

[54] INDEXING CAROUSEL INFEED UNIT
FOR CAN ENDS

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[58] Field of Search 198/24; 221/11, 81, 104, 105,
221/106, 113, 119, 121

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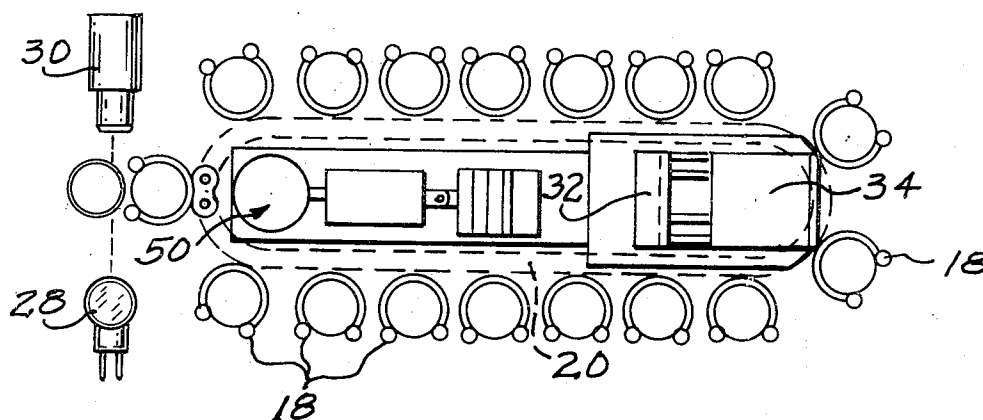
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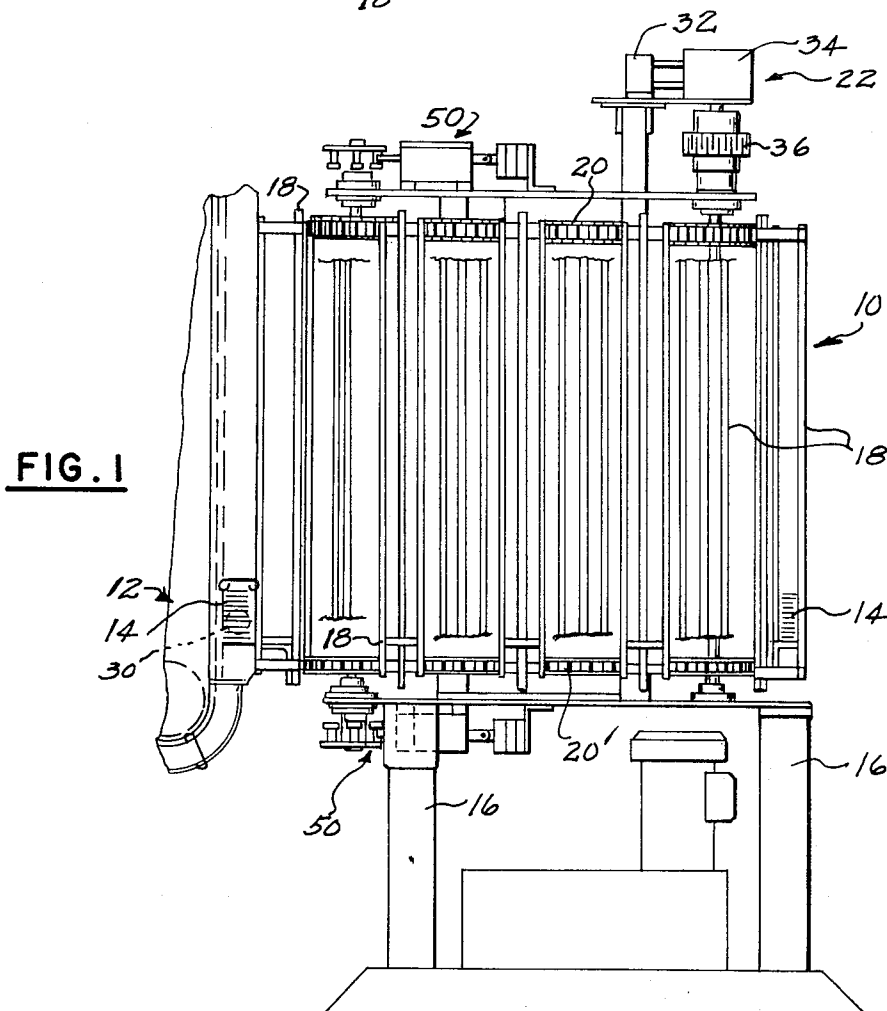
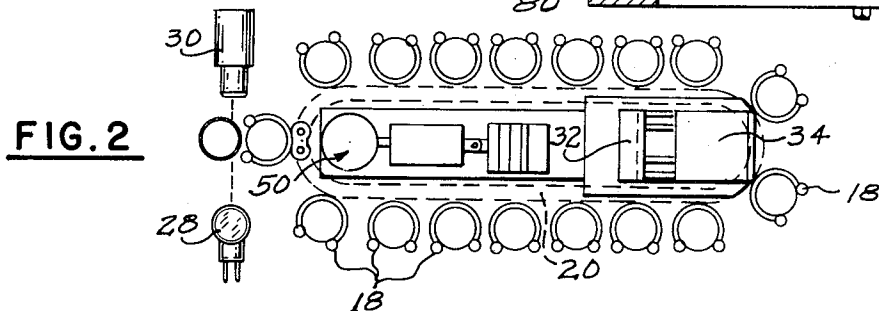
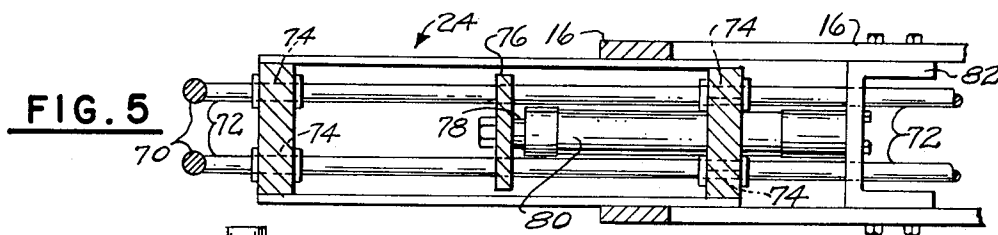
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[57] ABSTRACT

A carousel type infeed unit for supplying can ends to a receiving station of a can processing line, or the like. The infeed unit employs drive means including an endless conveyor element to which is attached a plurality of carrier members capable of receiving and releasably retaining a stack of can ends. The drive means further includes an indexing arrangement capable of producing controlled, incremental movement of the conveyor element, whereby the can end carrier members may be aligned with said receiving station, at which time an ejector arrangement is employed to engage and forcibly transfer a stack of can ends from the aligned carrier member to the receiving station. In addition, there is disclosed control means adapted for use with the infeed unit, which control means monitors the supply of can ends at said receiving station so as to attain automatic operation of the infeed unit as the need for additional can ends arises.

11 Claims, 7 Drawing Figures





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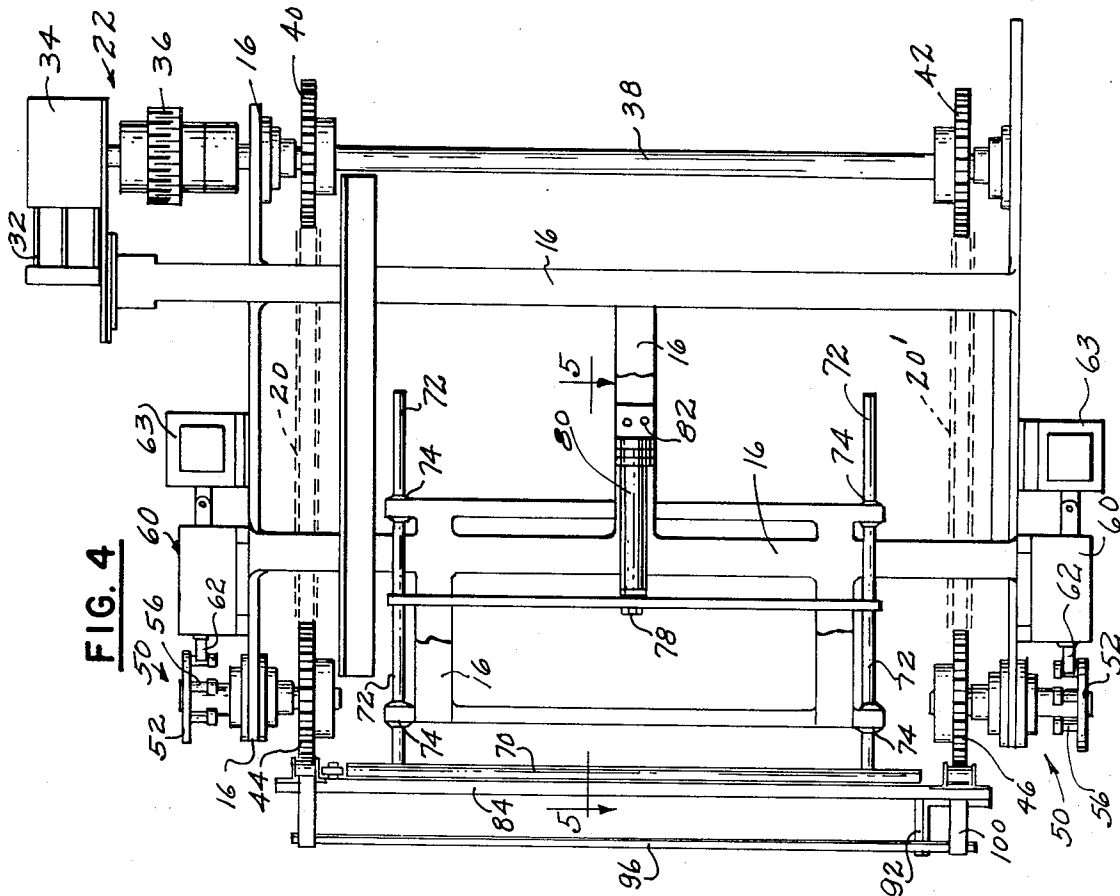


FIG. 4

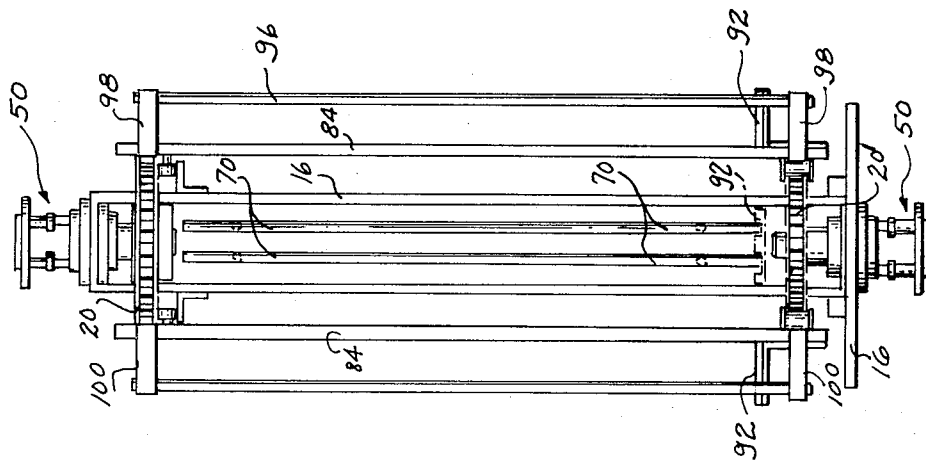


FIG. 3

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FIG. 7

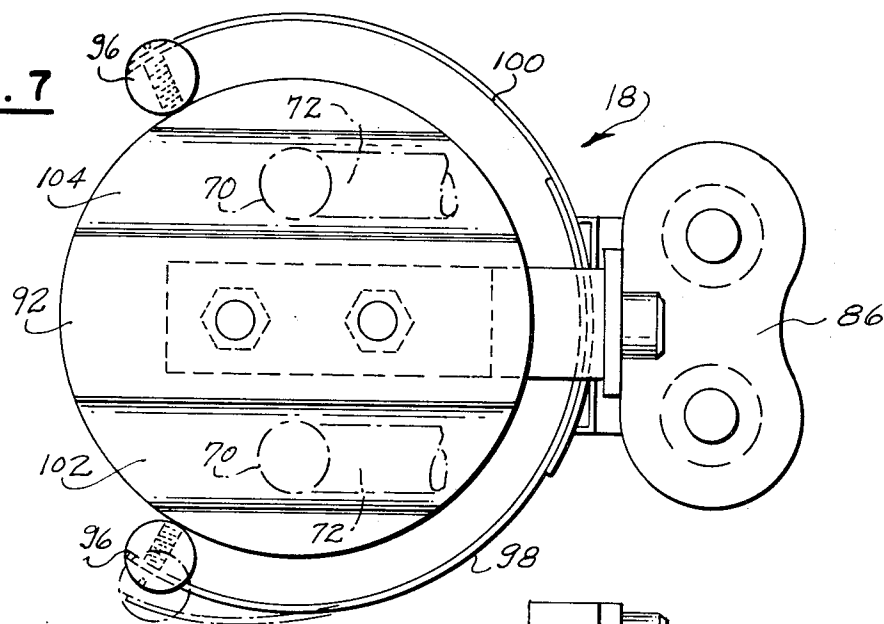
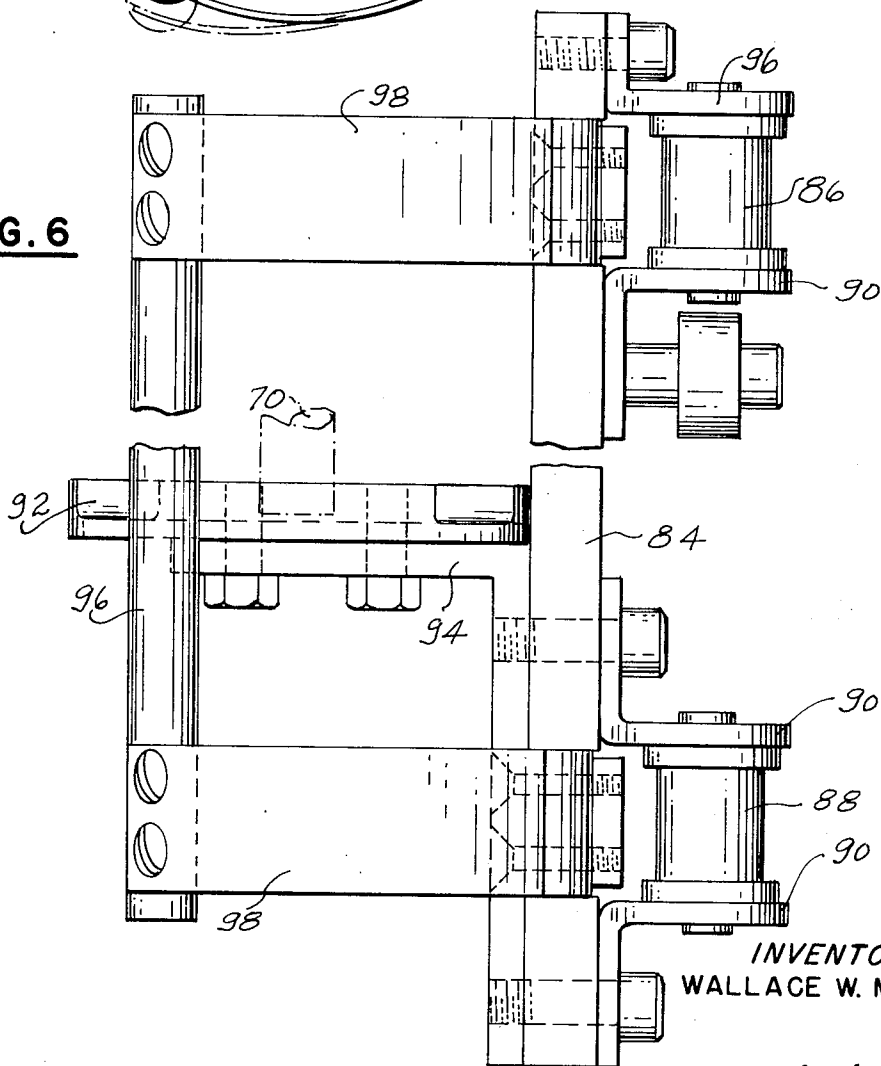


FIG. 6



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INDEXING CAROUSEL INFEED UNIT FOR CAN ENDS

BACKGROUND OF THE INVENTION

The present invention relates to can assembling and manufacturing industries, and more specifically to apparatus for assuring a continuous supply of can ends to a processing line.

The level of technology in the design and development of can processing and manufacturing equipment has proceeded to a point wherein presently this equipment operates at extremely high rates of speed. Speed of operation is necessary in order to attain economic production; however, this factor has created certain problems with regard to can end supply. More specifically, the rates of speed of operation encountered are such that existing infeed arrangements either require continuous supervision and attention by an employee, or, if of an automated or semi-automatic nature, it has not proven dependable in service.

The various objectionable features of the prior art devices are obviated by the apparatus of the present invention in that there is provided an infeed unit which may be characterized as being of the indexing, carousel variety. This infeed unit is capable of receiving and storing a quantity of can ends sufficient to permit the processing line with which it is associated to operate for an extended period of time. Accordingly, the indexing and transfer steps being automatically performed, the only manual operation required is the loading of the can end receiving members or trays. The elimination of continued supervision, taken in conjunction with the dependable automatic operation afforded by this invention, permits a single employee to attend and service a plurality of processing lines. Taking into account the fact that can processing plants normally operate on a 24-hour a day basis and employ a substantial number of processing lines, this elimination of maintenance personnel materially reduces operating costs.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of an indexing carousel infeed unit constructed in accordance with the present invention and associated with a receiving station; for purposes of clarity, alternate tray or carrier members have been broken away to expose to view the chain-type conveyor element employed;

FIG. 2 is a top plan view of the unit of FIG. 1, illustrating the disposition of the can end receiving carrier or tray members;

FIG. 3 is a front elevational view similar to FIG. 1 but on an enlarged scale and having all but one of the carrier members removed for purposes of illustration;

FIG. 4 is a front elevational view of the unit of FIG. 3, the tray member in alignment with the receiving means having been deleted to expose to view the forward end of the ejector ram;

FIG. 5 is a partial sectional view taken through the machine of FIG. 3, and illustrating the transfer mechanism employed with the present invention;

FIG. 6 is an interrupted view of a preferred form of carrier member, illustrating the construction of the upper and lower segments of said member; and

FIG. 7 is a top plan view of the tray carrier member of FIG. 6.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, there is illustrated a carousel infeed unit 10 constructed in accordance with the present invention and associated with a receiving station 12 for supplying the can ends 14 thereto. The receiving station 12, as illustrated, receives and maintains the can ends 14 in stacked relation and may be operatively connected with a conveyor for transferring the can ends 14 to a remotely located processing machine, or alternately, the station 12 may be directly coupled with a processing machine to serve as the input thereof.

The infeed unit 10, as can be understood from a viewing of FIGS. 1 and 2, is comprised of a frame 16 about which is mounted a plurality of can end carrier or tray members 18. These carrier or tray members 18 are constructed to receive and releasably retain a stack of can ends 14, the preferred construction thereof being detailed hereinafter with reference to FIGS. 6 and 7. Continuing with reference to FIG. 2, the individual, vertically disposed carrier members 18 are mounted on an endless conveyor element in the form of a sprocket chain 20. The sprocket chain 20 is operatively connected to a drive arrangement 22 for controlled, incremental movement, as will be explained and discussed more completely with reference to FIGS. 3 and 4. Disposed interiorly of frame 16 of the illustrated and preferred form of the invention, is a can end ejector or transfer mechanism, designated generally 24, and illustrated in FIG. 5. Upon alignment of one of the carrier members 18 with the receiving station 12, same will also come into alignment with the ejector mechanism 24 which then may be operated to engage and forcibly transfer can ends from said aligned carrier 18 to the receiving station 12.

In addition to the above-mentioned basic elements of unit 10, in the illustrated, preferred embodiment, a control arrangement 26 is employed. This control arrangement 26 monitors the level of the can ends at the receiving station 12, and upon reduction of said level below a selected location, generates a pulse or signal which will initiate a cycle of operation of the unit 10. As such, the carousel infeed unit of the present invention is thus adapted for automatic operation, as the need for can ends at station 12 arises.

It should be realized that the control arrangement 26 may be of any one of a number of known constructions. In the illustrated embodiment, a photoelectric arrangement, comprised of an emitter 28 and a receiver 30, is employed. The emitter and the receiver 28 and 30 are positioned such that a beam of energy from the emitter 28 passes through the receiving station 12 at a relatively low prescribed level. Accordingly, when a supply of can ends exists at said station above said level, the beam is blocked; however, when said supply drops below the preselected level, the beam falls upon the receiver 30, thus producing the control signal which effects indexing and resupply.

For purposes of an initial understanding of the present invention, the general mode of operation of the infeed unit 10 will be described briefly. Accordingly, assuming a supply of can ends 14 at the receiving station 12 and an emptied carrier tray 18 in alignment therewith, as the level of can ends at station 12 drops

below the desired level, a control signal is produced by receiver 30 which energizes the drive arrangement 22. The operation of said drive arrangement 22 is cyclic rather than continuous, producing a controlled, incremental movement of the sprocket chain 20, and correspondingly, indexing of the carrier members 18. The degree or length of this movement will, of course, vary depending upon the geometry of the infeed unit; however, it is selected to be such as to bring the next succeeding carrier member 18 into alignment with the receiving station 12. Accordingly, upon arrival of the loaded carrier member 18 in alignment with the receiving station 12, the transfer mechanism 24 is operated to eject forcibly and transfer a stack of can ends from said carrier member 18 to the receiving station 12. The transfer mechanism 24 then retracts, completing a cycle of operation.

It should be noted, however, that the exact sequence or timing of the various steps in the above-described cycle may be varied, as desired. For example, the cycle could start with a loaded carrier tray 18 in alignment with the receiving station 12, the first positive operation being operation of the transfer mechanism 24. Accordingly, upon retraction of the ram mechanism 24, the drive means 22 will be operated to index the next succeeding, loaded carrier member 18 into aligned relation with station 12, completing the indexing cycle. The particular control circuitry, including timing devices and the like, has not been detailed, as one skilled in this area could devise numerous control systems to attain a desired sequence of operation.

As can be seen from the above, the operation of the infeed unit 10 is controlled by and regulated to the demands of the processing machinery utilizing the can ends 14. As the need for can ends arises, the infeed unit 10 will be cycled to supply a fresh stack of ends 14 to the receiving station 12. Thus, an operator need perform but one manual function, and that is the loading of the numerous carrier members or trays 18 with can ends. Since this operation can be effected rapidly and efficiently with pre-stacked and packaged can ends, a single operator can easily service a plurality of machines, the exact number depending upon the speed of the processing line.

Attention is now directed to FIGS. 3-5 in conjunction with which a more detailed description of the construction of unit 10 will now be given. That is to say, the specific elements of the preferred embodiment which enable attainment of the automated, cyclic operation described above will be reviewed in detail. In this regard, it should be noted that the unit 10, as shown in FIG. 3, has all but one of the carrier or tray members removed for purposes of clarity of illustration.

Considering first the drive arrangement 22, said arrangement includes a prime mover 32 in the form of an air or hydraulic cylinder mounted atop a frame 16. In the illustrated embodiment, the piston rod (not shown) of the cylinder 32 is operatively engaged with gearing (also not shown) disposed within the housing 34. Engaged with said gearing, through a chain coupling 36, is a main drive shaft 38 which is journaled for rotation relative to the frame 16 at the rear portion thereof. Positioned on the drive shaft 38, at spaced locations, are a pair of sprocket gears 40 and 42. Proximate the forward end of the infeed unit 10, there are mounted

two additional, spaced, independently journaled sprocket gears 44 and 46 which operate as idler gears. The aforementioned endless sprocket chain 20 is engaged over the gears 40 and 44, and an additional sprocket chain 20' is engaged over the sprocket gears 42 and 46. Thus, said sprocket chains 20 and 20', as well as the respective gears 40-46 are connected for joint, correlated movement.

Upon operation of the infeed unit 10 to achieve indexing, the cylinder 32 is energized, the movement of its piston being converted to rotary motion of the drive shaft 38 by means of the gearing in housing 34 and the chain coupling 36. When shaft 38 rotates, the gears 40 and 42 are driven to produce movement of the respective sprocket chains 20 and 20' to which are attached the numerous can end carrier members 18.

By adjusting the stroke of the piston for the cylinder 32, the approximate cyclic movement of the carrier members 18 can be attained. However, it is absolutely necessary that these carrier units 18 be properly aligned with the receiving station 12 and the transfer mechanism 24. Should the carrier members 18 be out of alignment, the effective transfer of the stacked can ends will not be accomplished.

To attain the desired and necessary alignment of the carrier members 18 with the receiving station 12, the present invention employs novel alignment means 50 as discussed immediately hereinafter. Recalling the independent journaling of the sprocket gears 44 and 46 provided at the forward end of unit 12, the movement of these gears will be correlated directly to that of the sprocket chains 20 and 20' and correspondingly, the resulting movement of the carrier units 18. As such, the novel alignment means 50 of the present invention operates in conjunction with one or the other, or both, of these gears 44 and 46. In the preferred, illustrated embodiment, a pair of said alignment means 50 is employed, one for each of said sprocket gears 44 and 46.

Since the alignment means 50 for each said sprocket gear 44 and 46 is identical, only that mounted atop the frame 16 will be discussed in detail, it being understood that the lower construction is substantially identical thereto. Basically, the alignment means 50 includes a disc or plate 52 mounted to an end of the shaft 54 which is journaled to frame 16 and has the aforementioned sprocket gear 44 mounted on the opposite end thereof. The plate member 52 includes a plurality of abutment surfaces provided by a number of studs or elements 56 depending from a surface thereof. The circumferential spacing between the adjacent studs or members 56 is calculated so as to correspond to the length of movement required to index a carrier member 18 into proper alignment with the receiving station 12. Disposed adjacent to said plate 52 is a stop arrangement 60 which includes a retractable stop member 62 operated by a solenoid 63.

Accordingly, prior to indexing of the infeed unit 10, the solenoid 63 is energized to effect retraction of the stop 62 from its blocking engagement with a first one of the studs 56. This action frees the plate 52 and correspondingly, the gear 44 for rotation; however, as soon as said first stud 56 passes the stop 62, it is returned to its initial position wherein it will now engage the next succeeding stud 56 thereby preventing further movement of the gear 44, as well as the

sprocket chain 20. The relation of the studs 56 to each other being correlated to the spacing between respective carrier members 18, the allowed movement thus produced will bring a new carrier member 18 into proper alignment with the receiving station 12. To accommodate this blocking action, without an adverse effect on the entire drive arrangement, the gearing in housing 34 preferably is such as to provide for some slippage, should the piston stroke be longer than actually required to attain alignment.

It will be noted that the drive ratio between the gear 44 and plate 52 is 1-to-1 in the illustrated embodiment. As such, by employing different ratios, the spacing between the studs 56 may be altered while achieving the same result, provided that a proportional relation to the movement of the carrier members 18 is maintained. In fact, with a proper gear ratio, only one such stud may be employed, in this instance the full 360 degree circumferential movement of the stud 56 producing the necessary incremental movement required to attain the proper alignment of member 18 as discussed above.

When in proper alignment with the receiving station 12, the carrier members 18 are also aligned with the transfer mechanism 24. However, in order to understand the transfer operation, it must be realized that the carrier members 18 are of an open frame construction, as illustrated in FIGS. 6 and 7. As such, the forward ram element of the transfer mechanism 24 can enter said frame construction to engage and forcibly eject the stack of can ends 14 from said carrier member.

With regard to FIGS. 3-5, the construction of the transfer mechanism 24 of the preferred and illustrated embodiment will now be detailed. In this instance, the general construction of the transfer mechanism 24 is probably best understood upon a viewing of FIG. 5, keeping in mind that said figure is a partial, horizontal sectional view taken through the machine 10 and providing a plan view of said mechanism. Basically, the transfer mechanism 24 is comprised of a ram or pusher in the form of two spaced, parallel, vertically disposed, elongate members 70. The spacing between the respective members 70 is such as to be somewhat less than the diameter of the can ends 14. Elongate members 70 are connected at the upper and lower ends thereof to two pair of horizontally disposed rods 72 which are slidably mounted to the frame 16 at spaced locations by a plurality of slide bushings 74, so as to provide for rectilinear movement of the members 70. A plate element 76 is affixed to rods 72 for movement therewith, and is in turn, operatively coupled to the piston rod 78 of an air or hydraulic cylinder 80. The cylinder 80 is stationary, being mounted to the frame 16 by a bracket 82. Accordingly, upon operation of the cylinder 80, the plates 76, rods 72 and the elongate ram members 70 will move forward. This forward movement will cause the elongate pushers 70 to enter within framework of the carrier members 18 to engage and forcibly eject a stack of can ends therefrom. Therefore, assuming proper alignment with the receiving station 12, the stack of can ends will be transferred to said station. The transfer operation being completed, the cylinder 80 is then operated to retract the ram 70, therefore enabling subsequent indexing of the carrier elements 18 as needed.

While it is envisioned that various types or constructions of carrier elements 18 may be employed, FIGS. 6 and 7 illustrate a preferred form. In this regard, FIG. 6 is a fragmentary, elevational view of the carrier member 18 illustrating the construction of the upper and lower segments thereof. FIG. 7, on the other hand, is a top view augmenting FIG. 6.

More specifically, each carrier member 18 is comprised of an elongate, vertically disposed main standard 84, having on one side thereof, means for attachment to the respective spaced sprocket chains 20 and 20'. As illustrated in FIGS. 6 and 7, this means is in the form of a pair of chain links 86 and 88 mounted directly to said standard by brackets 90.

On the opposite side of standard 84, there is positioned the means for releasably retaining a stack of can ends. In this regard, the carrier or tray members 18 include a base or supporting plate 92 mounted to the lower portion of standard 84 by a bracket 94 and suitable bolt means. Disposed outwardly of the standard 84 and in proximity to the periphery of the plate 92, is a pair of elongate, vertically disposed rod elements 96. These rod elements 96 are connected to the standard 84 at the upper and lower portions thereof by a pair of leaf springs 98 and 100. As such, the rod elements 96 are expandable or separable to allow for the entry or discharge of can ends into or from the framework provided by the carrier members 18. In addition, the width of the main standard 84 in the horizontal plane, is somewhat less than the spacing between the ram elements 70 so as to permit said ram members to pass freely on opposite sides thereof during engagement and transfer of the can ends supported on the base plate 92.

To facilitate and insure complete transfer of the can ends, the base plate 92 is provided with a pair of spaced, parallel grooves or channels 102 and 104. During the transfer operation and upon entry of the elongate ram elements 70 within the framework of the carrier members 18, the lower ends of said ram elements 70 will be received within the channels 102 and 104, as illustrated by the phantom outline of the rods 70 in FIGS. 6 and 7.

The employment of the channels 102 and 104 for reception of the ends of the elongate elements 70 provide several important features. Primarily, this disposes the ends of the elements 70 below the lowermost can end 14 so as to insure complete transfer. In addition, the channels or grooves 102 and 104 provide a fail-safe factor in that if the carrier members 18 are not properly aligned, the ram elements 70 will strike either the periphery of the plate 92 or the standard 84, thus preventing further movement and premature ejection of the can ends.

Accordingly, it is believed clear that the present invention provides an infeed unit which is capable of controlled, automated supply of can ends to a receiving station. It should be kept in mind, that the unit 10 shown in the drawings and hereinabove described, is illustrative of but one form or embodiment of the present invention, and it is envisioned that various changes in the structure, or alternate sequences of operation from those described, will no doubt occur to those skilled in the art; as such, said changes or modifications are to be understood as forming part of the present invention, insofar as they fall within the spirit and scope of the claims appended hereto.

What is claimed is:

1. Apparatus for supplying can ends, or the like, to a receiving station, said apparatus comprising: a frame; drive means mounted to said frame and including an endless conveyor element; a plurality of carrier members mounted to said conveyor element, each said carrier member including a frame construction comprising, an elongate supporting standard attached to said conveyor element, a base plate carried by said standard for supporting a stack of can ends, and spring means including a pair of spaced elongate elements attached to said supporting standard by resilient means and disposed such that the distance therebetween is less than the maximum width of the can ends to be disposed therein, such that said elongate elements may be forcibly spread to provide for reception and ejection of a stack of can ends, while permitting said stack of ends to be moved laterally of said carrier member; said drive means further including means capable of producing controlled, incremental movement of said conveyor element whereby said carrier members may be sequentially aligned with said receiving station; ejector means for engaging a stack of can ends carried by a carrier member aligned with a receiving station and forcibly transferring said stack of can ends laterally from said aligned carrier member to said receiving station.

2. Apparatus for supplying can ends, or the like, to a receiving station, said apparatus comprising: a frame; drive means mounted to said frame and including an endless conveyor element; a plurality of carrier members mounted to said conveyor element, each said carrier member including a frame construction comprising, a base plate for supporting a stack of can ends, and spring means for releasably receiving and retaining the stack of can ends supported on said base plate, while permitting said stack of ends to be moved laterally of said carrier member; said drive means further including means capable of producing controlled, incremental movement of said conveyor element whereby said carrier members may be sequentially aligned with said receiving station; ejector means for engaging a stack of can ends supported by a carrier member aligned with said receiving station, and said ejector means, upon engagement with said stack of can ends moving said stack laterally of the carrier member past said spring means, thereby forcibly transferring said stack of can ends from said aligned carrier member to said receiving station.

3. Apparatus as defined in claim 2 wherein said carrier member further includes an elongate supporting standard carrying said base plate and said spring means, and being attached to said conveyor element; and said spring means include a pair of spaced elongate elements attached to said supporting standard by resilient means and disposed such that the distance therebetween is less than the maximum width of the can ends to be conveyed, such that said elongate elements may be forcibly spread to provide for reception and ejection of a stack of can ends.

4. Apparatus as defined in claim 2 further including sensing means associated with said receiving station for monitoring the level of can ends and being operably connected with said ram means, such that when the supply of can ends at said receiving station reaches a predetermined level, said ram means will be operated to transfer an additional stack of can ends to said receiving station.

5. Apparatus as defined in claim 2 further including control means associated with said receiving station for monitoring the level of can ends therein, said control means being such that when said level falls below a predetermined value, said drive means is operated to index a full carrier member into position, and said ram means is energized to transfer a fresh supply of can ends to said receiving station.

6. Apparatus as defined in claim 5 wherein said control means includes photoelectric sensing means associated with said receiving means for monitoring the level of can ends therein, said photoelectric sensing means being such that when said level falls below a predetermined value, a control signal is produced which effects indexing of the carrier members and operation of said ejector means to transfer a fresh supply of ends to the receiving station.

7. Apparatus as defined in claim 2 wherein said endless drive means includes a pair of spaced, sprocket gears over which is engaged an endless sprocket chain which has the carrier members attached thereto, and indexing means operatively connected with one said sprocket gear for producing a desired degree of movement upon actuation thereof.

8. Apparatus as defined in claim 7 further including alignment means for properly positioning the carrier members with respect to the receiving station, such that transfer of said stack of can ends from said carrier members to said receiving station may be completed.

9. Apparatus as defined in claim 8 wherein said alignment means comprises retractable stop means, and means having at least one abutment surface formed thereon and being rotatable in conjunction with said drive means, with the relative angular relationship between said abutment surface and said stop means being correlated to the positioning of said carrier members with respect to said receiving station, such that upon an instance of engagement of said stop means with said abutment surface, further operation of said drive means is precluded with one said carrier member being properly aligned with said receiving station, retraction of said stop means permitting further operation of said drive means to bring an additional carrier member into proper alignment.

10. Apparatus as defined in claim 9 wherein a plurality of abutment surfaces are provided, the circumferential spacing between adjacent surfaces being proportionally related to the spacing between adjacent carrier members.

11. Apparatus as defined in claim 10 wherein the proportional relation is of a ratio of 1-to-1.

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