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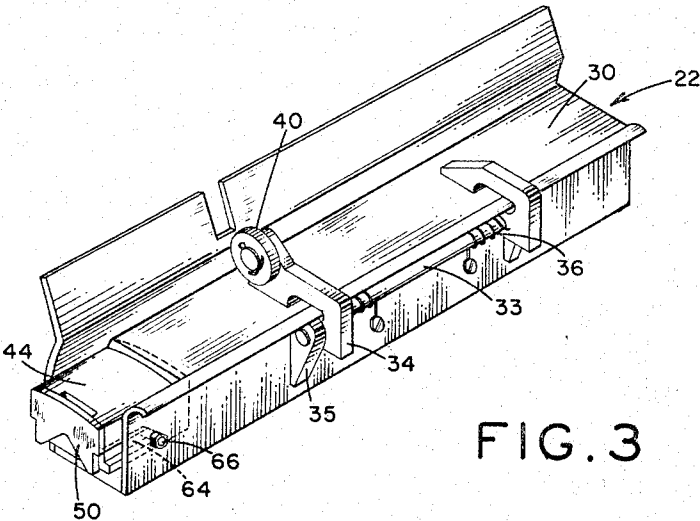
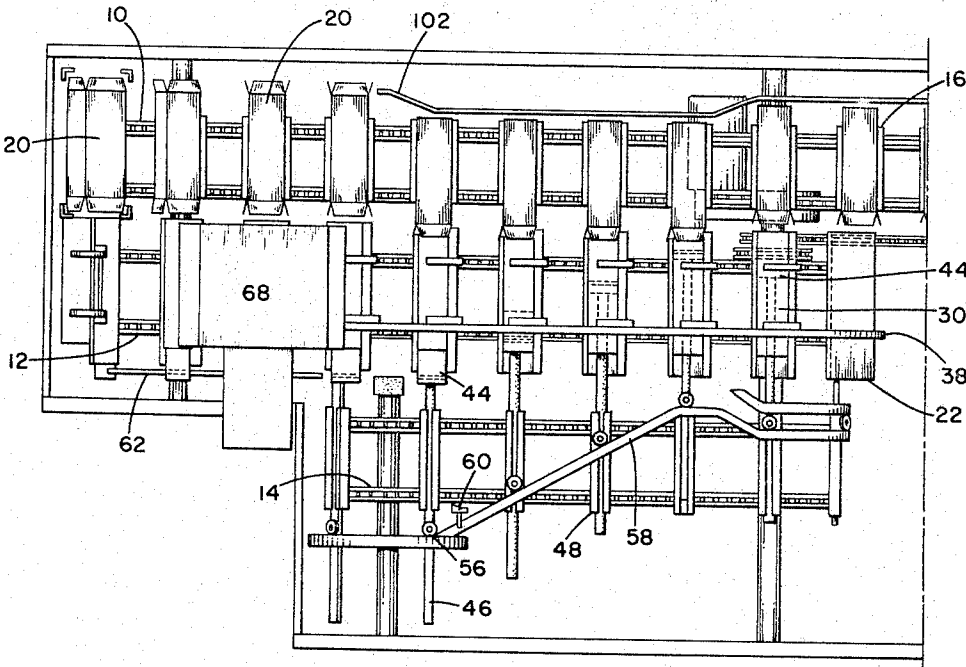
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MACHINE FOR FILLING CARTONS

Filed Oct. 3, 1963

3 Sheets-Sheet 2



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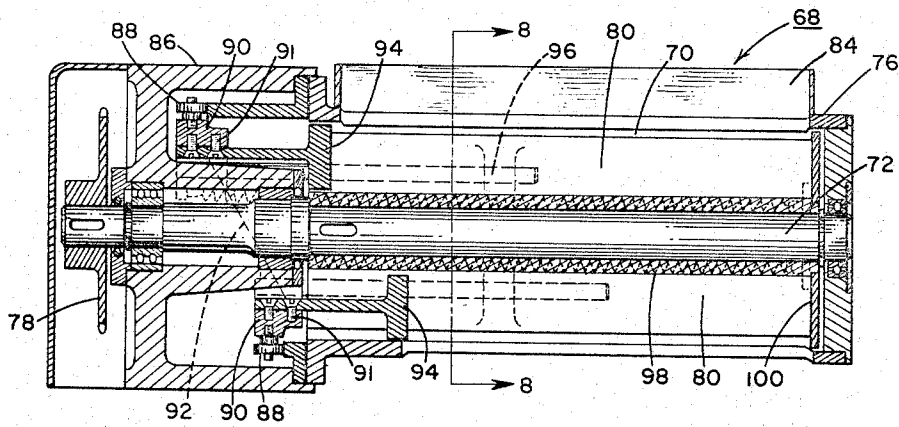


FIG. 6

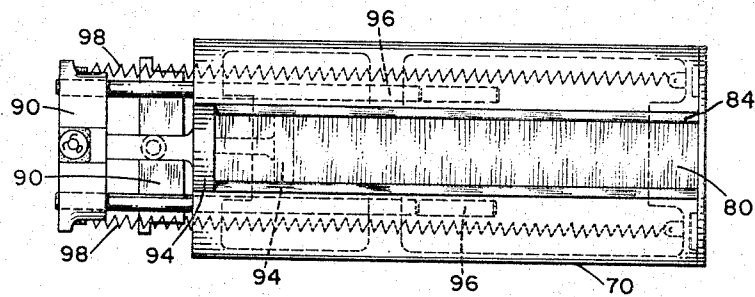


FIG. 7

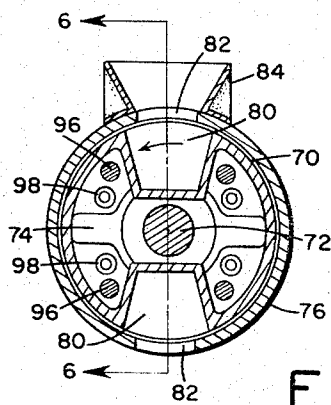


FIG. 8

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MACHINE FOR FILLING CARTONS

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20 Claims. (Cl. 53—252)

This invention relates generally to a packaging machine and, more particularly, to a segment thereof employed for automatically filling cartons with longitudinally extending objects such as macaroni.

One of the broad objects of this invention is to provide a machine for filling cartons in which weighed quantities of macaroni, spaghetti, or similar brittle goods can be packed into folding cartons or boxes in a fully automatic manner and with more care than heretofore possible.

Another object of this invention is to provide a packaging machine having a high degree of operating efficiency, a high work rate, and being particularly adapted to fill the cartons to maximum capacity.

Another object of this invention is to provide a machine for filling cartons, which is of simple construction and readily accessible for maintenance.

A more specific object of this invention is to provide a container, constituting part of the machine in accordance with this invention, adapted to facilitate the loading, aligning and packing of the goods in a unique manner and to protect the contents thereof in case of malfunction of the machine, and in which the critical surfaces of the container are not exposed to or come in contact with the brittle material to be packed.

Another more specific object of this invention is to provide as part of the packaging machine a feeding mechanism which longitudinally aligns the brittle goods and discharges them into the container in this state to facilitate filling the carton to maximum capacity and to simplify any subsequent alignment or leveling requirement.

Briefly, an aspect of the present invention resides in the provision of a packaging machine for filling cartons which includes a first endless conveyor arrangement, longitudinally extended and constructed and arranged to move articles or goods of the type heretofore mentioned. A plurality of receptacles for receiving empty boxes or cartons are spaced longitudinally along and secured to the first endless conveyor arrangement. There is also provided a second endless conveyor arrangement disposed substantially parallel to the first conveyor, the first and the second conveyors are both adapted to move at substantially the same speed and in a common direction. A plurality of containers are carried on the second conveyor and are spaced longitudinally thereon at substantially the same distance as said receptacles are spaced on the first conveyor and are aligned therewith transversely to the direction of travel. A feeding station is disposed above the second conveyor in an operative proximity to the containers for sequentially filling same. And, finally, a plunger is carried in each of the containers and is movable therein to position the contents of the containers into the cartons in a predetermined sequence.

Another aspect of the present invention resides in the provision of a packaging machine for filling cartons which includes a first endless conveyor arrangement, longitudinally extended and constructed and arranged to move articles or goods of the type heretofore mentioned. A plurality of receptacle for receiving empty boxes or cartons are spaced longitudinally along and secured to the first endless conveyor arrangement. There is also provided a second endless conveyor arrangement disposed substantially parallel to the first conveyor, the first

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and the second conveyors are both adapted to move at substantially the same speed and in a common direction. A plurality of containers are carried on the second conveyor and are spaced longitudinally thereon at substantially the same distance as said receptacles are spaced on the first conveyor and are aligned therewith transversely to the direction of travel. A feeding station is disposed above the second conveyor in an operative proximity to the containers for sequentially filling same. There is also disposed a plunger, which includes a thrust body and a first coupling member secured to the thrust body, in each of the containers. The plunger has a cross-sectional area which is substantially the same as the corresponding cross-sectional area of the container. These plungers are slidably disposed in the containers for moving the contents thereof into the carton in a predetermined manner. A third endless conveyor arrangement is also longitudinally extended and disposed parallel to the other conveyors and adapted to travel at the same speed and in a direction common to both conveyors. Finally, a push rod assembly is movably carried on the third conveyor. The push rod includes a second coupling member which is connectable to the first coupling member to link the plunger and the push rod when the container is in a position coextensive to the third conveyor. The first and second coupling members are constructed and arranged to automatically disengage when the container on the second conveyor departs from the coextensive position with respect to the third conveyor.

A further aspect to the present invention resides in the provision of a packaging machine for filling cartons which includes a first endless conveyor arrangement, longitudinally extended and constructed and arranged to move articles or goods of the type heretofore mentioned. A plurality of receptacles for receiving empty boxes or cartons are spaced longitudinally along and secured to the first endless conveyor arrangement. There is also provided a second endless conveyor arrangement disposed substantially parallel to the first conveyor, the first and the second conveyors are both adapted to move at substantially the same speed and in a common direction. A plurality of containers are carried on the second conveyor and are spaced longitudinally thereon at substantially the same distance as said receptacles are spaced on the first conveyor and are aligned therewith transversely to the direction of travel. A feeding station above the second conveyor includes a device for measuring the objects as well as for aligning the objects prior to discharge into the containers on the second conveyor. The aligning device is positioned above the containers and includes a drum having two radially arranged and oppositely located chambers which are arranged to sequentially register with the containers for receiving and ultimately discharging the objects. One of the purposes of this drum is to longitudinally align the objects in the chamber. This is accomplished by means of pistons disposed within the chambers and axially moved therein by means of a cam and cam follower arrangement which form part of the aligning and discharging device.

For a better understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawings, and its scope will be pointed out in the appended claims.

In the drawings:

FIGURE 1 is a longitudinal view shown partly in section of a machine for filling cartons in accordance with this invention; and

FIGURE 2 is a plan view of the machine illustrated in FIGURE 1; and

FIGURE 3 is a perspective view of a container; and
FIGURE 4 is an end view of the container according to FIGURE 3 with portions of a push rod shown in section; and

FIGURE 5 is a sectional view of the push rod and a plunger taken along line 5—5 of FIGURE 4; and

FIGURE 6 is a longitudinal view shown in section taken along line 6—6 of FIGURE 8 of an aligning and feeding mechanism; and

FIGURE 7 is a plan view of the drum shown in FIGURE 6; and

FIGURE 8 is a cross-sectional view of the device according to FIGURE 6, taken along line 8—8 of FIGURE 6.

Referring now to FIGURES 1 and 2, there are shown three endless conveyors 10, 12 and 14 of the double chain type, suitably supported and disposed parallel to each other. The longitudinally extending conveyors are caused to move at the same speed and in a common direction by means of conventional equipment including a motor 11 coupled to a drive unit 13. Movement is imparted to the conveyors by gear chains 15 and 17 which connect gears 19 and 21 mounted on the transmission shaft 13a to gears mounted proximate to the conveyor chain, only one of which, see 23, is shown.

The first conveyor 10 carries plurality of receptacles 16 longitudinally spaced along the conveyor 10 and securely mounted thereto. The receptacles are U shaped and formed with open ends and are adapted to receive, sequentially, from a stack 18, folding cartons 20, which are opened and placed into the receptacles, and thereafter filled with goods of the type here under consideration, and closed and transported to the end of the system. This invention relates primarily to the filling aspect of the packaging machine and, hence, reference to other parts of the machine has been limited to those desirable for ease of description and understanding.

The middle or second conveyor 12 carries a plurality of containers 22 which are securely mounted to the chains of the conveyor and spaced longitudinally thereon at substantially the same distance as the receptacles on conveyor 10 and aligned therewith in a direction transverse to the direction of travel of the conveyors. The containers 22 are adapted to receive the packing goods, such as longitudinally extending objects e.g. macaroni which are pre-weighed or measured by means of a scale 24, or other well known devices, and axially aligned prior to discharge into the containers 22 as hereinafter further described.

Each container 22 is in cross-section, see FIGURE 4, generally U shaped thus forming a top opening 22a. The container is composed of a back side wall 26 and front side wall 28, the latter facing in the direction of travel of the conveyors, but is without end walls. The back side wall 26 extends vertically to a certain height, parallel to the front side wall 28 and then bends slightly inward and thereafter swings in the opposite direction, i.e. angularly outward to broaden the opening of the container.

Disposed horizontally between the walls and secured to the front side wall 28 is a cover 30 to close opening 22a. The cover is hinged to wall 28, thus facing in the direction of travel of the conveyors, by means of two arms 34 welded to the cover and at the opposite end the arms are mounted about a bar, 33, suspended on eyelets 35, about which the arms can rotate, providing an axis of rotation external to the container 22. The bar 33 receives two torsion springs 36 which engage the arms 33 forcing them downwardly to maintain the container in normally open position. In this open position the cover is contiguous to the side wall 28 and forms a vertical extension thereof. The two walls combined provide a funnel-like opening into the container. In closing the container, the cover facilitates an alignment of the goods, e.g., the macaronies, and slightly presses them together

so that they fit neatly into the container and do not protrude outward. Preferably, the cover surface 32 facing the interior of the container is for this purpose formed with a slight concave curvature.

In order to avoid that food particles, or the like, get caught between the cover and the front wall, the upper portion of the front wall 28 is curved outwardly forming a protective surface over eyelets 35.

To automatically close the covers, there is provided a stationary guide rail 38, see FIGURE 1, which engages a roller 40 rotatably mounted on each cover 30 and presses the cover downward against the tension of spring 36 to close the container and maintain it closed. The guide rail 38 begins to engage the roller 40 while the container is being filled, as hereafter further described, see 38a FIGURE 1, and maintains this engagement until the container is above a catch basin 42 located right below the lower part of the conveyor 12. The catch basin 42 serves to receive those goods which were not packed into a carton 20 either through some mechanical failure or a lack of cartons.

The containers 22 each carry a plunger mechanism 44 which is slidably disposed therein to move transversely to the direction of travel of the conveyors. The mechanism 44 has a cross-section very similar to the configuration defined by the container to prevent thin objects from getting lodged between the plunger and the interior walls of the container.

The plunger mechanism is essentially a solid trust body 44 and includes a coupling member 50, see FIGURES 3 and 4, composed of a vertically extending plate arranged at the outer end and spaced slightly relative to the thrust body of the plunger 44, see FIGURE 5. The bottom portion thereof is formed with a triangular cut out, see FIGURE 4. The coupling plate 50 may be simply screwed to the plunger as shown.

The plunger mechanism is axially displaced or moved within the container by a longitudinally extending push rod 46, see FIGURE 2. The push rod is movably mounted in a slide 48 secured to the third conveyor 14. The slides 48 permit the push rod to move transversely with respect to travel of the conveyors.

The opposite end of the push rod 46 may be deemed to constitute a second coupling member adapted for thrust engagement with the first coupling member 50 of plunger 44. The former is composed of a longitudinal extension terminating with a collar 54. The collar is, in engagement position, firmly locked between the plate 50 and plunger 44, see FIGURE 5.

The push rod is locked into engagement with the plunger, for moving same toward the center of the container when the container and the push rod enter on the conveyor the horizontal section from the turn section, see 46a in FIGURE 1. The collar 54 gradually interposes itself between the plate 50 and plunger where the collar becomes firmly seated and centered when the horizontal movement begins. Conversely, the members are disengaged when the push rod completes its lower horizontal run and begins to enter the left hand turn as shown in FIGURE 1, see 46b while container and plunger continues to move horizontally. It is obvious, of course, that the container and the push rod must be aligned on the two conveyors in the direction transverse to the direction of travel of the conveyors for such engagement to take effect. The push rod 46 is provided with a roller 56 rotatably mounted thereto and slidably above the slide 48. The roller is normally in engagement with a guide rail 58 formed to impart to the roller and the push rod the necessary transverse movement to cause the plunger to be displaced within the container in a predetermined sequential manner.

In order to avoid a transverse movement of the push rod 46 in the absence of a carton 20, in a receptacle 16, there is provided a switch 60, shown only in part, mounted to the guide rail 58 responsive to a carton sensing device (not shown). An angular movement of the switch 60

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causes the roller 56 of the corresponding push rod to move only parallel to the movement of the conveyor and not transverse thereto. Consequently, the goods contained in the container 22 are not emptied into the receptacle 16. The goods, in this instance, are then emptied into the catch basin 42, as aforesaid, see point A, and the empty container proceeds again to a filling station which includes scale 24 and feeding device 68.

Upon disengagement of the plunger and the push rod at point A, a guide rail 62 engages the plunger 44 by protruding into the space between the plunger 44 and plate 50. The guide rail 62, as all other guide rails, is securely fastened to the frame of the machine and extends parallel to conveyor 12 for the distance as shown. The guide rail thus prevents any transverse movement of the plunger while in engagement therewith.

The plunger mechanism is also formed with two longitudinally extending slots 64, one on each side wall thereof, which abut pins 66 to limit the outward movement of the plunger. Particularly, during the horizontal stretch on the lower part of conveyor 12.

The containers 22 are filled, sequentially, by means of an alignment and feeding device 68 illustrated in FIGURES 6 to 8. The feeding device is composed of, essentially, a drum 70 mounted about a rotatable shaft 72 with a support 74, being interposed therebetween. The drum 70 is rotated in the direction as indicated within a stationary housing member 76 concentrically arranged and of cylindrical configuration. On one end of the shaft there is secured an external gear 78 meshing with a gear chain drive (not shown) to rotate the drum.

The drum 70 is formed with two chamber 80 arranged radially 180° apart and extending axially all along the drum. The chambers 80 register simultaneously with two openings 82 in cylinder housing 76 once during each full revolution of the drum. Welded to the cylinder, proximate to one of the openings, is a hopper-like structure 84.

Contiguous to and coaxial with the drum is a structural support and housing 86 for two independent cam units consisting essentially of a cam follower such as rollers 88 rotatably mounted on a cross bar 90 and adapted to follow, together with the cross bar, a cam surface 92. Securely attached to each cross bar 90, by means of screws 91, is a piston member 94 which extends from the support and housing structure 86 into one of the chambers 80 and is reciprocally disposed therein. The second piston 94 is identically disposed in the other chamber. Each cross bar also receives two longitudinally extending guide rods 96 suitably supported within the drum 70. Finally, two tension springs 98 are mounted on the cross bar and extend axially through the drum and are secured to the drum to cause the cam follower 88 to operatively engage the cam 92 at all times. The cross bar, including all the parts mounted thereon, is thus a component part of the drum and rotates in unison therewith, while the structural support 86 is connected to the outer housing 76 and is thus stationary. Hence, the pistons within the chamber reciprocate therein following the curve of the cam 92.

In operation, the goods or objects to be packed are charged sequentially through hopper 84 and opening 82 into the chambers 80 when the chambers sequentially register therewith. The goods within the chamber are then discharged through the lower opening 82 as shown, when the drum has rotated 180°. This will then coincide with the presence of a container 22 beneath the discharge opening of the drum.

The longitudinal alignment of the goods within the container is facilitated by arranging, initially, one cam follower 88 at the highest peak of the cam structure 92, so that the piston within a given chamber is in its most outward position while the chamber is being filled. Upon charging the chamber and a further rotation of the drum 70, the curvature of the cam 92 permits the pistons, under pressure from the springs, to move inwardly into the chamber pushing the goods toward end plate 100 until

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the distance between the piston 94 and the end plate 100 is decreased to a predetermined extent, which is only slightly greater than the longitudinal length of the longest object. The pistons are then maintained in this position until the good have been discharged from the chamber through the opening 82 and are thereafter brought again to the initial position as aforesaid by the joint action of cam 92 and cam follower 88.

The overall operation of this device is as follows. A carton 20 is placed from stack 18 into the receptacle 16 on first conveyor 10. At about the time that the given carton is securely in place, the filling station located above conveyor 14 and including measuring device 24 and the aligning and feeding device 68 have measured or weighed the goods, longitudinally aligned them and charged the goods into a transversely positioned container 22. When the container has been completely filled, the roller 40 of the container is engaged by rail 38 which is effective to close the container 22. A guide rail 102 causes the carton or box to be moved against the end opening of the container 22. The push rod 46 on the third conveyor 14 and more particularly the coupling member 52 and 54 has in the meantime engaged the coupling member 50 of the plunger 44. Thereafter, the push rod 46 is caused to be moved transverse to the direction of travel of the conveyors, moving the plunger against the goods within the container and ultimately displacing the goods out of the container and into the contiguous carton 20. The push rod 46 in combination with the guide rail 58 is adapted to move the plunger past the axial center of the container 22 and close to the end opening of the carton. The guide rail 58 thereafter catches the roller 56 of the push rod and causes the push rod and plunger to be returned to their initial position. The carton 20 on the conveyor 10 is transported to an end station, not shown, and the empty receptacle returns in a continuous fashion on the conveyor again to the carton loading position.

While there have been described what are at present considered to be the preferred embodiments of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and it is, therefore aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim is:

1. In a machine according to claim 4, wherein each of said containers has a top opening; a cover hinged to said container and registering with said opening; a spring mounted on said container engaging said cover to normally maintain the container open; and a stationary rail disposed along said second endless conveyor means proximate to said containers to engage said cover and close said container against the force of said spring.

2. In a machine according to claim 1, wherein said cover is provided with a rotary roller for engaging said rail; and said rail extends longitudinally along said second conveyor between the location of said feeding means and the said predetermined location where the contents of said containers are moved into said cartons.

3. In a machine according to claim 1, wherein the contour of one portion of said guide rail is substantially parallel to the direction in which said second endless conveyor means travels and effective to maintain said plunger means in its most outward position, another and contiguous portion of said rail extending transverse to said direction and effective to gradually thrust said plunger means toward the opposite end of said container, and a third guide rail portion extending again parallel and effective for maintaining said plunger means in the most advanced position.

4. In a machine for filling cartons with relative thin longitudinally extending objects comprising: first endless conveyor means longitudinally extending and constructed and arranged to receive and move articles; a plurality of

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receptacles for receiving empty cartons spaced longitudinally along and secured to said first conveyor means; second endless conveyor means disposed substantially parallel to said first means, said first and second means being adapted for moving at substantially the same speed and in a common direction; a plurality of containers carried on said second conveyor means and spaced longitudinally thereon at substantially the distance as said receptacles and being aligned therewith transversely to the direction of travel; feeding means adapted and arranged to operate, automatically, in a predetermined sequence with said conveyors, said feeding means being disposed, vertically spaced in suitable juxtaposition to said container, said feeding means including a quantity measuring device, piston means for longitudinally aligning said objects and means for permitting the discharge of said objects into said containers in an aligned relationship; plunger means in each of said containers and movable therein to push the contents of said container into said carton in a predetermined sequence.

5. In a machine according to claim 4, wherein said means for longitudinally aligning said objects comprises a housing having intake and discharge openings; a drum rotatably disposed in said housing having two radially arranged and oppositely located chambers, said intake and discharge openings being arranged to sequentially register with said chambers; and piston means axially movable within said chambers to align longitudinally the ends of said objects.

6. In a machine according to claim 4, a third endless conveyor means constructed and arranged to travel at the same speed and in a common direction with the two other conveyor means; and a plurality of slides securely mounted to said third endless conveyor means and adapted for slidably receiving said push rod means.

7. In a machine for filling cartons comprising: first endless conveyor means longitudinally extending and constructed and arranged to receive and move articles; a plurality of receptacles for receiving empty cartons spaced longitudinally along and secured to said first conveyor means; second endless conveyor means disposed substantially parallel to said first conveyor means, said first and second conveyor means being adapted for moving at substantially the same speed and in a common direction; a plurality of containers carried on said second conveyor means and spaced longitudinally thereon at substantially the distance as said receptacles and being aligned therewith transversely to the direction of travel; feeding means disposed in operative proximity to said containers for sequentially filling same; plunger means including a thrust body and a first coupling member secured to said body in each of said containers, said plunger means having a cross-sectional area substantially the same as the corresponding cross-sectional area of said container; the plunger means being slidably disposed in said containers for moving the contents of said container into said carton; third endless conveyor means longitudinally extending and disposed parallel to said second conveyor means and adapted to travel at the same speed and in a direction common with the two other conveyor means, said third conveyor having its ends located substantially intermediate the ends of said second conveyor and diverging therefrom; push rod means movably carried on said third conveyor means and including a second coupling member connectable to said first coupling member to link said plunger means and said push rod means when said container is in a position coextensive to said third conveyor means, said connection formed by said first and second coupling members including a groove in the periphery of one of said coupling members extending transversely to the axis of said plunger, and a projection on the other one of said coupling members movable into and out of said groove by movement substantially perpendicular relative to said plunger axis, said coupling members being effective to

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engage and disengage when said third conveyor diverges at its respective ends from said second conveyor.

8. In a machine according to claim 7, and a guide rail for engaging said first coupling member of said plunger means when said first and second coupling member are disengaged.

9. In a machine according to claim 7, wherein said first coupling member includes a plate containing said groove, said plate being spacedly secured to said thrust body; and said second coupling member includes a collar interposed between said plate and said thrust body abutting said groove when said first and second coupling members are engaged.

10. In a machine according to claim 4, wherein said plunger means is provided with a longitudinally extending slot; and a bolt in one of said walls protrudes through the slot to limit the outward movement of said plunger means.

11. In a machine according to claim 10, and means for actuating said piston means, the former comprising a cam in said housing and a cam follower connected to said piston means.

12. A machine according to claim 11, wherein said cam in combination with said cam follower is constructed and arranged to axially displace said piston means within said chamber, said piston means being in a position of minimum displacement when a given chamber registers with said intake opening and in a position of maximum displacement when said given chamber registers with said discharge opening.

13. In a machine for filling cartons comprising: first endless conveyor means longitudinally extending and constructed and arranged to receive and move articles; a plurality of receptacles for receiving empty cartons spaced longitudinally along and secured to said first conveyor means; second endless conveyor means disposed substantially parallel to said first means, said first and second means being adapted for moving at substantially the same speed and in a common direction; a plurality of containers carried on said second conveyor means and spaced longitudinally thereon at substantially the distance as said receptacles and being aligned therewith transversely to the direction of travel; feeding means disposed in operative proximity to said container, said feeding means including a measuring device, and means for longitudinally aligning said objects and sequentially discharging said objects into said containers; said last-named means including a housing having intake and discharge openings; a drum rotatably disposed in said housing having two radially arranged and oppositely located chambers, said intake and discharge openings being arranged to sequentially register with said chambers; and piston means axially movable within said chambers to align longitudinally the ends of said objects; plunger means including a thrust body and a first coupling member secured to said body in each of said containers, said plunger means having a cross-sectional area substantially the same as the corresponding cross-sectional area of said container; the plunger means being slidably disposed in said containers for moving the contents of said container into said carton; third endless conveyor means longitudinally extending and disposed parallel to said second conveyor means and adapted to travel at the same speed and in a direction common with the two other conveyor means; push rod means movably carried on said third conveyor means and including a second coupling member connectable to said first coupling member to link said plunger means and said push rod means when said container is in a position co-extensive to said third conveyor means, and said first and second coupling member being constructed and arranged to automatically disengage when said container departs from said co-extensive position.

14. For use with a machine for filling cartons, a device for receiving longitudinally extending objects, aligning and discharging such objects, comprising: a housing having intake and discharge openings; a drum rotatably

disposed in said housing having two radially arranged and oppositely located chambers, each said chamber having an end wall, said intake and discharge openings being arranged to sequentially register with said chambers; and piston means axially and sequentially movable within each of said chambers toward the respective end wall thereof after communication of a given chamber with said intake opening to align longitudinally the ends of said objects.

15. A machine according to claim 4, wherein the rearward wall of said container has a vertically extending bottom portion and a slightly angularly, rearward extending, top portion, the angular portion being located at a point above the cover in closing position, and the top end of the forward wall being curved in the forward direction.

16. A machine according to claim 15, and hinging means secured to the forward wall substantially underneath said curved portion and to said cover, the rotating axis of said hinge means being located proximate to the curved end portion but spaced therefrom to provide an axis of rotation located remote and external from the main body of said container.

17. In a machine according to claim 15, wherein said cover in its open position is contiguous to the said forward wall, and forms together with said last-mentioned wall a substantially continuous surface and in combination with the rearward wall a funnel-like opening.

18. In a machine according to claim 15, wherein said plunger comprises a body having a configuration complementary to the transverse cross-section of said container and being slideably disposed therein, a vertically extending coupling plate spacedly secured to said body; push rod means including longitudinally extending portions thereof effective to disengageably lock between said

body and said plate of said plunger means for moving the latter in the container transversely to the direction of travel of said conveyors; and a guide rail disposed co-extensive with said second endless conveyor means; and follower means connected to the push rods means and engaging said guide rail to transfer movement imparted thereto by the contour of the guide rail.

19. A device according to claim 14, and means for actuating said piston means, the former means comprising a cam in said housing and cam follower connected to said piston means.

20. A device according to claim 19, wherein said cam in combination with said cam follower is constructed and arranged to axially displace said piston means within said chambers, said piston means being in a position of minimum displacement when a given chamber registers with said intake opening and in a position of maximum displacement when said given chamber registers with said discharge opening.

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