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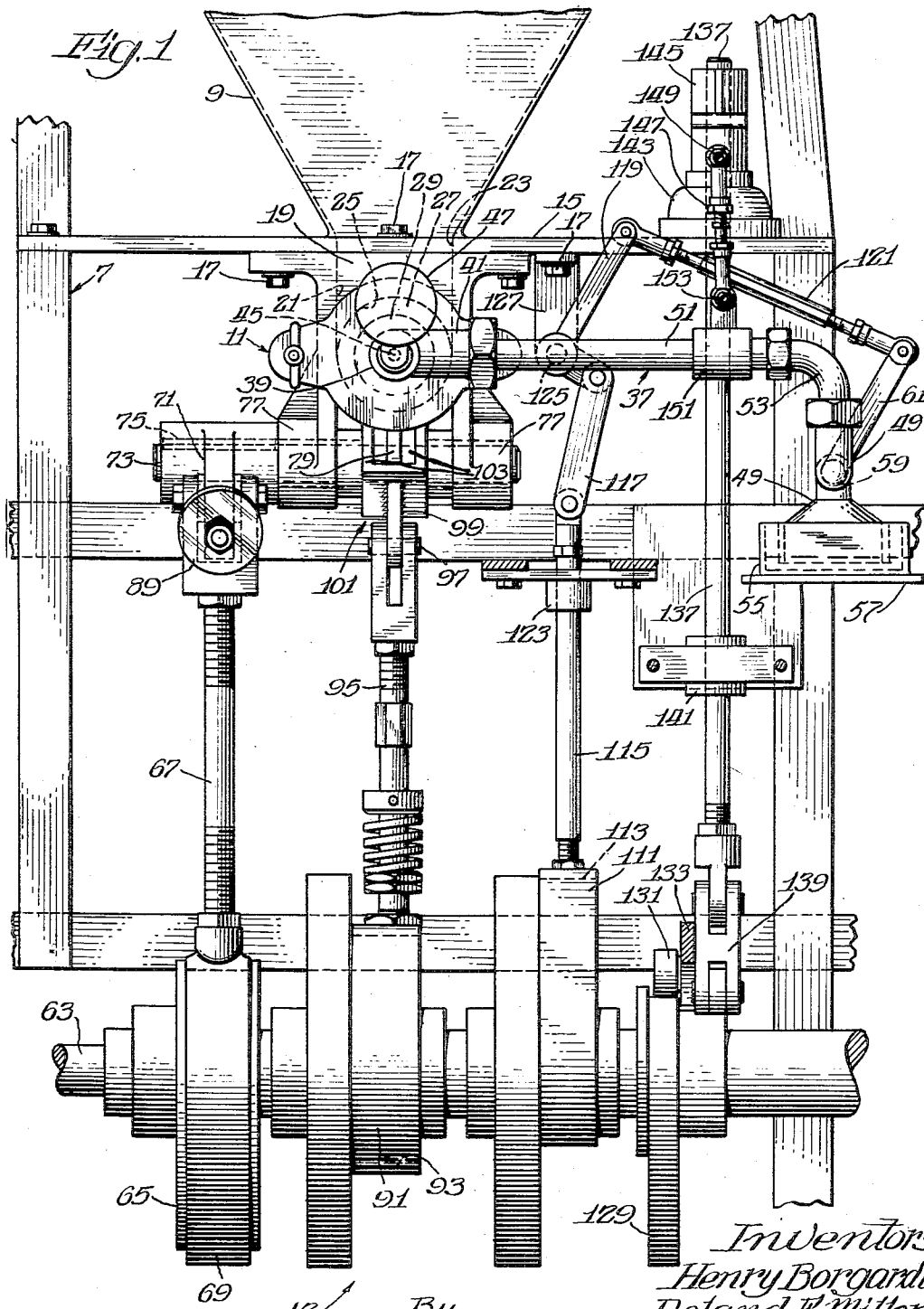
H. BORGARDT ET AL

2,854,170

VISCOUS MATERIAL DISPENSER

Filed Sept. 14, 1955

3 Sheets-Sheet 1



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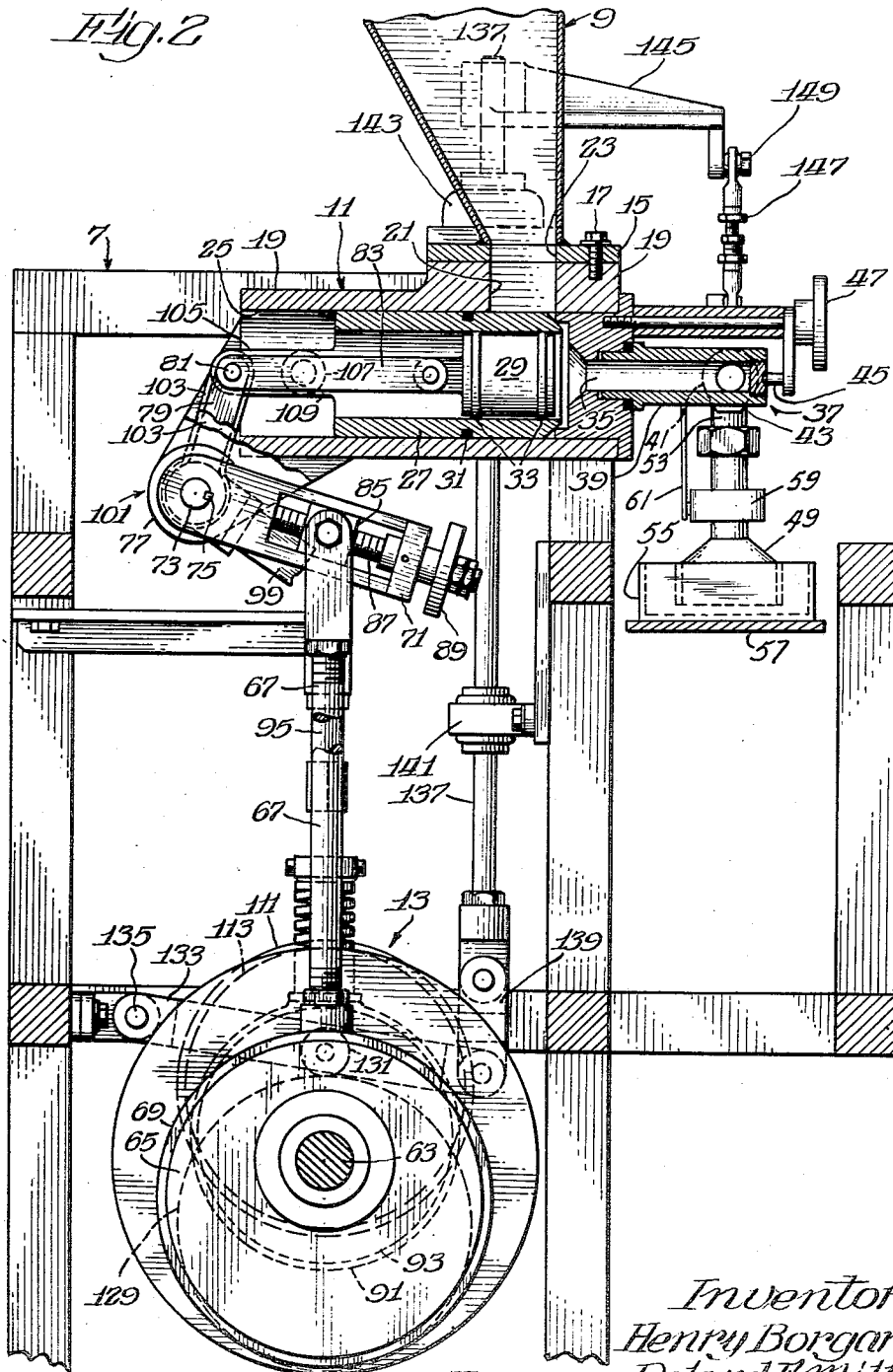
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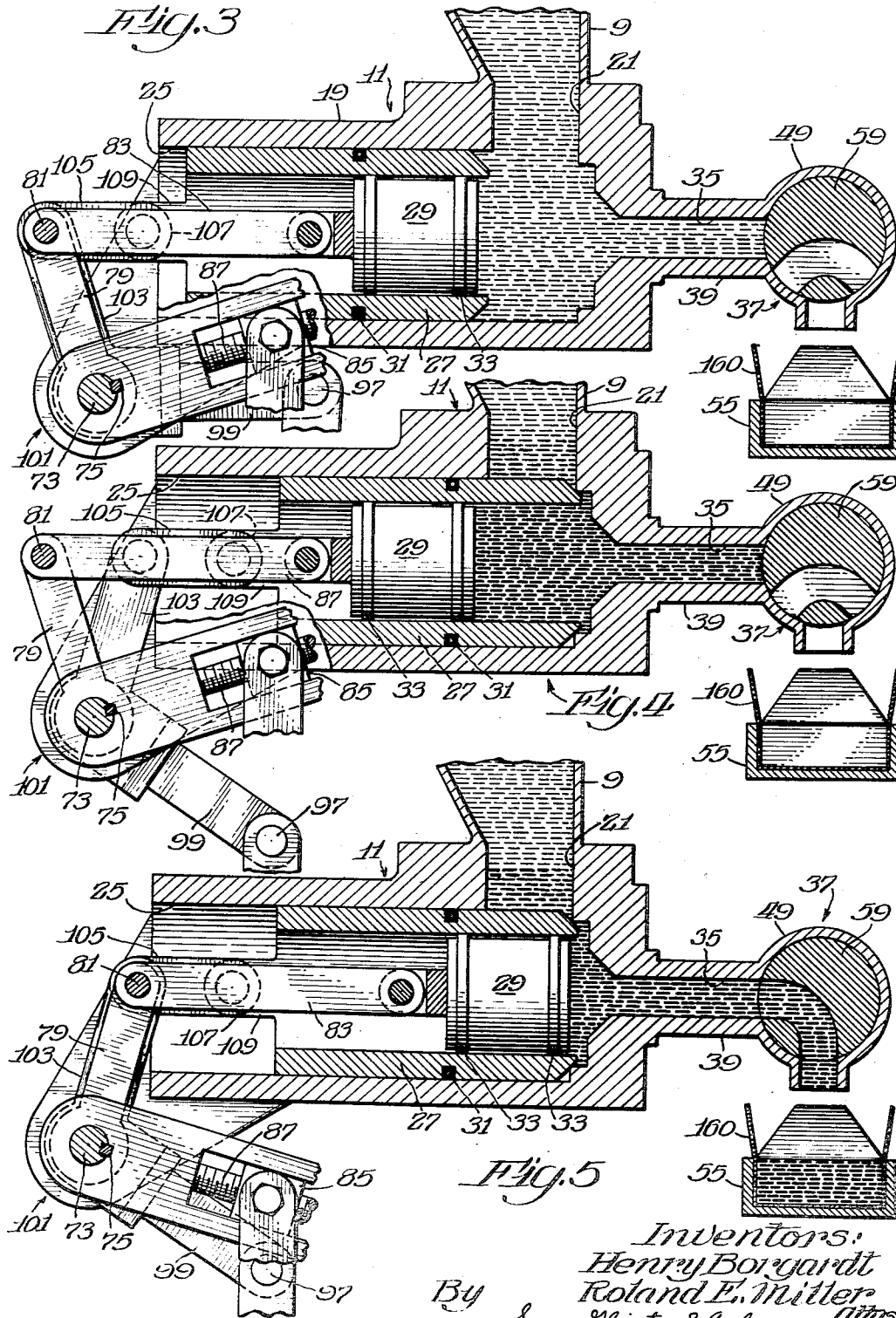
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VISCOUS MATERIAL DISPENSER

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8 Claims. (Cl. 222—1)

The present invention relates generally to the art of packaging and is particularly directed to a method and apparatus for filling containers with a viscous material.

In the packaging of very viscous materials, for example cream cheese, mayonnaise and the like, it has been very difficult to maintain a satisfactory weight range for each package while operating under assembly-line procedures at relatively fast speeds. The very nature of such products fosters a tendency for air to be entrapped within the material so that a given volume of the material varies appreciably in weight with each dispensing operation. In order to compensate for this condition, it has been customary heretofore to dispense a sufficiently large volume or mass of material so that the minimum weight requirements are met under even the most adverse conditions. However, this is very uneconomical in that most of the packages or containers are considerably overweight as a result of following the above procedure. In some instances, this practice may also add to the difficulties and expense encountered in providing a container of suitable volume.

The principal object of the present invention is to provide a novel method and means for filling a container with a predetermined amount of material. Another object is to provide a novel and improved means for filling containers with a viscous fluid or semi-fluid material, in a manner affording accurate measurement of the material at each filling operation. A further object is to provide a power-driven filling apparatus of the type referred to, which is capable of conditioning the viscous material during operation so as to substantially reduce or eliminate air from the material and thereby present a predetermined uniform measurement of the material throughout repeated filling operations of the apparatus.

Other objects and advantages will become apparent as the disclosure progresses, with reference to the accompanying drawings wherein:

Fig. 1 is an elevational view of apparatus embodying the principles of this invention.

Fig. 2 is a view taken from the left in Fig. 1, with parts omitted or in section to more clearly illustrate certain details of the mechanism.

Figs. 3-5 are enlarged, schematic showings of the disclosed embodiment, illustrating the several main stages of operation of the machine.

The assembly line packaging of fluid and semi-fluid materials is ordinarily accomplished by sequentially passing the containers under a valved filler spout, and the filler mechanism is suitably actuated to discharge a predetermined quantity of the material into each container. The prior devices for accomplishing this operation have not been too satisfactory in the handling of viscous fluids and semi-fluids, particularly when each package or container is designated as containing a specified weight of the material, because of the tendency of such materials to accumulate air. Consequently, it has been necessary to provide a sufficiently large volume at each dispensing operation, so that even under the most extreme conditions the

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net weight of the substance is at least the minimum required weight.

The above situation is, of course, quite unsatisfactory in that it results in many, if not most, packages being overweight and thereby produces a loss to the manufacturer. Furthermore, it provides for the packaging of the material with the air entrapped therein, which condition will either afford unsightly voids in the material or result in a compacting of the material to a reduced volume after it has been packaged. In either case the ultimate consumer is very likely to have the impression that he has been sold an underweight package.

Generally, the present invention provides a solution to the above problem by a novel manner of handling the material so as to provide a pre-compressing of the viscous material and thereby eliminate air from the quantity to be discharged into the container.

With reference to the drawings, it is seen that the apparatus chosen to illustrate the invention comprises generally a frame structure 7 supporting a hopper 9 which delivers the fluid or semi-fluid material to a filler mechanism 11. The latter is power actuated through a drive means indicated generally at 13.

More particularly, it is seen that the hopper structure 9 is welded or otherwise suitably secured to a cross frame member 15 which also supports the underlying filler mechanism or dispenser 11. The latter is secured to frame member 15, as by a series of cap screws 17, and includes a main housing portion 19 having a passageway 21 formed in the upper part thereof which may be rectangular or any other suitable form and which generally coincides with the opening at the lower end of the hopper and extends downwardly therefrom. Of course, a similar sized opening 23 is provided in the frame member 15 to afford communication between the hopper and the filler.

The filler housing 19 also includes a horizontal, cylindrical bore 25 disposed at right angles to the vertical passageway 21 and containing a movable sleeve 27 and a cylindrical plunger or piston 29 disposed within the sleeve 27 for axial movement relative thereto. Suitable means is provided to prevent leakage between the sleeve and the bore 25, such as the O-ring 31, and the piston 29 is also equipped with rings 33 of tetrafluoroethylene polymer, such as the product sold under the trademark "Teflon," or the like to prevent leakage between the inner wall of the sleeve 27 and the piston.

The forward end of the bore 25, that is the inner end which communicates with the passageway 21 leading from the hopper, communicates with a co-axial bore 35 of reduced size which extends to the forward end of housing 19. The outer end portion of bore 35 is adapted to receive one end of a filling spout assembly 37 which, in the illustrated machine, is adapted to deliver material at a position forwardly of and spaced laterally from the housing 19. At one end of the spout assembly there is provided a swivel mounting including a nipple 39 which is rotatably mounted in the bore 35 and has a laterally projecting pipe section 41 secured to its outer end in fluid communication therewith. The outer end of the nipple 39 is closed by a plug 43 having an axial recess in its outer face for receiving a supporting swivel pin 45. The pin 45 is carried by a screw-thread locking device 47 detachably secured to the housing 19 and this pin coacts with the nipple 39 to hold the latter in place while affording some degree of axial adjustment for the nipple.

The pipe 41, which extends at right angles to the nipple 39, is connected through another pipe section 51 and an elbow 53 in fluid communication with a valved dispensing part comprising a filler spout 49. In the illustrated structure, the spout 49 is divergent in shape to thereby generally conform with the width of the package

to be filled which is set in a rectangular form 55 (Fig. 2) carried on an endless conveyor belt 57. The spout 49 includes a suitable cylindrical valve, indicated at 59 in Fig. 1, which is rotated about its axis by an arm 61 secured to one end of the valve to open and close the port communicating with the atmosphere at the end of the spout.

For operating the above-described dispensing mechanism there is provided the drive mechanism 13 which includes a suitable source of power (not shown) connected with a drive shaft 63 suitably journaled on a lower portion of the frame 7. As will be seen, the rotation of the drive shaft 63 effects reciprocal movement of the sleeve 27 and the piston 29, affords vertical swinging movement of the spout assembly 37 about the axis of the swivel pin 45, and opens and closes the dispensing valve 59, all in properly timed sequence.

Looking at Fig. 1, the first drive means to the left on the drive shaft 63 is for effecting reciprocation of the piston 29 relative to the sleeve 27 in housing 19. This drive comprises an eccentric 65, a circular strap 69 rotatably mounted on the eccentric, and a connecting rod 67 adjustably fixed to the upper portion of strap 69. The upper end of the connecting rod 67 is pivotally connected to an arm 71 which is fixed to a cross shaft 73 by a key 75. The shaft 73 is rotatably mounted in a pair of aligned journal portions 77 which are formed integrally with the housing 19 at the rearward end thereof. Also keyed to the cross shaft 73 for rotation therewith is a second arm 79 which completes the crank assembly for the piston 29 and which is pivotally connected at its free end by a pin 81 (Fig. 2) to the adjacent end of a piston rod 83 for the piston 29.

It will be noted that the stroke of the piston 29 may be adjusted in two ways. First, the connecting rod 67 is threaded at both ends to afford variation of the effective length of the rod. Then too, the upper end of the connecting rod is pivotally connected to an internally threaded trunnion 85 carried by a screw 87 having an adjusting knob 89. The latter adjustment affords a variation in the effective length of the arm 71 and, consequently, also serves to change the length of stroke for the piston 29.

The second drive means, from the left in Fig. 1, is for effecting reciprocation of the sleeve 27 and includes a boxed cam on the drive shaft 63 comprising a guide fork 91 fitted with a bearing and cam follower that is operated by a closed cam 93. An adjustable length connecting rod 95 is fixed at one end to the guide fork 91 and the upper end of the connecting rod 93 is pivotally connected, through a pin 97, with a depending arm portion 99 of a crank assembly 101 which is rotatably mounted on the cross shaft 73. The crank assembly 101 also includes a yoke comprising a pair of spaced apart arms 103, each of which is pivotally connected at its free end to a link 105 (Fig. 2) extending inwardly of the sleeve 27 and fixed to the inner side walls of the sleeve as by a cap screw 107 or the like. The links 105 are restrained against swinging movement relative to the sleeve 27 by suitable means, such as the inwardly projecting bosses or shoulders 109 which engage the upper and lower edges of the links.

There is also provided means for operating the valve 59 in the filler spout 49 from the drive shaft 63. More particularly, the valve operating means is in the form of a second box cam on the shaft 63 (Fig. 1) which comprises a guide fork 111 including a bearing and a cam follower that is operated by a closed cam 113. The guide fork 111 is operatively connected to the valve 59 through a connecting rod 115, a link 117, bell crank 119, an adjustable link 121, and the lever 61 which rotates the filler spout valve 59. The connecting rod 115 is guided in its vertical movement through means of a bearing bracket 123 carried by the frame, and the bell crank 119 is pivotally mounted on a cross shaft 125 car-

ried by a pair of depending bracket arms 127 fixed to an upper portion of the frame.

The final and fourth driving connection with the shaft 63 includes means for swinging the filler spout assembly 37 about the axis of the swivel pin 45, to thereby permit the filler spout 49 to rise with the level of the material in the container as the latter is being filled. This drive arrangement includes an eccentric cam 129 on the shaft and a cam follower 131 rotatably carried on a link 133 which is pivotally connected at one end to a portion of the frame 7 by a pin 135 (Fig. 2). The other end of link 133 is pivotally connected to the lower end of a connecting rod 137, through a link 139, and the connecting rod extends vertically through a pair of axially aligned bearing brackets 141 and 143 to a position of support for a laterally projecting arm 145 fixed on the rod 137.

The free end of the arm 145 is disposed in overlying relation to the filler spout assembly 37 and is connected therewith through means including an adjustable-length link 147. The latter link is pivotally connected to the arm 145, by a suitable fastener 149, and to a sleeve 151 on the pipe section 51 of the filler spout assembly by a fastener 153. It is seen, therefore, that as the laterally projecting arm 145 moves vertically with the connecting rod 137 it effects a corresponding movement of the filler spout assembly about the swivel pin 45.

Having in mind the foregoing description of the selected embodiment of the invention, an explanation of the operation of the mechanism will be given with particular reference to the schematic illustrations in Figs. 3-5. As seen in the latter figures, the features of this invention are particularly concerned with the operation of the filler mechanism and the description will be largely confined to such operation. It should be understood, however, that the above described drive mechanism is properly arranged and timed to afford the sequence of movements to be related.

In the initial stage of the operation, as seen in Fig. 3, the hopper 9 is filled with the fluid or semi-fluid viscous material to be handled, and the sleeve 27 and piston 29 are retracted to fully open the passageway 21 and permit entry of the material into the passageway 35 and thence to the filler spout 49. At this stage, the valve 59 in the end of the spout is closed.

As the drive shaft 63 is rotated it first causes the cam 91, operating through connecting rod 95 and the associated parts described above, to move the sleeve 27 inwardly of the bore 25 in housing 19 to shut off the passageway 21 (Fig. 4). Continued rotation of the drive shaft 63 causes motion to be transmitted through the eccentric 65 and connecting rod 67 to move the piston 29 inwardly relative to the sleeve 27, as seen in Fig. 5. The inward movement of the piston 29 is also accompanied by a movement of the filler spout valve 59 to an open position to permit the discharge of material through the spout under the pressure of the piston. The valve 59 is, of course, operated by the cam 111 on the drive shaft in the above described manner. Furthermore, the cam 129 is effective during the flow of material from the spout 49 to cause the spout to rise with the level of the material being dispensed into the container 160 held by the package form 55.

The above manner and sequence of operation offers considerable advantage over previous methods for filling containers and is particularly effective in producing uniform measurements of viscous material, wherein substantial quantities of air are often trapped within the material to produce considerable variation in the measurements of the quantities dispensed. The described apparatus and method successfully combats this latter difficulty by providing a two-stage pressure action on the volume of material to be dispensed during each cycle of operation.

First, the sleeve 27 moves into its position closing off the passageway 21 leading from the hopper and thereby

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traps a quantity of the material between the piston 29 and the closed valve 59 in the filler spout. This action is, of course, quite rapid and is believed to have a two-fold effect. It creates a pressure on the material within the closed sleeve to compress any air bubbles present in that area, and it also creates a force on the material immediately overlying the sleeve 27 in passageway 21. The latter force is due to the displacement of a substantial quantity of material from the dispenser back to the hopper, through the action of the sleeve 27, and the material thus displaced acts in opposition to the pressure head of the material in the bottom of the hopper 9 to compress the material and thus remove the air bubbles from that portion of the material which will be dispensed during the succeeding cycle of operation. Consequently, there is in effect a pre-conditioning of the material at the bottom of the hopper 9 to present a more compact material to the piston during its succeeding stroke.

Then too, the cut-off of the material to be charged into the filling spout by a relative thin-walled sleeve can be done more rapidly and with less disturbance of the material than with a solid plunger or piston of similar capacity.

The second pressure stage in the dispensing operation is, of course, the discharge stroke of the piston 29 when the material contained by the sleeve 27 is forced through the pipes leading the open filler valve 59 in spout 49. The viscous material having been pre-compressed by the sleeve 27, both when such material was in the bottom of the hopper 9 and later when it was received into the bore 25 in the filler housing 19, there remains no appreciable trace of air in the material and it is dispensed in its most compact form.

Heretofore, it was accepted that with the dispensing of viscous fluid or semi-fluid material, such as cream cheese and mayonnaise, a weight tolerance of +6 grams was necessary for 8 ounces of material. With the described apparatus it has been possible to reduce the weight tolerance to +3 grams for 8 ounces and still produce no underweight packages. The resulting savings to a producer of millions of such packages annually is, of course, very substantial. Further, the present invention has made possible this very appreciable savings in material per package, while operating at the same or even greater rate of speed than previously.

Although described with respect to a particular embodiment, it should be apparent that the principles of this invention might readily be incorporated into other embodiments. Furthermore, although particularly advantageous in the handling of viscous fluid and semi-fluid materials, application of the principles of this invention might be made to other forms and types of materials.

We claim:

1. A method for dispensing viscous material in predetermined quantities from a source containing a larger quantity of such material, comprising the sequential steps of drawing a predetermined quantity of viscous material from the source into a closed dispenser having a valved discharge port and in a manner such that said predetermined quantity is subjected to a pressure head of said larger quantity of material, sealing off fluid communication between the dispenser and the source of said viscous material while exerting sufficient pressure on the material in the dispenser to displace a substantial quantity thereof from the dispenser to the source, and opening the valved discharge port and applying pressure to the material in the dispenser to thereby force the material through the open discharge port.

2. A method for dispensing viscous material in predetermined quantities from a source containing a larger quantity of such material, comprising the sequential steps of displacing a predetermined quantity of viscous material from the source into a closed dispenser having a valved discharge port, while maintaining a pressure head on said predetermined quantity equal to that of

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at least a portion of said larger quantity, sealing off fluid communication between the dispenser and the source of said viscous material while displacing a substantial quantity of the viscous material from the dispenser back to the source to thereby exert a counter-pressure on a portion of the material in said source adjacent the dispenser to compress such portion of material in preparation for subsequent entry thereof into the dispenser, opening the valved discharge port, and then applying pressure to the material in the dispenser to thereby force the material through the open discharge port.

3. A method for dispensing viscous material in predetermined quantities from a source containing a substantially larger quantity of such material, comprising the sequential steps of drawing a predetermined quantity from the source at a position below the upper level thereof into a closed dispenser having a valved discharge port, whereby the predetermined quantity is subjected to the pressure head of the substantially larger quantity of viscous material above the position of withdrawal into the dispenser, sealing off fluid communication between the dispenser and the source of viscous material while exerting sufficient pressure on the material at the point of communication between the dispenser and the source to displace a substantial quantity of such material from the dispenser to the source, opening the valved discharge port, and then applying pressure to the material in the dispenser adjacent the fluid seal between the dispenser and the source, to thereby force the material through the open discharge port.

4. Means for dispensing viscous materials being delivered from a source under pressure, said dispensing means comprising a valved dispensing opening, a housing defining a chamber affording fluid communication between said source and said dispensing opening, means disposed within said chamber for movement relative thereto which is operable to exert sufficient pressure on the material to displace a substantial quantity thereof from said chamber to said source while closing off fluid communication between said source and said chamber, and additional means for applying pressure to material within said chamber to thereby force said material through the valved dispensing opening.

5. Means for disposing viscous materials being delivered from a source containing a substantially larger quantity than that to be dispensed, said dispensing means comprising a housing defining a chamber having fluid communication with a valved dispensing opening, a member movable in said chamber to close off fluid communication between said chamber and said source while exerting sufficient pressure on the material in said chamber to displace a substantial quantity thereof from said chamber back to said source, and a piston movable within said chamber to force the material confined in said chamber by said movable member out through said dispensing opening.

6. Means for dispensing viscous materials from a hopper, comprising a housing defining a cylindrical chamber communicating with the bottom of said hopper, means disposed within said chamber which is operable to shut off the flow of material between said hopper and said chamber by moving through the material, said latter movement exerting sufficient pressure on the material to displace a substantial quantity of the material from said chamber to said hopper, a valved discharge port having fluid communication with said chamber, and a piston slidably mounted in said cylindrical chamber to force the material confined therein through said discharge port.

7. Apparatus for dispensing viscous materials being delivered from a source under pressure, comprising a housing defining a cylindrical chamber having a port providing fluid communication with said source, a cylindrical sleeve mounted in said chamber for sliding movement axially thereof and operable to control said port,

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said sleeve having a tapered leading edge adapted to exert sufficient pressure on the material in the chamber to displace a substantial quantity thereof from said chamber to said source as said sleeve is moved to close said port, means defining a valved discharge opening having fluid communication with one end of said chamber, and a piston slidably mounted within said sleeve for movement axially thereof to force material confined in said chamber by said sleeve out through said discharge port.

8. Material dispensing apparatus for delivering measured amounts of material from a hopper, comprising means defining a housing disposed below said hopper and including a generally horizontal, cylindrical chamber having a port therein affording fluid communication with the hopper, a cylindrical sleeve slidably mounted in said chamber and operable to control fluid communication between said hopper and chamber through said port, said sleeve exerting sufficient pressure on the material during the closing of said port to displace a substantial quantity of the material from said chamber to said hopper and thereby pre-compress said substantial

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quantity of material in preparation for subsequent entry thereof into the chamber a discharge spout having fluid communication with said chamber and including valve means for controlling the discharge of material through said spout, a piston slidable within said sleeve, and power-driven operating means for said sleeve, piston and discharge valve means which is operable to sequentially move said sleeve to a position closing off said port in said chamber, open said discharge valve means, and move said piston through its pressure stroke to thereby discharge material confined in said housing by said sleeve and said valve means out through said discharge spout.

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