

Sept. 24, 1957

S. ROSEN
FILLING MACHINE

2,807,213

Filed Feb. 27, 1956

3 Sheets-Sheet 1

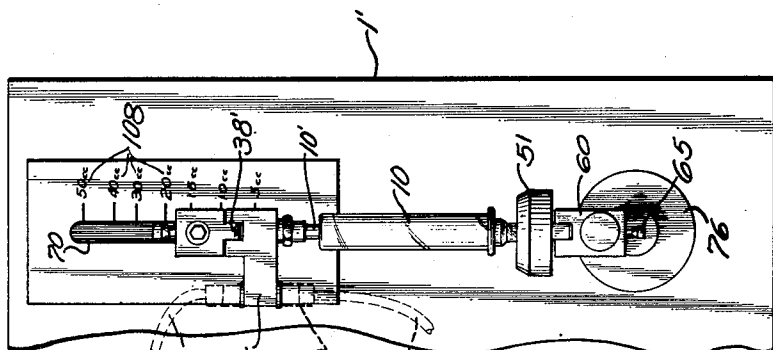


Fig. 2.

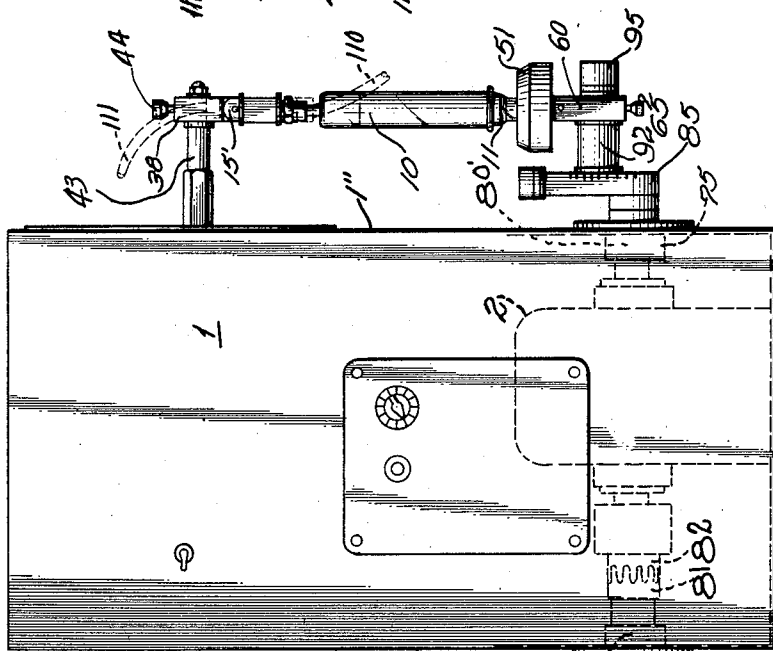
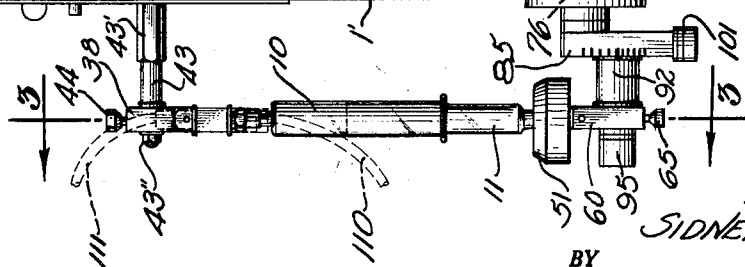


Fig. 1.



INVENTOR.
SIDNEY ROSEN

BY
Joel E. Barrett
Attorney

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3 Sheets-Sheet 2

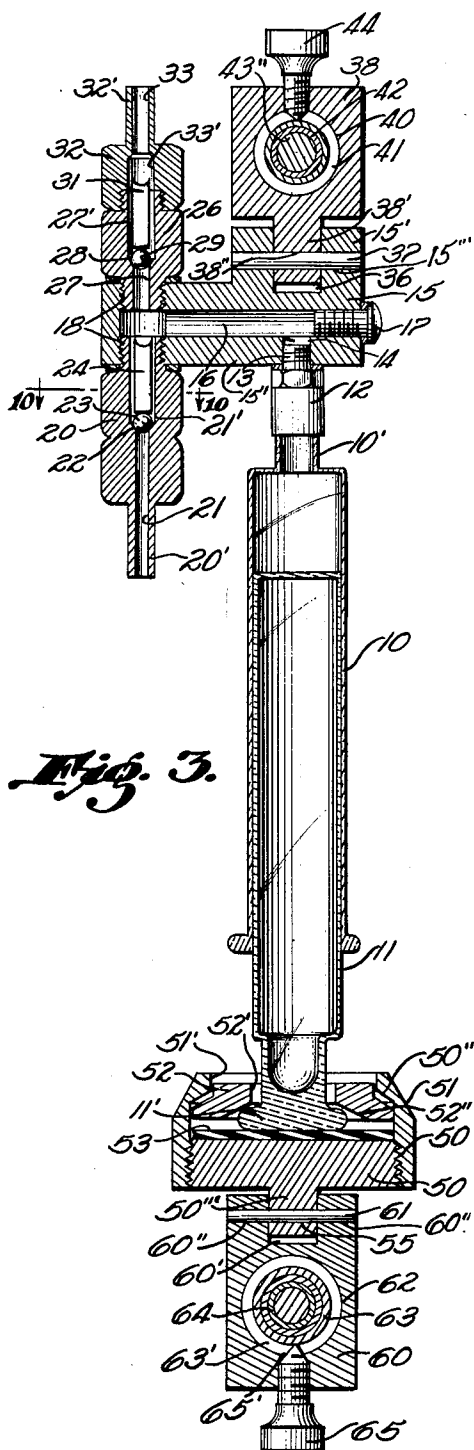
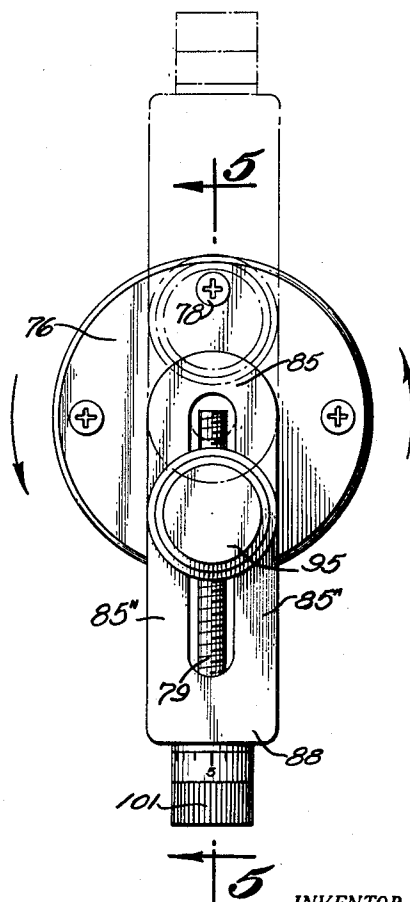


Fig. 3.

Fig. 4.



INVENTOR.
SIDNEY ROSEN
BY
James D. Dore
Attorney

Sept. 24, 1957

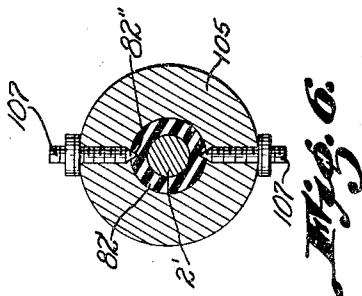
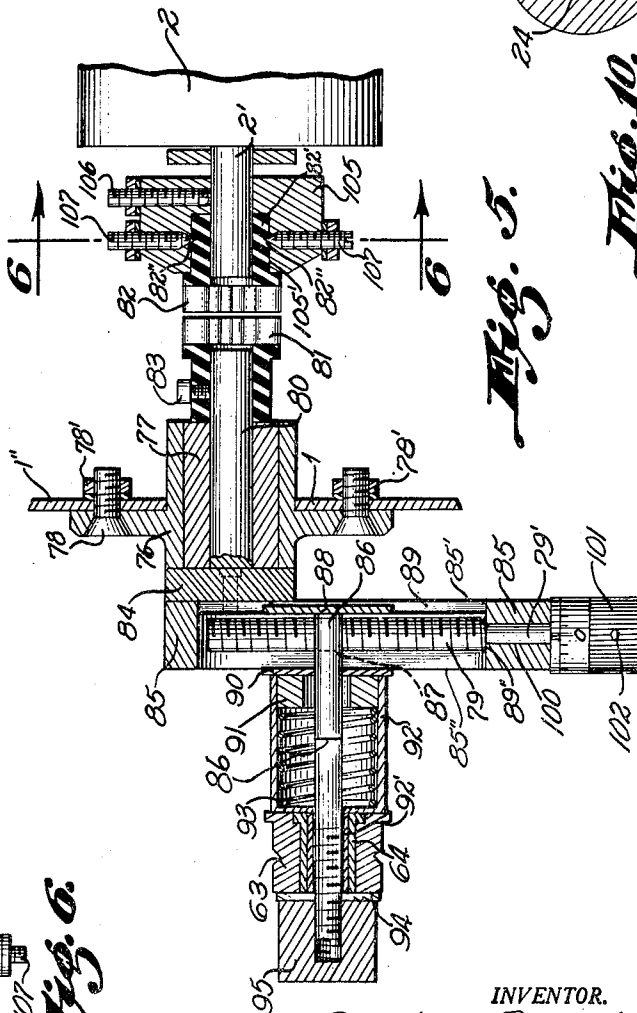
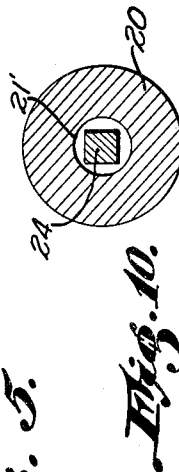
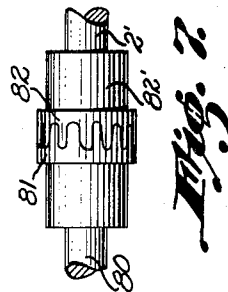
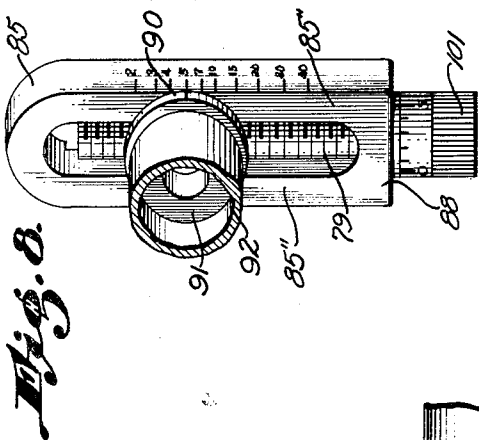
S. ROSEN

2,807,213

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3 Sheets-Sheet 3



INVENTOR.
SIDNEY ROSEN
BY *Jawley & Co.*
attorneys

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FILLING MACHINE

Sidney Rosen, Baltimore, Md.

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5 Claims. (Cl. 103—4)

The present invention relates to an improved filling machine for high speed filling of vials, ampoules and small containers. The device enables high production with a minimum amount of equipment.

One object of the invention is to provide a filling machine in which small or moderate producers may enjoy high speed and economical production at a fraction of the cost of conventional fillers.

Another object of the invention is to provide a filling machine having a variety of uses in filling and mixing of liquid compositions.

A further object of the invention is to provide a filling machine in which the timing of the mixing of the different compositions may be accurately controlled.

While several objects of the invention have been set forth, other objects along with its uses and advantages will become apparent as the nature of the invention is more fully disclosed, consisting of its novel structure, arrangement and combination of its several parts as described and illustrated in its preferred form, in which:

Figure 1 is an elevational end view of the improved filling machine showing a pair of reciprocating pumps operating alternately in respect to each other.

Figure 2 is a fragmentary front elevation of the machine showing one of the pumping elements.

Figure 3 is an enlarged sectional view of one of the pumping elements.

Figure 4 is an enlarged front view in elevation of the pump operating means.

Figure 5 is an enlarged fragmentary sectional view of the pump operating means taken substantially on the line 5—5 of Figure 4.

Figure 6 is a sectional view taken along the line 6—6 of Figure 5.

Figure 7 is a view in elevation of the coupling between the pump operating means and the main operating shaft.

Figure 8 is a perspective elevational view partly broken away of one of the parts of the pump operating means.

Figure 9 is an end view of the cabinet in elevation partly broken away, illustrating the pumps working in unison.

Figure 10 is a fragmentary elevational view of a conventional type flexible coupling.

In referring to the drawings, like reference numerals are used to indicate like and similar parts throughout the several views.

The machine comprises a base in the form of a cabinet 1 for carrying one or more pumping elements together with supporting elements therefor and driving and control elements. The driving means comprises a motor 2 which is provided with a special electronic speed control (not shown).

While the pumping elements are identical, not all of the detail description will include both units as the description of one pumping unit will suffice for the other.

The machine as illustrated in Figure 1 shows a cabinet having sides 1, 1', 1'', and a pumping unit located on each

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of the sides 1' and 1'' of the cabinet. Referring at the present time in particular to the pumping unit located on the side 1' of the cabinet (see Figures 1, 2 and 3 in particular) there is provided a cylinder 10, a piston 11, and a head piece 11' which is carried on the outer end of the piston 11. The pump may be in a range of sizes and is preferably constructed of a non-corrosive material such as stainless steel, glass or the like. In using a glass pump, the upper end of the cylinder is provided with a reduced portion 10', and fixed to this reduced portion 10' is a metal fixture 12. This fixture is sealed to the extension 10' and is provided on its outer end with a thread 13. The thread 13 is threadably receivable into a threaded aperture 14 within a member 15. A portion of this member 15 extends well to one side of the aperture 14, as shown at 15'' and is provided with a lateral opening 16, having a threaded clean out stopper 17. The aperture 14 leads into the lateral aperture or opening 16. The portion 15' of the member 15 is provided with a threaded aperture 18 which communicates with the opening 16 at right angles. This aperture 18 is preferably parallel with the aperture 14, both apertures 14 and 18 extend normally in a vertical position when in operating position on the machine. Secured into the lower portion of the aperture 18 is a threaded fitting 20, which is provided with a reduced portion 20' on its lower end. This fitting 20 is provided with an opening 21, which has an increased diameter 21' adjacent its upper threaded end. At the junction of the two diameters of the openings 21 and 21' there is a beveled seat 22 into which a ball valve 23 will conveniently seat. Over the ball valve 23 is a small weight 24 of rectangular or triangular cross-sections. The weight is adapted to slide freely within the opening 21' and is arranged within the opening as illustrated in Figure 10. The ball valve 23 has a diameter less than that of the diameter of the aperture portion 21' in order to allow the liquid to pass around the ball valve on its way from the small diameter aperture 21 through the larger diameter aperture 21' to the aperture 16. This type of valve allows a liquid to move through the aperture 16 when the piston 11 is moved downwardly within the cylinder 10.

In the upper end of the threaded aperture 18 there is a threaded member 26 similar to the member 20 except the valve is designed to work in the opposite direction to that in the member 20. In the member 26 there is provided an opening 27 having an enlarged portion 27'. There is a beveled valve seat 28 at the junction of the openings 27 and 27'. Adapted to fit within this seat is a ball valve 29, and over the ball valve is a valve weight 31 similar to weight 24 which acts on the ball valve similar to that described for the valve weight 24. Threadably engageable with the member 26 is a member 32 which is provided with a relatively short aperture portion 33' communicating with and having the same diameter as the aperture portion 27' after which the aperture is reduced as shown at 33 and extends to the upper end of the member 32. The ball valve 29 is adapted to operate to allow the liquid being pumped to unseat the valve and pass out through the opening 33 when the piston is moving upwardly to exhaust the liquid from the cylinder of the pump while the weight 24 and the pressure of the liquid on the ball valve 23 will cause the ball valve 23 to be seated and prevent the liquid from flowing back through the intake aperture 21.

On the opposite side of the member 15 from the aperture 14 is a boss 15' which is slotted, as shown at 36. Through this boss is an aperture 15''. Working in close association with the member, or portion 15, is a member, or portion, 38 which is provided with a reduced section 38' adapted to be slidably receivable into the slot 36 of the member 15. Through the section 38' is an aperture

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38" to correspond to the aperture 15". Through these apertures there is inserted a pin 37 to provide a hinged joint between the portions 15 and 38 adapted to hinge along an axis substantially perpendicular to the elongated axis of the pump cylinder and piston. Extending through the outward portion of member 38 and perpendicular to the aperture 38" is an aperture 40 into which a sleeve 41 is slidably receivable. Within the sleeve 41 there is preferably a bronze bearing bushing 42 through which is inserted the reduced portion 43" of the outer end of the adjustable stationary arm 43. The opposite end of the stationary arm 43 is adjustably carried on the side of the cabinet. The sleeve 41 is provided with a groove into which the inner end of a pointed thumb screw 44 engages to hold the members 15 and 38 upon the arm 43. The two members 15 and 38 make up the supporting elements for the cylinder element of the pump.

The outer end 11' of the piston is adapted to be carried in a piston supporting unit for operating the piston within the cylinder. This holding element comprises a member 50 having an outer peripheral thread 50'. Threadably receivable over this member 50 is a cap 51 having an opening 51' smaller than the opposite threaded end 50'. Adapted to fit within the cap 51 is a retaining member 52 of such dimensions as to engage the inside under edge 51" of the narrow opening 51'. This retaining member 52 is provided with a center opening 52' of such diameter as to allow the piston when removed from the cylinder to pass therethrough, but to engage the enlarged head portion 11' adjacent the beveled surface 52" of the member 52. Below the head 11' and between the outer surface of the head and the upper surface of the member 50 is a resilient washer 53. The head 11' is clamped between the surface 52" and the washer 53 as the cap 51 is screwed down upon the threaded member 50. The member 50 is provided with a square or rectangular boss 50" which is provided with an aperture 55 for hingedly connecting the member 50 to a closely associated member 60. This member is provided with a slot 60' adapted to slidably receive the portion 50" of the member 50. The sides of the slot are provided with apertures 60". A pin 61 extends through the apertures 55 and 60" for holding the two portions, or members, 50 and 60 in hinged relationship. The portion 60 of the piston supporting member is provided with an aperture 62 into which is slidably receivable a sleeve 63. The sleeve 63 is provided with a bearing bushing 64. The aperture 62 is located on the opposite side of the member 60 from the aperture 60" and is perpendicular to the axis of the aperture 60".

The stationary arm members 43 are fixed along slots 70 in the cabinet at the proper point for a certain size pump. The inner ends of the arms 43' are provided with a threaded aperture (not shown) and a threaded machine screw and washer on the inside of the cabinet; these screws are adapted to engage the portion 43' for holding the arms in selected position. The portion 43' is wider than the slot and forms a shoulder for holding the arm at selected points along the slot when the previously mentioned machine screws are tightened on the washer inside the cabinet.

The piston supporting means as previously mentioned are attached to the outer end 11' of the piston and are operated by a member carried on the outer end of the shaft 80. For rotating the shaft 80 there is the motor 2 arranged so that its shaft 2' extends perpendicular to the two sides of the cabinet carrying the pumping units. Attached to the cabinet opposite the motor shaft are bearing supports 75 and 76 having preferably bronze bushings 77. The bearing supports are secured to the cabinet 1 by suitable holding means, as illustrated, by the screws 78 and the nuts 78'. The bearing supports support shafts 80 and 80' which in turn carry means for producing the eccentric motion. The shafts 80 and 80' are connected with the motor shaft 2' by flexible couplings. One of these couplings is especially mounted as shown in

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Figure 5. In this especially mounted coupling one part 81 is connected with the shaft 80 and is secured thereto by set screw 83, the outer end of the shaft 80 being fixedly secured to a member 84 which in turn is fixedly connected to the member 85 which is the supporting element for the eccentric piston operating unit. The support member 85 is slotted (as shown in Figure 8) and is provided with a movable arm 86. This arm 86 is part of the eccentric unit and is provided with a threaded aperture 87 through one end thereof into which a micrometer adjusting screw 79 is threadably received. The inner end of the arm 86 is provided with a fixed plate 88 which is adapted to slide along a recess 89 extending inwardly from the rear surface 85' of the member 85. The arm 86 is flattened on the sides the flat sides being in a plane perpendicular to the elongated axis of the micrometer screw 79 from the shoulder 86' to the plate 88 to give sufficient stock to provide for the threaded aperture 87. The arm 86 extends through the slot in the member 85 from the plate 88 to a point well beyond the outer surface 85" of the support. Over the arm 86 is a bearing washer 90 adapted to frictionally engage the outer surface 85" of the support member 85. Adjacent the washer is a bushing 91. Over the bushing 91 and engaging the washer 90 is the member 92 having its outer end 92' reduced to support a bearing for the piston support and operating member 60. Rotatably supported over the portion 92' is the bearing 63 having a bushing 64 for engaging the reduced portion 92'. Extending between the bushing 91 and the shoulder of the reduced portion 92' is a compression spring 93. This spring keeps the member 92 in proper position when adjustments are being made to the eccentric. Adjacent the outer end of the reduced portion 92' of the sleeve 92 is a retaining washer 94 for fixedly engaging the outer edge of the above mentioned sleeve portion 92' and also slidably engaging the outer edges of the bearing 63 and its bushing 64. There is provided a nut 95 which is threadably receivable over the outer end of the arm 86 for holding the bearing 63 in rotatable position on the portion 92' of the member 92.

The micrometer adjustment screw 79 is rotatably mounted into the outer end of the member 85. The screw has a reduced portion 79' which is rotatably received into an opening 100 through the outer end of the member 85. There is a shoulder 89" which will keep the screw from moving outwardly and there is provided a graduated knurled thumb piece 101 secured to the outer end 79' of the micrometer screw for operating the screw and to prevent the adjusting screw from moving inwardly. The thumb piece is held in place on the outer end of the portion 79' of the screw 79 by a set screw 102. The micrometer adjusting screw is provided with a predetermined pitch and the thumb piece is graduated in thousandths from 1 to 25 and the pitch of the adjusting screw is such that upon a complete revolution of the thumb piece the adjusting screw will move the arm 86 twenty-five thousandths of an inch in either desired direction throughout the limitations of the adjustable length of the screw and the member 85. The adjustment is done when the nut 95 is loosened which will loosen the friction washer 90. After the adjustment is made the nut 95 is again tightened. The eccentric unit, including its supporting members and the like, are exactly the same on each side of the machine. The pump units and their supporting elements are constructed of a suitable non-corrosive material such as stainless steel, glass, plastic, etc.

As mentioned hereinbefore, at least one of the eccentric assemblies must be adjustable about the motor drive shaft 2' in order to get additional uses and results from the machine. This is best shown in Figure 5. This is done by providing a collar 105 which is fixed to the shaft 2' by set screws 106. One half of the flexible coupling 82, which is provided with a shoulder 82', is mounted over the shaft 2'. The shoulder 82' is adapted to enter a recess 105' of the collar 105 and is held in the collar by set

screws 107. The inner ends of these set screws are pointed and are adapted to fit into two small tapered recesses 82' formed in the outer surface of the shoulder portion 82' of the flexible coupling. These recesses 82' are diametrically opposite each other so that the arms 85 operating each of the two pumps may be positioned on the motor shaft to move the pistons in alternate directions as shown in Figure 1, or to move the pistons in the same direction at the same time, as shown in Figure 9.

Referring again to the arm 43, it may be seen in Figure 2 that the cabinet carriers graduations 108 along the slot 70 marked off in 5 cc. to 50 cc. This gives a setting for the stationary supporting arm 43 for the sizes of pump to be used.

The pump is connected to the liquid supply by a flexible tube 110, preferably a suitable plastic tubing, which is extended over the reduced portion 20' of the member 20 which is connected to the reservoir of liquid. Over the portion 32' there is provided a flexible tube 111 similar to the tube 110 to convey the liquid to the vials.

The motor is preferably of the shunt wound type and is electrically controlled by a special device (not shown) to give to the motor shaft any constant speed within certain limits regardless of the load.

The pumping units and their supporting members are easily removed by releasing the thumb screws 44 and 65. The whole assembly may be removed and placed into a steam sterilizer for cleaning. The pumps displace a fixed quantity of liquid with each stroke and are adjustable to very small variations by the micrometer adjusting screw 79 operated by the thumb screw 101.

The machine may operate either one or two pumps. A number of short cuts may be made by using both pumps at one time. If it is a straight vial filling operation, the pumps may be set in phase or unison, as shown in Figure 9. If it is a mixing operation, two different liquids may be put in the same container in different quantities by using different size pumps or by adjusting the eccentrically mounted members 92. In a straight pumping operation the eccentric means may be shifted to 180 degrees about the shaft in relation to the other eccentric means in order to get a continuous flow, as a continuous flow is required in many metering operations. The alternate position of the pumps is shown in Figure 1. The machine may operate continuously or be operated by a simple electric switch, preferably one that is operated by foot.

By means of the hinged action about the pin 37 adjacent the upper end of the pump and the hinged action about the pin 61 adjacent the lower end of the pump, there is no strain on the operating pump as a result of any misalignment in the pump supporting members when it is connected into the member 15 and clamped to the lower end of the piston by the cap 50. As the axes of these hinge pins are parallel and the bottom and top pump holding elements 60 and 38 respectively are rotatably supported on the outer end of the sleeve member 92 and the stationary support 43, there is no strain in any direction on the pump when assembled and in operation as the hinge pins are in parallel lines perpendicular to a line running through the axis of the stationary arm 43 and the axis of the rotatable shaft 80 and in a plane perpendicular to the axis of the rotatable shaft.

The machine may be used singly or in multiples by means of the electronic control. The machines may be synchronized to operate at the same speed and at the same time.

The machine has many uses and advantages which are not found in the conventional filling machine including its accuracy and positive pumping. The micrometer adjustment of the pump is accurate to a fraction of one percent, and the ease of removing the complete pump assembly for cleaning or steam sterilizing is very advantageous.

While the preferred form of the invention has been illustrated and described in detail, it is not intended as a

limitation as the scope of the invention is best defined in the appended claims.

I claim:

1. A filling machine comprising in combination, a base having at least one reciprocating pump including a cylinder element and a piston element carried on the base, a supporting member for the cylinder and a supporting member for the piston, means for securing the pump supporting members on the base, one of the pump supporting members having an elongated bearing pivotally mounted upon a pin carried on the base and the other pump supporting member having an elongated bearing mounted upon a rotatable shaft rotatably mounted upon the base, means for eccentrically mounting the second mentioned pump supporting member to the rotatable shaft, each pump supporting member having a separate hinge adjacent their mountings with the pivot mounting on the base and the mounting on the rotatable shaft the hinge axis on the two hinges being along parallel lines substantially perpendicular to a line running through the elongated axis of the pivot of the mounting of the first mentioned pump support and the elongated axis of the rotatable shaft, and means for rotating the said shaft.

2. In a device as set forth in claim 1 in which the means for eccentrically mounting the pump supporting member comprises, a rotatable member carried on the outer end of the rotatable shaft and extending laterally beyond the diameter of the shaft to form an off-set member from the axis thereof, a guide way associated with the off-set member, an arm slidably carried in the guide way for supporting the second mentioned pump supporting member, the off-set member having index markings evenly spaced along the edge of the guide way, the axis of the shaft and arm being parallel and a micrometer screw adjustment for moving the arm along the guide relative to the axis of the shaft for a predetermined number of index markings determining the length of the stroke of the piston within the cylinder for a given quantity of liquid per stroke.

3. A filling machine comprising, in combination, a base having a pair of reciprocating pump units including cylinders and piston elements for each pump unit carried on the base, a supporting member for each of the cylinders and a pump supporting member for each of the said pistons, means for securing the pump supporting units on the base, one of each of the pump units supporting members being pivotally mounted on the base and the other pump supporting members being carried on each end of a single rotatable drive shaft rotatably mounted upon the base, means for eccentrically mounting the second mentioned pump supporting members to the rotatable shaft, each pump supporting member having a separate hinge adjacent their mountings with the pivot mounting on the base and the mounting on the rotatable shaft along parallel lines perpendicular to lines running through the pivot points of the mountings of the first mentioned pump supports and the axis of the rotatable shafts and in planes perpendicular to the axis of the rotatable shaft and means for rotating the said shaft means for adjusting the eccentrically mounted pump supports about the axis of the drive shaft in order that the pumps may be operated in time relation in respect to each other.

4. In a filling machine as set forth in claim 3 in which the eccentric means operating the two pump supporting members carried thereby are adjustable about the axis of the rotatable shaft relative to each other, whereby the actions of the pumps may be varied from acting alternately to acting in unison.

5. A filling machine comprising, in combination a base having at least two upright side portions, a pair of rotatable shafts extending through each wall on substantially the same axis, a single driving means connected with the two shafts, a reciprocating pump including a cylinder and a piston element carried on each of the side portions, each cylinder and piston having a supporting element

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therefor, one of each of the pump supporting elements being pivotally mounted to a pin one each side of the portions of the machine and the other pump supporting elements being connected to the outer end of the respective rotatable shaft, means for eccentrically mounting the second mentioned pump supporting elements to the rotatable shafts, comprising a rotatable outer face member carried on the outer ends of each of the two shafts and extending laterally beyond the diameter of the respective shafts in the form of an off-set from the axis thereof, 10 a guideway associated with the off-set members, an arm carried in each of the guideways of the off-set members for supporting the second mentioned pump supporting member, the off-set member having index markings evenly spaced along the edge of the guide way the axis of the shafts and arms being parallel and a micrometer screw adjustment for each of the arm members for moving the arms relative to the axis of the respective shafts for deter-

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mining the length of the stroke of the pistons within their respective cylinders, each pump supporting member having a hinge adjacent their pivot mounting on the base and a hinge adjacent their mounting on the rotatable shaft along parallel lines perpendicular to lines on each of the sides of the machine running through the elongated axis of the pivot pins of the mountings of the first mentioned pump supporting means and the axis of the rotatable shaft.

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