or cutting edges 542, 544, are offset from the respective lever arms so that they are more or less in exact opposition to each other and generally transverse to the length of the carrier strip when assembled to the cans as they proceed under the influence of the six pack segregator 488.

The cutting edges 542, 544 are actuated toward and away from each other by a moving bar 546 (best shown in FIG. 26) which moves up and down in a vertical plane, as viewed in FIGS. 25, 26 and 34. The moving bar 546 is actuated by a force rod 552 and has mounted thereon for cooperation with the respective slots 538, 540, a pair of projecting pins 548, 550. Thus, as the bar 546 raises and lowers, the pins 548 and 550 coact with the said slots 538, 540 to cause a positive controlled inward, outward movement (relative to each other) of the arms 534, 536 about pivot pins 530, 532. The force rod 552 is fixedly attached to a cam actuated rod plate 554 for movement in timed relationship to other components in the handle inserter mechanism in a manner to be later explained. It will be appreciated, however (as best shown in FIG. 21), that the cutter insert 544, 542 impinge upon the web portion 78 between adjacent six packs while said web portion 78 is under tension from the blocks 494 on opposite sides of the six packs. It will, further, be appreciated that the cutting mechanism is on the upstream (relative to the flow of cans) side of the handle inserter mechanism.

It is, thus, seen that adjacent carrier packages are severed from each other while moving continuously through the area 56. Simultaneously with the spacing and severing of adjacent carrier packs, carrier handles or bails 70 are assembled into successive six packs 62 passing through the area of 56.

The handle 70 assembled into the carriers by the handle inserter means 486 are preferably formed of a tough but somewhat flexible plastic material. The handles per se form no part of this invention, and are the subject of a patent application in the name of Ougljesa Jules Poupitch, Serial No. 795,103, filed February 24, 1959, entitled Handle Device, assigned to the same assignee.

As best shown in FIGS. 40 and 41, the handles 70 each have a flat straight section 556 and a rack of handles is formed by the joining of the portions 556 to adjacent handles by thin spaced web sections 558, 560. Each handle is generally U shaped and is formed with a pair of diverging legs 562, 564, each of which is formed with an arrow-shaped head portion or anchoring means 566, 568, each successive head 566, 568 also being adjoined to the next adjacent head in a rack or group of heads by a thin web section. Thus, the handles 70 are adjoined in parallel relationship to each other in a rack-like form as shown in FIG. 40 and it will be particularly noted that the handle racks as initially supplied have an initially diverging relationship of the arms 562, 564 for purposes that will hereinafter appear. The racks of handles are conveniently manufactured in groups of approximately 25 and are adapted to be automatically fed from a magazine type of storage area for insertion into suitable apertures in the carrier web.

The entire handle inserter mechanism is mounted on the carriage means 512 and essentially comprises the storage or magazine means 570, the rack drop-down means 572, the rack advancing means 574, the single or individual handle precise control means 576, and the single handle cutoff or separator means 578 which includes the single handle actuator and assembler means 580 and the control means 576. It will be apparent through the later discussion, that the handles are conveniently moved as a group or rack from the storage means 570 and that the separation of the discrete individual handles 70 from the rack of handles occurs just prior to the actual insertion of the handles into the handle receiving apertures in the carrier web assembled to the cans 64.

The storage means 570 is best shown in FIGS. 26, 37, 38, 39, 43, 44 and 45. As shown in FIG. 2, the storage means 570 is located for ease of access from the outside of the machine and to this end are mounted on the carriage means 512 as shown, and, more particularly, to the vertical plates 522. The handle storage means 570 comprises a pair of spaced magazine side plates 582—584, which are attached at the front ends to plate 522. The sidewalls 582, 584 extend in a generally transverse direction relative to the long dimension of the assembled carrier and cans. The sidewalls 582—584 are preferably coated with a friction reducing material, such as "Teflon" at 586 and 588 for purposes which will hereinafter appear. A short backwall 590 is formed with a U-shaped aperture 592 as best shown in FIG. 37. Thus, the magazine is formed by the plate 522 (the front wall), the two sidewalls 582—584 and the backwall 590.

A rather heavy casting 594 forms the magazine base and as showns in FIGS. 44 and 45, has a generally planar top portion and angularly diverging sides 596—598. The divergence of the sides 596—598 is in general conformity to the divergence of the arms 562—564 of the handle rack (see FIG. 40). As shown in FIGS. 37, 44 and 45, the magazine is adapted to contain a plurality of handle racks, the ends 566—568 being so formed that the tips thereof are in exact alignment for sliding coaction with "Teflon" surfaces 566—588. The handle racks drop one by one, by a mechanism to be later described, and to assure that there are always handle racks available, an interlock means 600 shuts down the machine by means of a detector switch if there are insufficient handles in the magazine. More particularly, the interlock means 600 comprises a switch 602, best shown in FIG. 26, having an actuator arm 604 which extends through a suitable slot 606, formed in the wall 522 of the magazine. As shown in FIG. 26, the front edge of the handle racks continually engage the actuator arms 604 to keep the switch 602 normally closed. The switch 602 will open, causing the machine to shut down when there are insufficient racks in the magazine 570 to continue biasing arm 604 in the manner shown in FIG. 26.

Means for segregating and dropping down a single rack of handles from the stack of racks in the magazine, is provided by the rack drop down means 572 which is best shown in FIGS. 39, 43, 44 and 45. The rack drop down means 572 essentially comprises a pair of spaced stationary bars 608—610 which are located on the respective magazine sidewalls 582—584, adjacent the base portion 594. The bars 608—610 have an angularly diverging undersurface 612 and generally planar top surface 614, the latter being in substantial alignment with the planar top of the base 594. Thus, the bars have a triangular shape and serve to normally prevent the rack of handles

from dropping down to the base 594. As shown in FIG. 43, the spaced stationary bars 608—610 are formed with a plurality of notches 616 which are immediately adjacent portions of the sidewalls 582—584 (where the sidewalls 582—584 are not notched out).

A pair of movable drop down bars 618—620 are mounted for movable coaction with the ends 566—568 of handle arms 562—564 of a handle rack that is located on the stationary bars 608—610. As perhaps best shown in FIG. 45 the movable drop down bars are formed with vertically aligned end surfaces 622—624 along the length thereof and have augularly divergent upper surfaces 626—628. The angle of surfaces 626—628 provides a wedging coaction with the end surface of the penultimate handle rack while the last rack in the stack is being engaged by surfaces 622—624.

As shown in FIG. 39, the drop down bars 618—620 are formed with a pair of notches 630 for cooperation with the support portions of the sidewalls 582—584. As shown in FIG. 43, the magazine sidewalls have slots formed therein for cooperation with the major extents of the movable bars 618—620. The bars 618—620 are mounted for simultaneous rectilinear inward, then outward motion in relatively opposite directions respectively, the at rest position being shown in FIG. 43 and the extreme inward position being shown in FIG. 39. To this end a pair of augular bracket members 632—634 are mounted to magazine walls 582—584 on the outside thereof and serve to mount a plurality of bellcranks 636–638 for bar 618 and bellcranks 640 and 642 to serve drop down bar 620. As shown, the bellcranks are mounted near the ends of the respective drop bars and on the outside of the magazine walls, bellcranks 636 and 638 being pivotally mounted on the bracket 632 by pivots 644 and 646, respectively, and bellcranks 640—642 being pivoted to bracket 634 by pivots 648—650. The bellcranks are pivoted to the respective drop down bars 618 and 620 by pivots 650—652 and pivots 654—656 respectively. To assure simultaneity of action, a pusher link 658 connects bellcranks 636 and 638 and another pusher link 660 connects bellcranks 640 and 642. Link 658 is pivotally mounted to one arm of each of the bellcranks 636—638 by pivots 662 and 664, whereas link 660 is pivoted to the arms of each of the bellcranks 640—642 by pivots 666 and 668. The bellcranks 636 and 640 are each formed with a projection arm to mount a cross link 670 and is pivotally attached thereto by suitable pivot pins 672 and 674.

A solenoid 676 having a movable armature therein (shown in FIG. 37) has an extension arm 677 which is mounted to the armature at 680 and the other end is mounted to cross link 670 by a suitable pin 678. A spring, 682, which is anchored at one end at 680 and the other end at an anchor pin 684 biases the armature and hence, the whole mechanism through the linkages just described to the "at rest" position shown in FIG. 43. Means for actuating the solenoid 676 is provided by a switch 690 having a switch button 688 which is, in turn, actuated by an elongated switch actuator element 686. It will be appreciated that the switch actuator 686 is comprised of an elongated thin piece of flexible steel which is pivotally mounted at the end opposite from the switch button. Thus, upon the end of the handle rack, located on the magazine base 594, attaining the position shown in FIG. 26 (out of contact with the actuator 686), the switch 690 closes the circuit to the solenoid so as to actuate the linkage mechanism to the position shown in FIGS. 39 and 45. This causes the arms of the last rack (located on bars 608—610) to be slightly compressed and to be pushed past the stationary bar members 608, 610, allowing the rack to drop down to the base 594 under the influence of gravity. Thus, automatic means for dropping down or feeding another rack to the base portion 594 is provided whenever the prior rack located on the base portion 594 has been advanced sufficiently such that there is clearance for the next rack on said base.

In recapitulation, a plurality of stacks of handles are placed in the magazine, the bottommost rack being located on the stationary bar 608—610. The solenoid actuates the moving bar 618—620 through the linkages and bellcranks causing relative opposed inward movement of bars 618 and 620, surfaces 622 and 624 thereon engaging the heads 566—568 of the respective handles in the rack causing them to move inwardly beyond the inwardly most projecting surfaces of the bars 608—610. The handle racks, under the influence of gravity and the compression force of the arms 562—564, move downwardly and outwardly assuming the position shown in FIG. 45. The rack is then advanced to the handle assembly area by a means about to be described. Spring 682 returns the linkages to the position shown in FIG. 43, the solenoid becoming deenergized by the handle rack engaging elongated switch actuator blade 686. When there are too few racks in the magazine chamber, switch 692 is actuated by actuator 694, the end of which senses the absence of racks in the magazine. The apparatus is, thus, shut down until such time as more racks of handles are loaded into the magazine 570.

The initial rack-advancing means 574 comprises a pair of spaced moving belts or O-rings 692—694 as best shown in FIGS. 39 and 26. The moving belts 692—694 are adapted to move in a counterclockwise direction, as viewed in FIG. 26, and towards the top of the sheet, as viewed in FIG. 39, to advance a rack of handles that has been dropped down onto the base 594 of the magazine. As shown in FIG. 26, the top of the O-rings are mounted to project a slight distance above the planar surface of the base 594 to, thus, engage the undersurface of the bail portion of the handle rack. O-ring or belt 692 is suitably mounted on spaced pulleys 696—698 and belt 694 is mounted on similar pulleys 700—702. Pulleys 696 and 700 are driven by a through shaft 704 which mounts a pulley 706 on an end thereof which extends outside of magazine sidewall 582, as shown in FIG. 37. Pulley 706 is, in turn, driven by an O-ring belt means 708 which is mounted on pulley 710 which is attached to an auxiliary drive shaft means, to be later described. A rack dropping down onto the surface of the base will be moved or biased toward the left, as viewed in FIG. 26.

The initial rack advancing means 574, also, forms a part of mechanism for precise control of the individual handles on the rack of handles and is included in the single handle control means 576. This mechanism is best shown in FIGS. 27 through 33, and FIGS. 38 and 39. As the handle racks are advanced by the initial advancing means 574, they come under influence of toothed handle engaging members 712—714 which serve to positively control the handle racks in the vicinity of the assembly operation and, also, serve to position the last handle for presentation to the mechanism for moving it down into intimate association with the carrier web. The toothed handle engaging members 712—714 have a complex motion shown schematically in FIG. 32 (which is a semi-diagrammatic capsulization of the various positions shown in FIGS. 27 through 30). Associated with the end of each of the members 712—714 is a cutoff means which severs the short web between adjacent heads, such as 566—568, in a handle rack, as shall become apparent hereinafter, the final severing of discrete handle from the rack per se occurring during a later operation.

The toothed handle engaging member 712—714 are mounted on a carriage-like reciprocating underplate 716 (best shown in FIG. 38). The carriage plate 716 is mounted on a pair of fixed rods 718—720 which extend in the same general direction as the base 594 and are mounted on the underside thereof in suitable casting lugs. The rods 718 and 720 fit within suitable bores in the plate 716. On the underside of plate 716 (which is mounted for motion on the underside of the base plate 594) is a

plate groove 722 which is adapted to slidably receive a pushplate link 724 having an offset end 725 which is shown in the center of FIG. 26. The pushplate link 724 is adapted to, both move the reciprocating carriage underplate 716, and to move relative thereto in a manner hereinafter to be explained. Input motion is presented to pushplate link 724 at the offset end 725 thereof by a pushrod 726 which is pivotally mounted thereto at 728, as best shown in the schematic FIGURES 27 through 32. The pushrod 726 is mounted at its outer end to a crank arm 730 by a suitable pivot pin 732, the crank 730 being driven by a drive shaft yet to be described. A study of FIG. 26 will show the rotary motion of the crank 730, will produce a reciprocatory motion of plate link 724 within the plate groove 722.

The plate 724 is formed with a transverse groove 734 near the end thereof that is opposite from the offset end portion 725. A bellcrank member 736 (which looks like a cam member in top view in FIG. 31) rotates on pivot 738 mounted on carriage plate 716 and is formed with a depending fixed pin 735 which is adapted to coact with slot 734. The carriage plate member 716 mounts another fixed pin 742 which extends upwardly and coacts with the curvilinear slot fromed in bellcrank member 736. Thus, rectilinear movement of the plate 724 will cause the sides of the groove 734 to engage pin 735 which will in turn cause the bellcrank 736 to revolve around its pivot shaft 738, the amount of movement being determined by the length of curvilinear grooves 740. The length of groove 740 in the direction of movement of plate 724, is less than the total amount of movement of plate 724, such that the carriage 716 moves on the rods 718 and 720 by virtue of the groove 740 cooperating with the pins 742 which is fixed to plate 716. The entire carriage plate 716 will move from the position shown in FIG. 27 to the position shown in FIG. 28 and then back again, as shown in FIGS. 30 and 29, all under the initial input motion from crank 730.

The bellcrank 736 is formed with a pair of upwardly projecting oppositely disposed pins 744—746 which translate the rotational aspect of the movement of the bellcrank 736 into the rectilinear relatively opposite closing and separating movement of the handle engaging jaw members 712 and 714. To this end, pins 744 and 746 cooperating respectively with and serve to actuate sliding bars 748 and 750. Bar member 748 is formed with a slot 752 at the end thereof for cooperation with pin 744 and bar member 750 is formed with a slot 754 for cooperation with pin 746. The bar members 748 and 750 extend generally transverse to plate member 724 and have a rectilinear movement transverse thereto to thereby move members 712 and 714 in relatively approaching and separating movements, it being appreciated that the jaw members or handle engaging means 712 and 714 are mounted on the outside of and spaced upwardly from plate member 716 for cooperation with the diverging sides of the magazine base plate 594 near the end thereof.

The jaw members or handle engaging means 712—714 are substantially mirror images of each other and are formed with a plurality of projecting teeth 756. Each tooth is separated by a groove 758 which is formed with a complementary configuration to the configuration of the arms 562—564 of an individual handle 70 for cooperation therewith. The individual teeth 756 are formed with a relieved edge on opposite sides of the midpoint thereof, as shown at 760 and 762 to assure that the individual handle arms 562—564 slide down into the groove 758. It will be appreciated that all of the surfaces of the teeth are angularly divergent, one such end surface 764 being the base of the groove 758, and are in substantial alignment with the normal angle of the divergent arms 562—564 of a rack of handles as they are situated on the base 594.

Attached to the leading edge (to the left as viewed in FIG. 31) of each handle engaging toothed member 712—714 is a knifeplate cutoff means 766, having a sharpened edge 768. It will be noted that the knifeblade edge 768 is spaced below the toothed portion 756 and upon inward motion (relatively approaching each other) of the toothed members 712—714, the edge 766 will engage the web portion between adjacent handle heads on a handle rack, such as 566 and 568. This severs the arrow heads one from the other, so that they will be presented for cooperation with downwardly moving members (to be later described). The relative relationship of the members 712—714 to a handle rack and to the end of base portion 594 may be seen in FIG. 42. Thus, it is seen that the arrowheads 566—568 are not normally engaged by the toothed members, rather the toothed members are spaced slightly thereabove and the arms 562—564 are engaged by the notches 758 between the projecting teeth 756, the handle rack as well as the individual handles being advanced as shall now be described.

As shown in FIGS. 27 through 32 the jaw members 712 and 714 described a motion generally, as shown in FIG. 32. Thus, the individual jaw member has a movement that roughly circumscribes a square such that, as shown in FIG. 27, it is initially spaced away from and out of engagement with the handle rack resting on the block 594, then as shown in FIG. 28, moves back beyond end surface of the base member 594 and the handles mounted thereon, then, as shown in FIG. 30, comes in (relatively approaching) and simultaneously picks up the last four handles on a rack of handles and severs the web portion of the last handle and the penultimate handle then, shown in FIG. 29, moves the rack along the base until the end handle is presented out beyond the outer edge of the base, then returns to the initial position. The movements of the parts through the complex linkages described and the relative position of the parts at each stage are shown very well in FIGS. 27 through 32 and will not be further described. However, from the foregoing, it will be seen that there is precise controlled movement of the individual handles, as well as the rack of handles and the last handle is presented for downward movement for assembly in a manner as yet to be described. It will be apparent that this movement of the handles is in precise timed relationship to the movement of other components of the apparatus by the drive means which will move crank 730, the timing thereof being related to the timing of the rest of the apparatus.

A spring loaded detent ball 770 and a screw-type dogpoint 772 are shown in FIG. 38 of the drawings. The dogpoint 772 rides in a groove in underplate 716 to limit outward motion thereof on the rods 718—720. The detent balls 770 provide resistance to motion of underplate 716 while sliding bars 748 are moved "in" to engage the handle strip and "out" to disengage the handle strip.

The single handle actuator and assembler means 580 generally comprises the following means: a platform means 774, a holddown spring means 776, a clamping clock holddown means 778, a handle arm orientation means 780, and inserter needle means 782. These means all operate in timed relationship to each other and to the rest of the apparatus, as will become apparent with a reading of the description of the drive means.

The platform means 774 is comprised of a pair of spaced rocker arm members 784—786 which are substantially mirror images of each other and are shown in FIG. 42 in end view (see, also, FIGS. 42A through 42C). The rocker arm members are located in spaced longitudinal slots 788—790 which, in turn, are located in the end portion of the base member 594 and are equally spaced from the midline of said base portion intermediate the outside ends thereof, as viewed in FIG. 42. The end portion of the base portion 594 is formed with a cross slot 792 (spaced somewhat from the end portion 814 of the base) which connects the longitudinal slots 788—790 with elongated longitudinal outboard slots 800 and 802 which are best seen in FIG. 38. A pair of cross pins

794—796 are spaced from each other and are located in longitudinal slots 788 and 790 and are perhaps best shown in FIGS. 42A through 42C. A spring anchor arm 798 mounted on the rocker members extends through cross slot 792 into an outboard slot such as 802 to anchor one end of a spring 806, the other end of the spring being anchored to an upright pin 804, which is shown in FIG. 42A. The spring 806 biases the rocker arm into the position shown in FIG. 42A.

Each rocker arm is formed with a slot 808 and 810 at each end thereof for coaction with cross pins 796 and 794 respectively. The outside end portion of each of the rocker arms are formed with a horizontal handle engaging surface 812 which, due to the configuration of the slots 808—810, maintains its horizontal relationship during movement of the rocker arm when the rocker arm is depressed by the handle engaging mechanism yet to be described. The motion of the end surface 812 of the rocker arm relative to the end face 814 of base member 594 is pictorially conveyed in successive views 42A through 42C, and it will be noted that the length of each of the slots 808—810 is sufficient to allow the furthest outwardly projecting end surface of the rocker arm to become positioned completely within the confines of the longitudinal slot 788 as shown in FIG. 42C (FIG. 42C is to be considered diagrammatic since the rocker arm would have started to return to its original position by the time the needle means obtained the portion shown in this view). From the foregoing it will be apparent that the normal position of the rocker arm is that shown in FIG. 42A, the surfaces 812 providing a supporting relationship to the undersurface of a handle bail for purposes to be described. However, as soon as sufficient pressure is placed upon the handle bail to overcome the bias of spring 806, the rocker arm will move as shown to the position shown in FIG. 42C.

As best shown in FIG. 42A through 42C and FIGS. 34 through 34B, an angularly diverging thin holddown means 776 in the form of a spring having one end 816 attached to member 522 by a suitable screw 818, is provided to engage the top portions of the handle bails during the rack-advancing operation and the inserter operation. The spring means 776 may be conveniently made of a thin sheet metal material and the outer end 820 thereof is adapted to extend beyond the face 814 of the base portion 594. The end portion 820 extends for a distance of approximately the width of one handle bail portion, as best shown in FIG. 42C.

The holddown spring means 776 is periodically engaged by a clamping block means 778 which takes the form of a rectilinear block 822 which may be formed of an organic plastic material such as nylon or the like. The rectilinear block 822 (shown in FIGS. 42A through 42C and FIGS. 34 through 34B) is spaced immediately above the spring means 776 for coaction therewith, so that the end handles are precisely and firmly positioned during the actual shearing of the last handle relative to the next to the last handle. The rectilinear block 822 is attached to a push rod 824 which is adapted to be moved by and to move relative to a tube 826. The tube 826 is formed with a bore 828, having a shoulder 830 therein. The rod 824 is formed with a head 832 which is engageable by a compression spring 834, the other end of the spring engaging the end of the bore 836 to exert a constant biasing force on the head of the rod 832. It will be understood that this forms a lost motion connection, with the arrangements of the parts such (as is shown in FIG. 34) that the head 832 has a substantial amount of travel within the bore 828. The head 832 engages the shoulder 830 only at the end of the upward stroke of the rod so that the movement of the block is in essence in the neighborhood of 1/16 of an inch or less. Stated another way, the tube 826 has a stroke of approximately 5" and the block has a movement of approximately 1/16 of an inch. The inter-relationship of these parts to the other parts of the apparatus will be later described. The tube 826 is formed with a coupling 838 in its midportion to allow the assembly of the components. The tube 826 is adapted for movement relative to spacer blocks 526—528 through conventional bearings 839 and is attached at its upper end to block 554 for movement therewith.

Handle or bail arm orientating means 780 is provided in the form of spaced inverted L-shaped members 840—842 which are substantially mirror images of each other. Each of the L-shaped members have offset upper ends 846 and the lower ends 844 have a curvilinear surface 848 which coacts with the inserter needle and with the arm of a handle bail, in a manner to be described. Offset end 846 is attached to a rod 850 which is adapted to slidably coact with a tube 852, having a bore therewith. A pin 854 is fixed on the tube 852 near the lower end thereof for coaction with a slot 856 formed in the rod 850. A spring member 858 engages the end of the rod 850 at one end and engages the end of the bore 860 at the other end to provide a lost motion coaction for purposes hereinafter appearing. The tube 852 is mounted in suitable bearings 862 and is attached at its upper end to the rod actuating plate 554.

The inserter needle means 782 comprises a pair of spaced needle members 864—866. Each needle member 864—866 is substantially the mirror image of the other and each is bifurcated into mirror image halves 868—870 by a central slot 876 as shown in FIGS. 46, 47 and 48, the lowermost end portion of the needles, adjacent the slot portion, being formed into clamping jaw surfaces 872—874. These jaws are adapted to engage the arms on a handle bail, in a manner to be later explained. To assure easy entry of the handle or bail arms 562—564, the jaw surfaces are relieved at 878 and 880 and as is shown in FIG. 46 a second relief is provided at 882. The terminal end surfaces 884—886 are adapted to engage the heads 566—568 of a handle arm immediately adjacent to where it is attached to the arm proper. This cooperation is shown in FIG. 42B. It will be noted that the backside of the needle members (opposite from the relieved surfaces 880—882) is tapered or relieved at 888. The tapered surface 888 coacts, as does surface 890 of the needle, with the curvilinear surface 848 of the arm orientation means 780. The needles are provided with offset flat cam surfaces 892—894 intermediate the ends thereof, as shown in FIG. 47. The coaction of surfaces 892—894 with rollers 910—912 will be later described. The shank portions 898 of the needles are fixedly mounted to push rods 900—902. The rods are conveniently mounted for movement in bearings 904 for movement by rod plate 554 which mounts the rods 900—902.

As shown in FIGS. 36 and 36A, spaced rollers 906 and 908 are adapted to coact with cam surfaces 892—894 of the needle means to cause same to open and close on the downward and upward strokes of the needle, as will become apparent. The rollers 906—908 are mounted in offset relation to a pivot link 914 and are mounted on pins 910 and 912 respectively, as shown in FIG. 36A. The links 914 are pivotally mounted on pins 916, the latter in turn being mounted in suitable mounting brackets 918. The rollers are lightly biased in a downward direction by flat springs 920 which are mounted to the sidewalls 922—924 (see FIG. 36A) by suitable fastening means 922. The links 914 are biased into engagement with base portion 921 which restrains their downward movement and they are free to pivot upwardly (along the dotted lines) against the bias of spring 920. Thus, upon upward stroke of the needles, the rollers automatically relax sufficiently for disengagement of the jaw portions thereof with the handle arms and on the downward stroke they are brought together for clasping, clamping engagement of the arms of the handle bail portion.

A perusal of FIGS. 34 through 34B and 42 through 42C shows the relative coaction and movements of the

parts upon downward movement of the plate 554. Thus, in its retracted position, the needles are spaced above the orientation arms 840—842, the curvilinear surfaces 844 of the latter engaging the handle arm portion as shown in FIG. 34B prior to engagement thereof by the jaw members of the needle members. Upon the needle inserting the handle head portions 566—568 in the handle receiving apertures 82 in the carrier web at the most downward position of the needles, the upward stroke is started and the jaw portions of the needles are relaxed upon upward movement to allow relative movement of the handle arms and the needle jaw portions, the heads 566—568 of the handles preventing the removal of the handle arms 562—564 from the apertures 82. Thus, the handles are automatically assembled into the six packs. It will, further, be appreciated that the holddown spring means 776 and nylon block 822 also operate in sequential relation, as does the platform means while a shearing action of the handle web portions 558—560 occurs. The web portions are sheared off at the juncture of the surface 814 and the base portion 594 by the downward movement of the needles. To assure no distortion and a clean shearing action, the platform means supports the handle 70, so that stresses are correctly presented to the handle web to afford rapid fire insertion of handles in the passing carrier web. The spring means 776 and holddown block means 778 hold or clamp the top portions of the handles so as to prevent distortion and, also, to assure clean, positive shearing.

The drive and timing mechanism for areas 56 and 58 of the assembly apparatus utilize the same prime mover motor 425 utilized to drive the rest of the apparatus. A second output shaft 924 emanates from gear box 429 (shown in FIG. 20A) extends longitudinally along the machine to a gear box 926. A fine adjustment handle wheel 928 is conveniently coupled into said shaft 924 to provide an adjustable relationship between the two gear boxes. Gear box 926 (located immediately below the handle inserter assembly area 56) has a vertical output shaft 930 (best shown in FIGS. 1 and 22). Shaft 930 extends through a bearing 932 and terminates in a face gear 934. The face gear 934 engages and drives bevel gear 936 located on one end of cross shaft 938 as shown in FIGS. 21 and 25. Mounted on the other end of cross shaft 938 is bevel gear 940 which is operable to rotate shaft 942 which has a complementary bevel gear 944 mounted thereon. As shown in FIG. 25, shaft 942 extends vertically upwardly through a clutch coupling 946 and has an intermediate bevel gear 948 located thereon and another bevel gear 950 located near its upper extremity. Intermediate gear 948 is mounted to drive shaft 952 which is suitably mounted in a bearing 954 fixed to vertical plate 510. A bevel gear 956 coacts with gear 948 and is operable to drive a cam means 958 which is located at the end of shaft 952 opposite from the gear 956. The cam means 958 has a cam track 960 in its face which operates to coact with a cam follower 962, mounted on sideplate 524 which is a portion of the carriage means 512. As shaft 952 rotates, the carriage means pivots on yoke members 514 and 516 about shaft 964 located near the top of the apparatus, as shown in FIG. 25. The carriage means, thus, swings in a pendulum-like movement to afford a longer time interval for precision coaction with the web of the carrier means moving under the influence of the conveyor belt 108 and under the influence of means 488. It is during the forward swing (in the direction of the moving cans) that the operation of cutting the carrier web and insertion of the handles takes place.

Mounted on cross shaft 964 are a pair of bevel gears 966 and 968, the former coacting with bevel gear 950 and the latter coacting with a bevel gear 970 mounted on short shaft 972 (best seen in FIG. 25). Shaft 972 mounts a pulley 974 which drives a belt 976 to in turn drive a pulley 978 located on shaft 980 at the lower front end of the magazine portion of the assembly apparatus. Belt 976 provides the input power for the rack-advancing means and assures a timed relationship between the rack-advancing means and the other components of the entire apparatus 50. An adjustment roller 982 is located on the outboard side of the magazine sidewall to adjust the tension on belt 976. The rollers and drive means and pulleys above described are perhaps best shown in FIGS. 25, 33 and 37. The shaft 980 mounts the crank link 730 and the drive pulley 710 which operate the various rack-advancing means and single handle control means, above described.

Up and down movement of rod actuating plate 554 and, hence, the actuation of holddown block means 822, the orientation arms 840—842 and the needles 864 and 866 and the scissors action of the knives 542—544 is provided by a cam 984 containing a track 986 which coacts with follower 988 mounted on an extension 990 which is attached to said plate 554. The cam 984 is mounted on shaft 964 and, thus, is in timed relationship to the rack advancing aspect of the single handle control means and to the other components of the apparatus. The sequential operation of the components attached to the plate or bar 554 is illustrated in FIGS. 42 through 42C and FIGS. 34 through 34B. The simultaneous coaction of the single handle advancing means which, also, advances the rack of handles, is shown in FIGS. 27 through 32 and it will be appreciated that the front handle on a rack of handles is presented to position outboard of the surface 814 of the base 594 prior to the descent of the spaced inserter needles.

Means for timing and driving the other components from the input gear 934, mounted on shaft 930, is provided by a pair of sprockets 992 and 994, shown in FIG. 25 in the lower left hand corner thereof. The outboard sprocket 992 mounts a chain 996 which engages another sprocket 998 to drive the shaft 1000. Shaft 1000 (as shown in FIG. 20A) mounts a sprocket 1002, which in turn mounts another chain 1004 which drives the conveyor or belt drive means 1006 and driving belt or conveyor 108. A suitable, adjustable idler tension means 1008 is provided to adjust the tension on the chain 1004. Thus, the conveyor belt 108 is driven in timed relationship to the other components of the apparatus.

Means for driving the unitizing means 484 in timed relationship to the other components is provided by the inboard sprocket 994 mounted on shaft 938 and as shown in FIGS. 21 and 22, drives a chain 1010 which, in turn, drives a sprocket 1014 mounted on shaft 1012. An adjustable tension member 1016 in the form of a roller pulley member 1016 is provided to adjust the tension of this chain 1010. A pair of gears 1018 and 1020 are mounted intermediate the ends of shaft 1012 to drive gears 1022 and 1024, respectively, which are mounted on the ends of driven shafts 503 and provide the input power to the unitizing means as earlier described.

Returning now to the attachment which comprises the high-speed distribution means, which was mentioned briefly heretofore, it will be seen that the means 1026 is well illustrated in FIGS. 5A, 5B and 5C. The distribution means 1026 essentially comprises a sinusoidal distribution means 1038, a side bumper flow control means 1040, back-up jam sensing means 1042, lane entry jostling means 1044, and drive means 1046 for affording timed relationship of the aforementioned components of the distribution means with each other and with the rest of the apparatus.

The sinusoidal distribution means 1038 comprises a movable cage means 1048 adapted to confine and direct a procession of single file cans emanating from the filling apparatus 60, as shown being diverted from a conveyor belt in the left hand portion of FIG. 5A. The cage means 1048 comprises spaced side members (two on each side) 1050—1052, which are held in spaced relation by top spacer members 1054—1056—1058. Depending spaced

side members 1055—1057—1059 support the two elongated side members on each side of the cage, as shown in FIG. 5B. The cage, of course, is open at the bottom so that the cans may be moved forwardly by the conveyor belt 86.

The top spacer member 1054 extends to the left as shown in FIG. 5A, and at the end thereof supports a pin 1060 which pivotally mounts the cage to transverse channel support bar 1062 which is, in turn, supported in elevational relationship to the belt 86 by suitable angle braces 1064 at the ends thereof. The transverse bar 1062, also, has two depending support members 1066 which support the end of the track for the cans 1028 emanating from the filling machine.

A pair of elongated longitudinal bar members 1068—1069 are fixed to the top of spacer members 1056—1058 to form a groove and at the ends thereof is an upright extension 1070 which supports a pin 1072 with a roller 1074 thereon. The roller 1074 is adapted to coact with and roll on the upper surface of the transverse plate 1076 the front edge thereof having an arcuate surface 1078. The plate 1076 is physically mounted to another transverse channel member 1080, which is mounted in parallel elevational relationship to transverse channel or bar member 1062 by suitable suports 1086. The plate 1076 may be mounted by vertically rising block members 1082—1084, shown in FIG. 5A. So that the cage means 1048 may be moved back and forth transversely across the belt 86, a pin and roller 1088 is mounted in the slot formed by the spaced bars 1068—1069 to attach a lever arm 1090 which is fixedly attached to gear 1092 rotating on shaft 1093. The shaft 1093 is supported on bar 1080 and the gear 1092 is rotated by a complementary beveled gear 1094 mounted on shaft 1096. A pulley 1098 is mounted on the outboard end of shaft 1096 and is driven by a suitable belt 1100 as shown in FIG. 5B. The input power to belt 1100 and the timed relationship of the movement of the cage, relative to the rest of the components, will be explained hereinafter.

From the foregoing it will be seen that rotation of belt 1100 will cause shaft 1096 and gear 1094 mounted thereon to rotate gear 1092 causing the lever arm 1090 to rotate. Rotation of the arm 1098 causes the roller 1088 mounted in the groove between 1068—1069 to move the cage member transversely across the belt in a rhythmic motion and the movement of the cans emanating from the cage produces a sinusoidal wave form in top view.

Side bumper flow control means 1040 are located in opposed relationship in the form of short triangular metallic members 1102—1104 which are conveniently fastened to the outboard side rail extenders 90, as shown in FIG. 58. Each of the triangular members 1102—1104 is formed with a somewhat snubbed nose 1108 and the position of the bumpers 1040 is such that when the cage directs the cans against the side rails 90 at the end of the sweep of the cage means 1048, the cans are diverted out into the central portion of the belt 86. This compensates for the relatively longer period of time that the cage is located adjacent the two ends of the plate 1076 which would result in an overly heavy distribution of the cans in the outermost two lanes of the four lanes shown.

Safety interlock means in the form of "jam sensing means" 1042 takes the form of a pair of opposed switches 1110—1111 each of which has actuators 1114 extending through opposed slots 1112 located in the side walls of the outboard lane extenders 90, as shown. The switches 1110—1111 are so connected into the main controls of the apparatus 50 such that both switches must be actuated simultaneously to cause the apparatus to shut down. The actuation of one of the switches, such as 1110, does not cause the apparatus to shut down, and, in fact, each switch gets actuated at the end of each sweep of the cage means as it traverses the belt 86. However, in the event that the cans should become jammed and back up such that both switches are actuated by cans impinging on the actuators 1114, the apparatus will shut down and the operator can tend to the difficulties causing the jam-up.

Jostler means 1044 are provided for the entering ends of the can lanes and they project beyond the first extension members 1030—1036. There are three separate jostler means which are substantially identical and only one shall be described. As shown in FIG. 5C and FIG. 5A, a second projection means for each of the can lanes in the form of a deep U-shaped member 1116 is attached to the first extender of the can lanes, such as 1036. The base of the U forms a snub nose 1118 and the ends of the U-shaped member fit over and are fastened to the extender by suitable bolts which also serve to mount a support member 1112 which supports the second extender means 1116 in slightly elevated relation, relative to the belt 86. The supports 1122 are fixedly attached to a fixed rod 1120.

A depending jostler pin 1124 (best shown in FIG. 5C) extends slightly ahead of the snub nose 1118, at the front of the second projection means 1116, and is mounted on movable arm 1126 actuated by movable rod 1128 and attached to rod 1120 for pivotal movement thereon by a suitable pin 1130. The arm 1126 pivots on rod 1120 having a sweep, as shown in FIG. 5A, to jostle the cans that might tend to become located adjacent the entering end of the can lanes. The trailing end of the arm 1126 is formed with a pair of upright extensions 1132 which are formed with a suitable bore to receive the rod 1128. The uprights 1132 are mounted between two opposing compression springs 1134—1136, one end of each of said springs engaging the uprights 1132, the other ends engaging spaced retaining collars 1138—1140 which are adjustably mounted on rod 1128 by suitable adjustment screws 1142. Thus, movement of rod 1128 will normally cause the arm 1126 and, hence, pin 1124 to circumscribe a short art segment, as shown in the dotted lines in FIG. 54, by pivoting about pin 1130 mounted to fixed rod 1120. It will be appreciated that if a resistance of greater force than the amount of the biasing force of the springs is encountered by the jostle pins 1124, the springs will compress thereby preventing breakage of the parts. The actuator rod 1128 is mounted immediately behind fixed rod 1120 and has a pin on the end thereof 1144 for attachment to a bellcrank 1146 which is mounted on vertical shaft 1148. A second bellcrank 1150 (mounted below and in spaced relationship to bellcrank 1146) is attached to drive rod 1156 by a suitable end portion clevis 1154 having a pin 1152 at the end thereof. Thus, reciprocatory motion of the rod 1156 will cause transverse motion of the rod 1128 to, in turn, cause movement of the jostle pin, as aforementioned.

The drive means 1046 comprises a take off from the idler shaft of the belt 86 which is driven by the drive shaft 430, as shown in FIG. 1. The idler shaft 1158 (shown in FIG. 5B) has a sprocket 1160 located on the outboard end thereof which mounts a chain 1162 which drives sprocket 1164 mounted on stub shaft 1166. An adjustable idler member 1167 is mounted to provide suitable tension to the chain 1162, as shown in FIG. 5B. A pulley 1168 is mounted on shaft 1166 to drive belt 1100 which, in turn, drives the cage means and a crank member 1170 is, also, mounted on shaft 1166 to drive the jostle means 1142 in timed relationship through the drive rod 1156. From the foregoing, it will be apparent that the sinusoidal distribution means and the jostle means move in timed relationship to each other and to the rest of the components in the apparatus.

Although a specific embodiment has been shown and described, it is with full awareness that many modifications thereof are possible. The invention, therefore, is not to be restricted except insofar as is necessitated by the prior art and by the spirit of the depending claims.

What is claimed as the invention is:

1. An apparatus for assembling containers into packages for carrying, comprising means for supplying a suc-

cession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said means for supplying and said supply station for feeding said resilient carriers to said supply station in a substantially tension free condition, means for storing a plurality of containers, means for directing a procession of containers from said storage means to an assembly station spaced both therefrom and from said supply station, rotor means mounted proximate to both said stations, and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into engaging relation to containers in said assembly station.

2. For use with a container filling and closing machine, an attachment for assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying, in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, means for directing a procession of containers to an assembly station spaced from said supply station, rotor means mounted proximate to both said stations; and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

3. For use with a container filling and closing machine, an attachment for high speed assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying, in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, at least some of the margins of said apertures in said carriers being successively located on a variable spacing along the center line, means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, means for directing a procession of containers to an assembly station spaced from said supply station, rotor means mounted proximate to both said stations; and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

4. For use with a container filling and closing machine, an attachment for assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying, in continuous strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, drive and feed means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, said drive and feed means comprising a first rotary mounted member having projections coactable with the margins of the apertures of said carriers, and a second rotary member located adjacent to said supply station and the relationship between said first and second rotary members affording a slack portion in the continuous strip of carrier immediately adjacent to said supply station, means for directing a procession of containers to an assembly station spaced from said supply station, rotor means mounted proximate to both said stations; and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

5. The combination set forth in claim 4 wherein said first rotary member includes means for affording relative movement of said projections.

6. The combination set forth in claim 5 wherein the said projections are pin means and said means for affording relative movement thereof is cam means affording movement of the pin means relative to the circumferential periphery of the first rotary member.

7. In a machine for assembling containers into packs held together by generally flat somewhat elastic carriers, the combination of means for directing a procession of containers to a carrier and container assembly station, rotor means proximate to said assembly station, means for supplying a succession of carriers to said rotor means at a location circumferentially spaced from said assembly station, said rotor means including shoe means on the periphery thereof for picking up successive carriers from said carrier supplying means and applying the carriers into embracing relation to containers in said assembly station, and means for positively orienting said carriers and said shoe means.

8. A machine adapted for applying a succession of apertured carriers to a procession of containers to form carrying packs of containers, comprising, in combination, means for supplying a succession of apertured carriers to a supply station, means for supplying a procession of containers to an assembly station spaced from said supply station, rotor means mounted with an annular portion thereof extending through both said stations, a circumferential series of carrier applying elements on said rotor means adapted to pick up a succession of carriers at said supply station and apply the carriers into telescoping relation to containers in said assembly station, means associated with said carrier applying elements for positively orientating said carriers thereto and stripper means for separating carriers applied to containers from said applying elements.

9. In a machine for assembling containers into packs held together by generally flat somewhat elastic carriers, the combination of means for directing a procession of containers to a carrier and container assembly station, rotor means proximate to said assembly station, means for supplying a succession of carriers to said rotor means at a location circumferentially spaced from said assembly station, said rotor means including jaw means on the periphery thereof for picking up successive carriers from said carrier supplying means and applying the carriers into embracing relation to containers in said assembly station, means for positively orienting said carriers and said jaw means, and means for positively orienting said containers relative to said carriers and said jaw means.

10. The combination set forth in claim 9 wherein the jaw means have friction reducing means associated therewith for facilitating the applying of the carriers to an embracing relationship with said containers.

11. A machine adapted for applying a succession of apertured carriers to a procession of containers to form carrying packs of containers, comprising, in combination, means for supplying a succession of apertured carriers to a supply station, means for supplying a procession of containers to an assembly station spaced from said supply station, rotor means mounted with an annular portion thereof extending through both said stations, a circumferential series of carrier applying elements on said rotor means adapted to pick up a succession of carriers at said supply station and apply the carriers into telescoping relation to containers in said assembly station, means associated with said carrier applying elements for positively orientating said carriers thereto for consistent accurate application to said containers, comprising side edge orientation means for association with each of the side edges of the carriers, longitudinal orientation means for association with said carrier means intermediate said side edge orientation means, and transverse orientation means for orientating portions of the carrier transverse to the side

edges thereof, and stripper means for separating carriers applied to containers from said applying elements.

12. For use with a container filling and closing machine, an attachment for assembling containers discharged from the machine into packs for carrying, comprising, in combination, first storage means for supplying in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said first storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, second storage means for retaining a plurality of containers in non-jamming relation, means for moving a procession of containers from said second storage means toward an assembly station spaced from said supply station, rotor means mounted proximate to both said stations, means for segregating said containers for individual precise positional relationships with portions of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

13. For use with a container filling and closing machine, an attachment for assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, second storage means for retaining a plurality of containers in non-jamming relation, means for moving a procession of containers at a predetermined speed from said storage means toward an assembly station spaced from said supply station, rotor means mounted for movement at said predetermined speed and proximate to both said stations, means for segregating said containers including means for accelerating said container means relative to said predetermined speed to provide individual precise positional relationships with portions of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

14. For application to the discharge side of a container filling and closing machine, an attachment for high speed assembling of containers into carrying packs, comprising, in combination, means for supplying to a carrier supply station a succession of elastic carriers each defining a plurality of apertures for receiving containers, a carrier applying rotor having a periphery extending past said supply station to an assembly station underlying the rotor, means for supplying containers from the machine to said assembly station in timed relation to rotary movement of said rotor, and a circumferential series of carrier applying units mounted on the periphery of said rotor adapted to pick up a succession of carriers at said supply station and apply the carriers to containers at said assembly station, said successive carrier applying units in the series being relatively movable one to the other to vary the dimension therebetween.

15. A machine for assembling containers into carrying packs, comprising, in combination, means for directing containers to an assembly station, means for supplying apertured carriers, a series of carrier applying elements mounted for movement through a closed path extending past said supplying means and said assembly station, said carrier applying elements including means for picking up carriers from said supplying means and applying the carriers to the containers at said assembly station to encircle the individual containers in assembled relation thereto, means for directing assembled carriers and containers along a predetermined path, a carriage mounted for movement in adjacent relation to said path, a container spacing means mounted separate from and for movement in a plane transverse to said carriage and for movement along with and between containers assembled in adjoining carriers moving along said path, means for moving said carriage and said container spacing means in timed relation, carrier severing means supported by said carriage for severing adjacent carriers, and handle applying means supported by said carriage for applying handles to successive carriers.

16. For use with a container filling and closing machine, an attachment for assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station, means for moving a procession of containers along a predetermined path toward an assembly station spaced from said supply station, rotor means mounted proximate to both said stations, starwheel means located in said predetermined path for segregating said container means for individual precise positional relationships with portions of said rotor means, said starwheel means including means for deceleration and then acceleration of the individual containers in timed relation to the movement of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the aperture in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

17. An apparatus, for assembling a plurality of containers into packs for carrying, comprising, in combination, rotor means mounted for movement at a predetermined speed, means for supplying in strip form, a succession of interconnected apertured carriers to said rotor means, means for moving a procession of containers at said predetermined speed toward said rotor means, means for segregating said containers including means for accelerating said containers relative to said predetermined speed to provide individual precise positional relationships with portions of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured carriers and assembling the carriers into embracing relation to said containers.

18. The combination set forth in claim 17 wherein the means for segregating and accelerating the containers comprises rotatable starwheel means rotating at a predetermined speed, said starwheel means comprising a plurality of projecting tooth portions defining a pocket therebetween, each individual tooth portion having a leading edge portion and a trailing edge portion each of which is engageable with an individual container, said trailing edge portion being configured so as to decelerate a container and said leading edge portion being configured to accelerate a container.

19. A machine for assembling a plurality of processions of containers into carrier packs held together by apertured carriers, comprising, in combination, carrier applying rotor means, a plurality of means for storing a plurality of containers for each procession of containers, means for supplying a procession of containers from each of said storage means to an assembly station adjacent said rotor means, means for distributing, from a single procession source, containers to each of said storage means to load same in substantially equal amounts, means for supplying a continuous interconnected series of apertured carriers to said rotor means located in spaced relation to said assembly station, said rotor means including carrier applying elements for picking up said carriers from said supply means and moving the carriers into

encircling relation to containers at said assembly station, means for directing away from said assembly station the containers and the interconnected carriers encircling the containers, and carrier severing means operated in timed relation to said rotor means for severing adjacent carriers from each other.

20. In an apparatus for assembling containers, starwheel means adapted to be associated with path means containing a procession of moving containers and rotatable about an axis transverse to said path means comprising a plurality of tooth portions extending radially from said axis and into said path means, a plurality of container receiving pockets individually located between said tooth portions, said individual pockets being located relative to the radially outwardmost tip portion of said individual tooth portions so that a radii intersecting said outwardmost tip portion intersects with said individual pockets, each said tooth portion having a leading edge and a trailing edge, both of which are differently curvilinear in a generally radial direction, each said leading edge and trailing edge being simultaneously active on different successive containers in said path means and simultaneously imparting different force characteristics on said different successive containers in said path means.

21. In a machine for assembling a continuously moving procession of containers into packs for carrying, the combination of an endless series of carrier applying elements, means for continuously circulating said carrier applying elements through a closed path free of abrupt changes in direction and extending through an assembly station, means for supplying a continuous procession of containers to said assembly station for continuous movement through said assembly station in synchronism with the continuous movement of the carrier applying elements through the assembly station, carrier supply means for supplying a succession of elastic carriers in tension free condition to said endless series of carrier applying elements continuously circulating through said closed path, and said carrier applying elements including means for moving into assembled relation to containers moving through said assembly station elastic carriers supplied by said supply means to form assembled packs of containers.

22. In a machine for assembling a continuously moving procession of containers into packs for carrying, the combination of a rotor, an annular array of carrier applying means on said rotor, means for continuously rotating said rotor to effect continuous movement of said carrier applying means through an assembly station, means for supplying a continuous procession of containers to said assembly station for continuous movement through said assembly station in synchronism with the continuous movement of said carrier applying means through the assembly station, carrier supply means for supplying a succession of apertured elastic carriers to said carrier applying means on said continuously rotating rotor including means for supplying said carriers in a tension free condition, and said carrier applying means including means for moving into embracing relation to containers continuously moving through said assembly station elastic carriers supplied by said supply means to form assembled packs of containers.

23. In the apparatus set forth in claim 20, said path means comprising a pair of spaced lane members and a conveyor means movable relative to said lane members to move containers confined therein relative thereto, one of said lane members being apertured to receive said tooth and pocket portions of said starwheel means, said lane members each having a substantially straight portion and an offset portion, said offset portion being in the vicinity of said starwheel means to change the path of the containers acted on by the starwheel means to reduce the effects of centrifugal force imparted to containers by said starwheel means to afford a gentler handling of said containers.

24. An apparatus for assembling a plurality of containers into packs for carrying, comprising, in combination, rotor means mounted for movement at a predetermined speed, means for supplying in strip form, a succession of interconnected apertured carriers to said rotor means, means for storing a plurality of containers, distribution means for distributing, from a single procession source, containers to said storage means, means for moving a procession of containers from said storage means at said predetermined speed toward said rotor means, means for controlling said containers including means for accelerating said containers relative to said predetermined speed to provide individual precise positional relationship with portions of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured carriers and assembling the carriers into embracing relation to said containers.

25. The apparatus set forth in claim 24 wherein the means for distributing containers emanating from a single procession source to a plurality of storage means comprises conveyor means operable to move containers in a predetermined direction and of substantially greater width than said containers, a plurality of entry means for said storage means, and movable cage means spaced from said entry means and operable to receive a single lane procession of containers, said cage means being movable across the width of said conveyor means in timed relation to the speed thereof to distribute containers to each of said entry means of said storage means.

26. The apparatus set forth in claim 25 wherein the distribution means further includes side rail bumper means spacedly located from both said entry means for said storage means and from said cage means to redivert a portion of the single lane procession of containers emanating from said cage means toward the midportion of said conveyor means.

27. The apparatus set forth in claim 26 including can jam-up sensing means comprising a pair of spaced detector means disposed on opposite sides of said conveyor means, each of said detector means being located adjacent to one of said side rail bumper means whereby simultaneous actuation of both said detector means indicates a jam-up and automatically affords a shutdown of said apparatus.

28. The apparatus set forth in claim 26 wherein said entry means for said storage means includes jostler means movable in timed relation to said cage means and said conveyor means to normally prevent a jam-up of containers immediately adjacent thereto.

29. The apparatus set forth in claim 28 wherein said jostler means comprises a movable actuator rod extending transversely across said conveyor means, a fixed rod extending generally parallel to said actuator rod, an actuator arm pivoted to said fixed rod and formed with a depending container engaging portion at one end and with a force transmitting connection means to said actuator rod at the other end, said connection means comprising spring means interposed between said actuator arm and said actuator rod to provide a spring loaded force transmitting connection therebeween whereby movement of said actuator rod causes movement of said depending container engaging portion of said actuator arm.

30. A container and carrier assembling machine comprising, in combination, means for directing a procession of containers to a container and carrier assembly station, a carrier assembling rotor proximate to said assembly station, a circumferential series of carrier applying shoes mounted on said rotor in pairs to be moved by the latter into overlapping relation to containers in said assembly station, means for supplying to said rotor at a location circumferentially spaced from said assembly station a succession of apertured carriers, and means for pivoting said carrier applying shoes relative to said rotor, said pairs of carrier applying shoes defining diverging lips projecting radially outward to fit into apertures of carriers supplied from said supplying means and move the car-

riers into telescoped relation to containers in said assembly station.

31. The apparatus set forth in claim 30 wherein said carrier applying shoes are pivoted on said rotor in timed relation to rotation of said rotor.

32. A machine for assembling a procession of containers into a succession of carrying packs, comprising, in combination, means for directing a procession of containers to an assembly station, a rotatable rotor mounted in operative association with said station, a circumferential series of spaced carrier applying shoe sets mounted on said rotor in pairs, means for pivoting, in timed relation to rotation of said rotor, said carrier applying shoe sets, means for supplying a series of interconnected and apertured carriers to said rotor in spaced relation to said assembly station, said supplying means including a carrier feed roll around which interconnected carriers are aligned and directed onto said applying shoes on said rotor, said feed roll having parallel grooves therein in alignment with apertures of said carriers thereon, said carrier applying shoe sets projecting into the confines of the grooves of said feed roll, means for deflecting away from said rotor the opposite side edges of carriers moving onto said shoes, and means for moving corresponding shoes of each pair away from each other as the shoe sets approach said assembly station to expand the apertures in the carriers on the shoes to fit the carriers around containers in said station.

33. The apparatus set forth in claim 32 wherein at least some of centers of the margins of said apertures in said carriers are spaced from the centers of the margins of the next adjacent apertures by a different dimension.

34. The apparatus set forth in claim 33 wherein said carrier applying shoe sets are pivoted on said rotor to reduce the spacing therebetween.

35. The apparatus set forth in claim 34 wherein means are provided for said successive carrier applying shoe sets as a unit to move said sets closer to each other in the vicinity of said feed roll and farther from each other in the vicinity of said assembly station.

36. The apparatus set forth in claim 35 wherein means associated with said successive pairs of shoe sets deflects the portion of said carrier intermediate its side edges away from said rotor.

37. The apparatus set forth in claim 36 wherein said means for deflecting said carrier portion comprises biasing means having a portion aligned with said side edges of said carrier and in engagement therewith for biasing the longitudinal midportion of said carrier outwardly from said rotor.

38. The apparatus set forth in claim 36 wherein said means for deflecting said carrier portion comprises means aligned transverse to said side edges of said carrier and cooperable therewith to bias said carrier portion outwardly from said rotor.

39. The apparatus set forth in claim 36 wherein said means for deflecting said carrier portion also includes means external of said rotor and cooperable with said biasing means and engageable with said carrier on the side opposite thereof from said biasing means to orientate said carrier on said shoes.

40. The apparatus set forth in claim 39 wherein said individual shoe of each set of shoes is coated with a tough plastic material having a low coefficient of friction to aid in uniform expansion of the apertures in said carrier.

41. An apparatus for assembling a plurality of cylindrical containers into packs for carrying, comprising, in combination, rotor means mounted for movement at a predetermined speed, means for supplying in strip form, a succession of interconnected apertured carriers to said rotor means, means for storing a plurality of containers in non-jamming relation comprising area means defined by spaced elongated members extending generally along and defining a path for movement of said cylindrical containers, said members being spacedly mounted apart by a dimension greater than the outside diameter of the cylindrical container but not more than 1.866 times the outside diameter of the cylindrical containers, means for moving a procession of containers from said storage means at said predetermined speed toward said rotor means, means for segregating said containers including means for accelerating said containers relative to said predetermined speed to provide individual precise positional relationship with portions of said rotor means, and said rotor means including carrier applying means for picking up said succession of apertured carriers and assembling the carriers into embracing relation to said containers.

42. The apparatus set forth in claim 40 wherein there are a plurality of storage means therefor, each of which comprise discrete area means which are located in generally parallel relation to each other to provide parallel paths for simultaneous movement of containers on each path.

43. The apparatus set forth in claim 41 wherein the distance between said spaced elongated members progressively decreases, from a dimension substantially close to 1.866 times the outside diameter of the container to a dimension substantially equal to the outside diameter of a container in the vicinity of the means for accelerating said containers.

44. In apparatus for handling containers having a generally cylindrical portion, means for storing said containers in non-jammed relation on a moving conveyor means comprising, first and second spaced elongated members extending generally along and supportingly mounted above said conveyor means to confine said cylindrical containers therebetween, said first and second members being spaced apart a distance more than the outside diameter of said cylindrical containers and close to but not more than 1.866 times the said outside diameter of said containers to provide maximum storage per unit length of said members consistent with preventing a jamming relation of said cylindrical containers.

45. Apparatus for assembling containers into packs for carrying, comprising, in combination, means for supplying a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said means for supplying and said supply station for feeding said resilient carriers to said supply station in a substantially tension free condition, means for sensing the absence of a supply of carriers and operable in such event for stopping the apparatus, means for directing a procession of containers to an asembly station spaced both therefrom and from said supply station, rotor means mounted proximate to both said stations; and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the aperatures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

46. The apparatus set forth in claim 45 wherein the means for sensing the absence of a supply of carriers comprises a pivotally mounted weighted lever arm having an apparatus operating position and biased toward an apparatus stopping position, said lever arm being restrained from its apparatus stopping position by engagement with the interconnected apertured carriers.

47. A machine for assembling a plurality of processions of containers into carrier packs held together by apertured carriers, comprising, in combination, carrier applying rotor means, a plurality of means for storing a plurality of containers for each procession of containers, means for supplying a procession of containers from each said storage means to an assembly station adjacent said rotor means including means for sensing the absence of containers in each procession and operable in such an absence to stop the apparatus, means for supplying a continous interconnected series of apertured carriers to said rotor means located in spaced relation to said assembly

station, said rotor means including carrier applying elements for picking up said carriers from said supply means and moving the carriers into encircling relation to containers at said assembly station, means for directing away from said assembly station the containers and the interconnected carriers encircling the containers, and carrier severing means operated in timed relation to said rotor means for severing adjacent carriers from each other.

48. The machine set forth in claim 47 wherein means is provided for sensing a container that is misorientated and operable in such event to stop the apparatus.

49. The machine set forth in claim 48 wherein means adjacent to said rotor means is provided to retain the containers in oriented relation for assembly to the interconnected carrier.

50. For use with a container filling and closing machine, an attachment for high speed assembling containers discharged from the machine into packs for carrying, comprising, in combination, storage means for supplying, in strip form, a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, at least some of the margins of said apertures in said carriers being successively located on a variable spacing along the center line, said storage means comprising pivotally mounted support means, rotatable spindle means mounted on said support means, carrier reel means mounted for rotation with said spindle means, latch means for maintaining said support means in a substantially vertical plane, and loading base means coactable with said support means and disposed at an angle of less than 90° to receive said support means on pivoting thereof to afford a quick easy change of said carrier reel means, means located intermediate said storage means and said supply station for feeding said interconnected resilient carriers to said supply station in a substantially tension free condition, means for directing a procession of containers to an assembly station spaced from said supply station, rotor means mounted proximate to both said stations; and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

51. Carrier reel storage means for use in an attachment for high speed assembling of containers comprising pivotally mounted support means, rotatable spindle means mounted on said support means, latch means for maintaining said support means in a substantially vertical plane, and loading base means coactable with said support means and disposed at an angle of less than 90° to vertical to receive said support means on pivoting thereof to afford a quick easy manual change of carrier reel means mounted on said spindle means.

52. The storage means set forth in claim 51 including handle means for said support means affording manual pivotal movement of said entire storage means for quick easy loading thereof.

53. The apparatus set forth in claim 51 wherein said spindle means includes retaining means for said carrier reel and protuberance means for engaging said carrier reel to key said reel for movement with said spindle means, said retaining means and protuberance means being spaced from each other on the axis of said spindle means.

54. The apparatus set forth in claim 53 where said spindle means includes hub means of predetermined diameter and said retaining means includes pivotally mounted arms mounted on said hub means in a manner so that they may be selectively confined within or extend beyond the confines of said predetermined diameter of said hub means.

55. The apparatus set forth in claim 53 wherein said protuberance means are in the form of spacedly mounted sharp pointed members engageable with the side wall portions of said carrier reel.

56. The apparatus set forth in claim 54 wherein said pivotally mounted arms include manually engageable knobs for actuation thereof between selected positions.

57. Apparatus for assembling containers into packs for carrying, comprising, in combination, means for supplying a succession of resilient interconnected apertured carriers to a supply station spaced therefrom, means located intermediate said means for supplying and said supply station for feeding said resilient carriers to said supply station in a substantially tension free condition, means for sensing the absence of a supply of carriers and in such event stopping the apparatus, means for directing a procession of containers to an assembly station spaced both therefrom and from said supply station, rotor means mounted proximate to both said stations, means for sensing the absence of containers in said procession and operable on said absence for stopping the apparatus, and said rotor means including carrier applying means for picking up said succession of apertured resilient carriers at said supply station, expanding the apertures in the carriers, and assembling the carriers into embracing relation to containers in said assembly station.

58. The apparatus set forth in claim 57 wherein both of the means for sensing absence of the carriers and the containers are pivotally mounted lever means biased toward engagement with switch means operable to stop the apparatus.

59. The apparatus set forth in claim 57 including means for severing assembled interconnected carriers and containers into discrete package units.

60. A machine for assembling a procession of containers into a succession of carrying packs, comprising, in combination, a conveyor means, a rotor mounted above said conveyor means and including a circumferential series of carrier applying elements thereon, means for supplying an interconnected series of apertured carriers to said rotor, means for directing a procession of containers on said conveyor means into coacting relationship with said rotor, said carrier applying elements including means for picking up successive interconnected carriers from said supplying means and applying the carriers into assembled encircling relation to containers supplied by the said directing means, means for directing assembled containers and carriers along a predetermined path on said conveyor means, a carriage mounted in alignment with said path and above said conveyor means, means for moving said carriage repeatedly through a limited distance along said path in timed relation to movement of said rotor and said conveyor means, carrier severing means mounted on said carriage for movement horizontally across said path for severing adjacent carriers travelling along said path, handle inserting means mounted on said carriage for vertical inserting movement of carrying handles in successive carriers moving along said path, and linkage means for operating said severing means and said handle inserting means in timed relation to movement of said rotor and said conveyor means.

61. The machine set forth in claim 60 wherein the severing means comprises a pair of relatively movable spaced cutting edges adapted to move toward each other to sever the carrier web located therebetween.

62. The apparatus set forth in claim 60 wherein means is provided to place the interconnected carriers in tension during the operation of said carrier severing means.

63. The apparatus set forth in claim 62 wherein said carrier tension producing means comprises container engaging means adapted to being wedgingly inserted between adjacent containers for limited movement therewith along said limited segment of said path in timed relation to movement of said carriage means.

64. A machine for assembling a succession of containers into carrying packs, comprising, in combination, means for directing a succession of containers to an assembly station, means for supplying a succession of apertured somewhat resilient carriers, a series of carrier ap-

plying elements mounted for movement through a closed path extending past said supplying means and said assembly station, said carrier applying elements including means for picking up successive carriers from said supplying means and applying the carriers to the containers at said assembly station to encircle the individual containers in assembled relation thereto, means for directing assembled carriers and containers along a predetermined path, a carriage mounted in overlying relation to said path for limited movement therealong, means for moving said carriage a limited distance along said path in timed relation to movement of said carrier applying elements, container spacing means mounted below said carriage and adjacent to said path for movement along with and between containers from opposite sides thereof which are assembled in adjoining carriers moving along said path, carrier severing means supported by said carriage and operable in timed relation to movement of said spacing means for severing adjacent carriers, handle inserting means supported by said carriage and including a downwardly movable element for inserting handles in successive carriers; and means for operating said container spacing means, said carrier severing means and said handle inserting element in timed relation to movement of said carrier applying elements.

65. The apparatus set forth in claim 64 wherein said container spacing means comprises a pair of oppositely disposed sets of members disposed on opposite sides of said path of containers and carriers in assembled relation, each set comprising a series of vertically aligned spaced container engaging elements mounted for movement in a closed path intersecting with said container and carrier path and coextensive with at least a portion hereof.

66. The apparatus in claim 65 wherein said container engaging members are drivingly mounted on an endless chain and are formed with a rounded nose portion of larger dimension than the normal dimension of a V-shaped aperture formed by adjacent containers assembled in interconnected carriers whereby insertion of the rounded nose portion in said V-shaped aperture produces a tension in said interconnected resilient carrier.

67. The apparatus set forth in claim 66 wherein reaction means is provided for said container engaging members to afford forceable wedging engagement thereof between adjacent containers.

68. The apparatus set forth in claim 67 wherein said reaction means is disposed in parallel relation and adjacent to a segment of said container and carrier path.

69. The apparatus set forth in claim 68 wherein said endless chain mounting said container engaging members is mounted on spaced sprocket members, one of which is offset relative to the other when measured, relative to said container and carrier path.

70. The apparatus set forth in claim 69 wherein the sprocket member closest to said carrier applying elements is offset outwardly relative to said other sprocket member and to said reaction means to afford a "lead in" for entry of said container engaging elements in the V-shaped aperture between adjacent containers.

71. A machine for assembling a procession of containers with a succession of interconnected carriers to form separate carrying packs of containers held together by individual carriers, comprising, means for supplying an interconnected series of apertured carriers, means for directing a succession of containers to an assembly station, assembly means including carrier applying elements for moving an interconnected series of apertured carriers from said supply means into telescope assmbled relation to containers in said assembly station, means for directing away from said assembly station the containers and said continuous series of carriers assembled thereon, package unitizing and control means movable between nonsevered adjacent packs of containers assembled in adjoining carriers for positive control thereof, means for operating said package unitizing and control means in timed relation to movement of said assembly means, and carrier severing means operated in timed relation to said assembly means for severing from each other carrier packs under the positive control of said package unitizing and control means.

72. The machine set forth in claim 71 wherein said package unitizing and control means is disposed along a portion of the path of the continuous series of assembled carriers and containers and is operable to maintain positive control of said packs prior to, during, and after severing of said packs from each other.

73. The machine set forth in claim 71 wherein said package unitizing and control means comprises a plurality of spaced container engaging elements simultaneously engaging containers on opposite ends of a pack of containers.

74. The machine set forth in claim 73 wherein said package unitizing and control means comprises rail means engageable with the top portion of said container means to maintain vertical alignment thereof.

75. The machine set forth in claim 73 wherein said spaced container engaging elements are mounted on an endless belt means, there being two sets of elements mounted in opposing relation for simultaneous engagement with opposite sides of a pack of containers.

76. The machine set forth in claim 75 wherein said container engaging elements are composed of a tough, organic plastic for non-marring engagement of said containers.

77. The apparatus set forth in claim 75 wherein said container engaging elements are individually spaced from each other on said endless belt means by a dimension equal to the dimension of a discrete pack of containers assembled in a carrier.

78. The machine set forth in claim 77 wherein the container engaging elements have a vertical height of substantially one-half the containers and are mounted to engage the midportion thereof.

79. The machine set forth in claim 78 wherein the container engaging elements have a rounded surface coextensive with the vertical height thereof which is adapted to be inserted between adjacent end containers of discrete packs in an unsevered interconnected carrier relationship to place tension on the web portion of the carrier for easy severing thereof.

80. A machine for assembling a procession of containers with a succession of interconnected carriers to form separate carrying packs of containers held together by individual carriers, comprising means for supplying an interconnected series of apertured carriers, means for directing a succession of containers to an assembly station, assembly means including carrier applying elements for moving an interconnected series of apertured carriers from said supply means into telescope assembled relation to containers in said assembly station, means for directing away from said assembly station an interconnected group of containers and continuous series of carriers and along a predetermined path, means for segregating and controlling a discrete pack of said interconnected group comprising means disposed at opposite sides of said path and coextensive with at least a limited segment thereof and projecting therewithin, said means comprising spaced endless belts having pack engaging elements mounted thereon, said elements being spacedly mounted in opposed relation for simultaneous engagement with opposite end containers of a pack of containers, means moving said endless belts in timed relation to each other and to said assembled packs of containers, and carrier severing means operated in timed relation to said assembly means and said means moving said endless belts for severing from each other carrier packs under the positive control of said means for segregating and controlling a discrete pack.

81. A machine for assembling a procession of containers into a succession of carrying packs, comprising, in

combination, a rotor including a circumferential series of carrier applying elements thereon, means for continuously supplying an interconnected series of apertured carriers to said rotor, means for continuously rotating said rotor in a manner free from abrupt changes in speed of rotation, means for continuously directing a procession of containers into coacting relationship with said rotor, said carrier applying elements including means for picking up successive interconnected carriers from said supplying means and applying the carriers into assembled encircling relation to containers supplied by the said directing means, means for directing assembled containers and carriers along a predetermined path, a carriage mounted in alignment with said path, means for moving said carriage repeatedly through a limited distance along said path in timed relation to movement of said rotor, handle storage means, means for moving said handles from said storage means to an assembly position, handle applying means mounted on said carriage for applying carrying handles in said assembly position to successive carriers moving along said path, means associated with said handle storage means to sense an absence of handles in said storage means and operable in such event to shutdown said machine, and means for operating said handle applying means in timed relation to said continuous movement of said rotor.

82. Means for assembling a procession of containers into individual carrying packs each comprising a group of containers, said means comprising, in combination, means for supplying a procession of containers to an assembly station, endless means extending from said supply means to said assembly station and including carrier applying means moving in a closed path free from abrupt changes in direction for continuously moving successive carriers from said supply means into assembled relation to containers at said assembly station, means for directing the procession of containers with the carriers applied thereto away from said assembly station, single handle applying means mounted for alignment with the procession of assembled containers and carriers moving away from said assembly station, a handle supply magazine mounted to supply a succession of handles in rack form to said handle applying means, means to precisely control the end single handle of a rack of handles to position same for actuation by the handle actuating means, and means for operating said handle applying means in timed relation to movement of said endless means to apply carrying handles to successive carriers emerging from said assembly station in assembled relation to containers.

83. A machine for assembling into carrying packs a procession of containers issuing from a container filling and closing machine or the like, comprising, in combination, means for supplying a continuous series of interconnected carriers, means for directing a procession of containers to an assembly station, rotor means including carrier applying elements for picking up an interconnected series of carriers from said supply means and applying the carriers to the containers at said assembling station to encircle the containers, means for directing the procession of containers and the carriers applied thereto away from said assembly station, handle storage means for racks of interconnected handles, means for advancing a handle rack toward an assembly position, means for positively controlling a single handle of the rack of handles, and handle applying means operated in timed relation to rotation of said rotor means for applying carrying handles in said assembly position to the individual carriers with the containers assembled therein, and means for severing adjacent carriers from each other.

84. A machine for assembling a procession of containers into individual carrying packs comprising, in combination, means for supplying a succession of apertured and somewhat elastic carriers, means for directing a procession of containers to an assembly station, endless means including successive carrier applying elements thereon for moving successive carriers from said supplying means into encircling assembled relation to containers in said assembly station, means for directing the procession of containers and the carriers assembled thereon from said assembly station through a predetermined path, a pair of vertically movable bail guides mounted in overlying aligned relation to said path, a pair of vertically movable bail inserting needle means mounted in alignment with said guides for coaction therewith and for coaction with bails to be inserted, magazine means for feeding a succession of carrying bails to a position for coaction with said bail guides and said needle means, a bail holding means mounted for periodic engagement with said bail to be inserted, means for moving said holding means downwardly in timed relation to movement of said guide means and needle means to insert bails in underlying carriers, and means for moving said bail holding means, guide means and needle means to an inoperative position after insertion of a bail.

85. A machine for assembling a procession of containers into individual carrying packs comprising, in combination, means for supplying a succession of apertured and somewhat elastic carriers, means for directing a procession of containers to an assembly station, means for moving successive carriers from said supplying means into encircling assembled relation to containers in said assembly station, means for directing the procession of containers and the carriers assembled thereon from said assembly station through a predetermined path, carriage means adapted for limited repetitive movement along a limited segment of said predetermined path, and means mounted on said carriage means for movement therewith and relative thereto including a pair of vertically movable bail guides mounted in overlying aligned relation to said path, a pair of vertically movable bail inserting needle means mounted in alignment with said guides for coaction therewith and for coaction with bails to be inserted, magazine means for feeding a succession of carrying bails to a position for coaction with said bail guides and said needle means, a bail holding means mounted for periodic engagement with said bail to be inserted, means for moving said holding means downwardly in timed relation to movement of said guide means, and needle means to insert bails in underlying carriers, and means for moving said bail holding means, guide means and needle means to an inoperative position after insertion of a bail in timed relation to movement of said carriage means.

86. A machine for assembling a procession of containers into individual carrying packs comprising, in combination, means for supplying a succession of apertured and somewhat elastic carriers, means for directing a procession of containers to an assembly station, means for moving successive carriers from said supplying means into encircling assembled relation to containers in said assembly station, means for directing the procession of containers and the carriers assembled thereon from said assembly station through a predetermined path, a pair of vertically movable bail guides mounted in overlying aligned relation to said path, a pair of vertically movable bail inserting needle means mounted in alignment with said guides for coaction therewith and for coaction with bails to be inserted, magazine means for feeding a succession of carrying bails to a position for coaction with said bail guides and said needle means, a bail holding means mounted for periodic engagement with said bail to be inserted, means for moving said holding means downwardly in timed relation to movement of said guide means and needle means to insert bails in underlying carriers, said guide means moving into engagement with said bails after engagement of said holding means therewith and prior to engagement of said needle means, and means for moving said bail holding means, guide means and needle means to a loading position after insertion of a bail.

87. A machine for assembling a procession of containers into individual carrying packs comprising, in combination,

means for supplying a succession of apertured and somewhat elastic carriers, means for directing a procession of containers to an assembly station, means for moving successive carriers from said supplying means into encircling assembled relation to containers in said assembly station, means for directing the procession of containers and the carriers assembled thereon from said assembly station through a predetermined path, a pair of vertically movable bail guides mounted in overlying aligned relation to said path, a pair of vertically movable bail inserting needle means mounted in alignment with said guides for coaction therewith and for coaction with bails to be inserted, magazine means for feeding a succession of carrying bails to a position for coaction with said bail guides and said needle means, said magazine means including a base portion having a top and a front edge surface coactable with said bails to be inserted, said base portion being fixed for relative movement therewith by said guide means and said needle means, a bail holding means coactable with said base portion and mounted for periodic engagement with said bail to be inserted, means for moving said holding means downwardly in timed relation to movement of said guide means and needle means to insert bails in underlying carriers, and means for moving said bail holding means, guide means and needle means to a bail loading position after insertion of a bail.

88. The machine set forth in claim 87 wherein said magazine means, guide means, needle means, and bail holding means is mounted on a carriage means for limited repeated movement along at least a segment of said predetermined path.

89. The machine set forth in claim 88 wherein said base portion includes spring loaded movable platform means having a bail engaging surface initially positioned adjacent the confluence of said top and front edge surfaces of said base portion for supporting a bail.

90. The machine set forth in claim 89 wherein said bail engaging surface of said platform means is initially coplanar with said top surface of said base portion and is mounted for movement from a position initially extending beyond said front edge surface to a position within said base portion, as defined by said front edge surface.

91. The machine set forth in claim 90 wherein said bail engaging surface of said platform means is mounted by means which maintains a parallel relationship to the top surface of said base portion throughout the movement thereof.

92. The machine set forth in claim 91 wherein the arrangement and actuation of the parts is characterized in that said bail to be inserted is confined between said bail hold means and said platform means prior to engagement by said guide means and needle means.

93. The machine set forth in claim 92 wherein said bail hold means comprises a wide leaf spring means fixedly mounted relative to said base portion of said magazine means having a bail engaging surface and a movable block member engageable with the opposite surface of said leaf spring means to vary the holding pressure thereof.

94. The machine set forth in claim 92 wherein bails to be inserted are supplied in interconnected rack form and storage means for racks of bails, means for moving racks of bails, means for positioning racks of bails and means for severing portions of interconnected racks of bails for coaction by said needle means are provided to afford precise repetitive operation of the bail inserter mechanism.

95. The machine set forth in claim 94 wherein the means for positioning racks of bails comprises movable toothed ball engaging members positioned for coaction with bails mounted on said base portion of said magazine means.

96. The machine set forth in claim 95 wherein said base portion of said magazine means has opposite side surfaces and said movable toothed bail engaging members are movable along said side surfaces to advance a rack of handles.

97. The machine set forth in claim 96 wherein said toothed bail engaging means provide a step by step advancement of said bails in timed relation to downward movement of said guide means, needle means and hold-down means.

98. The machine set forth in claim 97 wherein the toothed bail engaging means comprises a pair of relatively movable jaw members each of which is mounted for coaction with a different one of the side surfaces of said base portion for movement toward, away and for a limited segment therealong.

99. The machine set forth in claim 98 wherein cutoff means is associated with the leading edge of each of said jaw members to partially sever an individual bail from a rack of bails to afford easier orientation of the individual bail by said guide means.

100. The machine set forth in claim 99 wherein said bails have a generally U-shaped form comprising a handle base portion and a pair of arm portions, said bails in a rack form being interconnected to the next adjacent bail at the arm portions and at the handle base portion, said arm portions being severed one from the next adjacent one in a rack by the cutoff means on each jaw member and the handle base portion being later severed from the next adjacent handle portions by downward movement of said needle means and said confluence of said top surface and front edge surface of said magazine base portion.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,967,635 | Tornberg | July 24, 1934 |
| 1,871,771 | Crafts | Aug. 28, 1934 |
| 2,587,953 | Arneson | Mar. 4, 1952 |
| 2,685,993 | Currivan | Aug. 10, 1954 |
| 2,751,730 | Gentry | June 26, 1956 |
| 2,756,553 | Ferguson | July 31, 1956 |
| 2,864,212 | Bruce | Dec. 16, 1958 |
| 2,874,835 | Ponpitch | Feb. 24, 1959 |
| 2,929,181 | Ponpitch | Mar. 22, 1960 |

# UNITED STATES PATENT OFFICE

# CERTIFICATION OF CORRECTION

Patent No. 3,032,943 May 8, 1962

James L. Reimers et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 1 and 2, for "James L. Reimers, of San Jose, California, and Frank J. Sass, of Hoopeston, Illinois," read -- James L. Reimers, of San Jose, California, and Frank J. Sass, of Hoopeston, Illinois, assignors to Illinois Tool Works Inc., a corporation of Delaware, --; line 11, for "James L. Reimers and Frank J. Sass, their heirs" read -- Illinois Tool Works Inc., its successors --; in the heading to the printed specification, lines 3 and 4, for "James L. Reimers, San Jose, Calif., and Frank J. Sass, Hoopeston, Ill." read -- James L. Reimers, San Jose, Calif., and Frank J. Sass, Hoopeston, Ill., assignors to Illinois Tool Works Inc., a corporation of Delaware --; column 5, line 13, for "can" read -- cam --; column 16, line 55, for "rollers" read -- roller --; column 40, line 58, for "therebeween" read -- therebetween --; column 45, line 68, for "assmbled" read -- assembled --; column 50, line 11, for "ball" read -- bail --; lines 59 and 60, for "Ponpitch", each occurrence, read -- Poupitch --.

Signed and sealed this 18th day of September 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents