June 7, 1960 G. L. OGLE ET AL 2,939,260

MACHINE FOR CLOSING CONTAINER FLAPS

Filed April 28, 1958 6 Sheets-Sheet 1

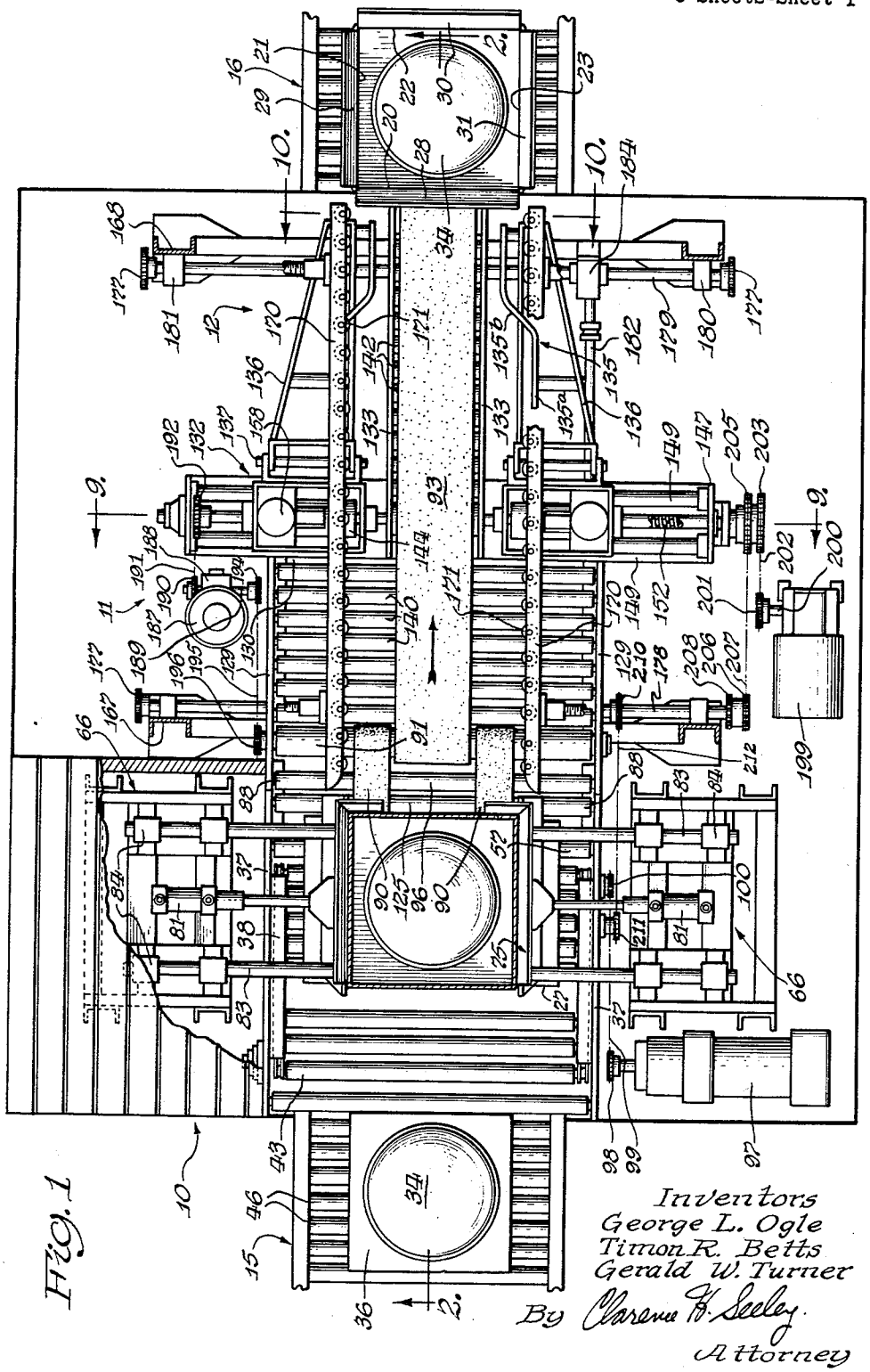


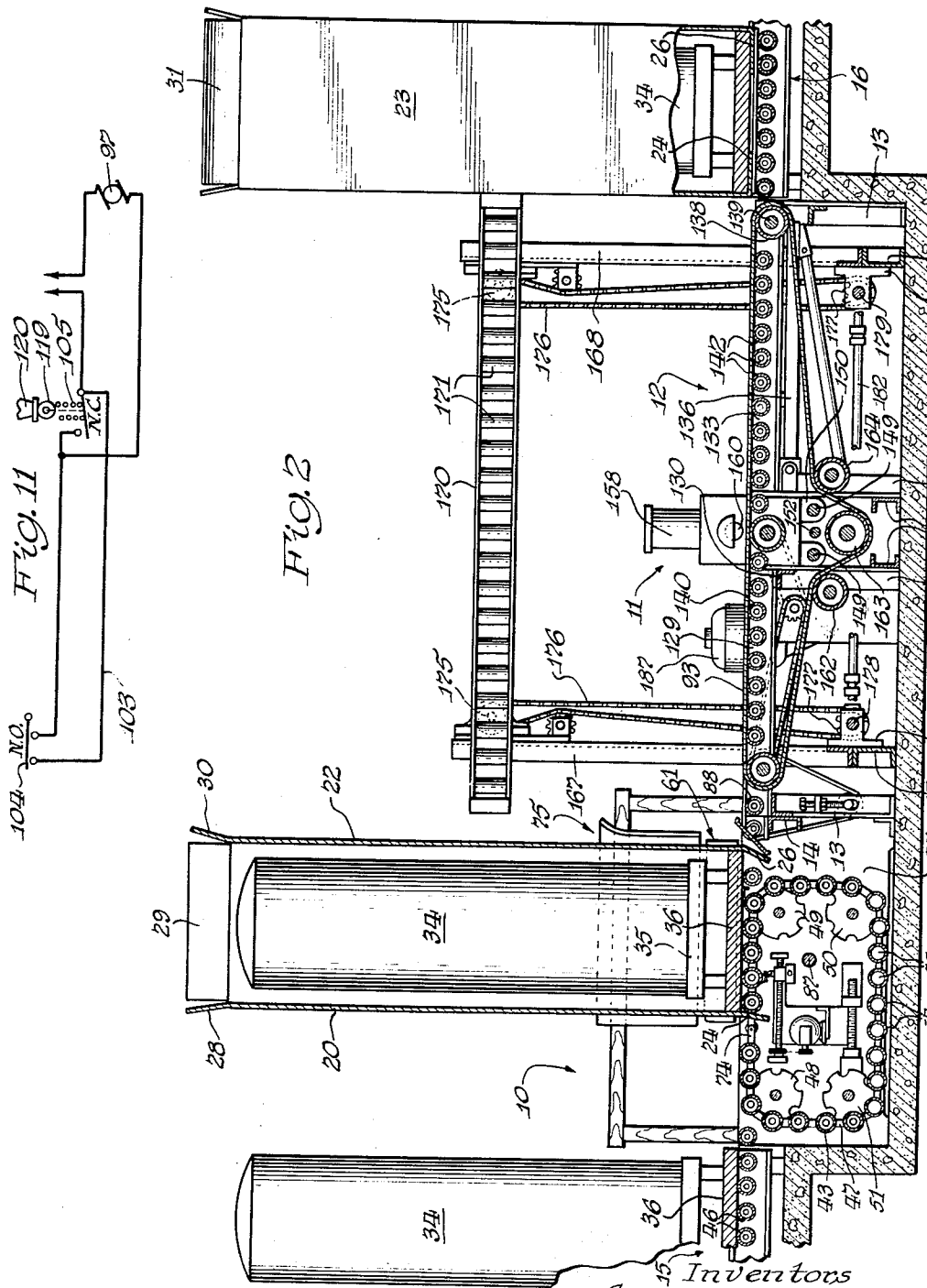
FIG. 1

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MACHINE FOR CLOSING CONTAINER FLAPS

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MACHINE FOR CLOSING CONTAINER FLAPS

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Fig. 3

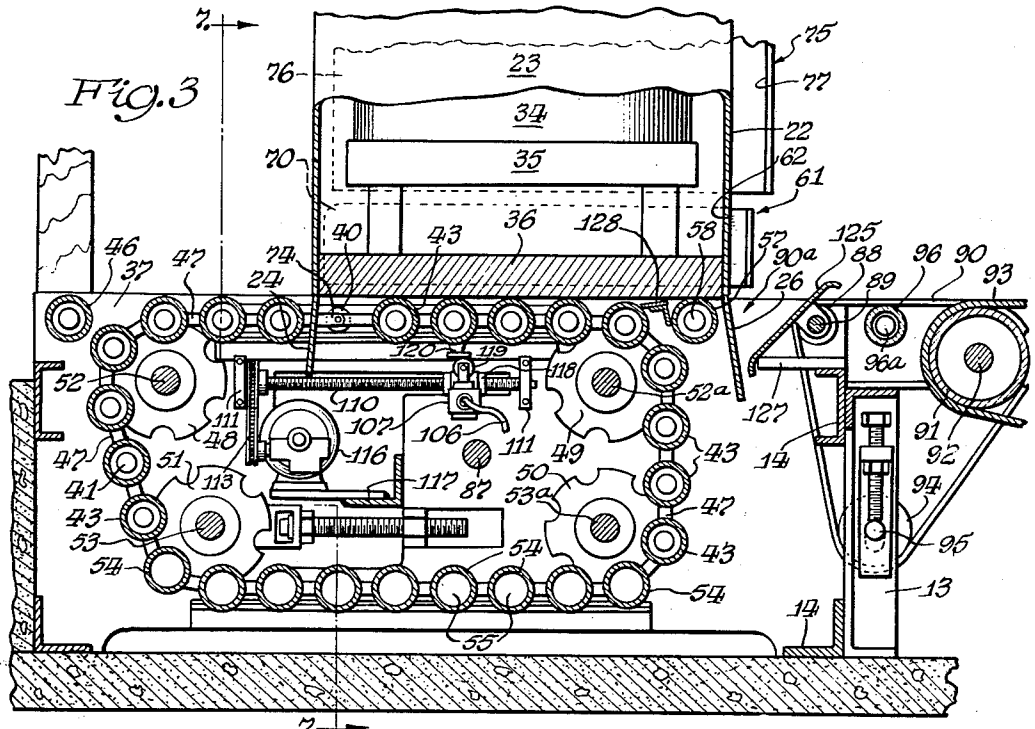


Fig. 4

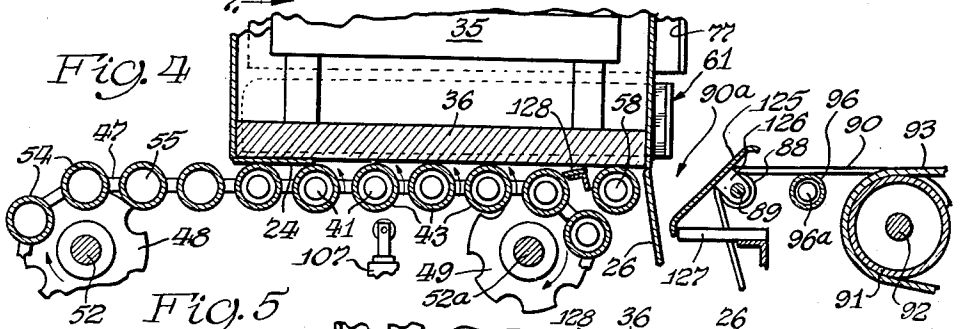


Fig. 5

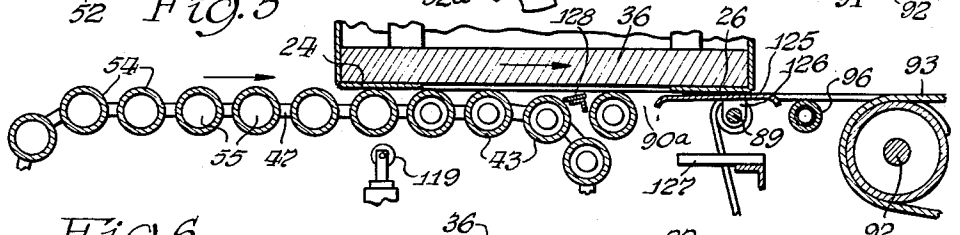
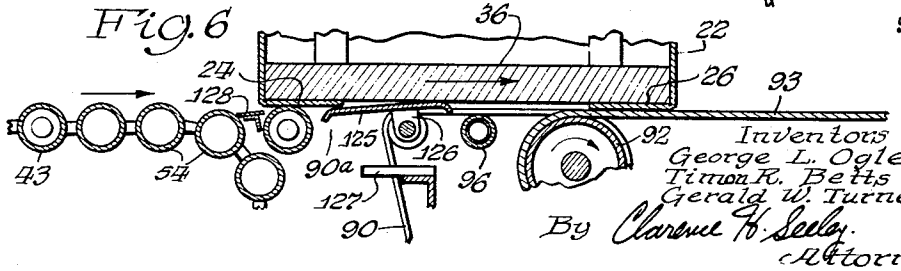


Fig. 6



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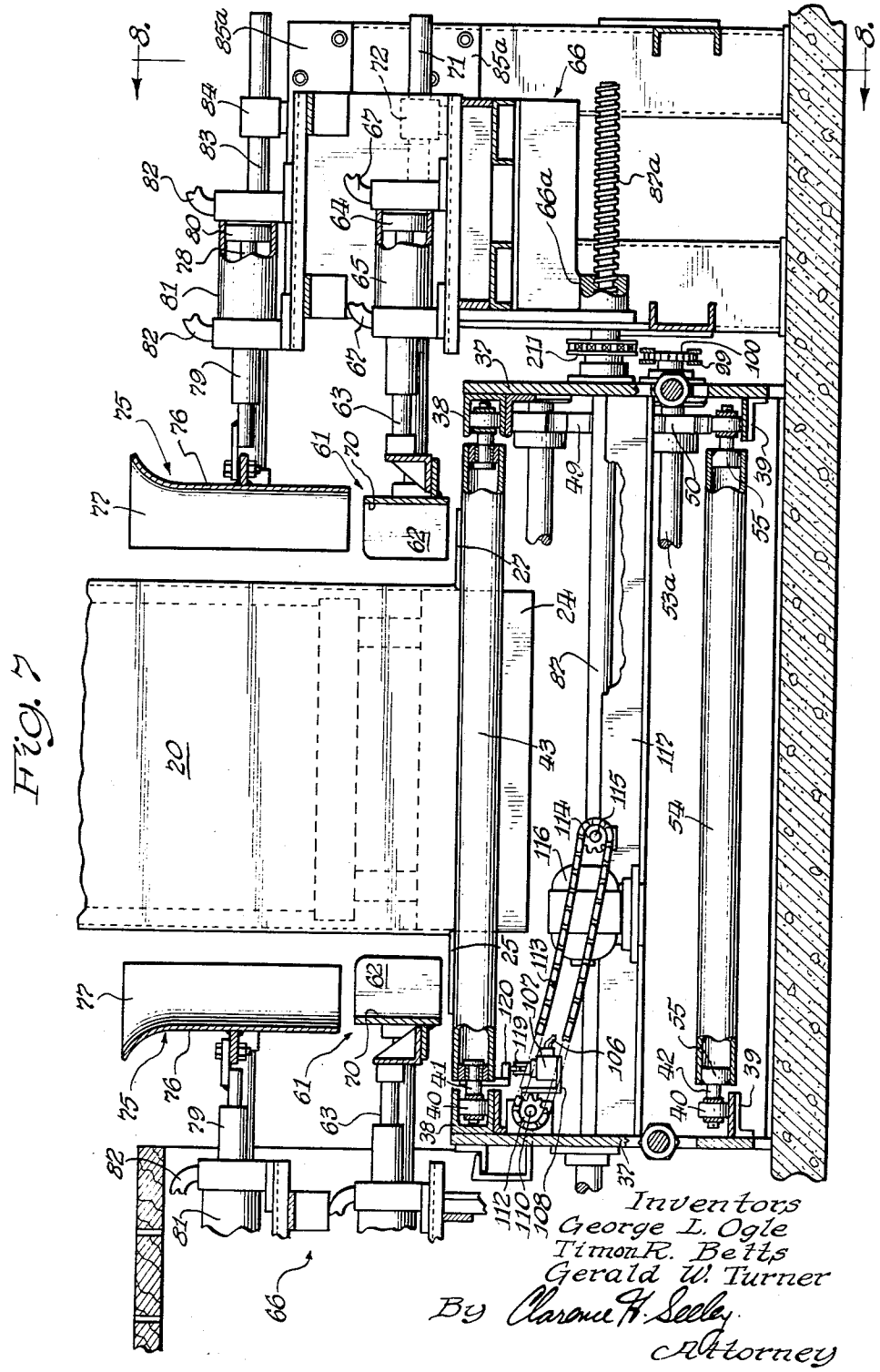


Fig. 7

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MACHINE FOR CLOSING CONTAINER FLAPS

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Fig. 10

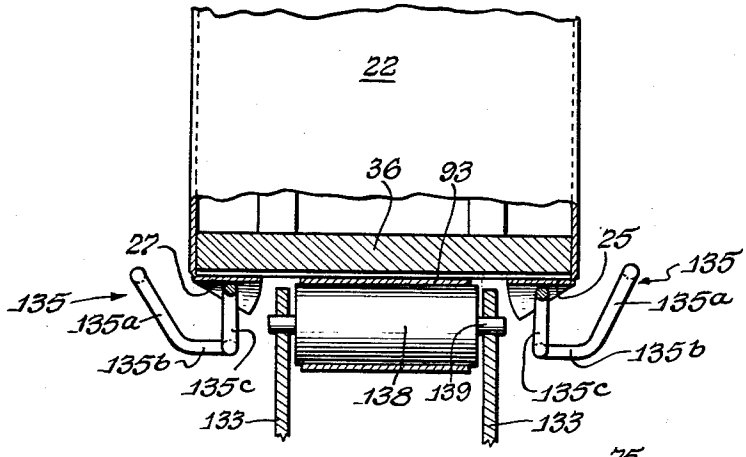
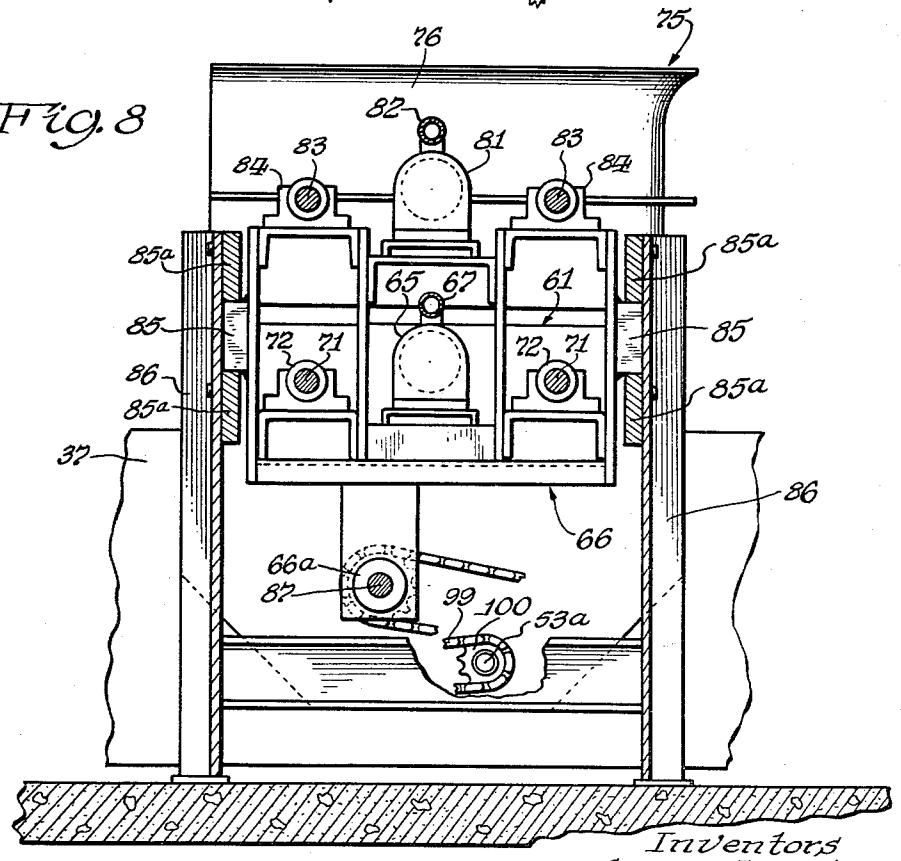


Fig. 8



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MACHINE FOR CLOSING CONTAINER FLAPS

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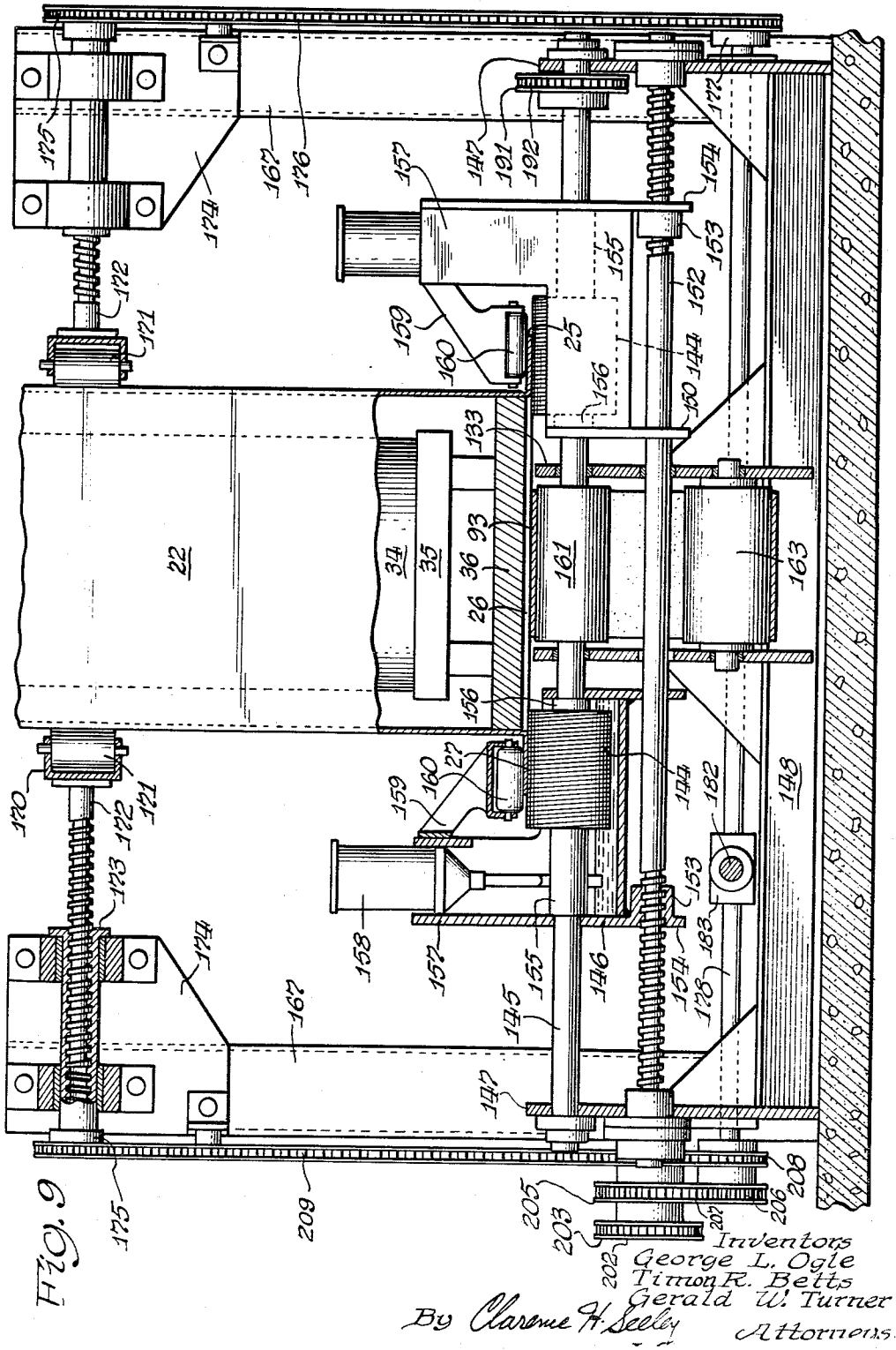


FIG. 9

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MACHINE FOR CLOSING CONTAINER FLAPS

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Filed Apr. 28, 1958, Ser. No. 731,464

16 Claims. (Cl. 53—374)

The present invention relates to machines for packaging heavy articles within shipping containers and more particularly relates to machines for closing the bottom flaps of a shipping container after the body portion of the container has been placed around the article to be packaged.

An important object of the invention is to provide a machine of the character referred to which may be effectively employed to enclose heavy articles, such as stoves, refrigerators, water heaters, washers, driers, and other heavy home appliances, within individual shipping containers in a rapid and efficient manner as the units are delivered in complete condition from present assembly lines, and specifically to fold inwardly and secure the bottom closures of containers of the type having a plurality of hinged flaps on the lower edges of their side walls.

Another object is to close and seal the bottom flaps of containers used for packaging articles too heavy for workmen to lift by hand and which it would be undesirable to lift by available machinery due to the possibility of causing damage to the units, the closing of the bottom flaps being effected by folding the individual flaps beneath the article while supporting it from below and at the same time continuing the forward movement of the unit to be packed with a minimum of stoppage.

Other objects are generally to improve mechanism for packaging heavy articles and to make such mechanism readily adjustable to accommodate articles of varying dimensions.

In the drawings, illustrating a preferred embodiment of the invention—

Figure 1 is a plan view of the machine;

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1 looking in the direction of the arrows;

Figure 3 is a fragmentary vertical sectional view illustrating in detail the flap folding mechanism, as shown in Figure 2 but on a somewhat larger scale.

Figure 4 is a fragmentary view, similar to Figure 3, showing the flap on the rear or trailing container wall after such flap has been brought to closed position;

Figure 5 is a fragmentary view showing the flap on the leading wall brought to closed position and the partially completed package being advanced beyond the folding station for the trailing and leading flaps;

Figure 6 is a fragmentary view similar to Figures 4 and 5 showing the manner of maintaining the trailing flap in closed position while passing the part of the station which folds the leading flap;

Figure 7 is a fragmentary, vertical sectional view taken substantially along line 7—7 of Figure 3 with certain parts omitted or broken away showing the mechanism for positioning the article to be packed in the desired location at the trailing and leading flap folding station, and details of certain of the driving and control parts;

Figure 8 is a vertical sectional view with certain parts broken away, taken along line 8—8 of Figure 7;

Figure 9 is a vertical sectional view taken along lines 9—9 of Figure 1;

Figure 10 is a fragmentary rear elevation with certain parts in section, taken along line 10—10 of Figure 1; and

Figure 11 is a diagrammatic view of the control circuit for the driving mechanism for the feeding conveyor.

The mechanism of the present invention as herein disclosed has particular applicability to the packaging of relatively heavy articles of elongated, upright shape, such as insulated water heaters for household installation. The invention however may be utilized in the packaging of many types of articles of varying sizes and shapes. The mechanism is designed to be incorporated as a part of a production line in which the article, in its completely fabricated stage, is supported on a suitable base, such as a wooden frame or a thick pad of corrugated fibre board sheet, such base being temporary and utilized for the purpose of giving adequate support to the article within the package during fabrication, storage and shipment to the final destination of the article.

A form of shipping container which may conveniently be employed is constructed of heavy corrugated or solid fibre paperboard, having a rectangular tubular shape, designed for shipment to the user in a flat, collapsed form. The container has closure flaps on the upper and lower ends of each wall. As the articles are delivered from their production line they are moved onto a supporting section where the container in expanded form is slipped down over the article with the flaps on the side walls extending outwardly and the flaps on the front and rear walls extending down through suitable openings. The partially completed package is then held from forward movement while certain elements of the support advance beneath the pad on which the article rests. This swings the flap on the trailing wall to its closed position beneath the pad, which for purposes of description may be considered as a part of the article to be packaged.

The partially packaged article is then advanced toward the glue applying station, and, as it advances, the bottom flap on the leading wall of the container is caused to swing up beneath the article to its closed position. A further advance of the container carries it past gluing means where glue is applied to the under surface of the outwardly extending flaps on the side walls. The container is then carried onto a relatively narrow supporting section which supports the partially completed package centrally in the direction of travel while the freshly glued side wall flaps are folded upwardly toward each other to bear against the under surfaces of the previously folded trailing and leading wall flaps. The package with the bottom flaps completely folded to closed position is then moved to a conveyor section on which it may remain while the glue sets. The top closure of the package may be brought to closed position at any convenient place either during or subsequent to the operations on the bottom flaps. The closing and sealing of the top closure forms no part of the present invention.

Referring more particularly to the drawings, the machine, according to the preferred embodiment, comprises a station 10 for folding the trailing and leading bottom closure flaps, a glue applying station 11, and a station 12 for folding the side wall flaps of the bottom closure. (See Figs. 1 and 2.) The machine is mounted on a plurality of vertically and transversely extending main frame members 13 and 14 which may be interposed between conventional production-line conveyor sections, indicated as a whole at 15 and 16.

A shipping container adapted for use with the present mechanism is shown in Figs. 1 and 2 and comprises a rectangular, tubular body portion having side walls 20, 21, 22 and 23 carrying respectively bottom closure flaps

24, 25, 26 and 27. The upper end of the container, if desired, may be closed with a similar set of flaps indicated at 28, 29, 30 and 31.

The article to be packaged is herein illustrated as a hot water heater tank 34, intended to be installed in a vertical position and resting on a base 35 supported on a plurality of legs. Before the assembly work on the heater is complete it is preferably secured onto a suitable pad or temporary base 36 which is designed to remain with the heater until it reaches its ultimate destination. This pad or base may be formed of any suitable material, such as wood strips nailed crosswise, or a number of layers of corrugated board glued together. The pad 36 is preferably of such size that it will fit the interior of the container. This pad, when enclosed with the heater within a container, reinforces the bottom construction of the container and makes it unnecessary for the container itself to provide all of the protection which the bottom of the package requires. In the present instance the bottom flaps of the container are made all of the same length and somewhat less than half the lateral dimensions of the container.

The mechanism for folding inward the flap 24 on the trailing wall 20 of the container is preferably arranged between laterally spaced frame plates 37, 37, suitably secured to the main frame members 14, 14. This mechanism provides means which, in one relation to the container and article to be packaged, serves to support the article at the same time the trailing flap is being folded into closed position, and in another relation serves to advance the partially formed package. This mechanism as a whole may be referred to as a feeding conveyor. A pair of upper guide channel members 38, 38 is secured on opposite frame plate 37 (see Fig. 7) and below these are secured guide rails 39, 39. Traveling within the guide channels 38 and bearing on the rails 39 are rollers 40, 40 within which two groups of spindles 41, 41 and 42, 42 are journalled. Oppositely positioned rollers 40 on their spindle 41 support the ends of elongated, transversely disposed, anti-friction elements, herein shown as conventional roller-conveyor rolls 43, 43, freely rotatable on the inner end portions of spindles 41. The supporting surface provided by the roller 40, as shown in Fig. 2, is in horizontal alignment with conveyor rolls 46, 46 on the production-line conveyor section 15, so that the article 34 may be moved readily from section 15 onto rolls 43, 43 to the desired position at the flap folding station 10.

The spindles 41, 41 and 42, 42 are preferably connected by link elements 47, 47 to form an endless chain supported on sprockets 48, 49, 50 and 51 carried on shafts 52, 52*a* and 53, 53*a* journalled in the frame plates 37, 37. As shown in Figs. 3 and 7, a number of the elongated transverse elements on this endless chain are in the form of rolls or cylinders 54, 54 which are held from rotation. For this purpose the spindles 42, 42 which are journalled in certain of the rollers 40 are firmly keyed or otherwise non-rotatably joined to their supporting links 47, and the inner ends of the spindles 42 carry fixed collars 55, 55 which are welded or otherwise fixed onto the cylinders. The function and operation of the non-rotatable elements 54, 54 will presently be explained.

At the end of the trailing-flap folding section, remote from the end of production line conveyor 15, there is provided a freely rotatable roll 57 journalled at each end on a spindle 58 fixed in the frame plates 37, 37. This roll 57 constitutes a part of the feeding conveyor.

Combined stop and positioning means are provided for limiting the travel of the article to be packaged as it moves into the desired position at the flap folding station. For this purpose stop elements 61, 61 are provided. Each has a vertically disposed plate portion 62 secured on a piston rod 63, having a piston head 64, movable within a piston 65 which is fixed in a retractable frame 66. Each cylinder is connected through suitable conduits 67 to a source of fluid pressure, and with controls (not shown) by which the pistons may be moved forward toward the article or retracted, thus moving the stop plates 62 into the path of the article or removing them from such path. The elements 61 preferably are also provided with plate portions 70 disposed at right angles to the stop plates 62 for the purpose of bearing laterally against the pad 36 to center the article on the supporting surfaces at the flap folding station. By the use of identical piston and cylinder units, controlled uniformly, the element to be packaged may first be stopped in its forward movement and thereafter may be centered at the flap folding station as one or the other of the lateral pressure plates 70 is brought into forceful contact with the pad 36. As shown in Figs. 1, 2 and 8, the elements 61 with the pressure plates 70 extend a substantial distance longitudinally of the flap folding station and the piston rod is connected centrally of these elements. For the purpose of controlling the movement of elements 61 with accuracy guide rods 71, 71 are rigidly secured to the rear part of each element, and these rods extend outwardly parallel with the piston rods 63 and pass through suitable guiding sleeves 72. This is shown in Fig. 8 and at the right hand side in Fig. 7.

Means are provided to assist an attendant to guide the container down over the article to be packaged. For this purpose similar guide and stop elements 75, 75 are arranged for movement toward and from the article. One portion of each element 75, indicated at 76, extends longitudinally of the flap folding station and preferably has a length approximately conforming to the largest container for which the mechanism is designed. The other portion of this guide element, indicated at 77, extends transversely of the flap folding station and is of limited length so that, when the guide means is retracted, the portion 77 will be removed from the path of the package. The parts adjacent the upper edges of the portions 76 and 77 are preferably flared outwardly to give a funnelling effect and make it unnecessary for the attendant to use extreme care in placing the container over the article. When the guide elements are moved into operative position they will be spaced apart so that the leading corners of the container will slide freely along the guiding surfaces and bring the container down accurately with the lower edges of the walls surrounding the pad 36. Before the container is slipped down over the article it should be understood that the article has been centered by utilizing the elements 61, 61, as above explained. As soon as the elements 61, 61, have performed their function they are retracted and remain in retracted position until required in positioning the next succeeding article.

Each guide element 75 may be extended and retracted by a piston rod 78 secured to the rear side of the longitudinal portion 76. The piston rod carries a piston 80 slidable in cylinder 81 which is secured onto suitable cross frame pieces on the retractable frame 66 on which the stop member 61 is also supported. Conduits 82, 82 are employed to connect the interior of the cylinder to a source of fluid pressure with controls (not shown) by which each piston may be moved forward toward the article or may be retracted. As shown in Figs. 1 and 7, guide rods 83, 83 are connected to the rear surface of each longitudinal portion 76 of the guiding elements 75 on each side of point where the piston rod is connected. The outer ends of the guide rods pass through guide sleeves 84, 84 secured to the frame 66.

Each frame 66 may be moved uniformly toward or from each other. For this purpose side blocks 85, 85 are secured at the sides of the frame 66. These blocks are received between upper and lower guide members 85*a*, 85*a*, supported on outer stationary frame portions 86, 86. The frame 66 has a downwardly depending leg carrying an interiorly threaded boss 66*a*. A shaft 87 having oppositely threaded portions 87*a*, 87*b* at each

end, is journalled in the frame plates 37 and the threaded portions are received into the threaded bosses on the movable frame at each side of the machine. Rotation of the shaft 87 in one direction will move both frames toward each other and rotation in the opposite direction will move the frames away from each other. The driving means for shaft 87 will be described below.

The attendant, when slipping the container down over the article, will usually first fold the lateral flaps 25 and 27 outward to break the score line connections of the flaps with their side walls, so that when the bottom edges of the container walls approach their final position on the supporting surfaces of the feeding conveyor, the flaps 25 and 27 can be folded to extend outward and lie flat on such supporting surfaces, as best seen in Fig. 7. Before the attendant takes up the container to slip it over the article he will seen that the stop elements 61, 61 are retracted, thus freeing the space adjacent the pad 36 so that the flaps 25 and 27 may be brought readily to an outwardly disposed, flat position on the supporting surface. Both the trailing and leading wall flaps are allowed to remain in the planes of their attached walls and these flaps will extend down through suitable openings in the supporting surfaces at the flap folding station. In order to accommodate the trailing wall flap one roller is omitted in the succession of rollers 43, 43 to leave an opening indicated at 74, see Fig. 3. The connected links 47, 47 on each side will carry at their juncture a short pin instead of a spindle. This pin will be journalled in a roller 40 and, like the remaining rollers, is adapted to be received in notches of the pairs of sprockets which support each chain of links.

With the container positioned around the article as illustrated in Fig. 3, and with the guide and stop elements 75 brought into position so that the surfaces 77 will extend into contact with the leading wall 22, the mechanism is in condition to fold the trailing wall flap 24 up against the under surface of the pad 36. This is done by advancing the rollers 43 beneath the article to cause the roller 43 which defines the rear edge of opening 74 to bear against the flap and, with a wiping action, move the flap from the position of Fig. 3 to the position shown in Fig. 4. The free end of the flap 24, as it swings upward, will in some instances brush against the surface of the roll 43 which defines the leading side of the opening 74 and thereby the end of the flap, being of paperboard and somewhat flexible, may be temporarily deformed. This, however, is not a detriment and does not weaken the package in any respect. The amount of deformation of the trailing flap as it is being folded will depend upon the relative sizes of the flap and the opening 74. It is to be understood that, as the rolls 43 advance, the assembled article and container will be held from forward movement by the transversely extending portions 77, 77 of the guide and stop elements 75 and the rolls will rotate beneath the flap 24 and pad 36 in a counterclockwise direction, as indicated by the arrows in Fig. 4. This makes the passage of the rolls beneath the partially completed package relatively easy. It is within the scope of the invention to employ in place of the rotatable rolls 43, any suitable supporting surface of a type that will reduce friction and keep abrasion of the pad and flap to a minimum.

In certain instances the attendant will find it unnecessary to utilize the guide and stop elements 75. He may depend upon the inertia of the article being packaged to hold it sufficiently from advancing and thus enable the conveyor to fold the flap 24 beneath the article. In such case the attendant preferably will bring the article to a stop on the feeding conveyor and place the container thereover. He may then operate the conveyor without utilizing the stop surfaces 77 and cause flap 24 to be folded beneath the article. A limited amount of forward movement of the assembled article and container before the flap 24 is completely folded is an advantage, rather than otherwise, as it minimizes the period during which the successive articles remain on the feeding conveyor. With flap 24 brought up to lie against the pad 36, the next operation is to fold up the leading flap 26 into contact with the bottom surface of the pad 36. At the left end of the flap folding station, as shown in Figs. 1, 2 and 3, there is provided a pair of aligned, spaced rolls 88, 88 carried on a shaft 89 with its ends supported in the side frame plates 37, 37. Around each of these rolls 88, 88 there is arranged a driven belt 90 forming a part of what may be termed the receiving conveyor for the glue applying station 11. Beyond rolls 88 the belts 90 pass around a roll 91 on shaft 92. A main receiving conveyor belt 93 which extends the length of the glue applying station also passes around roll 91. The roll 91 is a driven roll, the driving means for which will be described below. The two belts 90, 90 are relatively narrow and are arranged one on each side of the belt 93. The belts 90 also pass around rolls 94, 94 rotatable on a shaft 95 supported at its ends in opposite vertical frame members 13, 13. An additional roll 96 may be employed to support the belts 90 between rolls 88 and 91. This roll is freely rotatable on shaft 96*a*, supported at its ends in the frame plates 37, 37. The supporting surfaces of belts 90 and 93 are substantially horizontally aligned with the supporting surfaces provided by the feeding conveyor at the flap folding station.

The positioning of the rolls 88 is such that a space 90*a* is provided between the roll 57 and the vertical faces of belts 90 passing over the rolls 88. An opening between the feeding and receiving conveyors is thus provided to receive the downwardly projecting flap on the leading wall of the container.

After the trailing wall flap 24 has been folded beneath the pad 36, as shown in Fig. 4, the guide elements 75 are withdrawn to remove the portions 77 from the path of the package so that the package may be moved forward as shown in Figs. 4, 5 and 6. When the leading wall 22 and flap 26 thereon come into contact with the belt 90 at the place where it passes around rolls 88 the flap will be caused to swing about its hinged connection with wall 22 toward its closed position flat against the under side of pad 36. The belts 90 preferably have friction surfaces whereby as soon as the container is brought into supporting engagement with the belts the container will be urged forward thereover.

The partially packaged article may be moved by the attendant manually toward the receiving conveyor but the preferred manner of moving the article forward is through the operation of the transverse supporting elements making up the feeding conveyor. By reference to Fig. 3 it may be observed that the rotary elements 43 extend in the present instance from the space 74 rearwardly, or to the left, down to the sprocket 51. The length of this section of rotary elements may, in practice, be considerably in excess of the length of the longest trailing wall flap on containers to be handled by the mechanism. As the feeding conveyor is operated to advance the rotary elements beneath the article and swing the flap 24 upward, the rear section of the rotary elements moves in beneath the package, and the rotary elements have preferably performed their function somewhat in advance of the time when the first stationary element 54 comes into contact with the package.

As will be described presently, the feeding conveyor is preferably motor driven and the attendant, after starting the motor to begin the movement of the feeding conveyor, can observe when the flap 24 is folded into position and can then remove the stop element 75 by proper control of the piston and cylinder mechanism. The article is then ready to be advanced to cause the folding of the flap 26 and, so long as the rotary elements 43 are passing beneath the article, it will tend to remain unmoved due to its inertia. However, as soon as the non-rotary elements begin to move in beneath the article the

frictional effect will initiate movement of the article and it will advance onto the receiving conveyor after causing the upfolding of flap **26**, as above described, and as illustrated in Figs. 4, 5, and 6. While the article in practice will usually begin to advance after the movement of three or four stationary elements **54** thereunder, it is preferred to have the length of the stationary element section somewhat longer than the largest longitudinal dimension of packages to be handled.

In order to drive the feeding conveyor, a motor **97** is provided, suitably supported on the frame and carrying a sprocket **98** on its shaft. A chain **99** which passes around sprocket **98** also passes around a sprocket **100** on an extended end of driven shaft **53***a* which carries the feeding conveyor sprocket **50**. Means are provided for operating the feeding conveyor one cycle at a time and and for changing the point of stoppage of the feeding conveyor to cause the opening **85** to come to rest at any one of various desired positions to accommodate different sizes of containers. For this purpose a conducting circuit **103** is provided for motor **97**. See Fig. 11. The conductor **103** is fed from a suitable source of power and connected with the terminals of motor **97**. A main control switch **104** is provided to energize the motor. The switch is of the type which is normally open but may be closed by manual operation. A limit switch **105** is placed in the circuit and is joined with the conductor circuit through a flexible conductor section **106**. The switch **105** is adjustably carried in a switch box **107** slidable on a guide **108**. This guide is contained within the space enclosed by the transverse supporting members of the feeding conveyor. See Figs. 3 and 7. A longitudinally extending, threaded rod **110** is journalled at its ends in brackets **111**, **111** secured on frame plate **37**. Adjacent one end of the rod is keyed a sprocket **112** over which a chain **113** passes which also passes over a sprocket **114** on a jack shaft **115**, rotated by a motor **116**, secured on an angle iron frame member **117** having its ends secured in opposite frame plates **37**, **37**. The switch box **107** is secured to an interiorly threaded nut element **118** surrounding threaded rod **110**. By operation of the motor **116** selectively in a forward or a reverse direction the switch box **107** may be moved to different locations longitudinally of the feeding conveyor. Carried on the switch box **107** is a depressible switch actuating element **119** disposed in the path of a trip shoe **120** extending inwardly of the feeding conveyor. The switch **105** is a normally closed switch which is caused to open when the trip shoe **120** comes into engagement with and depresses the actuating element **119**. When the normally open main switch **104** is closed manually the motor **97** will become operative to actuate the conveyor. The attendant needs only to hold switch **104** closed for a brief interval during which time the conveyor will start and the trip shoe **120** will pass out of depressing contact with the actuating element **119**, permitting the normally closed switch **105** to close and so remain until the conveyor has made a complete circuit and the trip shoe **120** again contacts and depresses the element **119** to open the switch. This causes the feeding conveyor to stop with the opening **74** in proper position to receive the downwardly extending flap **24** of the shipping container to enclose the next article delivered to the feeding conveyor.

Means are provided to keep the trailing wall flap **24** from swinging away from its position against the bottom of the article as it passes over the opening **90***a* between the feeding and receiving conveyors. For this purpose a bridging element **125** is mounted to swing through a limited arc about shaft **89**. This bridging element is preferably located in the space between the short rolls **88**, **88**. See Figs. 1 and 3. The bridging element **125** is mounted on spaced lugs **126** having openings to receive the shaft **90**. The rearwardly directed portion or segment of the bridging element is preferably of a length adapted to close or bridge a major portion of the opening **90***a*. See Fig. 5. The forward section of the element **125** is arranged to extend upwardly above the level of the feeding and receiving conveyors. As the rearward segment is preferably longer than the forward segment the bridging element will normally swing by gravity to the position shown in Fig. 4, in which position it leaves the opening **90***a* substantially free. A transversely extending bracket **127** is preferably provided beneath the element **125** so that it will stop in its swinging movement at about a 45° angle with respect to the supporting level of the feeding and receiving conveyors.

As the advancing package passes the bridging element **125** its upper end is engaged and swings down, thus bringing the bridging element to an approximately horizontal position, as shown in Figs. 5 and 6. When the advancing edge of the upfolding trailing wall flap **24** passes beyond roll **58** it will slide along the upper surface of the upraised bridging element **125** and will remain supported by this element until after the flap has begun to ride along the surface of the belt **90**. As soon as the package passes the bridging element it will swing down by gravity thereby clearing the opening **90***a* to receive the leading wall flap on the container placed over the next succeeding article.

In order to prevent the leading edge of the flap **24** from passing down into the opening to the left hand side of roll **58**, as viewed in Fig. 3, a narrow plate **128** is secured at upwardly inclined angle along roll **58**. This plate may be supported on an angle bar having its ends secured in the opposite frame plates **37**.

The mechanism for applying glue to the flaps **25** and **27** carried by the container side walls and the mechanism for closing these flaps will now be described. Supplemental frame members **129**, **129** in the form of angle irons extend longitudinally with their vertical webs in alignment with the frame plates **37**, **37**. The horizontal webs of the frame members **129** are welded or otherwise suitably secured to the vertical frame members **13**. The longitudinal members are suitably connected by transverse frame members, one of which is indicated at **130**.

The length of the longitudinal frame members **129** may vary but preferably their length is not much in excess of the dimension of the largest container to be handled by the machine. The spacing between the members **129** is determined by the widest expanse between the outer edges of the side flaps of the container when such flaps are extended horizontally outward. The ends of the members **129** are secured to the frame of the glue applying mechanism, such frame being indicated generally at **132**. Additional longitudinal frame members **133**, **133** extend from the glue mechanism frame **132** to a point adjacent conveyor section **16**. These frame members are spaced relatively closely, for a reason which will presently be explained. The flap folding elements, indicated at **135**, **135**, are each mounted on a frame **136** attached to the glue mechanism frame **132**.

Belt **93**, which forms a part of the receiving conveyor, is relatively narrow and disposed centrally of the path of the partially packaged article. This belt passes over the roll **91** adjacent the leading flap folding mechanism. It extends past the gluing station **11** and lateral flap folding station **12** and passes around roll **138** on shaft **139**, supported in the frame members **133**. Between the roll **91** and the glue applying mechanism the belt **93** is supported on a number of idler rolls **140**, **140** mounted on spindles journalled in the frame members **129**. From the glue applying mechanism to the discharge end of the conveyor the belt **93** is supported on a number of idler rolls **142**, **142** mounted on spindles journalled in the frame members **133**.

As best shown in Figs. 1, 2 and 9, the gluing mecha-

nism comprises essentially a pair of glue rolls **144, 144** slidable along a driven shaft **145**, the lower surfaces of the glue rolls being adapted to travel in a glue supply held in glue pots **146, 146**. The glue rolls and glue pots are arranged for movement toward and away from the centerline of the conveyor belt **93** to adjust the mechanism to handle containers of varying sizes. The end portions of shaft **145** are journalled in upstanding frame members **147, 147** tied together by transverse frame members **148, 148**. The glue pots are supported for in and out movement on a pair of rods **149, 149** having their ends secured in the frame members **147**. See Figs. 1 and 2. Depending legs **150, 150** on the glue pots have apertures which slidably receive the rods **149**. A driven shaft **152** has its ends journalled in the frame members **147** and is located between the rods **147**. Portions of shaft **152** adjacent each end are screw threaded and pass through an interiorly threaded boss **153** secured on a downwardly extending leg **154** on each glue pot. Sleeves **155** and **156** at the ends of the glue roll **144** keep it in fixed position with respect to the glue pot. An upstanding part **157** on the glue pot supports the glue supply receptacle **158**. Attached to this part **157** is an arm **159** carrying a roll **160** with its surface located close to the glue roll which serves to contact the upper surface of the flap to be glued and hold it firmly against the glue roll in passing. A roll **161** is mounted centrally on the shaft **145** beneath the belt **93** and serves as an additional support for the belt at the gluing station. Rolls **162, 163** and **164** located in the lower part of the gluing mechanism frame may serve in a conventional manner as means for tightening belt **93**. The driving means for the conveyor belt, the glue rolls and for moving the glue pots in and out will be described below.

By reference to Figs. 1 and 9 it will be understood that the laterally extending flaps **25** and **27** are free to move along an unobstructed path from the leading and trailing flap folding station to the glue rolls where glue is applied to their under surfaces. After the laterally extending flaps have cleared the glue rolls they are ready to be folded in beneath the pad **36** and the previously infolded flaps **24** and **26** so they may be adhered thereto. As shown in Figs. 1 and 10, the flaps first move below parts **135***a* of the folding plow **135** which causes them to swing down. In many instances there is a natural tendency for the flaps to swing down to assume a uniplanar relationship to their supporting walls due to the inherent stiffness of the paperboard, tending to resist bending along the fold lines. As the container continues to advance, the flaps are influenced by the central parts **135***b* of the plows which move them inwardly and finally the flaps are moved upwardly by the parts **135***c* where they will be in engagement with the pad and the previously infolded flaps. By continuing the movement of the package from the belt **93** and onto the conveyor section **16**, the weight of the package will be imposed upon the infolded side wall flaps. The package is allowed to remain on conveyor **16** until the glue has become set.

The end of frame **136** adjacent the gluing mechanism frame **132** is preferably hinged as indicated at **137** so that the frame **136** and plows thereon may be swung upward, thereby affording easy access to the other parts at the discharge end of the conveyor belt **93**.

Means are provided for laterally supporting the upper portion of the packages. This is desirable in the handling of elongated articles such as water heaters, both to prevent accidental tipping and to keep the package properly positioned on the conveyor while glue is applied to the flaps and while the flaps are being folded by the plows. For this purpose upwardly extending frame members **167, 167** and **168, 168** are suitably secured to the base frame members **147** and **148**. In the upper part of the frame members at each side of the receiving conveyor are channel members **170, 170** in which are supported rollers **171, 171**. See Figs. 1, 2 and 9. The channel members have threaded rods **172, 172** secured to their rear faces, the threaded portions being received within interiorly threaded rotary sleeves **173** mounted in bearings in inwardly projecting frame parts **174** at the upper end of each of the upstanding members. At the end of each sleeve **173** is secured a sprocket **175** driven by a sprocket chain **176**, which passes over a sprocket **177** located in the lower part of the machine. Two of the sprockets **177** are secured at opposite ends of a shaft **178** and the other two sprockets **177** are secured at opposite ends of a shaft **179** journalled respectively in bearing brackets **180** and **181**. See Fig. 2. The two shafts are geared together to be rotated in synchronism by means of a shaft **182** having miter gears on its ends meshing with miter gear boxes **183** and **184**. Thus the rotation of shaft **178** will cause simultaneous rotation of shaft **179** and the two shafts operating together through the sprockets and sprocket chains will cause the sets of rolls **171, 171** to move either toward or from each other, depending upon the direction in which the shafts rotate.

The driving means for the glue rolls and for the receiving conveyor which conveys the packages past the gluing and folding stations will now be described. Referring to Figs. 1, 7 and 9, an electric motor **187** is positioned at the side of the machine and has its shaft connected through reduction gearing in a gear box **188** to drive a shaft **189**. At one end the shaft **189** carries a sprocket **190** over which passes a sprocket chain **191** which passes around a sprocket **192** on the glue roll shaft **145**. At its other end shaft **189** carries a sprocket **194** over which passes a chain **195** which passes around a sprocket **196** secured on the shaft **92** to which the roll **91**, around which the belt **93** passes, is also secured. Actuation of motor **187** serves to drive both the receiving conveyor and the glue rolls. The gear ratio is such that the conveyor and glue rolls are driven at the same speed. The driving means for effecting the adjustments for the centering and stop members on frame **66**, for the side guide rolls **171** and for the glue rolls is provided through electric motor **199**. The motor shaft **200** carries a sprocket **201** over which a chain **202** passes which in turn passes around sprocket **203** on the threaded shaft **152**, rotation of which serves to move the glue pots in and out. A second sprocket **205** on shaft **152** drives a sprocket **206**, on shaft **178**, through sprocket chain **207**. Another sprocket **208** on shaft **178** has a chain **209** passing therearound which passes around sprocket **175** which is located directly above sprocket **208**. Due to the gear connection between shafts **178** and **179**, all four of the sprockets **175** are driven in unison to rotate the interiorly threaded sleeves **173** to cause extension or retraction of the roller guides. A third sprocket **210** on shaft **178** drives sprocket **211** on shaft **87** through sprocket chain **212** to cause the threaded portion **87** to move the frames **66** toward and from each other.

To summarize the preferred manner of operating, the attendant will determine the width of the containers used to enclose the article to be packaged and by operation of the motor **199**, he will adjust the positions of the frames **66**, the upper side guides, the glue rolls and the flap folding plows, all of which is accomplished simultaneously, to accommodate the container which is to be used. The attendant will next observe the positioning of the opening **74** in the feeding conveyor, if necessary operating the motor **116** to adjust the switch box **117** to cause the conveyor to stop at the proper point. As the article, resting on pad **36**, moves from conveyor **15** onto the feeding conveyor at the folding station for the leading and trailing flaps, the attendant will first actuate the controls for the cylinders **65** to move the centering and stop elements **61** inwardly. This will both center and square up the pad

36 and will bring it to a stop at the desired location at the folding station.

The controls for cylinders 81 are next actuated to bring the guide and stop elements 75 into the desired position after which the centering and stop elements 61 are retracted. The attendant then squares up a collapsed container and slides it down over the article to be packaged. This operation is facilitated by the guiding and stop surfaces of the elements 75. The trailing wall flap of the container will enter the opening 74, the leading wall flap will enter the opening 90*a* and the side wall flaps will be folded outward to lie flat on the supporting surface of the feeding conveyor.

The attendant next actuates the motor 97 by closing the normally open switch 104 and holding it closed momentarily until the actuating element 119 for switch 105 has cleared the trip shoe 120 which allows switch 105 to remain closed through a complete cycle. The freely rotatable rolls 43 then travel below the pad 36 and the trailing wall flap will be folded beneath the pad. The attendant, upon observing that the conveyor has advanced sufficiently to fold up the trailing wall flap, may then retract the guide and stop elements 75 whereupon the partially formed package is free to advance. When the non-rotatable cylinders 54 begin to advance beneath the package the friction becomes such that the package is caused to move forward. This causes the leading wall flap to be folded beneath the pad 36 and causes the leading edge of the package to move onto the belts 90 which form part of the receiving conveyor. The movement of the package is thus facilitated.

The receiving conveyor belts 90 and 93 may be operated constantly and, when the package has been delivered onto the receiving conveyor, it requires no further attention by the attendant. The side flaps have glue applied thereto at the gluing station and these flaps are folded up beneath the pad and the previously infolded trailing and leading wall flaps by the folding plows, after which the package is delivered onto the roller conveyor 16. After an interval to allow the glue to become set the package is ready for shipment to its destination. As stated above, the top closure flaps may be closed and secured by any desired means forming no part of the present invention.

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.

We claim:

1. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least one wall, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed londitudinally of the frame, said conveyor comprising parts supported to advance bodily with respect to the conveyor frame and being constructed to provide a transversely extending, relatively narrow opening adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor to enclose the article to be packaged, a stop element located on the frame adapted to prevent the forward movement of the puartially packaged article on the conveyor, and means for advancing the conveyor bodily beneath the article to cause the portion defining the rear edge of the opening in the conveyor to engage the inserted flap on the trailing wall of the container and swing it forwardly and upwardly with a wiping action so that it will be brought to a horizontal position beneath the article to be packaged while the conveyor continues to support the article.

2. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least two opposed walls, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, said conveyor having parts supported to advance bodily with respect to the conveyor frame and being constructed to provide a transversely extending narrow opening adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor to enclose the article to be packaged, a selectively operable stop element located on the frame adapted to prevent the forward movement of the partially packaged article on the conveyor, and means for advancing the conveyor bodily beneath the article while the stop element is effective to cause the portion defining the rear edge of the opening in the conveyor to engage the inserted flap on the trailing wall of the container and swing it forwardly and upwardly with a wiping action so that it will be brought to a horizontal position beneath the article while the conveyor continues to support the article, a receiving conveyor on the frame aligned with the feeding conveyor to receive articles therefrom, said receiving conveyor being spaced from the feeding conveyor to provide an opening adapted to admit a downwardly extending flap on the leading wall of a shipping container placed around the article, means for rendering the stop ineffective, and means on said feeding conveyor and movable therewith for advancing the partially packaged article onto the receiving conveyor to cause the flap on the leading wall to swing upward, with a wiping action, to a horizontal position beneath the article.

3. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least two opposed walls, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, said conveyor having parts supported to advance bodily with respect to the conveyor frame and being constructed to provide a transversely extending narrow opening adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor to enclose the article to be packaged, a selectively operable stop element located on the frame adapted to prevent the forward movement of the partially packaged article on the conveyor, and means for advancing the conveyor bodily beneath the article while the stop element is effective to cause the portion defining the rear edge of the opening in the conveyor to engage the inserted flap on the trailing wall of the container and swing it forwardly and upwardly with a wiping action so that it will be brought to a horizontal position beneath the article while the conveyor continues to support the article, a receiving conveyor on the frame aligned with the feeding conveyor to receive articles therefrom, said receiving conveyor being spaced from the feeding conveyor to provide an opening adapted to admit a downwardly extending flap on the leading wall of a shipping container placed around the article, means for rendering the stop ineffective, means on said feeding conveyor and movable therewith for advancing the partially packaged article to the receiving conveyor to cause the flap on the leading wall to swing upward, with a wiping action, to a horizontal position beneath the article, and

means effective during the passage of an article over the opening between the conveyors for holding the upwardly folded flap on the trailing wall flat against the bottom of the article to prevent such flap from entering the opening.

4. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least two opposed walls, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, said conveyor being constructed to provide a transversely extending narrow opening adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor to enclose the article to be packaged, a selectively operable stop element located on the frame adapted to prevent the forward movement of the partially packaged article on the conveyor, and means for moving the conveyor beneath the article while the stop element is effective to cause the portion defining the rear edge of the opening in the conveyor to engage the inserted flap on the trailing wall of the container and swing it forwardly and upwardly with a wiping action so that it will be brought to a horizontal position beneath the article while the conveyor continues to support the article, a receiving conveyor on the frame aligned with the feeding conveyor to receive articles therefrom, said receiving conveyor being spaced from the feeding conveyor to provide an opening adapted to admit a downwardly extending flap on the leading wall of a shipping container placed around the article, means for rendering the stop ineffective, means operable after the stop is so rendered ineffective for advancing the partially packaged article to the receiving conveyor to cause the flap on the the leading wall to swing upward, with a wiping action, to a horizontal position beneath the article, said receiving conveyor including a bridging element rockably mounted intermediate its ends on a transversely extending, horizontal axis, the rearward segment of the bridging element being of less extent than the width of the opening between the conveyors and being adapted to swing into and downwardly of the opening, the forward segment on the other side of the axis extending beyond the opening and upward into the path of travel of the package, whereby the advancing movement of a package into contact with the forward segment, will rock said element on its axis causing it to approach a position parallel with the bottom of the package substantially closing the opening, and so remain while the package is bearing on the forward segment to prevent the trailing wall flap from entering the opening as the package moves onto the receiving conveyor.

5. Mechanism as defined in claim 3, wherein the means for holding the trailing wall flap in upwardly folded position comprises a movable bridging element adapted in one position substantially to close the space between the conveyors and in another position to leave the opening clear for the admission of the flap on the leading wall.

6. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least one wall, the combination of an elongated frame, a feeding conveyor on the frame comprising parts supported for bodily movement therealong, adapted to carry a heavy article to be packaged longitudinally of the frame, a receiving conveyor arranged to receive a heavy article from the feeding conveyor, said receiving conveyor being spaced from the feeding conveyor a distance to provide a narrow opening adapted to admit a downwardly extending flap carried on a wall of a shipping container placed around the article to be packaged, means for driving the feeding conveyor to move the partially packaged article from the feeding conveyor to the receiving conveyor to cause the edge of the receiving conveyor to engage and swing the downwardly extending closure flap, with a wiping action, up to a horizontal position beneath the article to be packaged.

7. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least one wall, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, said conveyor comprising a plurality of elongated supporting elements extending transversely of the frame, guide members arranged to receive the ends of the supporting elements, links connecting said elements to form a chain of said elements, there being a space between two adjacent supporting elements to form an opening in the conveyor adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor and enclosing the vertical sides of the article to be packaged, a stop element located on the frame adapted to hold a partially packaged article from forward movement on the conveyor, means for advancing the conveyor with the stop in holding condition to cause the element defining the rear of the opening to engage the inserted trailing wall flap of a container on the conveyor to swing it forward and upward beneath the article while the conveyor continues to support the article.

8. In a machine for closing and sealing the bottom closure of shipping containers of rectangular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least one wall, the combination of a frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, a receiving conveyor on the frame aligned with the feeding conveyor, said feeding conveyor comprising a plurality of elongated supporting elements extending transversely of the frame, guide members arranged to receive the ends of the supporting elements, links connecting said elements to form a chain of said elements, there being a space between two adjacent supporting elements to form an opening in the conveyor adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container positioned on the conveyor and enclosing the vertical sides of the article to be packaged, a selectively operable stop element located on the frame adapted to hold a partially packaged article temporarily from forward movement on the feeding conveyor, means for advancing the feeding conveyor with the stop in holding condition to cause the transverse element defining the rear side of the opening to engage the inserted trailing wall flap of a container on the conveyor to swing it forward and upward beneath the article while the conveyor continues to support the article, means for rendering the stop ineffective to permit the partially packaged article to move from the feeding conveyor to the receiving conveyor, a limited number of the transversely extending elements of the feeding conveyor on each side of its flap-receiving opening being in the form of anti-friction elements to facilitate movement of such elements beneath the article and closure flap while the stop is effective and the article is held from movement.

9. Mechanism as defined in claim 8, in which a group of transverse elements following in sequence behind those of the anti-friction type are elements with friction surfaces which, upon moving into supporting relation with the bottom of the partially packaged article, will cause the article to advance toward the receiving conveyor.

10. Mechanism as defined in claim 8, in which the supporting elements are linked together in the form of an endless chain, sprockets on the frame over which the endless chain of supporting elements is supported, the means for advancing the chain comprising an electric motor, a conducting circuit for the motor connected to a power source, a normally open, manually operable switch for temporary actuation of the motor, an additional circuit connecting the motor to the source of power, a second switch, normally closed, in said circuit, and means responsive to the movement of the feeding conveyor arranged to open said normally closed switch upon completion of one cycle of the feeding conveyor, whereby the conveyor will be stopped with the opening in the conveyor in proper position to receive the trailing flap of a container.

11. Mechanism as defined in claim 7, in which the supporting elements are linked together in the form of an endless chain, sprockets on the frame over which the endless chain of supporting elements is supported, the means for advancing the chain comprising an electric motor, a conducting circuit for the motor connected to a power source, a normally open, manually operable switch in such circuit for temporary actuation of the motor, an additional conducting circuit for connecting the motor to the power source, a second switch, normally closed, in such circuit, and means responsive to the movement of the conveyor for opening such normally closed switch at a predetermined point, whereby the conveyor will be stopped after one cycle with the opening in the conveyor in proper position to receive the trailing flap of the container.

12. Mechanism as defined in claim 11, wherein the means for opening the normally closed switch may be adjusted to cause the conveyor to stop with the opening therein in any one of a number of selected positions to accommodate containers of varying sizes.

13. Mechanism as defined in claim 1, in which the stop element includes parts adapted to engage the leading wall and a side wall of the container used to enclose the article and thereby serve to guide an expanded container while it is being moved down over the article.

14. Mechanism as defined in claim 13, in which the stop element is mounted for lateral extension and retraction, whereby it may selectively be brought into and out of operative holding relation with respect to a partially completed package.

15. Mechanism as defined in claim 1, in which there is operatively combined with the feeding conveyor a pair of centering elements mounted for lateral movement toward and from an article, and means for moving such centering elements simultaneously toward the article to center it on the conveyor, at least one of said centering elements including a portion extending laterally into the path of an article on the conveyor and disposed forwardly of the portions adapted to engage laterally against the article as it moves along the conveyor between the centering elements.

16. In a machine for closing and sealing the bottom closure of shipping containers of rectangular tubular form which are adapted to enclose heavy articles by slipping the container downward thereover, such containers having a hinged closure flap on the lower end of at least one wall, the combination of an elongated frame, a feeding conveyor supported on the frame to carry a heavy article to be packaged and on which the article may be conveyed longitudinally of the frame, said conveyor having a bodily movable anti-friction supporting surface and being constructed to provide a transversely extending, relatively narrow opening adapted to receive a downwardly extending, hinged closure flap on the trailing wall of a tubular container which has been positioned on the conveyor in enclosing relation to the article to be packaged, and means for bodily moving the conveyor longitudinally of the frame in a horizontal plane beneath the article to cause the portion defining the rear edge of the opening in the conveyor to engage the inserted flap on the trailing wall of the container and swing it forwardly and upwardly with a wiping action so that it will be brought to a horizontal position beneath the article to be packaged while the conveyor continues to support the article.

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