

Dec. 7, 1943.

M. HALLEAD ET AL

2,336,355

TUBE FILLING MEANS

Filed Nov. 11, 1937

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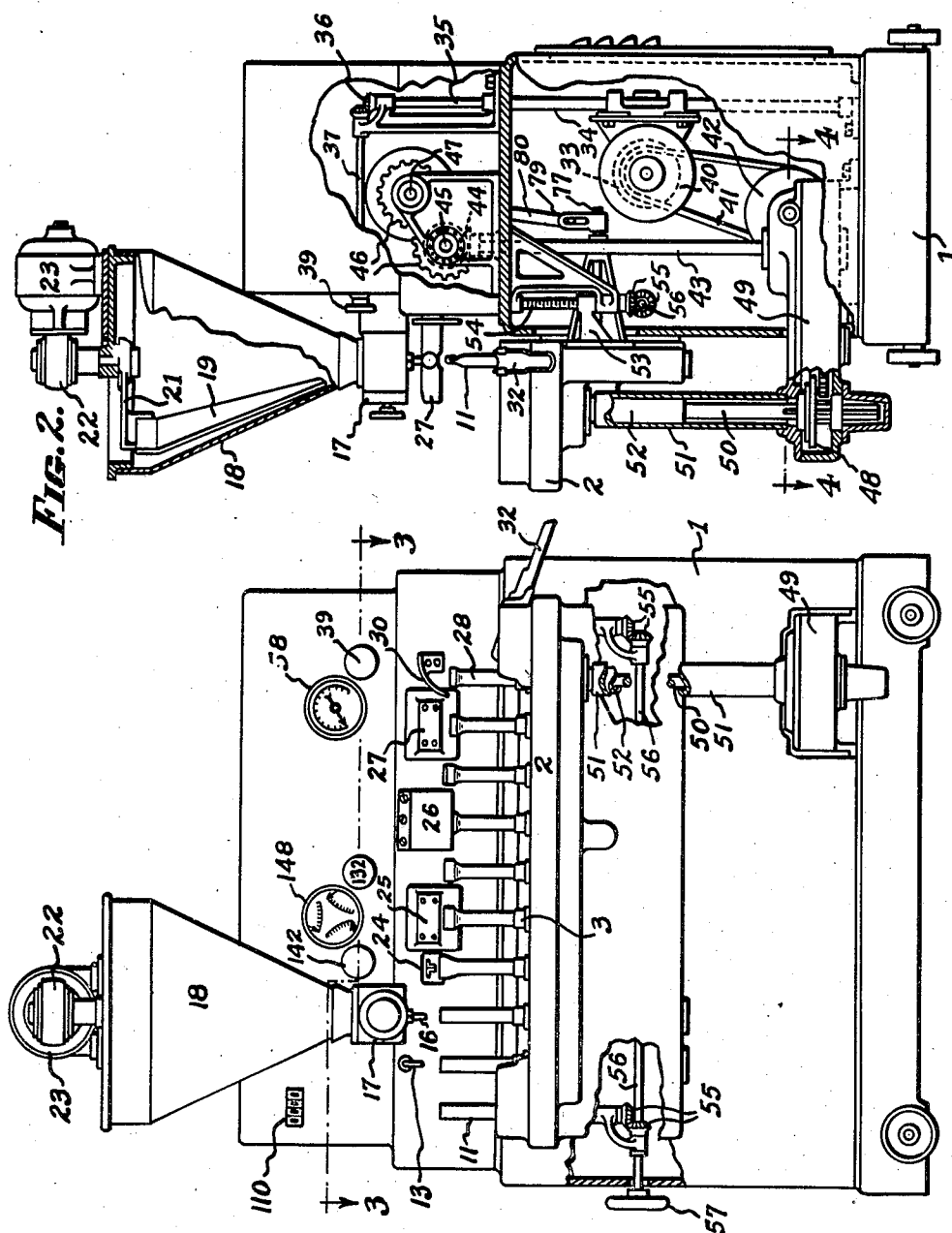


Fig. 2.

Fig. 1.

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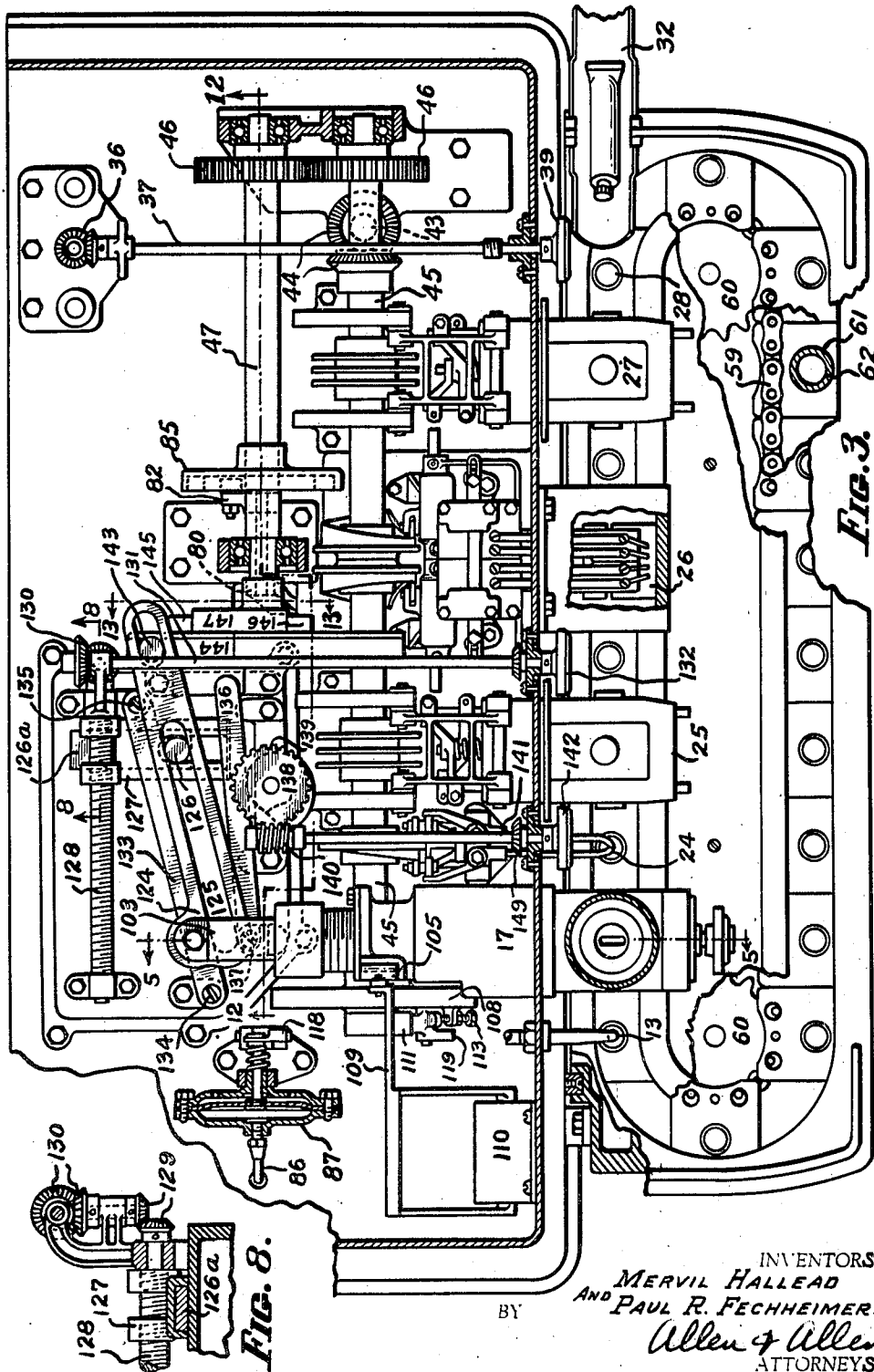
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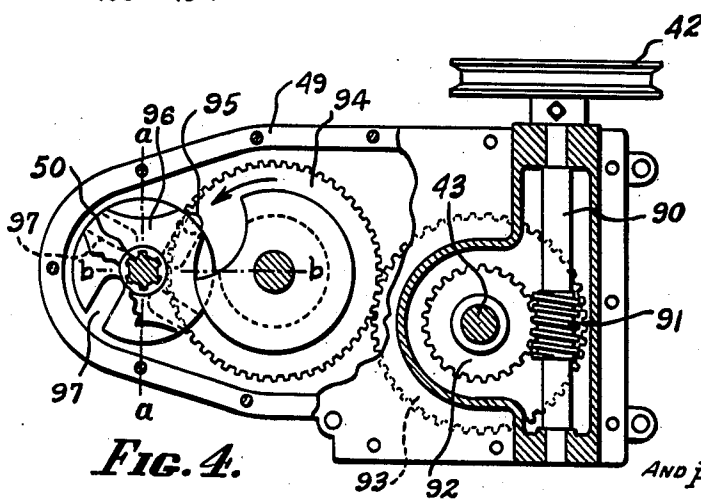
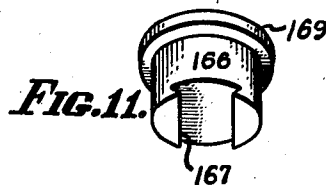
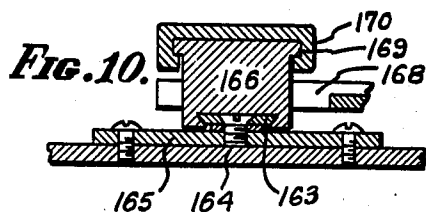
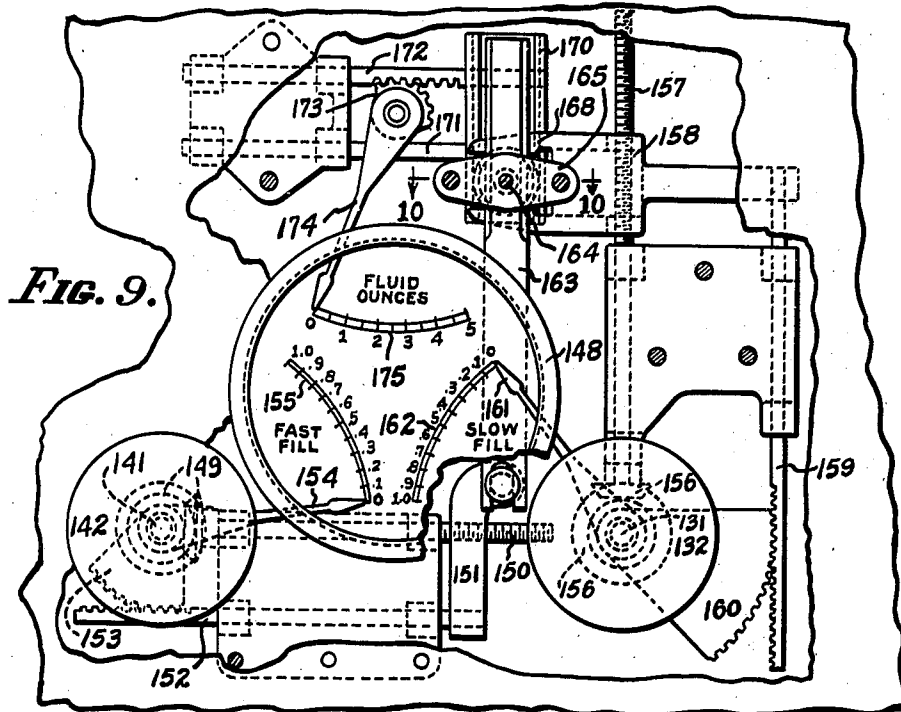
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4 Sheets-Sheet 4

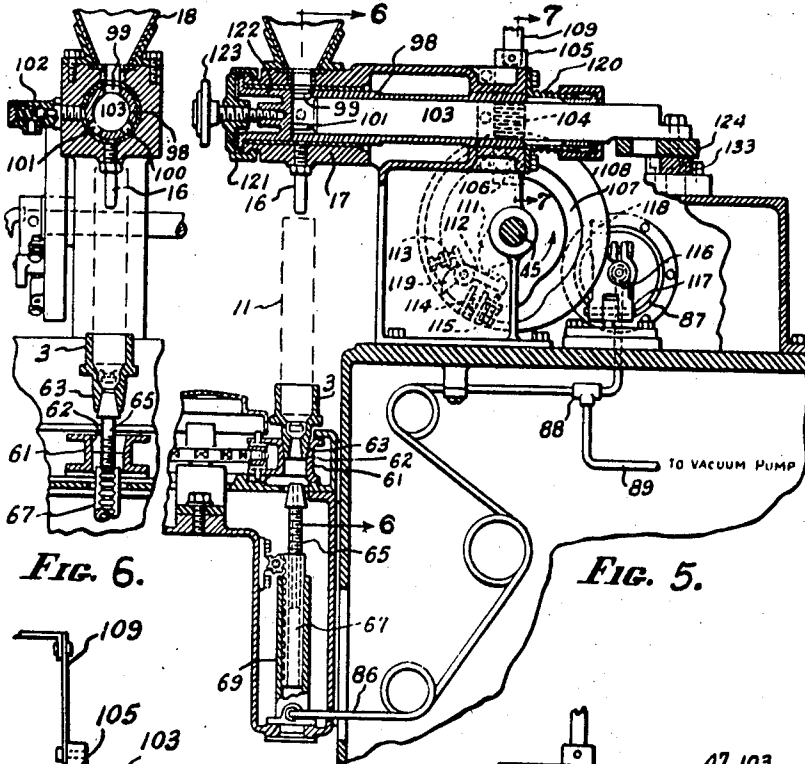


Fig. 6.

Fig. 5.

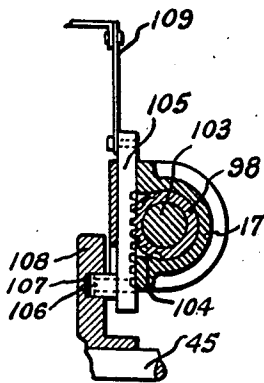


Fig. 7.

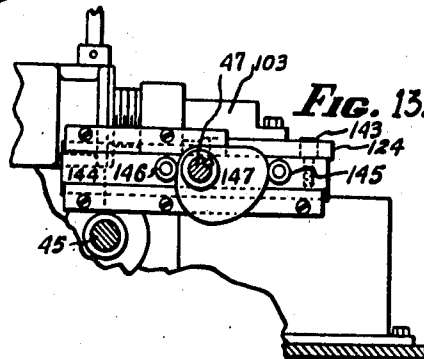
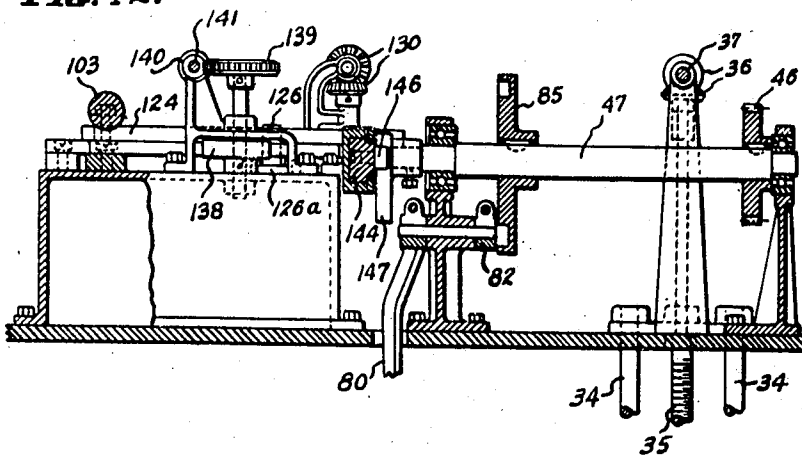


Fig. 13.

Fig. 12.



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TUBE FILLING MEANS

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Application November 11, 1937, Serial No. 174,079

7 Claims. (Cl. 226—107)

Our invention relates to the filling and sealing of the collapsible tubes of commerce, particularly where the tubes are sealed by interfusion of the tube walls. This case is related to the application of Fechheimer 710,824, filed February 12, 1934, which has now matured into Patent No. 2,102,840, dated December 21, 1937, and to the application of Hallead, 88,185, filed June 30, 1936, and to the application of Fechheimer and Hallead, 88,186, filed June 30, 1936, and is a continuation in part of the last mentioned case.

The objects of the present invention comprise the provision of a novel filling apparatus in which the tubes are acted upon by a filling device, a spreading device, a shearing device, a welding device, and a folding device, or a combination of these devices in succession, and also comprise specific inventions and improvements in novel gauging means, and means whereby different quantities of material may be fed at the same or different rates of speed.

These objects, and more specific ones which will be apparent to one skilled in the art upon reading these specifications, we accomplish by that certain construction and arrangement of parts of which we shall now described an exemplary embodiment. Reference is made to the accompanying drawings wherein—

Figure 1 is a front elevational view of an exemplary form of our machine.

Figure 2 is a side elevational view with parts in section.

Figure 3 is a horizontal section taken along the line 3—3 of Figure 1.

Figure 4 is a horizontal section of a portion of the main drive mechanism and a Geneva movement for the conveyor. It is taken along the line 4—4 of Figure 2.

Figure 5 is a vertical section through the machine taken along the line 5—5 of Figure 3.

Figure 6 is another vertical section taken along the line 6—6 of Figure 5.

Figure 7 is a sectional view of valve operating mechanism taken along the line 7—7 of Figure 5.

Figure 8 is a view of a gearing arrangement used in connection with the filling mechanism. It is taken along the line 8—8 in Figure 3.

Figure 9 is an elevational view with parts in section of gauging means for the speeds and quantity of filling.

Figure 10 shows in section a motion mechanism used in connection with the gauge, and is a view taken along the line 10—10 of Figure 9.

Figure 11 shows in perspective a stud used in connection with the mechanism of Figure 10.

Figure 12 shows a drive feature, taken along the line 12—12 of Figure 3.

Figure 13 is a cam feed mechanism employed in connection with the filler apparatus, and is a view taken along the line 13—13 of Figure 3.

The general as well as the specific organization of our apparatus will be apparent from the ensuing description. In Figures 1 and 2 we show an exemplary form of our structure having a body 1 comprising a suitable framework and housing members, the specific form of which may be varied to suit requirements. A conveyor for collapsible tubes is located in a housing 2, and will be the subject of particular description hereinafter. The conveyor bears holders 3 for the collapsible tubes, which may be loaded into the holders by hand or otherwise. The cap ends of the collapsible tubes 4 will be placed into the holders so that the tubes are inverted with their initially open bottom ends upward. Means are provided in connection with the conveyor for moving the tubes upwardly for filling and also for ultimate delivery in a sealed condition. The tubes, as shown in Figure 1 move in step-by-step manner from left to right.

In this path of travel they first come beneath a nozzle 13 whence a blast of dry gas is directed downwardly into the open bottoms of the tubes. This dislodges and carries away foreign particles such as cardboard fragments or other bits of packing materials which may be in the tubes. The nozzle 13 is connected to a suitable source of pressure (not shown). The blast may be left on at all times, or if desired a valve may automatically be operated by the conveyor or other suitable means.

Next each tube comes under a filling spout 16, and is elevated so that the spout extends into the open bottom end of the tube. This is advisable to prevent the filler material from contacting the end portions of the bottom walls of the tube, where it might interfere with sealing. The spout 16 is connected to a head 17 having feeding and valve mechanism hereinafter to be described; and a measured quantity of the filler material is automatically fed into the tube at a predetermined rate or rates. The filler material comes from a hopper 18, into which it is introduced in bulk. An agitating device 19 mounted upon a spider 21 is driven by a motor 23 and acts to keep the material down in the hopper.

The tube next comes beneath a spreader 24 by the action of which the bottom of the tube is flared or spread, and partially flattened.

Next it comes beneath a combined clamp and

shear 25, which pushes the flattened walls into tight engagement and shears these walls off accurately at a height appropriate for sealing. Shearing the tube ends is a precautionary measure having its importance in the subsequent welding. In all instances shearing is not necessary, and our invention includes machines in which the shearing device may be omitted.

26 indicates a sealing or welding head where the sheared ends of the tubes are fused together with the formation of a bead to effect a complete seal.

At 27, we have indicated a device for folding over the sealed bottom of the tube. This is largely for appearance, and where considerations of economy dictate may be dispensed with.

At a station marked 28, the filled and sealed tubes are displaced upwardly from the holders. They come against a deflector 30, which causes them to fall upon a chute 32 by which they are delivered to a suitable receiver.

Driving mechanism

A main drive motor 33 is shown slidably mounted upon a pair of vertical rods 34 on the main frame. The mounting means are also threaded and engage a threaded shaft 35 connected by suitable gears 36 to a shaft 37 brought out to a hand wheel 39 on the front of the main housing. By turning this hand wheel the motor may be raised or lowered upon the rods 34.

The motor shaft carries pulley means 40, which, in the embodiment shown, may be considered as a pair of conical pulley elements facing each other, and spring pressed toward each other. This is a known type of change-speed mechanism, whereby a change of speed may be effected by movement of the motor. The change-speed pulley 40 is connected by means of a belt 41 to the main drive pulley 42 of the machine.

The main drive pulley 42 is connected by suitable gearing with a vertical shaft 43, which in turn, is connected by bevel gearing 44 to a horizontal shaft 45 in the upper part of the machine. This shaft again, is connected by gears 46 to another horizontal shaft 47. The shafts 45 and 47 operate the various instrumentalities which have been described above, excepting the conveyor.

For the conveyor, there is a Geneva movement indicated generally at 48 and contained in a housing 49. A vertical shaft 50 connects the Geneva movement with the conveyor at one end thereof. It likewise is housed in interfitting tubular members 51 and 52. The reason for this construction is to maintain a completely housed condition, even though the conveyor may be raised and lowered to accommodate collapsible tubes of different lengths. To this end also, the shaft 50 is splined as shown at its lower end in Figure 2 and is slidable in the Geneva movement mechanism.

The conveyor, its housing, and the several appurtenant parts are mounted upon brackets at each end, one of which is shown at 53 in Figure 2. These are threaded upon vertical threaded shafts at each end of the machine, one of which is shown at 54. The threaded shafts are connected by bevel gearing 55 with a horizontal shaft 56, which is brought out through the housing at one end of the machine and is provided with a hand wheel 57. By means of this hand wheel, the conveyor may be raised or lowered for the purpose aforesaid.

All gears and shafts will be understood with-

out special description as having suitable mountings, brackets, journals, and the like.

A speed indicator 58 may be provided, if desired, upon the front of the machine.

Conveyor and attendant parts

The conveyor as best shown in Figure 3 comprises a chain 59 running over sprockets 60 and bearing members 61 having sockets 62 for the tube holders. Suitable supports for the conveyor will be provided as will be readily understood. The conveyor is also shown in vertical section in Figure 5. The tube holders 3 are also illustrated in section in Figures 5 and 6. They comprise a tapered neck portion 63 adapted to the sockets 62. They are perforated from end to end, and the upper portion is provided with a cup shaped socket to receive the capped end of the collapsible tube.

For raising the tube, as is done beneath the cleaning blast nozzle 13 and the filling nozzle 16, means are provided to pass through the members 61 of the conveyor and engage and raise the tube holders 3. These means comprise rods 64 and 65 threaded into plungers 66 and 67 which in turn fit into and are guided in cylinders 68 and 69. The rods 64 and 65 bear means for engaging and raising the tube holders 3.

In at least that raising and lowering device which underlies the filling spout 16, the rod 65 and plunger 67 are hollow and communicate with the hollow interior of the cylinder 69. This is connected by tubing 86 with a diaphragm device indicated generally at 87 in Figure 5, and also through a T connector 88 and a conduit 89 with a vacuum pump (not shown). The diaphragm device will be described more in detail hereinafter; and it will be explained that it controls a portion of the filling mechanism. The purpose of this construction is to provide a safety means in connection with our machine. When in Figure 5, the rod 65 is upraised, carrying the tube 11 up into filling position, its end makes contact with the tube holder 3. So long as a capped tube is in the tube holder, the orifice of the rod 65 will be effectively closed off. Thus a vacuum will be pulled on the diaphragm device 87, allowing a charge of filler material to be delivered to the tube 11. If, however, no tube is present in the holder 3, or if the tube in the holder happens to be without a cap, the diaphragm device 87 will remain unaffected, and no charge of filler material will be delivered. The mechanism for performing this operation in connection with the diaphragm device will be described hereinafter.

While we have indicated that a vacuum pump is preferably employed; it is not beyond the scope of our invention to cause the apparatus disclosed to pull its own vacuum. Thus when the plunger 67 has a close sliding fit in the cylinder 69, or is provided with rings or the like, it is evident that the raising of the plunger in the cylinder will tend to lower the pressure in the system which we have described, and the apparatus may be so adjusted that this lowering of pressure will operate the diaphragm device.

Also it will be evident that the safety features described are applicable to other types of filling devices than the one of our specific exemplary disclosure.

The conduit 86 may be looped or coiled, as shown, to permit raising and lowering of the conveyor.

Referring to Figure 4, the details of a Geneva movement for the step-by-step advance of the

conveyor will be understood. The main drive pulley 42 is fixed on a shaft 90 bearing a worm 91. This engages a worm wheel 92 on the vertical shaft 43. A gear 93, also fixed on this shaft, meshes with a gear 94, which is the driving member for the Geneva movement, and carries the driving pin 95.

In the ordinary Geneva movement, the driven member carries a minimum of four radial slots. Since the axis of the driving member must lie at the coincidence points of lines drawn perpendicular to the slots, which lines are also tangential to the circumference line of the driven member (the slots being radial) the maximum pitch diameter of the driving member cannot exceed the diameter of the driven member. Thus in a conventional four-slot Geneva movement the angle of the tangent lines is 90°, and the driving action of the driving member is effective over 90° of its rotation, the dwell occupying an angle of 270°. Thus the ratio of driving time to dwell is 1:3.

In our apparatus it is desirable to cut down the relative duration of the driving time and to provide for a longer dwell. In doing this it is advantageous to provide for relatively slow acceleration and rapid deceleration. We accomplish these objects by a construction such as that shown in Figure 4, wherein the slots 97 in the driven or maltese cross member 96 are not radial but lie at a different angle. Thus, if the slot into which the driving pin 95 is about to enter lies at an angle of 30° to a line *a-a*, normal to a line *b-b* drawn between the axes of the driving and driven members, a much larger driving member may be used, and the driving angle considerably cut down. With the particular angularity noted (which is exemplary only), the driving angle becomes 60° and the dwell angle 300°. This gives a ratio of driving time to dwell of 1:5. Other angularities may be used with corresponding variations of drive to dwell. The driving pin enters the slot more nearly in the direction of its length giving a slow acceleration and a rapid deceleration.

Filling mechanism

The nature of the filling mechanism may be seen in Figures 5 and 6. The filling head 17 is in the form of an elongated casing in which a hollow sleeve valve member 98 is rotatably but not slidably mounted. This sleeve valve has certain openings 99, 100 and 101. When the valve is in the position shown in Figure 6 the opening 99 is in communication with the opening of the hopper 18. The other openings are closed off. Material from the hopper can now be drawn into the interior of the sleeve valve.

If the valve is now rotated clockwise until the opening 100 comes into communication with the filler spout 16, it will be seen that the opening 99 will be closed off, and the interior of the valve will no longer be in communication with the hopper 18. Thus, material may be forced from the sleeve valve 98 and through the filler spout 16. At the same time, the opening 101 in the sleeve valve 98 comes into communication with a relief valve 102 which functions if there should be an obstruction in the mechanism.

The means for drawing filler material from the hopper 18 into the interior of the sleeve valve 98 and forcing it out again, is a plunger 103 operating within the sleeve valve. The means for operating the plunger will be described hereinafter.

As shown most clearly in Figure 7, the sleeve valve 98, in one part of its length, has teeth 104 cut in it. A rack 105 meshes with these teeth and is the immediate agency by which the sleeve valve is rotated. The rack bears a pin 106 lying in a cam groove 107 in a cam 108 on the shaft 45. By these means the rack 105 may be moved back and forth. Since each rocking movement of the sleeve valve 98 represents the filling of a tube, an arm 109 may be attached to the rack 105 and caused to actuate a counter 110 (see also Figures 1 and 3), also time-study and recording apparatus may be attached at this point.

The cam 108 is not, however, fixed on the shaft 45, but is rotatably mounted thereon. A dog 111 is fixed on the shaft 45; and a latch means is pivoted on the cam. This latch means has a latch 112 normally held in engagement with the dog by spring means 114, its movement in the latching direction being limited by an adjustable stop 113. Another adjustable stop 115 limits its movement in the other direction. Thus the dog can rotate the cam unless something releases the latch. This construction is shown in Figure 5.

The diaphragm device 87, referred to above, has its diaphragm connected to a lever 116, pivoted at 117 and having an arm 118 normally lying in the path of a trigger arm 119 on the latch means which is pivoted to the cam 108. Unless the diaphragm is actuated by vacuum in the line 88, this lever trips the latch means so that the cam does not rotate far enough to move the sleeve valve 98. It has been explained above how the lack of a tube in the holder 3 prevents the formation of a vacuum and the actuation of the diaphragm. Under these circumstances the sleeve valve 98 remains with its port 99 in communication with the hopper 18, and such filler material as is withdrawn from the hopper during the outstroke of the plunger 103 is returned to the hopper on its instroke. When, however, a tube is in the holder 3, the vacuum actuates the diaphragm to pull the lever means 116—118 out of the way, and the cam 108 is rotated by the dog so as to bring the sleeve valve port 100 into communication with the filler spout 16 during the instroke of the plunger 103.

The sleeve valve 98 is retained in longitudinal position at one end by a gland arrangement 120 through which the plunger 103 slides. At its other end it is retained by a plug 122 removably held by a screw 123 in a slip-on cap 121 on the end of the filler head.

The means for moving the plunger will be best appreciated from Figures 3, 12 and 13. An operating arm 124 is pivoted to the plunger 103 as best shown in Figure 3. This arm is slotted as at 125 throughout most of its length. A pin 126 forms a fulcrum for the arm 124. This fulcrum, however, is a movable one, being mounted upon a slide 126a in a member 127. The movement of the fulcrum pin 126 in the member 127 is up and down upon the drawing as shown in Figure 3, the movement, of course, being horizontal in the machine. The member 127 is also movable right and left in Figure 3, being threaded on a threaded shaft 128. This shaft is connected by gearing 129—130 (best shown in Fig. 8) with a shaft 131 which is brought out to a hand wheel 132 on the front of the machine. By means of this hand wheel the position of the member 127 may be varied at will.

The movement of the fulcrum pin 126 in the

member 127 is limited in one direction by a bar 133 which is fastened as at 134 and 135. In the other direction, it is limited by a bar 136 which is pivoted at one end at 137. The position of the bar 136 on the pivot 137 is determined by a cam 138. A gear 139 is connected to this cam and meshes with a worm 140 on a shaft 141, which again is brought out to the front of the machine and is provided with a hand wheel 142. Thus, by actuating the cam, the fulcrum pin 126 may either be fixed against the bar 133 or may be allowed a desired range of lost motion.

The right hand end of the operating arm 124 is slotted and is engaged by a pin 143. This pin is mounted on a carriage 144, slidable on the frame of the machine. Pins or rollers 145 and 146 on the carriage engage opposite sides of a cam 147 fixed on the shaft 47. By these means the carriage 144 is moved back and forth and the operating arm 124 is moved as a lever to actuate the plunger 103.

It will be apparent that by shifting the position of the member 127, the stroke and speed of movement of the plunger 103 can be varied. It will also be clear that the amount of lost motion of the fulcrum pin 126 in the member 127 can be varied to vary the stroke of the plunger 103 without changing its speed of movement. The stroke of the plunger will determine the amount of filler material fed through the filler spout 16. By these means, we are able not only to vary and determine the exact amount of filler material fed into each tube, but also to vary and determine the rate at which any given amount of filler material shall be fed. This latter feature of control is of importance since different consistencies of filler material have different optimum rates of feed. Variation in the amount of filler material fed is necessary, of course, in changing from one size of collapsible tube to another.

The particular filling means which we have disclosed is applicable, of course, to the filling of containers in general, and other than collapsible tubes, e. g., bottles, cans or the like with pasty or liquid materials.

Gauge mechanism

We have incorporated into our machine a novel gauge mechanism whereby the operator can more readily adjust the volume and rate of filling to the desired values. A dial means 148 is mounted upon the face of the machine and gives at all times an indication of these values.

Considering first the control shaft 141 for lost motion in the fulcrum pin 126 (and referring to Figure 9), this shaft is connected by gearing 149 with a threaded shaft 150. An arm 151 is threaded on the shaft. A rod 152 is fastened to the arm 151 and at one end has rack teeth meshing with the teeth of a segment 153 rotatably mounted on the shaft 141. A pointer 154 moving over a scale 155 in the dial means is connected with the segment 153. This pointer thus gives an indication of the amount of play in the fulcrum pin.

The control shaft 131 for the position of the member 127 is likewise connected by gearing 156 with a threaded shaft 157. An arm 158 is threaded on this shaft. This arm also carries a rod 159 bearing rack teeth at one end, which teeth mesh with the teeth on a segment 160 rotatably mounted on the shaft 131. A pointer 161 attached to the segment moves over a scale

162 in the dial means. The pointer thus gives an indication of the position of the member 127.

The arm 151 has a pivotal connection as shown with a bar 163. This bar is pivoted as at 164 on a fixed member 165 on the machine frame. Thus, as the arm 151 moves along its threaded shaft, the angular position of the bar 163 changes.

The bar has its edges beveled (see Figs. 9, 10 and 11) and a stud 166 is slidably mounted on the bar by means of a rabbet 167. The stud may be moved along the bar by means of a fork 168 on the arm 158. A flanged end 169 on the stud engages in a slide on a member 170. This member is guided for sliding movement by two rods 171 and 172 attached to it. The latter of these rods bears rack teeth meshing with the teeth of a segment 173 to which a pointer 174 is attached. The pointer moves over a scale 175 in the dial means.

The movements of the pointer 174 are thus controlled, but in different ways, by the movements of pointers 154 and 161. Unless the stud 166 lies directly over the pivot 164, movements of the arm 151 and bar 163 will cause movements of the pointer 174. Likewise, unless the bar 163 lies normal to the axes of rods 171 and 172, movements of the fork 168 will cause movements of the pointer 174.

The pointer 174 indicates the amount of material being filled into the tubes. If the shaft 141, for example, is kept at a certain position, adjustment of the shaft 131 will vary the quantity of material being filled. The converse of this is also true. With the mechanism shown, different rates of fill for the same quantity of material may be selected; or different quantities of material may be fed at the same or different rates of feed.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a filling mechanism for containers, a filling head, a plunger, a slotted lever arm for said plunger and attached to it at one end, means for reciprocating the other end of said lever arm, a carriage, a fulcrum means slidably mounted on said carriage, and means both for moving said carriage in the general direction of the length of said lever arm and for limiting the amount of movement of said fulcrum means on said carriage, whereby adjustments may be made in said mechanism for different rates of fill and different quantities of fill, substantially independently of each other.

2. In combination with mechanism as claimed in claim 1, manual operating means for said carriage and manual operating means for said fulcrum means, a gauge having a pointer connected with each of said manually operated means, said pointers being indicative of the rate of fill, and a pointer connected with a differential mechanism actuated by both of said manually operated means, said last mentioned pointer being indicative of the quantity of material being filled.

3. A filling device for containers, comprising a head having a filling opening, a source of filling material connected to said head, a rotary sleeve valve in said head, said sleeve valve having ports for connecting the interior thereof alternately with said source of filling material and said filling opening in said head, means for rocking said sleeve valve, a plunger slidable within said sleeve valve, means to actuate said plunger, means to

actuate said valve, a means responsive to the presence of a container to be filled, and a connection between said last mentioned means and said valve actuating means.

4. In a filling mechanism for containers, a filling head, a plunger, a slotted lever arm for said plunger and attached to it at one end, means for reciprocating the other end of said lever arm, a carriage, a fulcrum means slidably mounted on said carriage, and means both for moving said carriage in the general direction of the length of said lever arm and for limiting the amount of movement of said fulcrum means on said carriage, whereby adjustments may be made in said mechanism for different rates of fill and different quantities of fill, substantially independently of each other, said means for limiting the movement of said fulcrum means on said carriage being so disposed as to constrain said fulcrum to a series of positions at the end of the extreme feeding stroke of said piston such that the extreme feeding position of the piston will be at substantially the same point in said head, irrespective of the length of stroke of said piston.

5. In a filling machine, a filling means comprising a plunger operating in a cylinder, means for driving said plunger comprising motive means having a cyclical movement, and a connection between said motive means and said plunger comprising a lever having pivotal connection to each, fulcrum means for said lever, means for adjusting the position of said fulcrum in one direction, and abutment means for defin-

ing movement of said fulcrum in another direction whereby the stroke of said plunger can be caused to occupy less than the full time cycle of said cyclically moving means, whereby by means of said adjustments the rate and quantity of fill may be adjusted independently of each other.

6. The structure claimed in claim 5, including means in connection with said abutment means, for causing the filling stroke of said plunger to end at substantially the same point in said cylinder irrespective of said adjustments.

7. In a filling machine, a filling means comprising a plunger operating in a cylinder, means for driving said plunger comprising motive means having a cyclical movement, and a connection between said motive means and said plunger comprising a lever having pivotal connection to each, fulcrum means for said lever, means for adjusting the position of said fulcrum in one direction, and abutment means for defining movement of said fulcrum in another direction whereby the stroke of said plunger can be caused to occupy less than the full time cycle of said cyclically moving means, whereby by means of said adjustments the rate and quantity of fill may be adjusted independently of each other, and operable means in connection with both said adjustment means and located at a fixed position on said machine whereby said adjustments may be made during the operation of said machine.

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