Oct. 3, 1961 C. Z. MONROE ET AL 3,002,540

FILLER UNIT FOR A CONTAINER FILLING MACHINE

Original Filed July 16, 1957 5 Sheets-Sheet 1

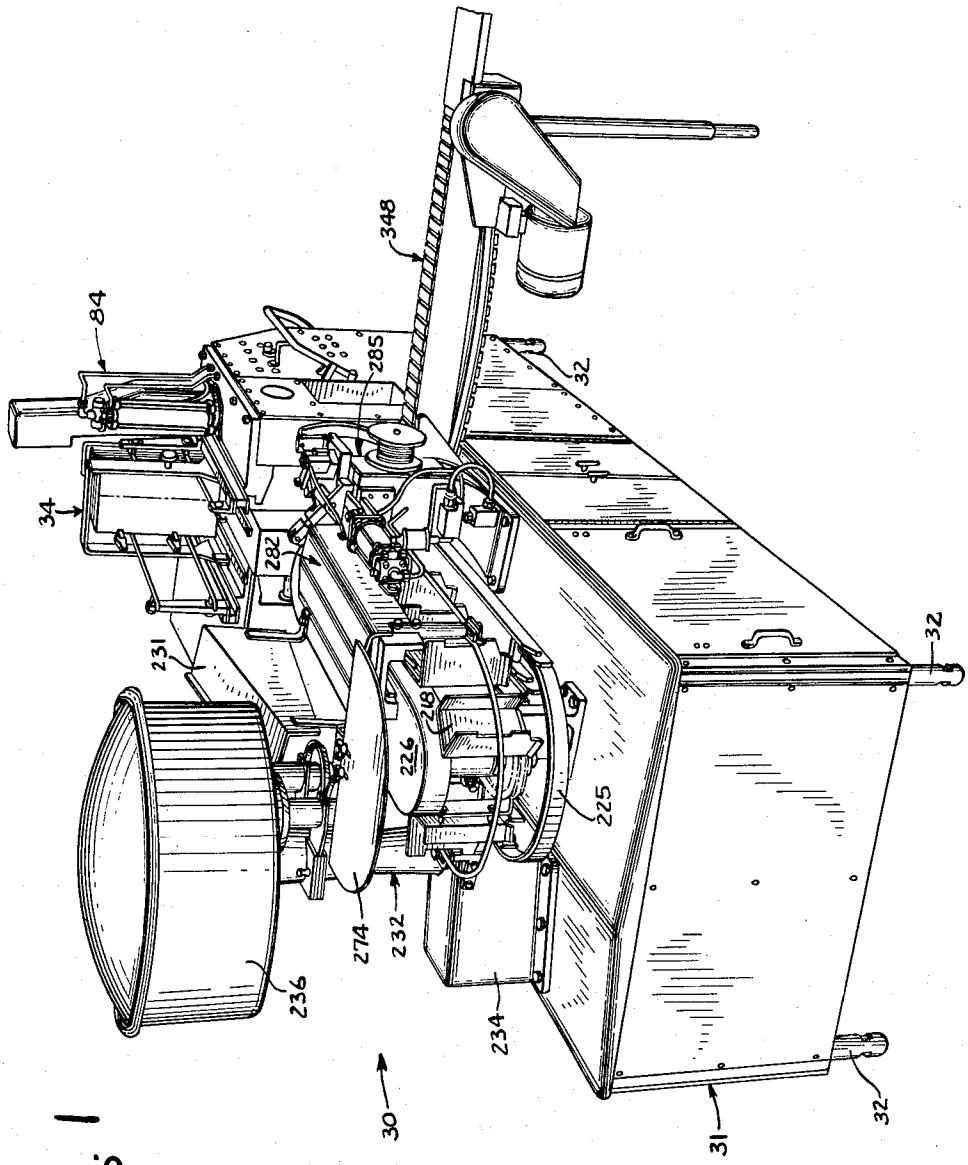


Fig. 1

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Original Filed July 16, 1957 5 Sheets-Sheet 2

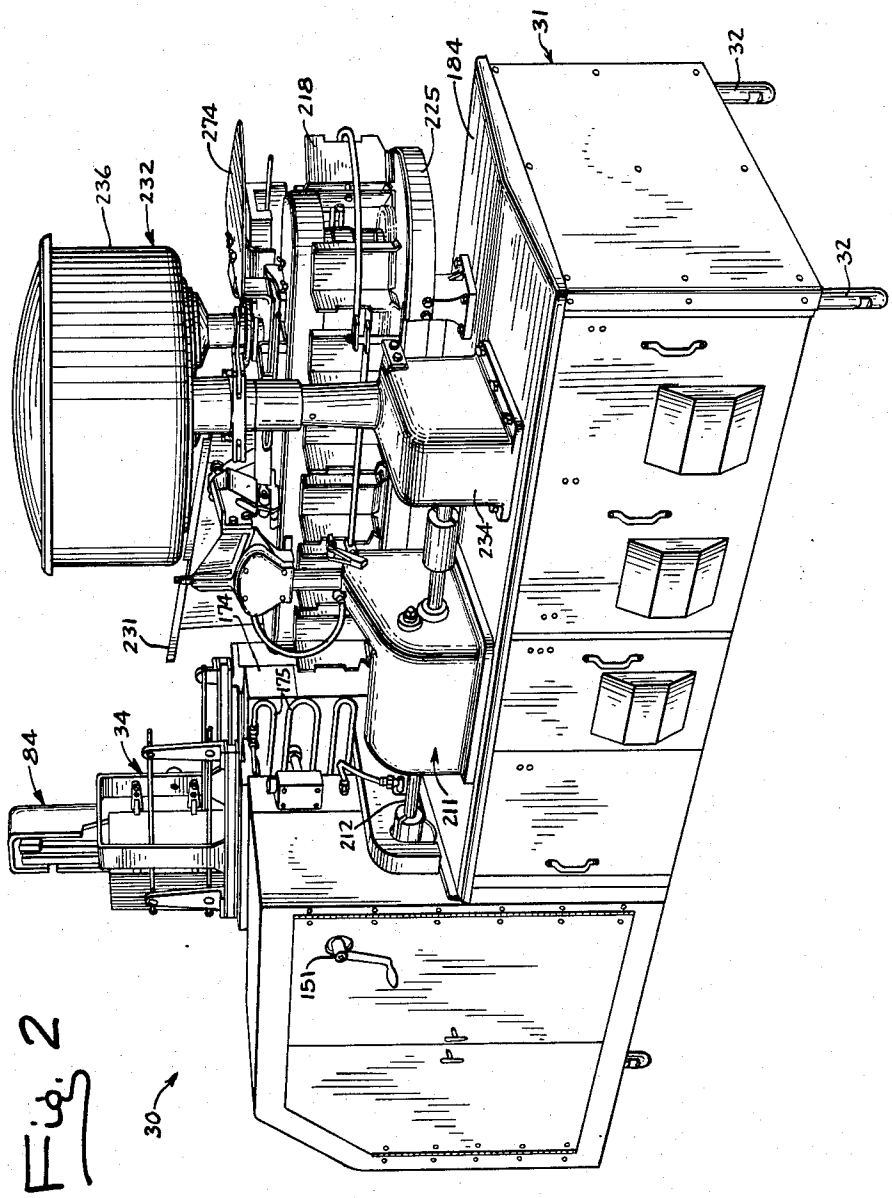


Fig. 2

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Original Filed July 16, 1957 5 Sheets-Sheet 3

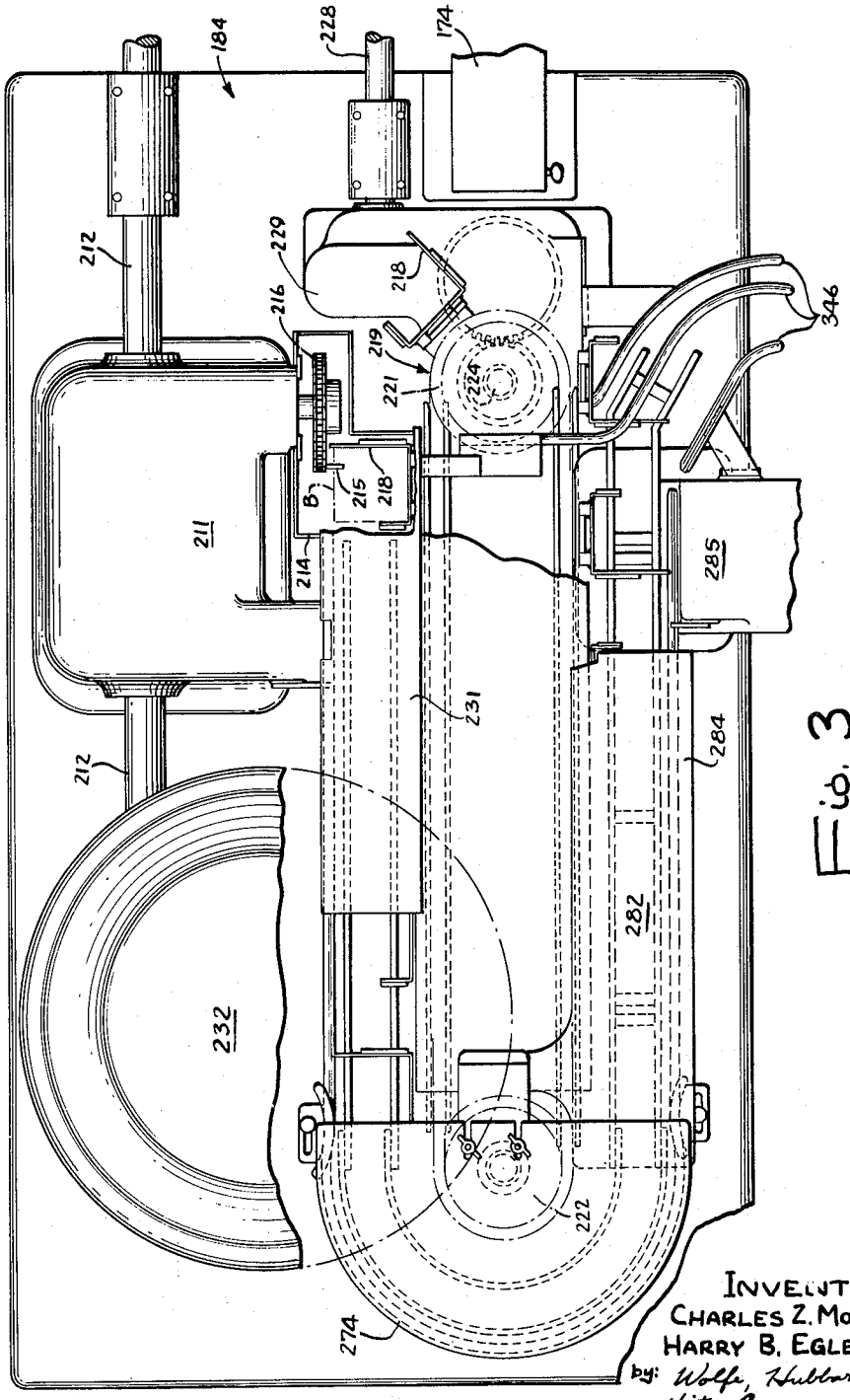


Fig. 3

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Fig. 6

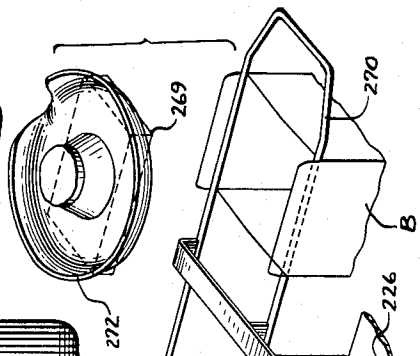


Fig. 5

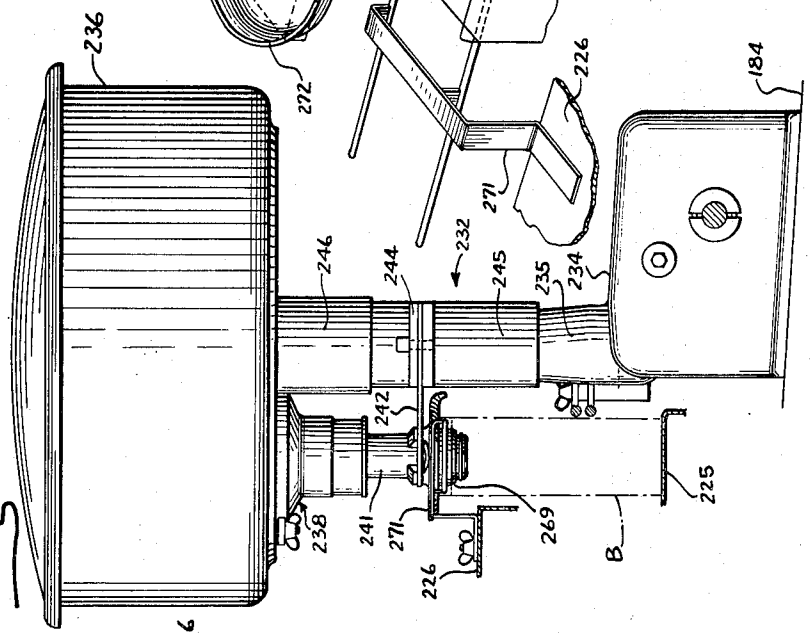
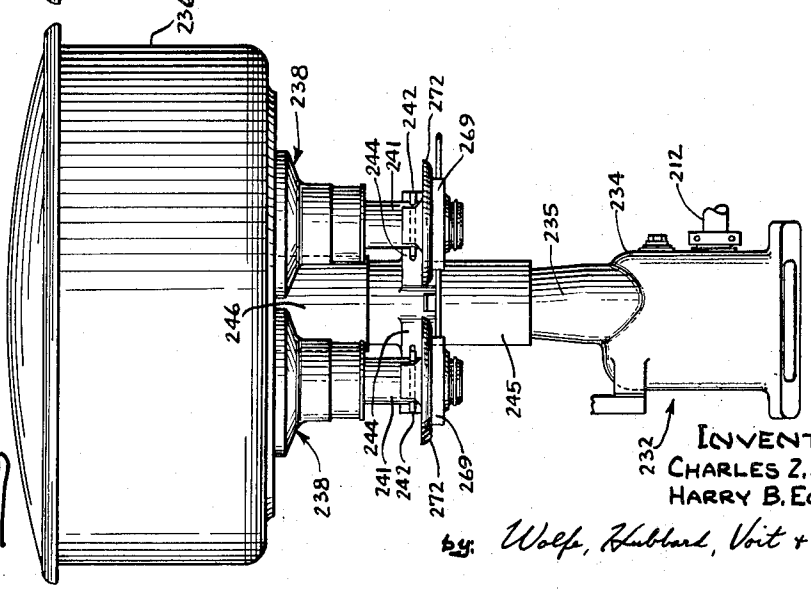


Fig. 4



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Fig. 7

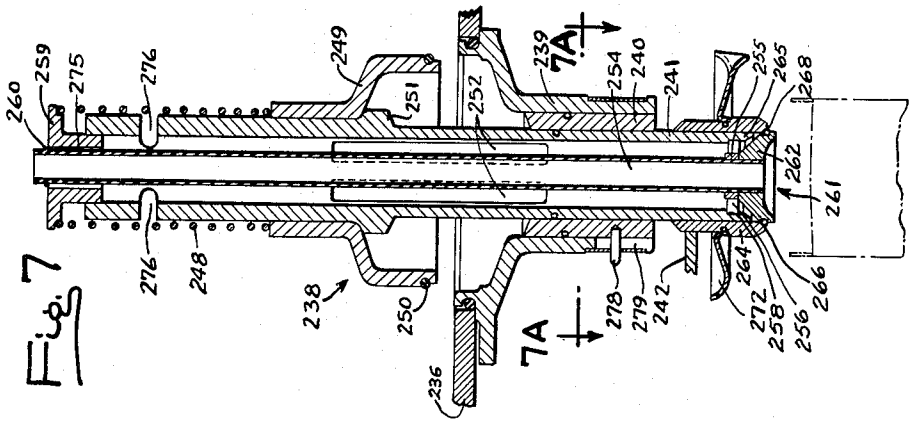


Fig. 8

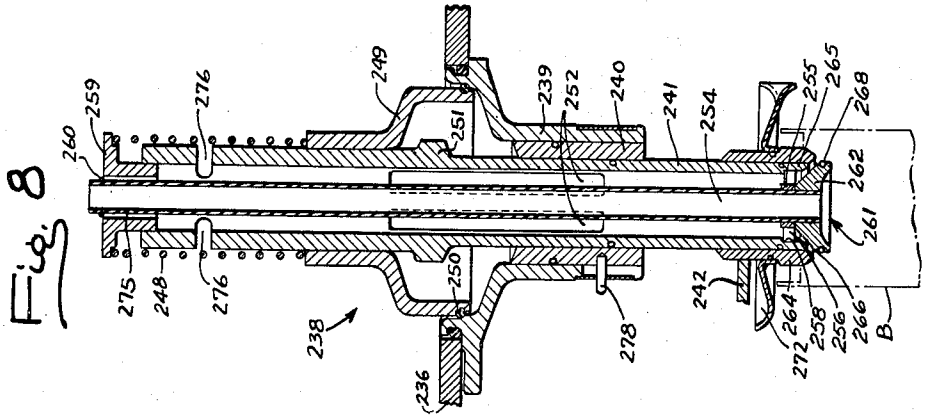


Fig. 9

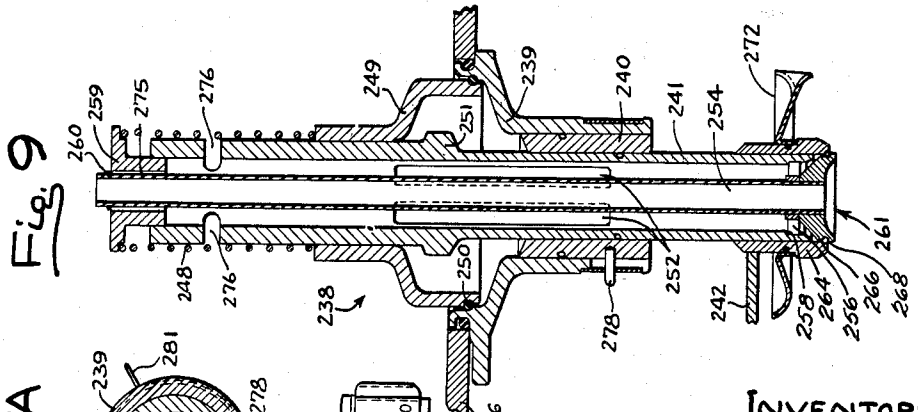


Fig. 7A

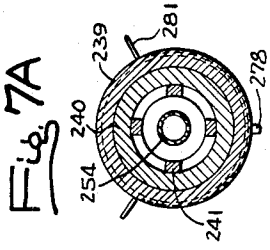
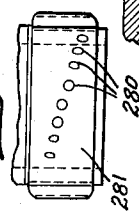


Fig. 7B



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United States Patent Office

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FILLER UNIT FOR A CONTAINER FILLING MACHINE

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Original application July 16, 1957, Ser. No. 672,200, now Patent No. 2,957,289, dated Oct. 25, 1960. Divided and this application Apr. 24, 1959, Ser. No. 808,854

6 Claims. (Cl. 141—308)

The present invention relates in general to carton forming machinery of the type disclosed in United States Patent Nos. 2,357,535 and 2,367,884, issued September 5, 1944, and January 23 1945, respectively, on the application of Charles Z. Monroe. More specifically, the invention is concerned with an improved filler unit adapted to me embodied in a machine for forming, coating, filling, closing and sealing gable top containers of paperboard or the like. The machine finds particular, but not exclusive, utility in producing, from flat collapsed blanks, finished and filled cartons of the type shown in United States Patent No. 2,750,095, issued June 12, 1956, on the application of Carroll R. Alden.

This application is a division of our copending application Serial No. 672,200, filed July 16, 1957, and entitled Machine for Fabricating Containers, now Patent No. 2,957,289, dated October 25, 1960.

One object of the invention is to provide an improved filler unit for a carton forming and filling machine of the character set forth and which will be of simple, rugged construction lending itself particularly well to easy assembly and disassembly for sanitary maintenance.

Another object is to provide a filler unit of the foregoing type capable of operating with speed, precision and reliability.

A further object is to provide a filler unit of the character set forth and having a particularly simple yet highly effective calibrating arrangement.

The foregoing and other objects will become apparent as the following description proceeds, taken together with the accompanying drawings, wherein:

FIGURES 1 and 2 are perspective views showing opposite sides of an illustrative machine embodying a filler unit exemplifying the present invention.

FIG. 3 is a fragmentary plan view of the machine and filler unit of FIG. 1.

FIGS. 4 and 5 are side and end elevational views, respectively, showing the filler unit of the machine.

FIG. 6 is an enlarged, fragmentary perspective view showing certain details of the filler unit.

FIGS. 7, 8 and 9 are enlarged vertical sectional views through one of the filler heads of the filler unit, and FIGS. 7A and 7B are fragmentary views detailing certain parts of the filler unit.

While the invention is susceptible of various modifications and alternative constructions, a certain illustrative embodiment has been shown in the drawings and will be described below in considerable detail. It should be understood, however, that there is no intention to limit the invention to the specific form disclosed, but on the contrary, the intention is to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more specifically to FIGS. 1 and 2, the invention is there shown exemplified in a novel machine 30 for fabricating containers of paperboard or the like and having a filler unit embodying the present invention. The machine is adapted to receive a supply of flat tubular blanks which are appropriately cut and scored, and to operate on them in such a manner that a procession of

filled and sealed containers is discharged therefrom. In the course of such operation, each flat tubular blank is withdrawn from a stack or magazine by means of a feeding mechanism, is erected into a tubular form and passed through a bottom forming mechanism, a moistureproof coating mechanism, and a cooling mechanism, the container then being filled, closed, sealed, and discharged from the machine.

The machine 30 is particularly well adapted to produce paper containers such as the familiar gable top paper milk container disclosed in Alden U.S. Patent No. 2,750,095, supra. This container comprises a single sheet of paper or paperboard cut and scored so as to be divided into a plurality of panels and areas which are utilized for the walls of the container and the closure parts when the container is erected. The blank, as presented to the machine, is folded upon itself and has its side seam already guided, thus defining a collapsed, open-ended tube. When erected and subsequently processed in the machine 30, the resulting container is self-sustaining in shape, strong, sanitary, and low in cost.

The illustrative machine 30 is constructed upon a console 31 supported a slight distance above the floor as by means of legs 32. The console is subdivided into a number of compartments each readily accessible from the exterior of the machine by means of access apertures or suitable doors.

The interior of the console 31 houses mechanisms for moving, erecting, bottom-forming, coating and cooling the containers fabricated by the machine 30. The exterior of the console, on the other hand, supports mechanisms for moving, partially closing or breaking, filling, closing, sealing and stapling the containers after they emerge from the interior. These latter mechanisms are situated primarily on top of the console 31.

Referring more specifically to FIGS. 1 and 2, it might be noted that the machine 30 has a magazine 34 situated on top of the console and adapted to hold a stack of flat, collapsed container blanks B. The blanks B are withdrawn one by one from the magazine and each erected in an open-ended, squared tube by means of a feeder unit. The latter presents each blank to a loader unit 84 which, in turn, transfers it to a mandrel assembly situated inside the console of the machine. The latter and various related mechanisms glue and close the bottom flaps of the blank, coat it with moistureproofing material, such as paraffin, and discharges it as an open-topped container into a large cooling compartment situated inside the machine console beneath an impervious roof panel 184. The cooled container is then transferred from the cooling compartment by means of an elevator and breaker mechanism 211 driven from continuous drive shaft 212 of the machine. The container B, still open at the top, is thereupon presented to a waiting carrier 218 forming one of a series of carriers on an upper conveyor 219 which moves the container under the splash guard 231 and past the various mechanisms on top of the console for the filling, closing, sealing and stapling operations.

All of the foregoing mechanisms are grouped in the machine 30 in a highly compact manner, thereby minimizing the size of the machine. Such compactness is achieved, moreover, while maintaining a relatively rapid flow of containers through the machine and permitting ready access for cleaning and maintenance. By reason of this, and also in view of the fact that the feeding and discharging stations of the machine are placed in relatively close proximity, it is readily possible for a single operator to run the machine.

Mounted on the impervious top 184 of the cooling compartment and on the same side of the conveyor 219 as the elevator and breaker mechanism 211 is a filler unit 232 (FIGS. 1–5, inclusive). The filler unit 232 com-

prises a base 234 (FIGS. 1, 2, 4 and 5) having an upstanding column 235 which carries a supply tank 236 at its upper end. The tank 236 is adapted to hold a relatively large amount of milk or other fluid to be packaged in the containers processed by the machine 30. Mounted within the supply tank 236 and projecting downwardly therefrom are one or more filler heads 238 (FIGS. 4, 5, 7, 8 and 9). In the present instance, the filler unit 232 has two such heads which are identical, each head being mounted in overlying relation with a corresponding container station along the supporting ramp 225. In this case, two-stage filling is employed, each filler head 238 supplying half the contents of the container and each container passing successively under each filler head.

Power for actuating the moving parts of the filler unit 232 is derived from continuously driven shaft 212. The latter operates a cam mechanism within the base 234 and moves the filler parts intermittently in timed relation with the motion of the upper conveyor 219.

As indicated in FIGS. 7 through 9, each filler head 238 comprises a fixed cylinder 239 detachably and sealingly mounted in a suitable aperture in the bottom of the supply tank 236. Adjustably and sealingly mounted within the depending portion of the fixed cylinder 239 is a calibration bushing 240. Slidably and sealingly mounted within the calibration bushing is an operating sleeve 241 adapted to be reciprocated vertically by means of a forked arm 242. The latter is rigidly fixed upon a bracket 244 which is rigidly secured to a movable sleeve 245 situated on the column 235 and reciprocated vertically by means of the filler unit cam mechanism. The top of the movable sleeve 245 is protectively enclosed by means of a skirt 246 (FIGS. 4 and 5) fixed to the top of the column 235.

Telescopically mounted on the upper end of the operating sleeve 241 (FIGS. 7, 8, 9) and resiliently biased downwardly with respect thereto by means of spring 248 is a displacement cylinder 249 which is somewhat bell-shaped. Adjacent its lower external periphery the displacement cylinder 249 is provided with an O-ring 250 adapting the displacement cylinder to sealingly engage the inner peripheral wall of the fixed cylinder 239 which projects upwardly into the supply tank. Within the interior of the displacement cylinder 249 the operating sleeve 241 is provided with a lateral enlargement, abutment, or shoulder 251 intermediate the ends of the sleeve 241. The abutment 251 is adapted to engage the inner wall of the displacement cylinder in the event of sufficient relative sliding between the latter and the operating sleeve. The operating sleeve is also provided with relatively long filling slots 252 providing communication between the interior of the operating sleeve and the interiors of the displacement cylinder and the fixed cylinder.

Concentrically mounted within the operating sleeve 241 and rigidly fixed with respect thereto is an air exhaust tube 254. The latter carries adjacent its lower end a detachable orifice control collar 255 having one or more radial abutments 256 which engage a suitable stop shoulder 258 inside the operating sleeve (FIGS. 7, 8 and 9). The upper end of the exhaust tube 254 is held in place by means of spring retainer collar 259 partially nested within the upper end of the operating sleeve 241. A retainer clip 260 attached to the upper end of the exhaust tube 254 prevents the spring retainer collar 259 from slipping off the tube. Spring 248, compressed between the retainer collar 259 and the upper end of the displacement cylinder 249, provides seating pressure for the latter and also maintains the exhaust tube 254 in position within the operating sleeve 241.

A dispensing valve 261 is mounted adjacent the lower end of the operating sleeve 241. In this instance, the valve comprises a head 262 of frusto-conical shape fixed to the lower end of the air exhaust tube 254 and a container-actuated valve bushing 264 sealingly and slidably mounted on the lower end of the operating sleeve (FIGS. 7, 8 and 9).

The head 262 is maintained in predetermined spaced relation with the internally tapered lower end portion 265 of the operating sleeve 241 so as to define an annular orifice of appropriate size for the viscosity of the fluid to be dispensed. The orifice control collar 255 positions the head 262 and thereby determines the size of the orifice. The vertical length of the collar 255 is somewhat greater than that of its radial abutments 256. The size of the dispensing orifice may, accordingly, be altered by detaching the collar 255 and reassembling it in inverted position on the tube 254.

The valve bushing 264 is formed with a tapered seat 266 at its lower end and which is adapted to sealingly engage a resilient O-ring 268 carried by the head 262. Engagement between the seat and O-ring 266, 268 when the bushing 264 is down, effectively closes the dispensing orifice.

For the purpose of opening the dispensing valve 261 upon descent of the operating sleeve 241 into filling position over a container B, provision is made for raising the valve actuating bushing 264 as an incident to such motion. In furtherance of this objective, the bushing 264 is provided with a generally rectangular container stop 269 (FIGS. 4, 5 and 6). As the sleeve 241 descends, the container stop 269 is accosted by the leading and trailing top edges of the container B, sliding the bushing 264 upwardly relative to the sleeve 241 and opening the dispensing orifice. In order to maintain the stop 269 in proper position and prevent rotational movement of the bushing 264 on the sleeve 241, the upper portion of the bushing 264 is cut away so that it will achieve a comfortable sliding fit between the prongs of the forked drive arm 242 which operates the sleeve 241.

To keep the mouth of the container B in a fully open position and also preserve sufficient stiffness in the container walls to lift the container stop 269, a spreader rail 270 of substantially U-shaped form (FIG. 6) is fixed in overlying relation with the filling stations. The spreader rail 270 is carried on a bracket 271 fixed to the cover 226 and is arranged with the rounded end of the U pointing in the direction from which the containers are received for filling. The rail 270 is so proportioned that it enters between the upstanding, opposed top flaps of the container and maintains them in fully spread relation.

To prevent accumulated condensation on the supply tank 236 or the filler heads 238 from dripping into the containers as they pass beneath these members, each bushing 264 is provided with a suitable annular drip pan 272 (FIGS. 4, 5 and 6). In addition, a downwardly inclined semi-circular protective panel 274 (FIGS. 1 and 2) is interposed between the tank 236 and the outer end of the conveyor 219. Further protection is also afforded by the splash guard 231 which extends under the tank 236.

The operation of the filler head 238 may readily be followed by starting with the head in the condition illustrated in FIG. 7. At this time, the displacement cylinder 249 and operating sleeve 241 are in their fully raised position, permitting fluid from the tank 236 to flow freely into the interior of the sleeve 241 and into the interiors of the cylinders 239, 249. As the forked drive plate 242 moves the operating sleeve 241 downwardly, the displacement cylinder 249, due to the biasing effect of spring 248, will also move downwardly until the lower end of the displacement cylinder 249 commences to telescope into the open upper end of the fixed cylinder 239. This pressurizes the fluid trapped between the interior of the cylinders 239, 249 and between the interior of the sleeve 241 and the exterior of the tube 254, causing excess fluid to surge upwardly and out through overflow vents 275 in the retainer collar and vents 276 in the operating sleeve. As the operating sleeve 241 descends further, the displacement cylinder 249 seats firmly within the fixed cylinder 239 but the sleeve 241 continues to descend. The shoul-

der 251 thereupon separates from the inner wall of the displacement cylinder 249 and, because the diameter of the sleeve 241 is, in the present instance, somewhat larger above the shoulder 251 than below it, additional fluid continues to be displaced or metered out of the interior of the head 238 via the vents 276. This metering action is due to the fact that the enclosed volume within the displacement cylinder 249 is being progressively reduced by the descent of the sleeve 241 and shoulder 251 therein with an increasing exposure of the larger diameter portion of sleeve 241 above the shoulder 251. Such action continues until the operating sleeve 241 has reached the extreme lower limit of its stroke, insuring that a consistently uniform quantity of fluid will be accumulated and discharged during each operating cycle of the unit.

As the operating sleeve 241 and dispensing valve 261 approach the lower limit of their travel, and provided that there is a container in the station underlying the filler head 238, the leading and trailing opposed top edges of the container B will accost the container top stop 269 (FIGS. 4, 5 and 6). Such action raises the bushing 264, opening the dispensing valve orifice as indicated in FIG. 8 and permitting a measured quantity of fluid from the interior of the filler head 238 to be discharged into the underlying container. The flow of discharged fluid tends to spread out and follow the interior walls of the container, with the result that air displaced by the incoming fluid is discharged centrally and upwardly from the container via the exhaust tube 254. The existence of an adequate air exhaust passage at this point materially reduces any tendency toward foaming.

After the contents of the filler head 238 have been discharged, the operating sleeve 241 is driven upwardly by the filler unit cam mechanism and the forked drive arm 242. As an incident to this upward travel, the valve actuating bushing 264 descends and closes the discharge orifice. The shoulder 251 of the operating sleeve 241 moves upwardly into contact with the inner wall of the displacement cylinder 249, lifting the same and restoring the parts of the filler head to the position indicated in FIG. 7 for the start of another cycle.

For the purpose of calibrating or adjusting the quantity of fluid dispensed by the filler head 238, the calibration bushing 240 may be precisely adjusted relative to the fixed cylinder 239 so as to change the internal volume of the latter. This is accomplished in the present instance by means of a locating pin 278 projecting from the bushing 240 and adapted to move vertically in a suitable slot 279 in the wall of the fixed cylinder 239 (FIGS. 7, 7A, 7B). The calibration bushing 240 and locating pin 278 may be adjustably positioned by engagement with any selected one of a plurality of calibration apertures 280 in a spring clip 281. The clip 281 is mounted in a shallow groove in the outer periphery of the fixed cylinder 239 and is held in place by means of a simple snap fit.

After the containers leave the filler unit 232, they are moved around the outer end of the conveyor 219 and presented to a closer mechanism 282 situated on the opposite side of the conveyor from the filler unit (FIGS. 1 and 2). The latter is adapted to interlock and fold the elements of the container top closure into closed position.

The container then enters the sealing and stapling mechanism 285 (FIGS. 1 and 3) where its top rib is firmly clamped between two jaws, sealed by means of heat, and receives a staple. The completed and filled container then emerges in finished form from the sealing and stapling mechanism 285 and is led by discharging guide rails 346 to an appropriate discharge conveyor 348.

We claim as our invention:

1. A filler unit for a container filling machine comprising, in combination, a supply tank, a fixed cylinder sealingly mounted in an aperture in the bottom of said supply tank, a displacement cylinder adapted to telescope within said fixed cylinder and to trap fluid within said cylinders, an operating sleeve having a lateral enlargement intermediate the ends thereof, said operating sleeve being slidably mounted within said cylinders for upward and downward movement therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, upward movement of said operating sleeve lifting said displacement cylinder through engagement of the same by said lateral enlargement, means for effecting downward movement of said displacement cylinder upon downward movement of said operating sleeve, means defining at least one aperture in that portion of said operating sleeve within said cylinders establishing communication between the latter and the interior of said operating sleeve, means defining at least one metering vent in that portion of said operating sleeve outside said cylinders but within said supply tank and also establishing communication between the latter and the interior of said operating sleeve, a dispensing valve at the lower end of said operating sleeve, and an air exhaust tube running longitudinally of said operating sleeve.

2. A filler unit for a container filling machine comprising, in combination, a supply tank, a fixed cylinder sealingly mounted in an aperture in the bottom of said supply tank, a displacement cylinder adapted to fit said fixed cylinder telescopically and to trap fluid within said cylinders, an operating sleeve having a lateral enlargement intermediate the ends thereof, said operating sleeve being slidably mounted within said cylinders for upward and downward movement therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, upward movement of said operating sleeve lifting said displacement cylinder through engagement of the same by said lateral enlargement, means for effecting downward movement of said displacement cylinder upon downward movement of said operating sleeve, means defining at least one slot through that portion of the wall of said operative sleeve enclosed within said cylinders, a dispensing valve at the lower end of said operating sleeve, a calibration bushing slidably and sealingly interposed between said fixed cylinder and said operating sleeve, and means for locating said calibration bushing at any one of a plurality of preselected positions relative to said fixed cylinder whereby the internal volume thereof is varied.

3. In a machine for filling containers, a filler head comprising, in combination, a fixed cylinder adapted for sealed mounting on the bottom of a fluid supply tank, a displacement cylinder adapted to fit telescopically within said fixed cylinder and to trap fluid within said cylinders, an operating sleeve having a lateral enlargement intermediate the ends thereof, said operating sleeve being slidably mounted within said cylinders to be moved upwardly and downwardly therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, upward movement of said operating sleeve lifting said displacement cylinder through engagement of the same by said lateral enlargement, means for effecting downward movement of said displacement cylinder upon downward movement of said operating sleeve, means defining at least one aperture in that portion of the wall of said operating sleeve within said cylinders, an air exhaust tube running longitudinally of said operating sleeve and having an enlarged head fixed to the lower end thereof, a detachable collar mounted on said tube adjacent said head, said collar having a plurality of radial projections engaging the lower end portion of said operating sleeve and spacing said head therefrom so as to define a discharge aperture, and a container-actuated valve bushing slidably mounted on the lower end of said operating sleeve, said valve bushing having means thereon to open and close said discharge aperture as an incident to said upward and downward motion of said operating sleeve.

4. In a machine for filling containers, a filler head comprising, in combination, a fixed cylinder mountable on the bottom of a fluid supply tank, a displacement cylinder adapted to fit telescopically within said fixed cylin-

der and to trap fluid within said cylinders, an operating sleeve having a lateral enlargement intermediate the ends thereof, said operating sleeve being slidably mounted within said cylinders to be moved upwardly and downwardly therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, upward movement of said operating sleeve lifting said displacement cylinder through engagement of the same by said lateral enlargement, means defining at least one aperture in that portion of the wall of said operating sleeve within said cylinders and at least one aperture in that portion of said wall above said cylinders, an air exhaust tube running longitudinally of said operating sleeve and having an enlarged frusto-conical head fixed to the lower end thereof, a detachable collar mounted on said tube adjacent said head, said collar having a plurality of radial projections engaging the lower end portion of said operating sleeve and spacing said head therefrom so as to define a discharge aperture, a container-actuated valve bushing slidably mounted on the lower end of said operating sleeve, said valve bushing having means thereon to open and close said discharge aperture as an incident to upward and downward motion of said operating sleeve, a retainer collar fixed to the upper end of said air exhaust tube, and a resilient element interposed between said retainer collar and said displacement cylinder for moving said displacement cylinder downwardly upon downward movement of said operating sleeve.

5. A filler unit for container filling machines comprising, in combination, a supply tank having an aperture in the wall thereof, a fixed cylinder mounted on said supply tank in communication with said aperture, a displacement cylinder disposed for telescopic engagement with said fixed cylinder, an operating sleeve mounted within said cylinders for upward and downward movement therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, said operating sleeve having a first portion mounted for sliding movement within said displacement cylinder and a second portion mounted for sliding movement within said fixed cylinder, a lateral enlargement on said operating sleeve between said first and second portions adapted to engage said displacement cylinder upon upward movement of said operating sleeve to move said displacement cylinder out of enlargement with said fixed cylinder, means for effecting downward movement of said displacement cylinder upon downward movement of said operating sleeve, a dispensing valve at the lower end of said operating sleeve, means defining communication between the interior of said operating sleeve and said cylinders, and means defining communication between the interior of said operating sleeve and said supply tank.

6. A filler unit for containers and comprising, in combination, a supply tank having an aperture in the wall thereof, a fixed cylinder sealingly mounted on said supply tank in communication with said aperture, a displacement cylinder disposed for telescopic engagement with said fixed cylinder, an operating sleeve mounted within said cylinders for upward and downward movement therein, means for moving said operating sleeve upwardly and downwardly within said cylinders, said operating sleeve having a first portion mounted for sliding movement within said displacement cylinder and a second portion mounted for sliding movement within said fixed cylinder, a lateral enlargement on said operating sleeve between said first and second portions adapted to engage said displacement cylinder upon upward movement of said operating sleeve to move said displacement cylinder out of engagement with said fixed cylinder, means for effecting downward movement of said displacement cylinder upon downward movement of said operating sleeve, a dispensing valve at the lower end of said operating sleeve, means defining communication between the interior of said operating sleeve and said cylinders, means defining communication between the interior of said operating sleeve and said supply tank, and an air exhaust tube housed within said operating sleeve and connected to said dispensing valve but sealed off from the interior of said operating sleeve.

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