United States Patent

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[15] **3,669,160**

[45] **June 13, 1972**

[54] MACHINE FOR AUTOMATICALLY FORMING, FILLING, CLOSING AND SEALING CARTONS

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Related U.S. Application Data

[62] Division of Ser. No. 409,911, Nov. 9, 1964, Pat. No. 3,405,505.

[52] **U.S. Cl.**.....**141/160,** 74/68, 222/250, 222/309

[51] **Int. Cl.**.....**B65b 43/42,** B67c 3/00

[58] **Field of Search**.....74/63, 68, 40, 41, 25; 103/153, 150, 11, 213; 141/160; 222/250, 309

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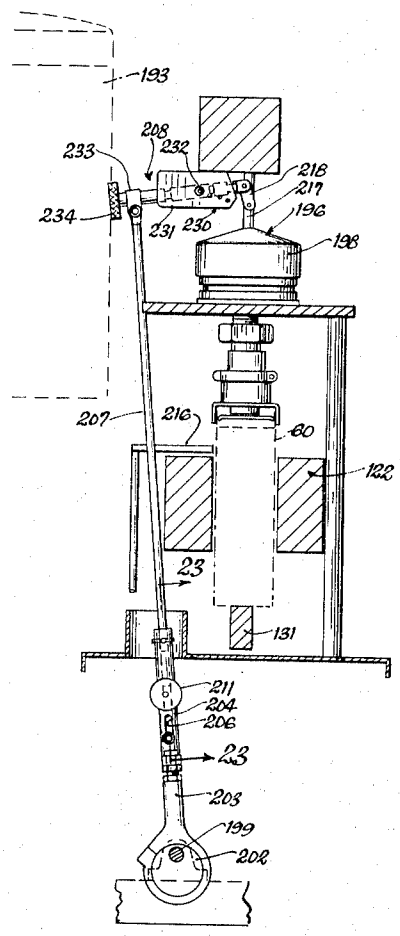
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[57] **ABSTRACT**

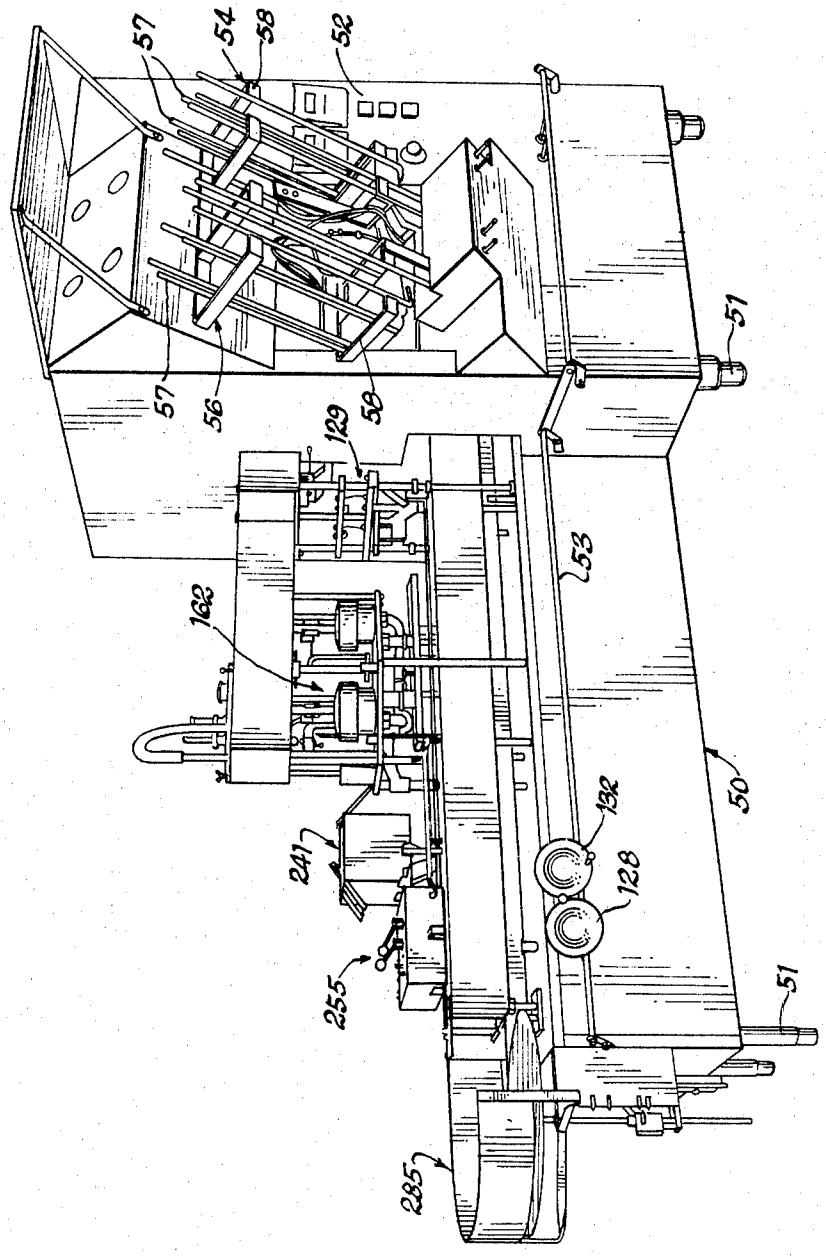
This invention relates to a filler unit for a machine for automatically forming, filling, closing and sealing cartons.

5 Claims, 7 Drawing Figures



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FIG. 1



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FIG. 3

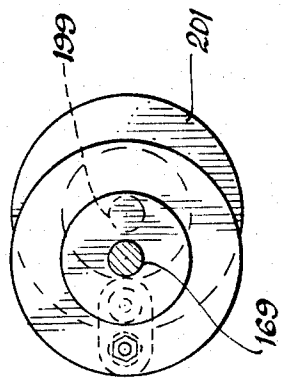


FIG. 2

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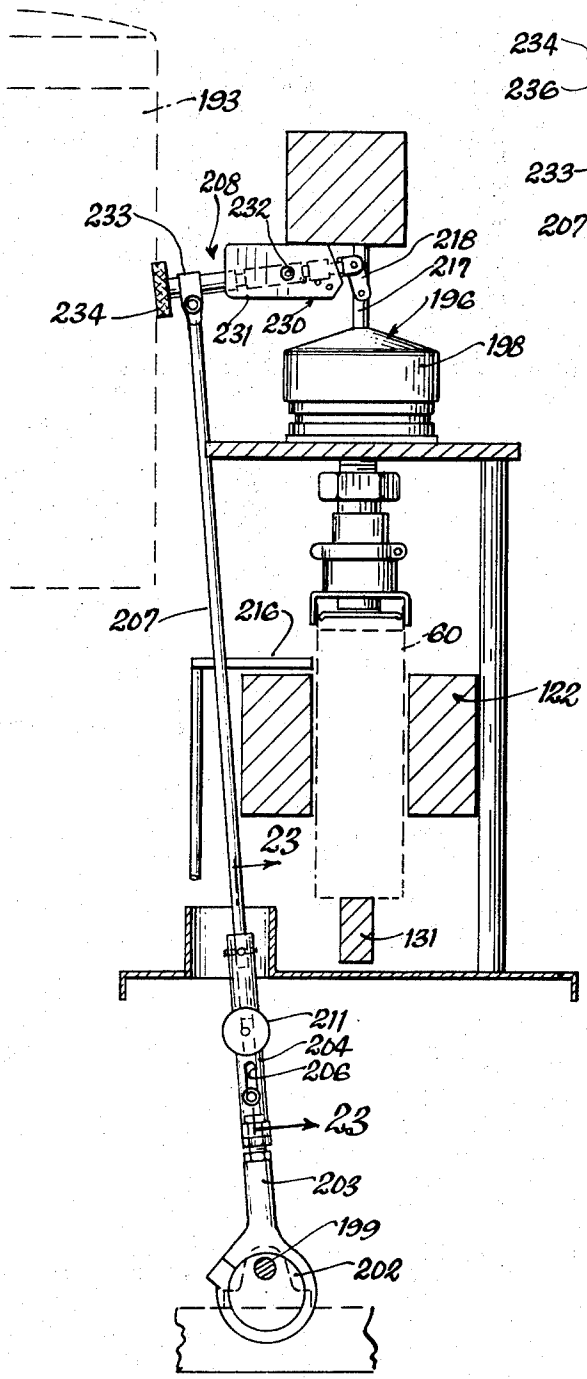


FIG. 4

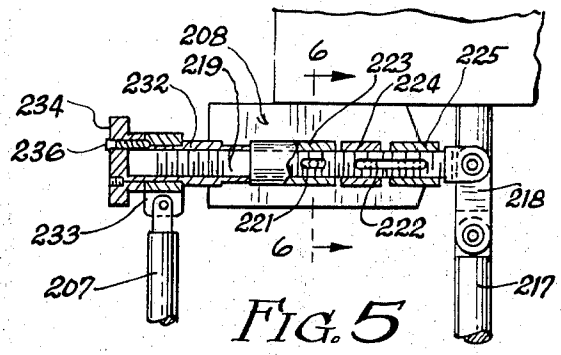


FIG. 5

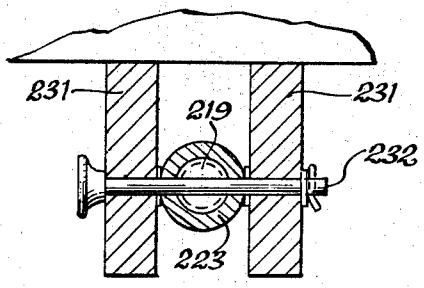


FIG. 6

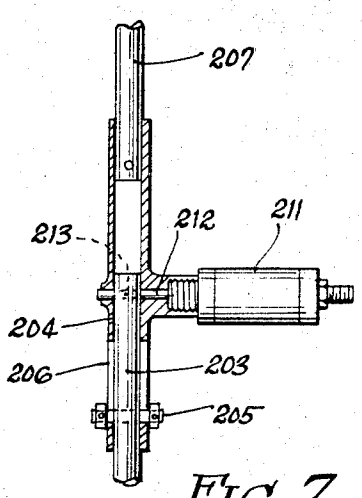


FIG. 7

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MACHINE FOR AUTOMATICALLY FORMING, FILLING, CLOSING AND SEALING CARTONS

This application is a division of application Ser. No. 409,911 filed Nov. 9, 1964 now U.S. Pat. No. 3,405,505.

One of the objects of this invention is the provision of an improved unitized machine for automatically forming plastic coated carton blanks into erected cartons, filling the same with a liquid, and closing and sealing the cartons into fluid-tight packages.

Another object of this invention is the provision of a machine of the foregoing type which is adaptable to operate on and fill cartons having different base sizes, for example, quart and half-gallon sizes, thereby eliminating the necessity for employing two different machines, each intended to produce only one size of filled cartons, as in prior art practices.

A more specific object is to provide a novel positive filling means for more rapid and accurate filling of cartons with a minimum of foaming, which filling means are particularly applicable for use in a unitized machine of the above described type.

Still a further object of this invention is the provision of novel filling means having micrometer adjustment means for accurately calibrating the volume of liquid discharged into a carton.

Still a further object of this invention is the provision of means to render the filling means inoperative and prevent discharge of liquid in the event a carton is not in position to receive the liquid.

Other and further objects and advantages of this invention will become apparent from the following description when the same is considered in connection with the accompanying drawings, in which:

FIG. **1** is a perspective view of a machine embodying the present invention.

FIG. **2** is a rear elevational view of the machine illustrated in FIG. **1**.

FIG. **3** is a cross-sectional view, on an enlarged scale, taken substantially on line **8—8** of FIG. **2**.

FIG. **4** is a cross-sectional view, on an enlarged scale, taken substantially on line **20—20** of FIG. **2**.

FIG. **5** is a cross-sectional view of a structural detail illustrated in FIG. **4**.

FIG. **6** is an enlarged cross-sectional view taken substantially on line **22—22** of FIG. **5**.

FIG. **7** is a cross-sectional view on an enlarged scale taken substantially on line **23—23** of FIG. **4**.

As indicated above, the filler unit is particularly applicable for use in a unitized machine of the type intended to process conventional plastic-coated gable-top cartons formed of paperboard or the like, and presently extensively employed for packaging milk and other liquids. The carton blank as it is delivered to the machine for processing is folded upon itself and has its side seam already adhesively secured, thus defining a collapsed open ended tube. The closure parts at each end are suitably scored and the carton when erected and subsequently processed in the machine results in a container which is self-sustaining in shape.

The unitized machine may comprise a console **50** supported on legs **51** and supplied with utilities, such as electric power, heating gas, compressed air and cooling water from appropriate external sources. An operator's control and indicator panel **52** and an emergency stop bar **53** are carried on the forward walls of the console **50**. Housed within the console and also arranged on a top portion thereof are the various component mechanisms which operate on the carton, the construction and operation of which are fully disclosed in the above-mentioned U.S. Pat. No. 3,405,505.

FILLER UNIT

The filler unit **162** which is disclosed in the above-mentioned U.S. Pat. No. 3,405,505 and which is the subject of the present invention comprises a supply tank **193** (FIG. **2**)

adapted to contain a supply of milk or other liquid to be packaged in the cartons processed by the machine. A supply line **194** delivers milk from a larger supply source. The filler unit includes two filler heads **196** and **197** which are identical, each head being mounted in overlying relation with a corresponding carton supported on the rail **131** (FIG. **4**) and movable by a conveyor **122**. Each filler head supplies substantially ½ of the liquid contents of the carton as it passes successively under each filler head.

Each filler head **196,197** includes a piston-type pump **198** (FIG. **4**) having a relatively large diameter cylinder, the stroke of each pump being adjustable, as will be hereinafter explained. Each pump **198** is connected by a separate conduit to the supply tank **193**. Since the pumps and their operating mechanisms are substantially identical, only one of the pumps and its mechanism will be described.

Referring to FIGS. **3** and **4**, the drive shaft **199** for the pumps **198** is suitably journaled in the frame of the machine and is offset from the shaft **169** but is connected thereto by a drag link mechanism **201**, illustrated in FIG. **8**. Accordingly, while the shaft **169** is rotated at a uniform speed, the shaft **199** for a portion of each rotation is caused to rotate at a higher rate of speed than the balance of the rotation. This action is utilized in the operation of the pump **196** so that the suction stroke of the piston is more rapid than the discharge stroke. In other words, the discharge interval for the pump is greater than the suction interval. The provision of an extended interval of time for filling the carton results in reducing foaming of the liquid discharged into the carton.

Referring to FIG. **4**, mounted on the shaft **199** is an eccentric strap **202** carrying an eccentric rod **203**. The free end of said rod is slidable in a sleeve **204** provided with registering longitudinally extending slots **206**. The rod **203** is pierced to receive a pin **205** which projects through the rod **203** and through the slots **206** on opposite sides, as seen clearly in FIG. **7**. As will be apparent, the rod **203** may move relative to the sleeve **204** within the limits of the length of the slot **206**. The upper end of the sleeve **204** is pinned to a lift rod **207** connected to an adjustable pump lever **208**, hereinafter to be described. The sleeve **204** is provided with a lateral boss **209** mounting an air cylinder **211** operatively connected to a pin **212** slidable in a bore in the boss. The upper end of the eccentric rod **203** is provided with a drilled hole **213** arranged to receive the pin **212**, as will be hereinafter explained.

Referring to FIGS. **2** and **4**, carton sensing means in the form of two trip levers **214** and **216**, each rockable about a vertical axis, are provided in close proximity to respective filler heads **196** and **197**. The levers **214** and **216** extend over the conveyor **122** and project into the path of travel of the cartons moving toward the filler unit. Each lever **214,216** is operatively connected to a separate valve control, not shown, for a respective air cylinder **211**. In non-operative position the pin **212** is normally retracted from the hole **213** in the eccentric rod **203** and said rod may move relative to the sleeve **204** without imparting any reciprocatory motion to the lift rod **207**. However, when a carton engages the lever **214,216**, the respective air cylinder **211** is actuated to project the pin **212** through the hole **213** in the eccentric rod **203**, thereby locking the sleeve **204** to the rod **203**, whereby reciprocatory motion is transmitted to the lift rod **207** to effect operation of the pump through one cycle of operation. This results in a measured quantity of liquid from the filler head being discharged into an underlying carton.

As a carton moves out of engagement with a trip lever **214,216**, the air cylinder **211** effects rapid withdrawal of the pin **212** to render the pump inoperative. It will be understood, however, that no matter at which point the pin **212** is retracted, the pump will always complete a full suction stroke, since the pin **205** will engage against the lower end of slots **206** and draw the lift rod **207** downwardly, thereby rocking the lever **208** to effect a suction stroke of the pump.

Each filler head **196,197** is so designed that the liquid entering the carton tends to spread out and follow the interior walls

of the carton, with the result that the air in the carton is discharged centrally upwardly from the carton.

The arrangement above described affords a safety means to prevent discharge of liquid from a filler head in the event that no carton is in position to move into filling position beneath a filler head. If a trip lever **214** or **216** is not engaged by a carton, pin **212** is not caused to be actuated and the lift rod **207** is not actuated to operate the pump.

Referring to FIGS. **4–6**, the adjustable lever **208** affords means for varying the stroke of the piston of pump **198**, thereby to vary the quantity of liquid which is delivered by the pump. The piston rod **217** of the pump **198** is connected by means of a link **218** to a threaded rod **219** which is provided with two elongated transverse slots **221** and **222**. The threaded rod **219** carries three collars **223**, **224** and **225** cooperating with said rod, the collars being adjustable longitudinally of the rod. Each of the collars **223** and **224** is provided with one transverse aperture, while the collar **225** is provided with two spaced transverse apertures. As will be seen in FIGS. **5** and **6**, the rod and collar assembly are disposed between a pair of parallel support members **231** which have four sets of registering apertures **230** (FIG. **4**) to receive a pin **232**, also adapted to pass through one of the apertures in a collar and through a registering slot of the threaded rod **219**. Carried on the rearward end of the threaded rod **219** is a threaded collar **285** provided with an annular recess to receive a strap **233** hingedly connected to the lift rod **207**. The collar **285** is provided with a knurled head **234** and with a detent pin **236** for effecting locking of the collar in a position of adjustment.

Each of the transverse apertures of the collars **223–225** in combination with a respective aperture **230** in the support members **231** constitutes a different fulcrum position for the operating lever **208** of the pump **198**, so as to vary the stroke of the piston thereof. For example, in the position illustrated in FIG. **4** where the fulcrum is located at a point most remote from the piston rod **217**, the pump **198** is adjusted to deliver substantially one quart of milk for filling a half-gallon carton. Successively, the fulcrum positions moving from left to right are employed for filling quart, ½ quart, and pint sizes of cartons respectively. In each case only substantially ½ of the quantity of liquid will be delivered by a filler head with each operation of the pump **198**. It will be understood that the relative positions of the several collars **223–225** are initially determined by trial and error and the collars then are locked in position by suitable set screws. Correspondingly, the position of apertures **230** are similarly determined.

As various sizes of cartons are required to be filled by the machine, the fulcrum position for the lever **208** is changed by removing the pin **232** from one position and placing it into another position. The sleeve **285** affords a micrometer adjustment of the pump piston travel for calibration of the volume of liquid delivered by the pump. Adjustment of the volume of liquid discharged by the pump is sometimes required as the character of the liquid changes during an operational period of the machine. It will be seen that an adjustment may be readily effected by an operator without the necessity of stopping the machine.

As will be seen by reference to FIG. **2**, the micrometer adjustment feature is eliminated at the first filler head **196**, since the purpose of this head is merely to deliver approximately ½ the final quantity of liquid discharged into the carton. At the final filling station or at filler head **197**, accuracy of volume, of course, is essential, and the quantity of liquid that is to be discharged into the carton below the head must be accurately controlled.

The use of two filler heads operating concurrently, the first delivering substantially ½ of the liquid to the carton and the second completing the filling of an already half filled carton, results in a very substantial reduction in filling time, since only ½ of the contents need be discharged into the carton at the final filling station. This results in a higher rate of production of the machine, as well as reducing the tendency of the liquid to foam during the filling operations.

At the next station immediately following the filler head **197**, a defoaming unit in the form of a tube **237** (FIG. **2**) mounted for vertical reciprocation is caused to enter the mouth of an underlying carton and to evacuate any foam that may be present. The tube **237** is connected by means of a flexible conduit **238** to the top of the supply tank **193** which is connected by means of another conduit **239** to an evacuating system, now shown.

It will be understood that various changes and modifications may be made from the foregoing without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A filler unit comprising a piston pump connected to a supply of liquid, reciprocating means for reciprocating the piston of said pump, said reciprocating means being coupled to said piston by a lever, the arrangement being such that the rate of movement of said piston on the suction stroke is greater than the rate of movement of said piston on the discharge stroke, said lever having a plurality of apertures longitudinally spaced, support means for said lever having a plurality of transverse apertures also longitudinally spaced, a pin constituting a fulcrum for said lever, said pin being adapted for selective positioning in selected apertures in said lever and said support means for varying the fulcrum position of said lever, whereby the stroke of the piston of said pump can be varied to vary the quantity of liquid discharged by said pump, and means on one end of said lever for connecting said lever to said reciprocable means, said connecting means being adjustably movable longitudinally of said lever for finely adjusting the stroke of the piston of said pump.

2. The filler unit of claim **1**, wherein said reciprocating means comprises a reciprocable rod for rocking said lever about said pin constituting a fulcrum for said lever, a drive shaft, a sleeve fixed to the lower end of said reciprocable rod, an eccentric mounted on said drive shaft, a connecting rod fixed to said eccentric and slidably received in the lower end of said sleeve whereby no motion is transmitted to said reciprocable rod, means for selectively locking said connecting rod to said sleeve to transmit reciprocating motion to said reciprocable rod and said lever to operate said pump.

3. The filler unit of claim **1**, wherein said reciprocating means comprises a reciprocable rod for rocking said lever about said pin constituting a fulcrum for said lever, a drive shaft, an eccentric mounted on said drive shaft, a sleeve fixed on the lower end of said reciprocable rod, said sleeve having a pair of registering elongated slots, a connecting rod fixed to said eccentric and slidably received in said sleeve, a pin passing through said connecting rod and said slots and operative on the downward movement of said eccentric to draw said reciprocable rod downwardly to effect a suction stroke by the pump piston, said connecting rod on the upward movement of said eccentric being slidable relative to said sleeve without transmitting corresponding movement to said reciprocable rod and said pump piston.

4. The filler unit of claim **3**, further comprising a pin slidable in said transversely registering apertures, an air cylinder carried on said sleeve and operatively connected to said slidable pin, means for actuating said air cylinder whereby said slidable pin is caused to pass through the apertures of said sleeve and said connecting rod when the same are caused to be moved into registration with each other thereby to lock said sleeve to said connecting rod and to effect transmission of motion from said eccentric to said pump piston.

5. The filler unit of claim **4**, further comprising control means for actuating said air cylinder, said control means having an arm disposed in the path of travel of the cartons to be filled by said filler unit and arranged to be engaged by each of said cartons as said cartons are moved into registration with said filler unit so as to effect actuation of said air cylinder thereby to effect actuation of said pump.

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