June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

CASE LOADING MECHANISM AND METHOD OF LOADING CASES

Filed April 25, 1957 7 Sheets-Sheet 1

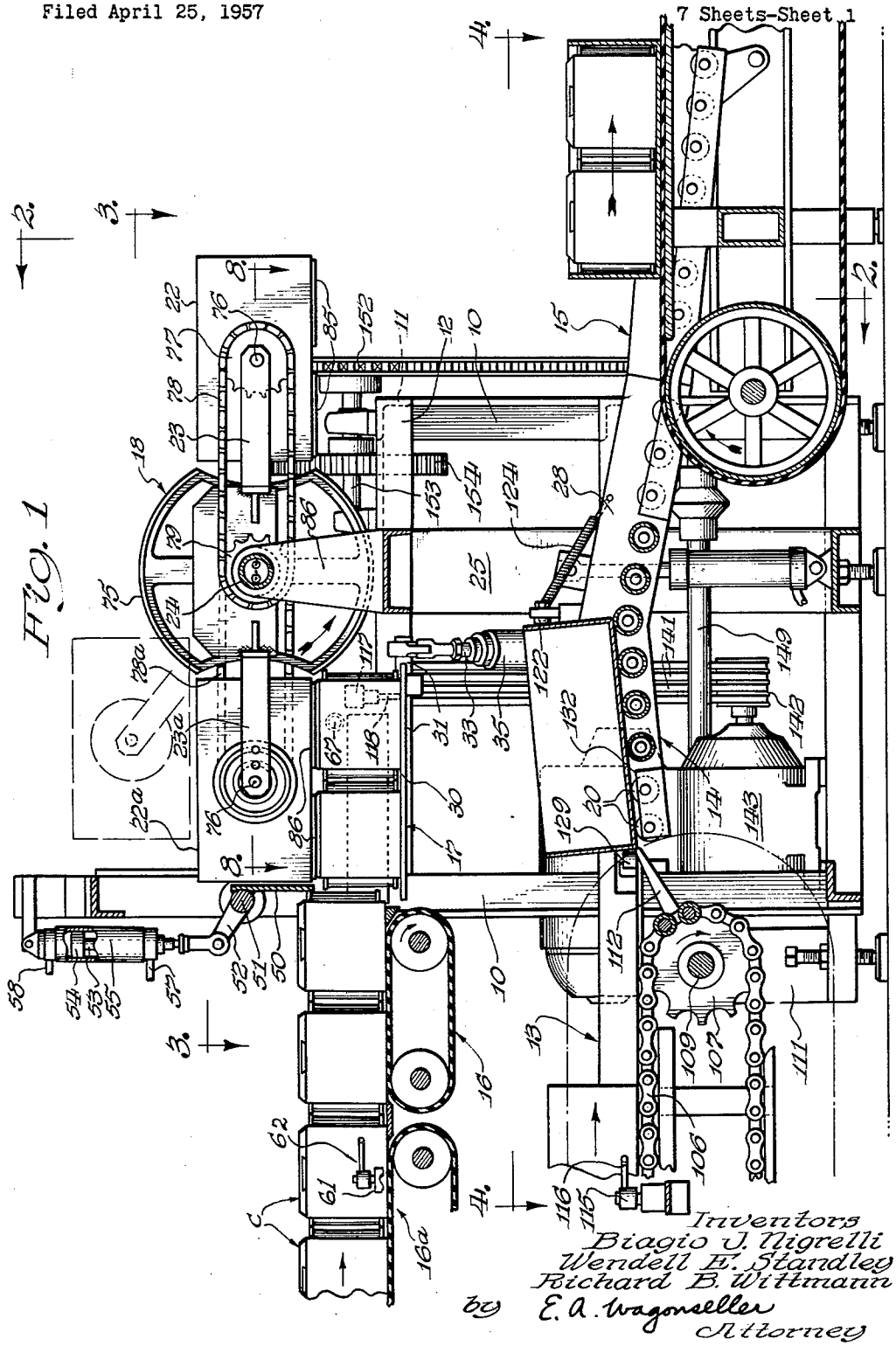

FIG. 1

Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Wittmann
by E. A. Wagonseller
Attorney

June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

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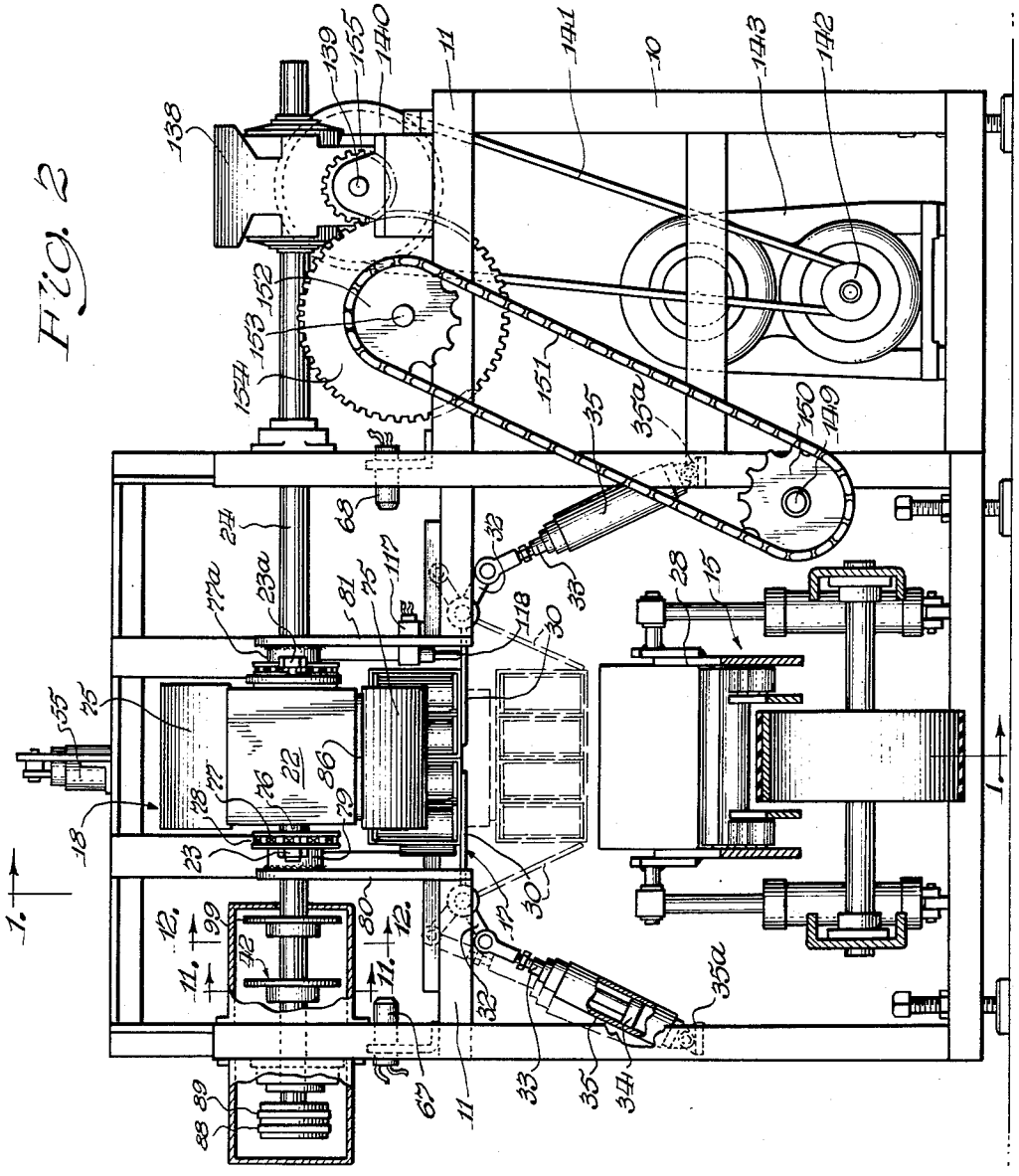
FIG. 2



Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Willmann
by E. A. Wagonseller
Attorney

June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

CASE LOADING MECHANISM AND METHOD OF LOADING CASES

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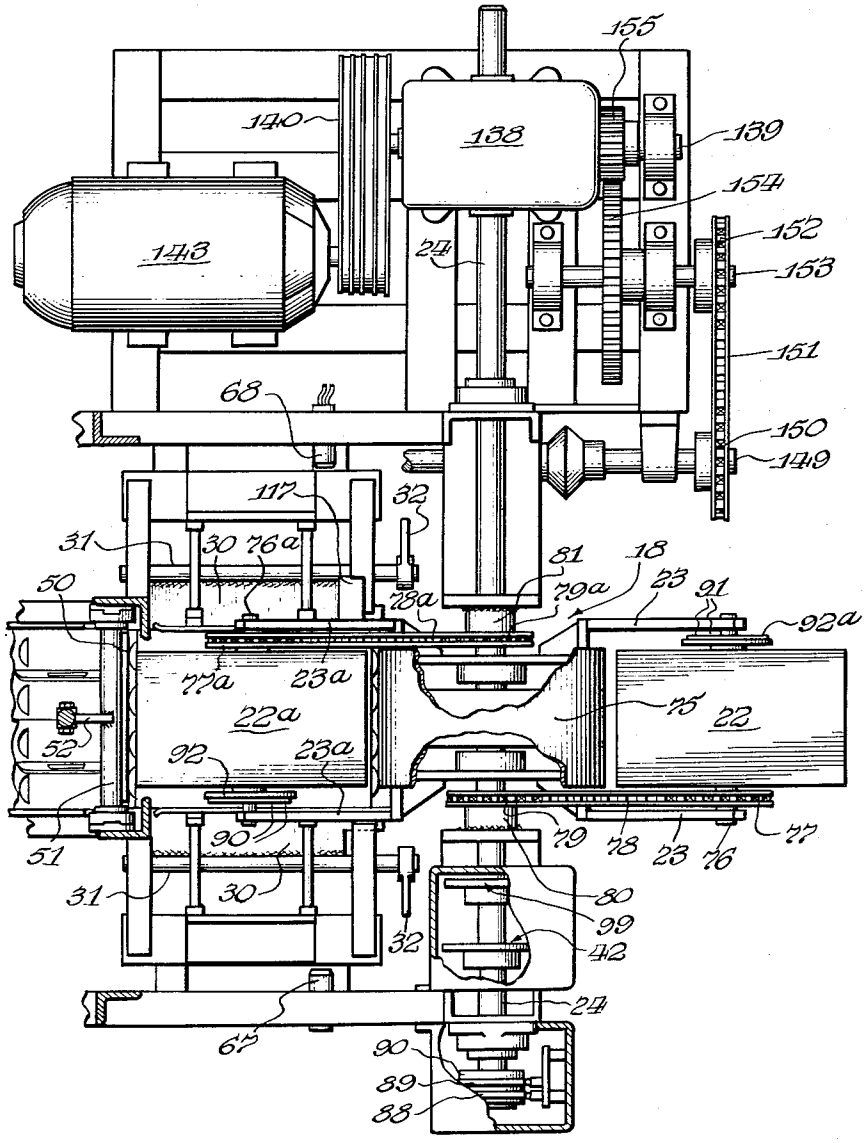
Fig. 3



Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Wittmann
by E. A. Wagonseller
Attorney

June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

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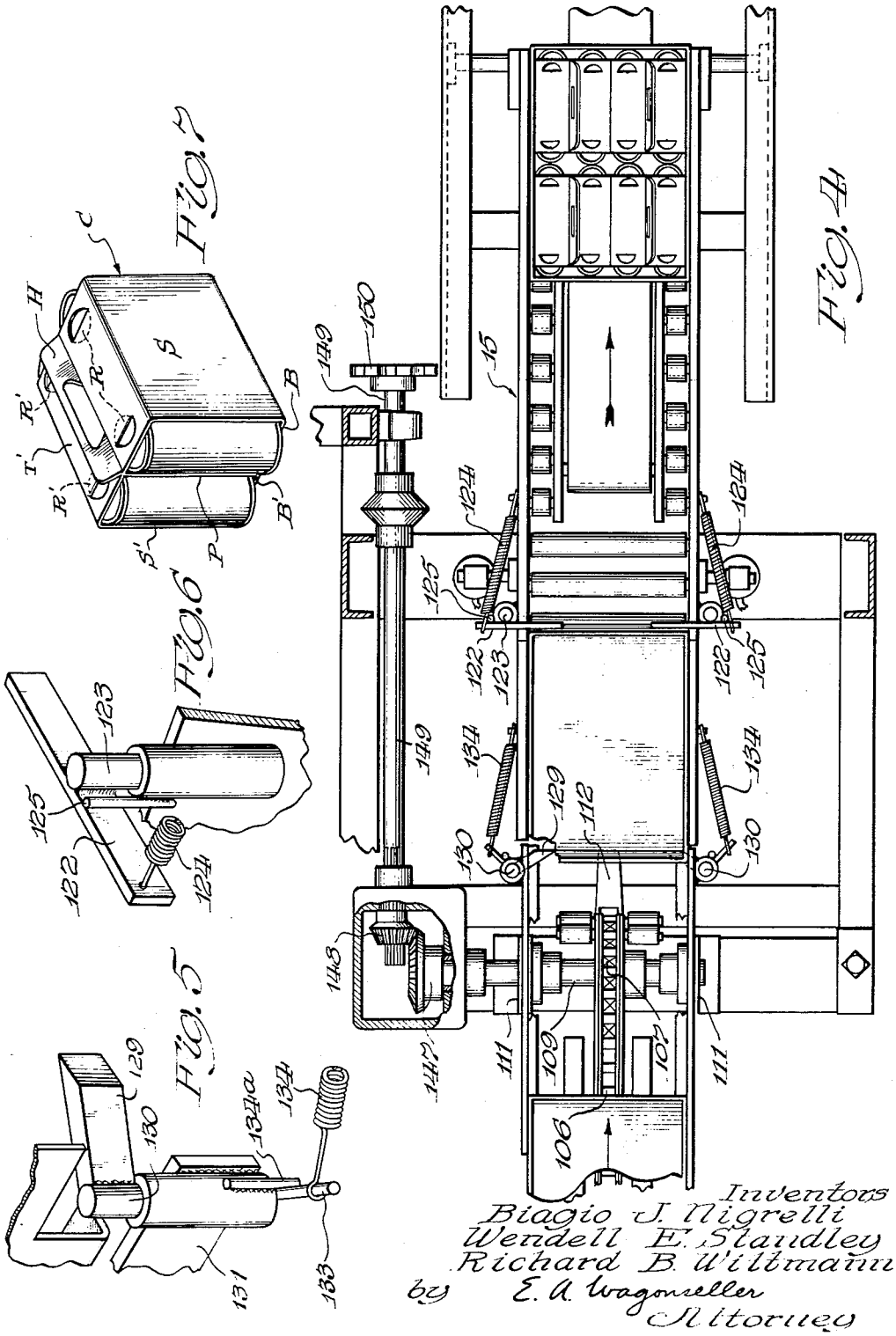

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CASE LOADING MECHANISM AND METHOD OF LOADING CASES

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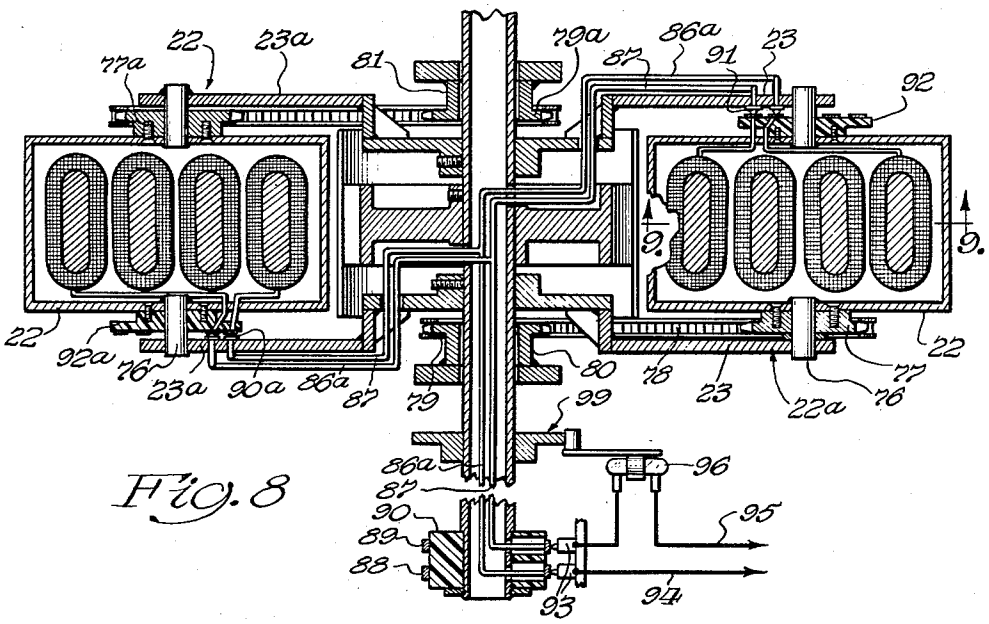


FIG. 8

FIG. 9

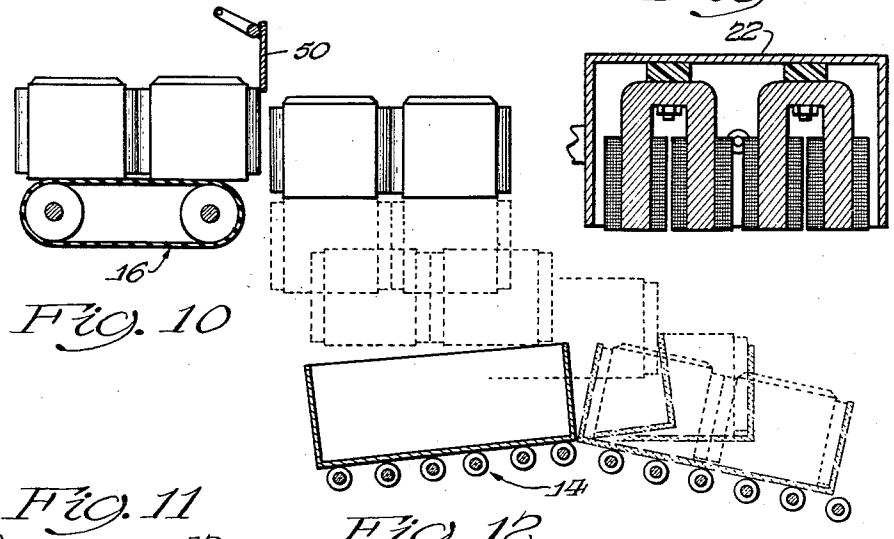


FIG. 10

FIG. 11

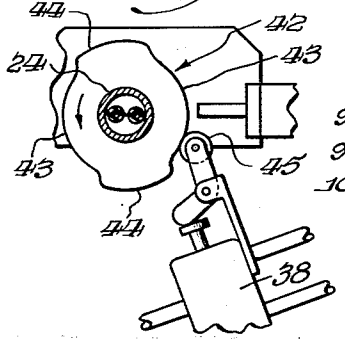
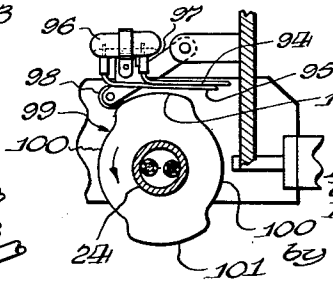


FIG. 12



Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Wittmann
by E. A. Wagmseller
Attorney

June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

CASE LOADING MECHANISM AND METHOD OF LOADING CASES

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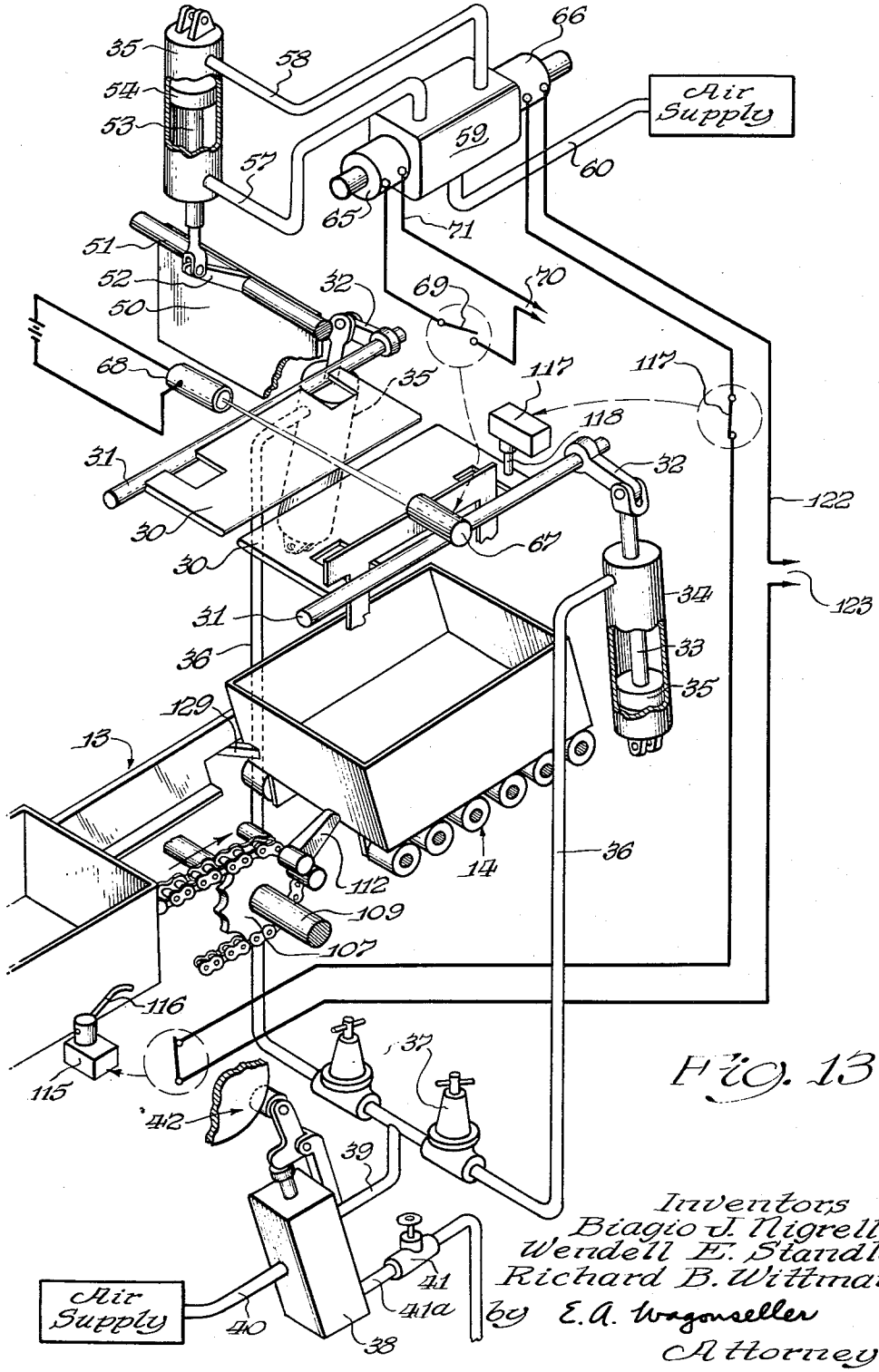

FIG. 13

Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Wittman
by E. A. Wagonseller
Attorney

June 7, 1960 B. J. NIGRELLI ET AL 2,939,256

CASE LOADING MECHANISM AND METHOD OF LOADING CASES

Filed April 25, 1957 7 Sheets-Sheet 7

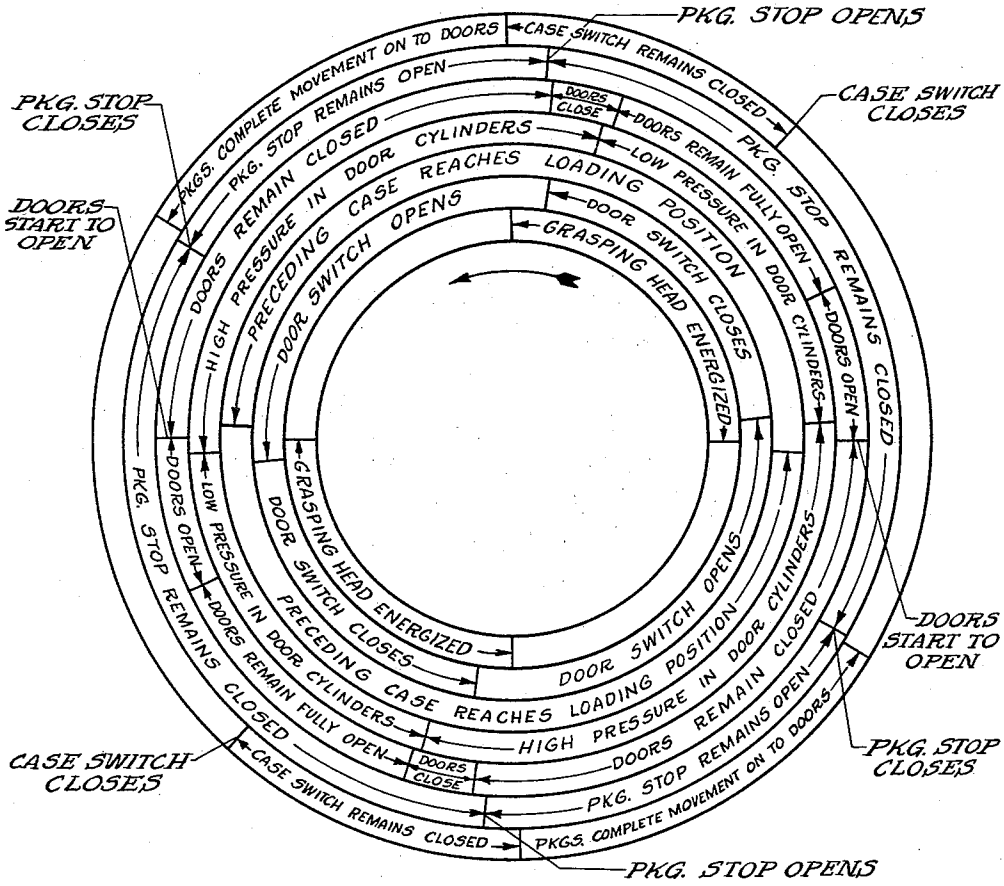

Fig. 14

Inventors
Biagio J. Nigrelli
Wendell E. Standley
Richard B. Wittmann
by E. A. Wagoneller
Attorney

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2,939,256

CASE LOADING MECHANISM AND METHOD OF LOADING CASES

Biagio J. Nigrelli, Skokie, Wendell E. Standley, Lake Forest, and Richard B. Wittmann, Chicago, Ill., assignors to Ralph W. Johns, Biagio J. Nigrelli, and Robert R. Johns, doing business as Johns, Nigrelli, Johns, Chicago, Ill., a copartnership

Filed Apr. 25, 1957, Ser. No. 655,086

20 Claims. (Cl. 53—26)

The present invention relates to mechanism and methods for loading shipping cases and more particularly for loading open top shipping cases or containers adapted to enclose a plurality of articles or a plurality of packages of articles, such as packages of filled cans.

An object of the invention is to provide efficient mechanism of the type referred to which is capable of engaging and supporting a segregated group of articles or packages and subsequently depositing the group en masse within an open top shipping case in a rapid and effective manner with a minimum of movement or travel of machine parts.

Another object of the invention is to provide a completely automatic machine which will convey packages to a loading station, segregate a predetermined number of packages arranged in a particular shape or pattern and deliver the group of packages to a shipping case supported at the loading station.

Another object of the invention is to provide mechanism synchronized with a case loader for conveying shipping cases to a point adjacent the loading station and delivering cases successively to the loading point ready to receive individual groups of packages.

Another object of the invention is to provide a package conveyor combined with a package segregating station effective to convey a succession of packages in face-to-face contacting relation to the segregating station, arrest the forward movement of the segregated group and the advancing succession of packages for an interval to permit removal of the segregated group, after which additional groups are delivered successively to the segregating station for successive removal.

Another object of the invention is to provide mechanism particularly adapted to transfer into individual open-top shipping cases on a conveyor successive, mechanically segregated groups of packages in a rapid and approximately continuous manner with only a minimum amount of stoppage or dwell in the forward movement of the successive cases.

Another object of the invention is to provide a case loader, including a package group grasping means, combined with an effective package-group segregaating station in the form of a displaceable support which is arranged above a shipping case loading station, so that a segregated group of packages may be grasped and held supported while the displaceable support is withdrawn or displaced, thus to permit movement of the grasping means through the space previously occupied by the displaceable support, and to enable the grasping means to deliver the package group to a shipping case.

Another object of the invention is to provide a case loader with magnetic grasping means combined with a package-group segregating station in the form of a displaceable support comprising oppositely hinged panels urged toward package supporting position and arranged over a shipping case loading station, the hinged panels being provided with means to decrease the force urging them toward supporting position to allow the magnetic grasping means to move down between them toward the shipping case with the effect that the hinged panels tend to center the group with respect to the shipping case and guide the group into the open top of the case.

Another object of the invention is to provide a conveying mechanism for successive cases to be loaded with groups of packages, wherein the loading means, while delivering such group of packages to a case, causes simultaneous advance of the case toward a location beyond the loading station.

Another object is to provide a magnetic engaging and loading means for the deposit into a shipping case of a group of packages containing magnetically permeable articles, such as filled tin cans of food, beverage or other canned products.

Another object is to provide a loading mechanism for transferring packages into cases, in which the articles to be loaded in the cases, as well as the cases, are conveyed separately to the loading point by conveyors, combined with an article transfer member which comprises a plurality of loading heads operating successively upon groups of packages, whereby stoppage of the travel of the articles and of the cases is minimized so as to make the operation substantially continuous.

A further object is to provide an improved and effective method for loading articles into shipping cases.

Additional and more specific objects of the invention will become apparent as the description proceeds.

In the drawings:

Fig. 1 is a side elevational view, taken partly in section along line 1—1 of Fig. 2, showing the principal parts of the mechanism;

Fig. 2 is a view, taken partly in section along line 2—2 of Fig. 1, showing the machine in end elevation as viewed from the delivery end;

Fig. 3 is a plan view, taken partly in section along line 3—3 of Fig. 1;

Fig. 4 is a horizontal view, taken partly in section along line 4—4 of Fig. 1, showing means for positioning a shipping case at the loading station;

Figs. 5 and 6 are detail perspective views of the stop members for the shipping case;

Fig. 7 is a perspective view of a carton holding six cans constituting a package which the mechanism is particularly designed to handle;

Fig. 8 is horizontal sectional view taken on line 8—8 of Fig. 1, illustrating the grasping head construction and wiring therefor;

Fig. 9 is a detail sectional view taken on line 9—9 of Fig. 8;

Fig. 10 is a fragmentary, schematic side elevational view showing the shipping case and package group to be loaded therein in various positions they assume during the loading;

Fig. 11 is a fragmentary detail view, partly in section, taken along line 11—11 of Fig. 2;

Fig. 12 is a view similar to Fig. 11, taken along line 12—12 of Fig. 2;

Fig. 13 is a schematic, idealized, perspective view to indicate the arrangement of operating cylinders, conduits, valves and electric wiring and control switches for various parts of the package collecting and loading mechanism, certain of the parts, however, being off-scale and not in their exact mechanical relationships;

Fig. 14 is a chart indicating the operating cycles of the principal parts of the mechanism.

The mechanism of the present invention, as herein disclosed, comprises essentially a conveyor for shipping cases to be loaded, a conveyor for articles or packages arranged adjacent the case conveyor, a displaceable support member upon which a group of packages can be segregated upon delivery from the package conveyor, a

package-group transfer and loading device arranged to engage and grasp the packages collected on the displaceable support and adapted to apply pressure on the packages to cause displacement of the support and thereafter to carry the packages through the support area and deposit them within a shipping case.

The arrangement of the loading device and case conveyor is such that as the group of packages is being loaded into the case, the latter is advanced in a direction away from the loading position and when the loading action has been completed the loaded case may move by gravity away from the loading station. The mechanism also includes automatically acting stop means for the packages on the package conveyor whereby, when a group of packages of predetermined size and shape has been formed on the displaceable support member, the oncoming packages are prevented from moving toward the support until the package-group has been moved past the support and the support has again been brought to package supporting condition.

The method herein disclosed comprises essentially the steps of segregating on a displaceable support a group of articles in a single layer, engaging the layer of articles with a grasping means capable of supporting the articles, removing the displaceable support and lowering the articles, while held by the grasping means, through the area previously occupied by the displaceable support, and depositing the articles within a shipping case, the shipping case being held in an inclined position on a support on which it is free to move and the grasping means being adapted to advance the case beyond the loading point as the group of articles is being deposited therein.

Referring more particularly to the drawings, the main frame of the loading mechanism comprises vertical members **10**, **10** and transversely and longitudinally extending horizontal members **11**, **11** and **12**, **12**. The shipping case conveyor to conduct shipping cases to the loading point is indicated as a whole at **13**. The conveyor section at the loading point and the conveyor section leading away from the loading point are indicated at **14** and **15** respectively. The conveyor for delivery of packages to the collecting point is indicated as a whole at **16**. The displaceable support means for collecting a group of packages is indicated generally at **17**. The package grasping mechanism for transferring groups of packages from the package support to a shipping case is indicated as a whole at **18**.

Articles of various kinds may be handled by the mechanism of the present invention. For purposes of illustration the type of article to be handled and loaded in shipping cases is a package containing six filled cans of beverage or other desired product. A carton suitable for use with the mechanism of the present invention is illustrated in Fig. 7 and is indicated as a whole at C. The carton comprises a two-part top wall T and T', a two-part bottom B and B', side walls S and S', a partition wall P, a handle panel H, and can retaining tabs R and R' on the respective top and bottom panels. An example of a carton construction of this type is disclosed in the patent to George H. Parker, No. 2,614,737, issued October 21, 1952. The handle panel H is preferably folded over to lie approximately flat or at a small angle with respect to the top panels. The handle preferably will remain folded down during shipment and may readily be swung upward for convenience in carrying the package.

Shipping cases employed to receive a plurality of packages, as herein illustrated, may comprise any usual or conventional form of case such as a corrugated container manufactured in collapsed tubular form and may be provided with two pairs of top and two pairs of bottom closure flaps. Such cases are usually referred to as regular slotted containers. The closure flaps on the end walls are usually somewhat less in length than one-half the length of the container and the flaps on the side walls are usually of a length equal to one half the width of the container so they will meet at the longitudinal center of the container. A container ready for loading will have its bottom flaps in closed position and its top flaps folded outwardly to provide free loading access. In the interest of simplicity of illustration the shipping cases are shown herein as open top trays.

In the present instance the mechanism is designed to deliver into a shipping case a single layer of four packages arranged in rows of two each way. That is, the shipping case has an internal length slightly in excess of the length of two packages placed end to end and has an internal width slightly in excess of the width of two packages placed side by side.

It is within the spirit of the invention to load cases with layers of more or less than four packages and also to load cases having a capacity of more than a single layer of packages.

In the preferred embodiment of the invention the conveyor section **14** is approximately the length of a shipping case and is provided with antifriction rollers **20**, **20**. It is preferably inclined upward at a small angle in the direction of travel of the cases. The packages collected on the displaceable support **17** are engaged by a grasping head **22** and in the present instance an oppositely disposed head **22***a* is employed. Both heads are carried by a rotor assembly which includes frame members **23** and **23***a* pivotally mounted on shaft **24** journalled in vertical standards **25**, **25**. After a grasping head has engaged a group of packages the support **17** may then be displaced to provide an unobstructed path to the shipping case open top. The grasping head carrying the group of packages is then lowered toward the uptilted case. The lower portion of the package group adjacent the leading edge of the case first enters the case and bears against such leading edge, advancing the case as the grasping head moves toward its lowermost position. As the case advances the group of packages is lowered into the case and the bottom surfaces of the packages approach the bottom of the case. At approximately the point where the frame members **23** reach a vertical position the grasping action of the head **22** is discontinued and the head is free to continue rotation in a counterclockwise direction, as viewed in Fig. 1. The case containing the packages has at this time advanced so that its mid-portion has passed beyond the uppermost anti-friction roller **20** of the conveyor section. The case is then free to advance further by gravity onto the section **15** which is preferably downwardly inclined and provided with anti friction rollers **29**, **29**. The case may then proceed to a flap closing and sealing station.

Displaceable package support

The preferred construction of the displaceable package support, the means for collecting a predetermined number of packages thereon, and means for discharge of packages from the support will now be described. The packages to be loaded into cases move toward the collecting station on conveyor **16** in two substantially contacting rows with the packages in end-to-end contact. Any suitable means may be employed to effect the result of keeping the packages in close end-to-end contact on conveyor **16**. For this purpose a feed conveyor **16***a* is provided, aligned with conveyor **16** and driven at a speed which is approximately one-third of the speed with which conveyor **16** is driven. As will be pointed out later in more detail, packages are normally held from movement at intervals on conveyor **16** so that even though conveyor **16***a* travels slower it is able, during the intervals packages are held from movement, to supply the desired number of packages to conveyor **16** in end-to-end contacting relation.

The displaceable support is located at the lower part of a free area in the frame of the loader and comprises

a pair of horizontally disposed panels or doors 30, 30, each lying in the same plane, with closely spaced free edges and hinged at their outer edge portions on hinge pin 31, 31, journalled in horizontal frame members 11.

Means are provided for holding the doors yieldably in package supporting position and for urging the doors toward closed position during all stages of their opening and closing movement. Preferably an increased holding force is exerted on the doors while they are supporting packages and such increased force is applied to return the doors to closed position after they have been opened to permit the passage of a group of packages. During a major portion of the door opening movement a decreased force is applied to the doors. For this purpose, externally of the pivotal mounting of the doors and rigidly secured to each door there is provided an arm 32 extending outwardly and downwardly at an angle. Each arm 32 is pivotally secured to a piston rod 33 in a cylinder 34 in which a piston 35 travels. The lower end of each cylinder 34 is pivoted at 35*a* on an upright frame member 10.

The lower portions of cylinders 34 are preferably open to the atmosphere and control means are provided for varying the pressure in the upper portions of the cylinders to cause the pistons 35 to apply varying degrees of force upon the support doors. For this purpose the upper part of each cylinder 34 is connected with individual conduits 36, 36 joined to suitable pressure regulating valves 37, 37. These in turn are connected to a single three-way, cam operated valve 38 through conduits 39, 39. A supply of air pressure is fed through valve 38 from conduit 40. A relief valve 41 is connected to valve 38 through conduit 41*a*. The opposite side of valve 41 is open to the atmosphere.

Valves 37, 38 and 41 may be of any suitable conventional form. The pressure regulating valves 37 are designed to admit a desired degree of maximum air pressure to each cylinder 34, depending upon their mounting and other characteristics. That is, the force imposed upon the individual doors by the pistons should preferably be only a small increment greater than that required to hold the support doors in supporting position with a given load on each. In the present instance, the load on each door is the weight of two packages. If the doors vary slightly in their mounting, as for example in the tightness of their hinges, it is desirable to compensate for such differences by adjusting the pressure regulating valves for each cylinder, and cause the doors to exert an equal resistance to downward pressure imposed upon them by the grasping heads.

Valve 41 is designed to be set to maintain a predetermined back pressure on the system which is in practice less than the maximum pressure for which valves 37, 37 will be set.

Valve 38 is designed to be cam operated, as will be described below, and has two positions. In one position valve 38 allows compressed air to flow therethrough to conduits 39, 39 and through the pressure regulating valves to reduce the pressure from the regular compressed air supply to the predetermined maximum suitable for each cylinder, as above explained. In the other position valve 38 closes off the flow of air from the compressed air supply and permits conduits 39, 39 to be connected directly through valve 38 with the conduit 41*a* and relief valve 41. This causes the pressure to be reduced in cylinders 34 by letting the air bleed out to the atmosphere through valve 41 until a predetermined lower pressure is obtained depending upon the degree of back pressure for which valve 41 has been set. In a typical installation the low pressure exerted on the pistons 35 may be in a range between 5 pounds to 10 pounds per square inch and the high pressure may be in a range between 40 pounds and 50 pounds per square inch.

As will be described in detail presently, each grasping head will in succession move down against packages on the support, engage the packages in supporting relation, and, by bearing forcefully upon the doors, will cause them to open and thereafter move the packages through the opening provided between the doors, and finally deposit the packages into an empty case at the loading station.

The valve 38 is preferably operated in a fixed cycle so that the desired maximum pressure is applied to the pistons 35, 35 through the regulating valve 37, 37 prior to the movement of packages onto the support doors and for a brief interval during which the doors are forced down through a small angle by the grasping head. At this point in the cycle the position of valve 38 is changed to connect conduits 39 directly with relief valve 41 through conduit 41*a*, thus allowing the pressure upon the pistons to be reduced to the desired minimum. For this purpose a suitable cam member 42 is keyed on the rotor shaft 24. The cam is symmetrical in contour to provide two sets of concentric surfaces 43, 43 and 44, 44 at different distances from the center of the shaft. A cam follower 45 bears against the cam and is mounted on a spring loaded, operating arm to form a part of the valve 38. When the cam follower is bearing upon a low surface 43 the valve 38 is conditioned to allow compressed air to flow from the regular supply through the pressure regulating valve to the cylinders; and when bearing upon a high surface 44, the parts of valve 38 will be shifted to close off compressed air from the regular supply and permit the high air pressure to bleed off through the relief valve until it reaches the desired degree of reduced pressure. As the high pressure dwell is preferably longer than the low pressure dwell, it will be noted that the surfaces 43, 43 are longer than surfaces 44, 44.

Means are provided for stopping the movement of packages toward the displaceable package support after the passage of a group of packages onto the support. In the present instance this is in the form of a movable stop which in one position holds the oncoming packages and in the other position allows the packages to move onto the support. As shown in Fig. 1, there is provided a stop member 50 pivotally mounted on a hinge pin 51 having its ends supported in upright frame members 10, 10. Rigidly secured to the stop on the opposite side of the hinge pin 51 is an arm 52 extending upwardly at an angle and pivotally connected to the lower edge of a piston rod 53, carrying a piston 54, movable in cylinder 55. The cylinder is mounted oscillatably on the frame at 56.

In order to enable the stop 50 to engage the oncoming packages effectively the conveyor 16 is located so that its conveying surface is somewhat above the surface of the displaceable support. In practice the support may be between one-half inch and one inch lower depending upon the size of the packages being handled. Thus the end of stop 50 can swing down just above the packages that have moved onto the support in readiness to engage a sufficient portion of the vertical faces of the oncoming packages on conveyor 16 to hold them from forward movement after they come into contact with the stop.

Conveyors 16 and 16*a* preferably comprise suitable endless belts having surfaces which will admit of slippage of the belts beneath the paperboard packages when the packages are held from movement, but will also present a sufficient degree of friction so that, once the stop is raised, movement of the belts will deliver packages onto the support from conveyor 16, and a new group of packages will be delivered onto conveyor 16 by conveyor 16*a*. Due to the one-to-three ratio of speed between conveyors 16*a* and 16, the packages on conveyor 16, as soon as the stop 50 is raised, will move quickly onto the support doors. These packages, at the time their movement onto the doors is complete, will be spaced somewhat forwardly from the oncoming packages on

conveyor 16. Thus, there will be no likelihood of interlocking of the exposed can chimes of the group of packages that have moved onto the support and the can chimes exposed in the leading faces of the following packages. As soon as the complete package group moves onto the support the stop 50 will be caused to close and will thus be in position to stop the movement of oncoming packages on conveyor 16.

Suitable control switches, one of which is indicated at 61, are provided along conveyor 16*a* to stop the operation of the grasping head rotor if there should be no packages ready on conveyor 16*a*. The switch 61 is provided with a spring-loaded finger 62 extending into the package path. Contact of the packages with the finger 62 will close this portion of the circuit to the grasping head drive. Absence of packages will cause the circuit to open and stop the driving means.

The operation of piston 54 to actuate the stop 50 is effected by compressed air led to the cylinder 55 through two conduits 57 and 58 connected with a valve 59 adapted to direct air under pressure from a supply conduit 60 selectively on one side or the other of the piston 54.

The valve 59 is a suitable four-way, double solenoid controlled, air operated valve of conventional form. This valve is schematically illustrated in Fig. 13 and comprises two separately acting solenoids, indicated at 65 and 66. The construction is such that momentary energization of one solenoid causes it to move a valve element or "spool" from one position to another where it will remain until the other solenoid is energized causing the spool to return to its first position. When solenoid 65 is energized it will cause the valve spool to move to a position to open conduit 58 to the atmosphere and cause air under pressure to be admitted from the source conduit 60 and directed through conduit 57 to hold the stop 50 closed until such time that the solenoid 66 is actuated. When solenoid 66 is energized the valve spool will be moved to the opposite position which will cause pressure to be removed from conduit 57 and applied to the piston through conduit 58. The valve will remain in such condition until solenoid 65 is again energized. As will be apparent as the description proceeds, the current supplied to energize solenoids 65 and 66 preferably flows for only a short period and at alternate intervals.

Circuit for closing package stop

In order to cause the stop 50 to move to closed position a photocell element 67 and a light source 68 are arranged at the sides of the displaceable support so that the light beam will cross above the support transversely of the line of travel of the packages and along a line remote from the discharge end of conveyor 16. While the light beam is unbroken a switch 69 is held constantly open and when the beam is interrupted the switch will be closed to allow current to flow from a source of electric current 70 through a conducting circuit 71 to energize solenoid 65. Thus, when a group of packages moves onto the support, following the opening of the stop 50, the leading packages will interrupt the light beam, closing switch 69 and actuating valve 59 to relieve the air pressure in conduit 58 and admit pressure through conduit 57 to move piston 54 upward and close the stop.

The circuit for opening the stop 50 will presently be described.

Means are provided to prevent packages delivered onto the support 17 from moving beyond a desired point, and, for this purpose, the rotor assembly carrying the grasping heads is formed with curved abutment plates 75, 75, concentric with shaft 24. As the leading packages move to position on the support 17 the upper portions of the packages engage whichever plate 75 that is then present adjacent the end of the support 17. The group of packages, when positioned on the support 17, will thus be in contact at the leading edges with one of the plates 75 and the trailing surfaces of the package group will be in contact with the leading faces of packages on conveyor 16 that are being held from forward movement by the stop member 50. The packages held on conveyor 16 are urged forward by movement of the belt beneath them and thus serve to hold the package group on support 17 firmly against the abutment plate. In practice the face of stop member 50, when in closed position, will be in line with the trailing faces of packages on the support 17 and thus the oncoming packages on the conveyor will bear both against the stop and the trailing faces of the packages on the support.

Package grasping head assembly

As stated above, the grasping heads 22 and 22*a* are mounted on frame members 23, 23*a* to revolve around shaft 24. Each head has projecting centrally therefrom on each side a pivot pin 76 and 76*a* respectively, secured from rotation with respect to the head and journalled in respective frame members 23 and 23*a*. The heads are thus rotatable within the frame and preferably are maintained constantly in horizontal planes. For this purpose sprockets 77 and 77*a* are bolted onto the housings of the heads, and around the respective sprockets pass sprocket chains 78 and 78*a*. Sprocket chain 78 is engaged with a sprocket 79 fixed to a sleeve 80, surrounding shaft 24 and secured against rotation; and the sprocket chain 78*a* passes around a sprocket 79*a*, fixed to a sleeve 81 surrounding shaft 24 and likewise secured against rotation. By thus holding sprockets 79 and 79*a* from rotation, and due to the fact that sprockets 77, 77*a*, 79 and 79*a* are all of the same diameter, it will be apparent that, as the rotor frame rotates through one revolution, the heads will make one complete rotation within the frame members. The heads therefore will be kept substantially in the same relative position to the horizontal throughout their movement around the shaft 24.

While various means may be employed for grasping packages delivered to the support 17 and for supporting the packages as they are transferred to the shipping cases, it is preferred to employ magnetic grasping means in the handling of packages of cans as herein disclosed. Each of the heads 22 and 22*a*, is arranged to house and retain a pair of electro-magnets 85, 85 and 86, 86, respectively, which may be of horseshoe shape or U-shape with their pole faces directed downward and adapted to come into flat contact with the top faces of a group of packages on the support 17. As herein disclosed, four packages are delivered to the support and the magnet poles are preferably arranged to contact transversely across the packages. That is, each magnet is adapted to grasp two packages.

In order to energize the magnets in each head during their cycle of movement and retain such magnets energized, pairs of conducting wires 86*a* and 87 extend through a central opening in shaft 24 and are connnected at one end to respective slip rings 88 and 89 secured to a drum 90 which is fixed on the end of shaft 24 to rotate therewith. The other ends of the pairs of conducting wires 86*a* and 87 extend respectively from shaft 24 along one of the arms 23 and one of the arms 23*a* and are connected with sets of brushes 90*a* and 91, respectively, carried by these arms. See Fig. 8. The set of brushes 90*a* bears upon slip rings carried in a disc 92*a* surrounding the pivot pin 76*a*, and fixedly secured to the housing of the head 22*a*, and such rings in turn are connected with the winding of the electromagnets in the head 22*a*. In like manner, the other set of brushes 91 bears upon slip rings carried in a disc 92 surrounding the pivot pin 76 and fixedly secured to the housing of the head 22, and such rings are in turn connected with the winding of the electromagnets in the head 22.

Current is fed to the collecting rings 88 and 89 through a pair of brushes 93, 93 connected with conducting wires 94 and 95.

For the purpose of energizing the electromagnets in

heads 22 and 22a for selected periods a switch 96, preferably a mercury switch, is arranged in the conductor 95, and a switch operating arm 97 having a cam follower 98 bears upon a suitable switch operating cam 99 having concentric pairs of high and low dwell surfaces 100 and 101. When the cam follower 98 is bearing upon surfaces 101 the switch 96 will be closed and both sets of magnets will be energized for a period somewhat more than 90° of the angular movement of the heads. It is to be noted that only one set of magnets actually needs to be energized, but certain benefits of simplification of the mechanism are obtained with the use of only a negligent amount of additional power.

The driving means for the grasping head rotor will presently be described.

Case conveyor

The shipping cases used with the present invention may be provided with closure flaps or, if desired, may be in the form of open top trays. If the cases are of the type provided with flaps the frame of the machine will preferably be of sufficient width to permit passage of the case with side flaps extending laterally and end wall flaps extending forwardly and to the rear. The cases are delivered to the loading point on conveyor 13 which includes suitable angle members 105 which support the case from below as well as forming side guides. Conveyor 13 also includes a suitable sprocket chain 106 passing around sprocket 107 on shaft 109 journalled on the base frame at the delivery end and around a sprocket, not shown, at the opposite end of the conveyor. The chain 106 has flight or pusher elements 112 secured thereon preferably at intervals approximately two and one-half times the length of the case to be loaded. The flights 112 extend upwardly a sufficient distance to push the case onto the conveyor section 14 which supports the case in stationary condition for a brief time interval. The free ends of the flights 112 are preferably rounded to facilitate pushing the case onto section 14. The driving means for the conveyor chain 106 will presently be described.

Circuit for opening package stop

An important feature of the present invention is to provide controls that will hold the package stop closed (*a*) until a case is available and ready to move to its loading position on conveyor section 14 and (*b*) until the support doors 30, 30 are in their "up" or supporting position. For this purpose a control switch 115, having a spring-loaded trip finger 116, is secured on the frame portion of conveyor 13 at a position somewhat back from the discharge end of conveyor 13. As a case is advanced on the conveyor 13, the trip finger 116 will be engaged by the case and moved to cause the switch 115 to close and remain in such condition, due to contact of the trip finger with the case side wall, until the case has moved beyond the trip finger, at which time the switch will move to open position.

A second control switch is arranged to be operated by one of the support doors. This switch is indicated at 117, mounted on one of the frame members 12 and includes a spring-loaded trip element 118 adapted to be engaged and moved from its normally open position to closed position upon being engaged and moved upward by a door in its upward swinging movement.

The switches 115 and 117 are in series in a conducting circuit 122 leading from a source 123. When both switches are closed current will flow through the solenoid 66 which is one of the controls for the four-way, double solenoid valve 59, controlling the cylinder to cause actuation of the stop 50. As stated above, the interruption of the light beam to the photocell unit 67 causes switch 69 to close and actuate solenoid valve 59 opening conduit 58 to the atmosphere and directing air under pressure to the lower end of cylinder 55.

The valve 59 is actuated by momentary closing of switch 69 and remains in condition to direct air pressure to the lower end of the cylinder until solenoid 66 is actuated. Accordingly, when both the case-actuated switch and the door-actuated switch are closed, the circuit to solenoid 66 is completed and valve 59 is actuated to relieve pressure from conduit 57 and connect conduit 58 with the source of pressure. This causes piston 54 to move down with consequent opening of the stop member 50. Due to the construction of valve 59 it will remain in the condition in which air pressure is directed through conduit 58 until solenoid 65 is again energized.

Thus, if the stop 50 is being held closed after actuation of the valve by solenoid 66, the support doors may be moved down and released for upward movement repeatedly by the grasping heads without affecting the position of the stop, as would happen if no case has moved up to the discharge end portion of conveyor 13. However, as soon as a case moves into position to close the case switch 115, the next closing movement of the doors 30 will cause the door switch 117 to close, immediately opening the stop 50 and allowing packages to move onto the support doors. As will be more fully pointed out below, the timing is such that the case will move from conveyor 13 and come to rest at its loading position on conveyor section 14 a short interval prior to the time the grasping head brings a group of packages into position to deposit them into the case.

As soon as the packages have moved to a position in which a group is delivered to the support and the light beam is interrupted, the stop 50 will be closed by actuation of the solenoid 65, due to closing of the photocell switch and thus the stop will remain closed until the next case trips and closes switch 115 and the door switch 117 is closed.

Positioning case at loading station

The upward inclination of the conveyor section 14 serves to position a case at the loading station. To assist in positioning the case with accuracy two sets of stop elements are provided at the loading station and they are so arranged that a conveyor flight element will move the case to a position between the stops after which the case will be influenced only by the stops until the packages begin to enter the case.

As shown in Fig. 4, spring-loaded stop elements 122, 122 are pivotally mounted at 123, 123 respectively on the upright frame members at the sides of the path of the cases. The springs 124 offer only a moderate degree of resistance so that after filling of the case it may readily pass beyond the stop elements. Abutments 125, 125 are provided to retain the stops in proper position where they will be contacted by a succeeding empty case after a loaded case is removed.

Two rearward contacting, spring-loaded stop elements 129, 129 are pivotally mounted at 130, 130 respectively on suitable supports 131 secured to the angle members 132, 132 of conveyor 14. These stop elements have rearwardly extending portions 133, 133 urged forwardly by springs 134, 134 respectively. The arrangement of the stop elements 129, 129 is such that a case may be moved between them and, while so moving, the stop elements are in slidable contact with the case side walls. When the end of the case passes beyond the stop elements their free ends are pulled inward by the outward force exerted on extended portions 133 by the springs so that the ends of elements 129 move in behind the case in position to contact its trailing end. Abutments 134*a*, 134*a* are provided to limit the inward swinging of the stop elements.

The position of the forward and rear stop elements with respect to the conveyor 13 is such that the flight members 112 will propel the case along the elements 129 and up against elements 122, moving them somewhat forward of their normal case holding position, to allow the elements 129 to snap into holding position at the rear end

of the case. As soon as the flight **112** has passed around sprocket **107** and out of contact with the end of the case, the force of springs **124** acting on stop elements **122** moves the case backward against elements **129**, thus accurately positioning the case at the loading station. The forward stops **122** may be omitted in certain installations and the cases could be permitted to move back against stops **129** through the action of gravity. However, this would result in a slower operation and it is therefore preferred to use stops **122** and gain the advantages of additional speed in the final positioning of the empty case ready for loading.

As previously explained, the grasping head, after engaging the packages on the support in a manner to support them, displaces the support doors downward and outward by applying pressure thereon. During the major portion of the downward swinging of the support doors a reduced upward force is applied to the doors which is not sufficient to prevent the downward movement of the package group held on the grasping head, and which acts to bring the packages into close side by side contact as well as to center the group over the case in the event the group should for any reason be off-center.

As the package group settles into the case it enters first at the leading end due to the slanting position of the case. The case then begins to advance due to the forward component of the revolving rotor carrying the grasping head. By the time the grasping head reaches the lowermost point in its travel the central part of the case has passed the highest roller **20** in the conveyor section **14**, thus carrying its center of gravity beyond such roller. When this point in the travel of the grapsing head has been reached, that is, when its pivot pin **76** has passed a vertical line through the center of shaft **24**, the grasping action is discontinued, and the filled case is then free to move by gravity away from the loading station along the downwardly inclined roller conveyor **15**.

Driving mechanism

The preferred form of driving means for the various parts of the mechanism will now be described. The shaft **24** of the grasping head rotor extends laterally at one side of the rotor into a gear box **138** and is connected through suitable reduction gear to a shaft **139** having a pulley **140** driven by a group of narrow belts **141** passing around pulley **142** on the shaft of motor **143**, suitably secured in the lower part of the base frame.

The case conveyor chain **106** is driven through sprocket **107** mounted on shaft **109** which extends laterally of the conveyor and carries a bevel gear **147**, keyed thereon, meshing with a bevel gear **148** splined on shaft **149**. The shaft **149** extends longitudinally of the case conveyor, below and transversely to shaft **24** and has keyed to its end a sprocket **150** driven through chain **151** on sprocket **152** keyed on a short shaft **153** journalled on suitable bearings on frame members **11**. The shaft **153** is driven through a gear **154** fixed thereon which meshes with a pinion **155**, fixed on shaft **139**. Due to the construction of the driving mechanism for the grasping head rotor and the case conveyor the two will be driven in proper timed relation so that each flight **112** will deliver a case to loading position just prior to the engagement of the packages by one of the grasping heads.

An electric motor and suitable gearing may be employed for driving the conveyors **16** and **16***a* to deliver packages in end-to-end contacting relation for intermittent delivery of package groups to the displaceable support.

Summary of machine operation and method of loading

In order to prepare the machine for operation a source of air pressure is provided for conduits **38** and **60**. Current of suitable value is provided for the solenoid valve **59** and for the magnetic grasping heads. The motor **143** is started to operate the grasping head rotor and case conveyor **13** and conveyors **16** and **16***a* are placed in motion. If the stop **50** should be in open position the solenoid switch **59** can be actuated by the operator by interrupting the light beam of the photocell manually to apply air pressure below the piston **54**, forcing it upward and closing the stop, which will then remain closed until the support doors are in supporting position and a case is present to close the switch **115**. If no cases are moving on conveyor **13** the switch **115** will of course remain open and the stop **50** will remain in lowered position. It is to be noted that the grasping head rotor may rotate and the grasping heads, even though not carrying packages, as they come into contact with the support doors **30**, **30**, will cause the doors to open and, after the head passes between the opened doors, they will move to closed position.

The operator will arrange to have a supply of packages in two columns present on conveyor **16***a* ready to be delivered to conveyor **16** and will provide for a supply of cases on conveyor **13**. Assuming that the solenoid valve **59** has been actuated to bring the stop **50** to its closed position, the leading packages of a succession of packages on conveyor **16** will be urged against the lowered stop. When the package stop is in closed position the support doors will normally be in their period of opening and closing, and one of the grasping heads, which may be assumed to be head **22**, and which may for convenience be called the first head, will be idle (even though energized at this portion of its idle travel) and will be approaching the uppermost point in its circular path, moving counter clockwise as shown in Fig. 1.

The sequence of operations is represented graphically in Fig. 14, which shows that one complete revolution of the grasping heads is completed at the same time the package stop and the displaceable support doors go through two cycles of operation.

As a case is brought to the discharge point of conveyor **13** it will contact the switch finger **116** and cause switch **115** to close. The preceding case is then being loaded by grasping head **22***a*, for convenience called the second head, and this case is beginning to move forward. When the second head has moved to a point sufficiently low to clear the support doors, they are free to move upwardly. Just beyond this point at which the head clears the doors the cam **42** has turned sufficiently to cause the cam follower to move the valve **38** to admit increased pressure to the door cylinders and the doors will be caused to move upward with a snap action. Movement of the doors to supporting position causes the door switch **117** to move to closed position. Since the case switch in the same circuit has closed earlier in the cycle, current will flow in conductor **122** to cause actuation of the four-way, double solenoid valve **59**, serving to open conduit **57** to the atmosphere and applying air pressure through conduit **58** against the upper part of piston **54**, moving the piston down and opening stop **50**.

Since the conveyor **16** has been constantly urging the packages forward, the removal of the stop causes the line of packages to advance and move two rows, two abreast, onto the package support doors. The leading packages are stopped by the curved abutment plate **75** and shortly prior to the stoppage of the package movement the leading portions of the package group interrupt the photocell light beam, causing switch **69** to move to closed position and reverse the position of the four way, double solenoid valve to open conduit **58** to the atmosphere and admit air pressure to conduit **57**. This causes the piston **54** to move upward and close the package stop **50**.

While the above has been taking place the conveyor has been moving the empty case toward its loading position. This case has been holding switch **116** closed to condition the conductor circuit **122** to close as soon as the support doors are brought to closed position. Shortly after the package stop closes the empty case reaches its final

position and is held stationary for a short interval between stops 122 and 129.

There is preferably only a very short interval between the stoppage of the empty case in loading position and the energization of the first head which at this time has reached a point slightly above the tops of the packages on the package support. The first head then contacts the packages and exerts pressure thereon sufficient to depress the support doors through a small angle. The valve control cam 42 on the grasping head rotor at this time has turned to a position in which the cam follower moves to a high cam surface 44. This changes the pressure in cylinders 34 to a substantially decreased value so that, thereafter, the doors will bear against the sides of the package group with a moderately firm contact, serving to center and guide the package group accurately into the empty case at the loading station.

The package group thus begins to enter the inclined empty case at its forward end. By having the leading faces of the packages in contact with the front or leading wall of the case, thereby moving the case and packages forwardly as the packages continue to settle in the case, the tendency is to assure that the trailing edge portions of the package group will easily clear the top edge of the trailing wall of the case and there will be no consequent fouling of the loading.

As the package group reaches a point in the loading where the packages are about ready to be released by the grasping head the case has advanced to a point where its center of gravity is beyond the end of the inclined conveyor section 14. Thus, when the head is deenergized and the filled case is released from the influence of the head, the case will move forward by gravity along conveyor section 15.

Just prior to the deenergization of the first head the support doors have again moved up to supporting position and the package stop has opened. Approximately simultaneously with the deenergization of the first head the next group of four packages begins to move onto the support doors. Following the stopping of the package group by contacting the curved abutment plate 75 and the closing of the stop 50, the second head will be swinging down toward the packages on the support ready to graps them magnetically, move them down between the doors and load them into the next succeeding empty case; and so the cycle of loading continues. The exact timing of the closing of the switches, opening and closing of the valves, energization of the magnetic grasping heads and positions of switches will of course be subject to variation and adjustment as circumstances require, depending somewhat on the height and length of the packages and speed of the machine.

It is to be noted that the oncoming packages on the package conveyor, in bearing against the group of packages on the displaceable support keep the packages on the support in close contact. However, when the packages on the support are engaged by the magnetic head and started on their downward travel there is no tendency for the chimes of the cans projecting from the package ends to lock or engage with each other. In the first place, the chimes of cans on the support are in contact with the sides of cans held in packages on the conveyor and in the second place the engagement of the package group by the grasping head is at a point in which the arms of the grasping head have moved just past the horizontal and further downward swinging of the heads produces a motion away from the ends of the packages on the conveyor. By the time the upper chimes of the cans in the package group move downward past the adjacent lower chimes of cans held in packages on the conveyor the lateral component of motion of the heads is ample to keep one set of chimes clear of the other.

By the provision of the pair of support doors, hinged along their opposite edges it is possible to locate the case conveyor in close proximity to the point of collection of the package group. It is necessary only to space the case conveyor down beneath the support doors a sufficient distance so that the free edges of the doors will swing clear of the top edges of the cases. There is also the further advantage that the doors are so controlled that they offer moderate resistance to the downwardly moving packages and, by so doing, the doors act as guides to center the group and guide it accurately into the case. Also, by reason of the compact arrangement of parts the packages after being collected into groups may be rapidly transferred into the empty cases which are designed to start their advance beyond the loading station as soon as the packages start to enter the cases. By this arrangement both the package groups and the empty cases need come to rest only momentarily and for practical purposes the transfer of packages into cases is substantially in a continuous motion.

While the foregoing description sets forth a preferred embodiment of the invention it is apparent that numerous changes may be made in the mechanism described without departing from the spirit of the invention, and it is desired that the present embodiment be considered in all respects as illustrative rather than restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

What is claimed is:

1. In a mechanism for loading a shipping case with a group of packages arranged in layer, a loading station including a case support for an open top shipping case, such case support permitting advancing movement of the shipping case, a displaceable support for a group of packages arranged in a single layer, such support being disposed adjacent to and aligned with the shipping case support, a case loading member including means to grasp a layer of packages, means for moving the loading member into grasping relation with a layer of packages on the displaceable support and thereafter to a position adjacent the opening of a case on the case support, means for actuating the loading member to grasp a layer of packages on the displaceable support, means for causing displacement of the displaceable support to provide an unobstructed passageway for the movement of a group of packages into the shipping case, means for continuing the movement of the loading member through a curved path and in a direction to cause advancing movement of the shipping case as the layer of packages progressively enters the case, and means for thereafter discontinuing the grasping engagement of the loading member.

2. In a mechanism for loading shipping cases with groups of packages, a loading station, a conveyor for delivering open top shipping cases in a single line to the loading station, said conveyor at the loading station having an antifriction section to support a container while being loaded, a loading member including means to grasp a package group arranged in a layer, the loading member being pivotally mounted to move through an arcuate path to deliver a package group to an open shipping case on the case support section, a package conveyor, a displaceable package support disposed above the case support section and arranged to receive a group of packages from the package conveyor, said package support comprising a pair of opposed, downwardly swingable panels hingedly supported at opposite sides of the loading member path, yielding means for urging the panels upwardly toward normal package supporting position in which they will be disposed across the path of the loading member, means for moving the loading member through its arcuate path and maintaining it substantially in horizontal position during movement, means for actuating the package grasping means after the loading means is moved down against packages on the support panels, whereby the packages are supported by the loading member, means for reducing the force by which the hinged panels are urged toward package supporting position to

facilitate downward swinging of the panels by the pressure exerted through the packages supported on the loading member, whereby the loading member will carry the layer of packages past the panels and into the open top of a shipping case, and means timed with the movement of the loading member to cause the release of packages from the grasping means to deposit the packages within the case.

3. A mechanism as defined in claim 2, wherein the loading member is mounted on a rotatable frame and, after deposit of a layer of packages in a shipping container, the loading member frame can move in a complete circle to bring the grasping means into engagement with another layer of packages on the displaceable support means, and means timed with the rotation of the loading member to increase the force by which the hinged panels are urged toward package supporting position as soon as the loading member has moved to a position to clear the free edges of the panels and cause the panels rapidly to move to normal package holding position.

4. A mechanism as defined in claim 2, wherein the anti-friction section of the conveyor is tilted upward in the direction of conveyor movement at a slight angle to hold a case from movement until a package group is partially delivered into its open top, the position of the inclined section with respect to the pivot on which the loading member is mounted being such that, as the loading member delivers packages into the case, the leading wall will be engaged by the leading surface of the package group and the case will be advanced as the packages settle into the case, and an additional conveyor section beyond the inclined section to receive the filled case when loading is completed.

5. In a mechanism for loading a shipping case with packages comprising magnetically permeable articles, such as filled cans, a loading member including an electro magnetic grasping head mounted for bodily swinging movement, a displaceable support means for a group of packages of filled cans, a shipping case support disposed below the package support, adapted to retain in position an open top shipping case, means for bodily swinging the magnetic grasping head and for retaining it substantially horizontal during swinging movement, the path described by the magnetic grasping head passing through the package support, a source of electric current, a circuit including switch means for energizing the electro magnet, means for actuating the switch to energize the magnet when the grasping head has been swung down to engage the top of a group of packages on the support, means for causing displacement of the support from the package group to provide an unobstructed path for the packages and grasping head to the open top of a shipping case on the case support, and means for opening the switch to deenergize the magnetic gripping head when the head has swung down sufficiently to deliver the group of packages into a shipping case.

6. In a mechanism for loading a shipping case with packages comprising magnetically permeable articles, such as filled cans, a loading member including an electro magnetic grasping head mounted for bodily swinging movement, a displaceable support means for a group of packages of filled cans, a shipping case support for an open top shipping case disposed below the package support, means for bodily swinging the magnetic grasping head and for retaining it substantially horizontal during swinging movement, the path described by the magnetic grasping head passing through the package support, a source of electric current, a circuit including switch means for energizing the electro magnet, means for actuating the switch to energize the magnet when the grasping head has been swung down to engage the top of the group of packages, the displaceable package support comprising at least one hingedly mounted panel normally disposed horizontally, yieldable means for urging the support upward toward horizontal position, means for reducing the force of the yielding means to facilitate downward swinging of the support due to pressure of the grasping head exerted through the packages, the displacement of the support means providing an unobstructed path for the passage of the packages and grasping head to the open top of shipping case on its support, means for opening the switch to deenergize the magnetic grasping head when the head has swung down sufficiently to deliver the group of packages into a shipping case, and means for returning the package support to horizontal position.

7. In a mechanism for loading shipping cases with packages, a loading station, a conveyor for delivering shipping cases successively to the loading station, means for retaining an open top shipping case in position at the loading station, a displaceable package support disposed in substantial vertical alignment with the conveyor at the case loading point, a loading frame member pivotally mounted at the loading station, opposed package group grasping members mounted in the loading frame member, one on each side of its pivotal mounting for circular movement about such pivotal mounting, the path of movement of the grasping members being through the space defined by the displaceable support and closely adjacent the open upper portion of a case at its loading position, means for rotating the loading frame in a direction from the package support toward a case at its loading position, means for actuating the grasping members selectively as an individual grasping member engages a group of packages on the package support, means for displacing the support after said actuation of the grasping member, means for causing continued rotation of the loading frame to deposit a group of packages in an open shipping case, and means for discontinuing grasping of the package group by the grasping member after deposit of the packages in a case.

8. In a mechanism for loading shipping cases with a group of articles arranged in a layer, mechanism for collecting and segregating a group of upstanding articles of uniform size comprising in combination, a displaceable article support comprising at least one displaceable panel normally disposed in horizontal position, a horizontally disposed conveyor arranged to deliver articles onto the article support, an abutment at the end of the article support remote from the conveyor discharge point to stop the travel of articles delivered onto the support, the dimension of the support between the conveyor discharge point and the abutment being substantially equal to a multiple of the article dimension, means for operating the conveyor, stop means at the discharge end of the conveyor adapted to hold articles from passing the discharge end, means for operating the stop means, a shipping case support located at a level below the displaceable support, a case loading means having a grasping member adapted to grasp and support a layer of articles delivered to the article support, means for actuating the grasping member to support articles delivered to the displaceable support, means for displacing the support, means for moving the grasping member and articles carried thereby downwardly in a path through the space normally occupied by the displaceable article support to deliver the articles to an open-top shipping case on the shipping case support, and means for releasing the articles from the grasping member.

9. In a mechanism for loading open top shipping cases with a group of articles arranged in a layer, a displaceable article support upon which a group of articles may be supported, means for delivering a layer of articles onto the article support, a shipping case support located on a level below the displaceable article support, a case loading means having a grasping member adapted to grasp from above and support a layer of articles delivered to the article support, the article support comprising a pair of panels disposed in edge to edge relation to form a unitary, substantially horizontal support, said panels being hingedly

mounted at their edges remote from their meeting edges, means normally urging the panels toward article holding position, the grasping member being mounted for movement down between the hinged panels in downwardly swung position, means for moving the grasping member downward, said shipping case support being located symmetrically below the panels in downwardly swung position, means for varying the force with which the panels are urged toward article holding position, and means acting in time with the downward movement of the grasping means to reduce substantially the force by which the hinged panels are urged toward article holding position, whereby the panels will closely engage articles while they are being lowered toward a case by the grasping means and act to guide the articles into the open top of a case.

10. In a mechanism for loading an open top shipping case with a group of articles arranged in a layer, a support for collecting a group of packages to be loaded in a case, said support comprising a pair of adjacent, aligned, oppositely hinged, downwardly swingable doors of uniform size, a grasping head adapted to engage the top of a package group on the support doors and grasp the group in supporting relation, mean for moving the grasping head forcefully against packages on the doors to initiate opening thereof preparatory to delivery of the packages held thereon into a shipping case positioned below the doors, means associated with each support door for yieldingly holding said doors in package supporting position with sufficient force to support a predetermined weight of packages thereon, and means for individually varying such yielding means to adjust said means whereby each door is adapted to offer substantially the same resistance to downward pressure of the packages forced against the doors by the grasping head.

11. In a mechanism for loading an open top shipping case with a group of articles arranged in a layer, a loading station including a support for a rectangular, open top shipping case, a grasping head for delivering a group of articles to the case, said head being mounted for movement in a vertical plane along a curved path whereby the deposit of the article group into the case causes concurrent advancing movement of the case away from the loading station, an endless conveyor having its end adjacent the case support and adapted to deliver a case to the support, spring-loaded rear stops disposed at the sides of the case support adapted to be displaced during passage of a case therebetween and to snap into the path of the case after the trailing end has passed said stops, spring loaded front stops extending into the path of the case and spaced from the rear stops one case length, said front stops permitting overriding of the case ahead of the rear stops by an appreciable distance, and a flight on the case conveyor to propel the case onto the case support to cause the trailing case wall to clear the rear stops, said front stops, after the conveyor flight passes out of contact with the end of the case, causing retrograde movement of the case against the rear stops thereby to position the case accurately for loading.

12. In a mechanism for loading shipping cases with groups of packages, a conveyor including a loading station for movably supporting an open top shipping case, a loading member including means to grasp a package group arranged in a layer, means for mounting the loading member for movement in a fixed path, at least a part of which is curved, to deliver the package group into an open top shipping case at the loading station, displaceable support means located in the path of the loading means and adapted in one position to support a layer of packages in such path, means for moving the loading member into engagement with packages on the support, means for selectively actuating the grasping means to support the packages, means for removing the displaceable support means to clear the path for the loading member to the open top of a shipping case at the loading station, the path of movement of the loading member having a component conforming with the path of movement of the case on the conveyor, whereby progressive delivery of the package group by the loading member into the shipping case will cause advancing movement of the case along the conveyor.

13. In a mechanism for loading shipping cases with a layer of uniform sized, rectangular, upstanding packages, means for collecting and segregating a group of such packages comprising in combination, a displaceable support adapted to hold a layer of such packages in face-to-face contact, such support comprising a movable panel normally disposed horizontally, a conveyor arranged to deliver packages in face-to-face relation onto the package support, the delivery end of the conveyor being disposed somewhat above the package support, whereby the upper portions of the package faces on the conveyor will be maintained at a higher level than the packages on the support, a stop element arranged at the discharge end of the conveyor and having a part swingable from raised position over the support to a lower position at the discharge end of the conveyor, whereby the packages at the discharge end of the conveyor may be held from advancing movement by such swingable stop part contacting solely the vertical portions of the faces of the packages on the support, and means for moving the stop element selectively from operative to inoperative position.

14. In mechanism for loading shipping cases with packages of uniform height, the combination of a grasping member adapted to support a layer of packages conformable in horizontal contour to the interior of the shiping case to be loaded, an anti-friction support for a shipping case, such support having an upwardly inclined section and a downwardly inclined section leading therefrom, means for supporting the grasping member for progressive, controlled movement from an elevated position above the case support to a lower position adjacent a case on such case support and forwardly along such support in a direction toward the downwardly inclined section, whereby the advancing lower edge of the package layer held by the grasping member may first enter the leading edge of a shipping case on the upwardly inclined support section, thereby moving the case forwardly along the upwardly inclined section, and thereafter may be deposited within the case as the grasping member moves downward and forward, the extent of the upwardly inclined support section being such that the case is moved off said section by engagement of the package group with the leading edge of the case and onto the downwardly inclined section during deposit of the package layer in the case.

15. In a mechanism for loading shipping cases with packages of uniform size, the combination of a frame, a pair of horizontally aligned, downwardly swingable, package supporting doors mounted on the frame on hinges along their opposite edges, means yieldingly holding the doors in horizontal position, means for delivering a package group onto the doors while in horizontal position, a support for a shipping case located below the hinged doors, said support being disposed sufficiently below the doors so that they may swing to open position without striking the case, a grasping member supported for movement from a position above the doors, thence down between the doors, when in open position, to a point adjacent the top of a case on the case support, said grasping member being adapted to engage and support a layer of packages delivered onto the doors, means for moving the grasping member downward against the packages on the doors to cause the doors to open and move the package layer therebetween, whereby the package layer may be delivered into a case on the case support, and means for returning the grasping member to a position above the doors along a path separate from its downward path of movement between the doors.

16. In a mechanism for loading shipping cases with a

group of packages arranged in a layer, a frame, a loading member having a grasping head adapted to support a layer of packages, means for pivotally mounting the loading member for rotary movement on the frame, a displaceable package support for receiving a layer of packages, a conveyor for delivering packages thereto, said displaceable package support being disposed in the path of the grasping head, a segmental abutment plate concentric with the pivotal mounting of the loading member, rotatable therewith, and having its abutment surface spaced a limited distance from the edge of the displaceable support, whereby packages moving onto the displaceable support will be stopped by the abutment plate in proper position for grasping engagement by the grasping head.

17. In a mechanism for loading shipping cases with a group of articles, a loading station, means for supporting and releasably retaining an open shipping case in stationary position at the loading station but free for advancing movement, means for segregating a group of articles in a layer adjacent the opening of the case and conformable in contour to the interior of the case to be loaded, a loading head mounted for movement in a path, at least a portion of which is curved, to move the loading head approximately tangentially to the edges of the case defining the load-receiving opening and in the direction of advancing movement of the case, said loading head including means for holding the group of articles in fixed relation therewith, whereby movement of the loading head with the article group through said path of movement will progressively deliver articles into the case and simultaneously advance the case.

18. In a mechanism for loading a shipping case with articles, a loading station including a support for a rectangular, open top case, loading mechanism for delivering a group of articles into the case at the loading station, a conveyor adapted to deliver a case to the loading station, spring loaded rear stops disposed at the sides of the case support adapted to be displaced forwardly during passage of a case therebetween and to be returned into the path of the case after the trailing end has passed said stops, spring loaded front stops extending into the path of the case and spaced from the rear stops one case length, said front stops permitting overriding of the case beyond the rear stops by an appreciable distance, said case conveyor being adapted to propel a case onto the case support to cause the trailing wall to clear the rear stops and thereafter temporarily discontinue its propelling effect, said front stops acting, when the propelling force of the conveyor is discontinued, to cause retrograde movement of the case against the rear stops thereby to position the case accurately for loading.

19. Mechanism for loading open-top, four-walled shipping cases with packages comprising, in combination, a grasping head adapted to support packages in depending relation to the grasping head, a loading station which includes an anti-friction support on which a shipping case may be placed to receive packages and a conveyor section aligned with the anti-friction support upon which cases may be conveyed after leaving the anti-friction support, means for assembling a group of packages in position to be grasped by the grasping head, means for moving the grasping head, while carrying packages, from an elevated position above the anti-friction support to a lower position adjacent a case at rest on the case support to cause the packages partially to enter the case, said means also serving to move the grasping head forwardly along such support in the direction of the conveyor section, means for maintaining the grasping head operative to support packages after the lower portions of the packages have entered the case and thereafter for a limited distance after the grasping head is being moved in the direction of the case conveyor to bring the packages into contact with the leading wall of the case and cause the case to advance while being loaded, and means for discontinuing the action of the grasping head to cause the packages to be deposited within the case.

20. The method of loading open top shipping cases with articles of uniform height which comprises segregating a group of articles in a layer having a contour conformable to the interior of the case to be loaded, supporting in close proximity to the article layer an open top case for free advancing movement on a plane inclined at a small angle to the plane of the layer of articles, supporting the layer of articles with a grasping device, moving the grasping device through a curved path in the direction of the open top of the case while maintaining an angular relation between the article layer and the case to deliver the layer of articles into the case with the leading edge of the article layer entering the case initially at the leading edge of the case and simultaneously effecting its advancement, and thereafter releasing the articles from the grasping device.

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