

July 8, 1930.

C. E. BRE MILLER

1,769,941

FILLING APPARATUS

Filed June 14, 1926

2 Sheets-Sheet 1

Fig. 1.

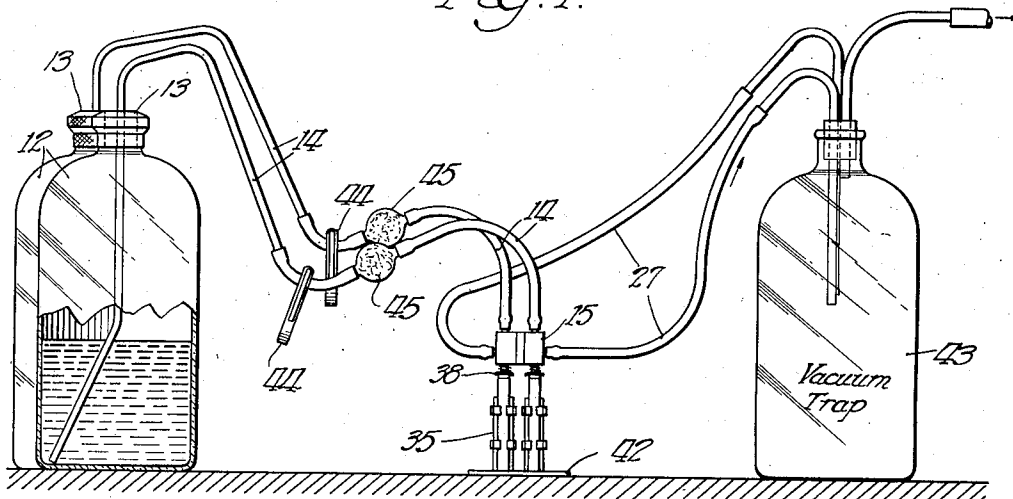
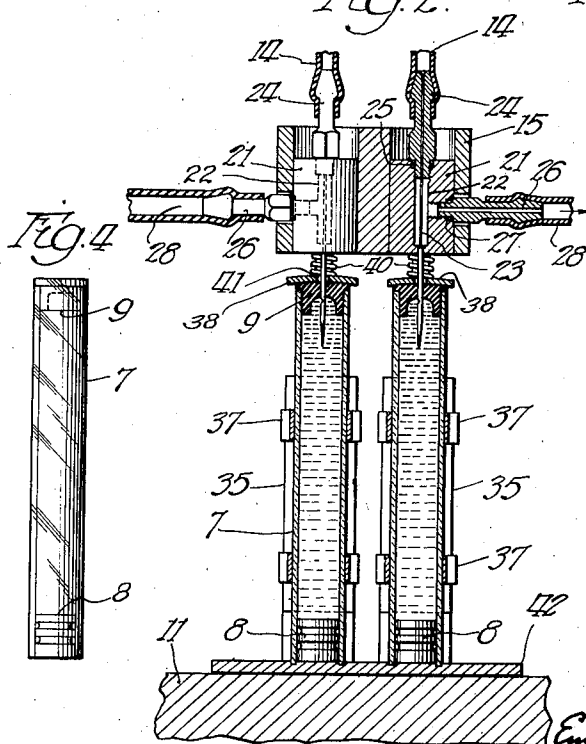


Fig. 2.

Fig. 3.



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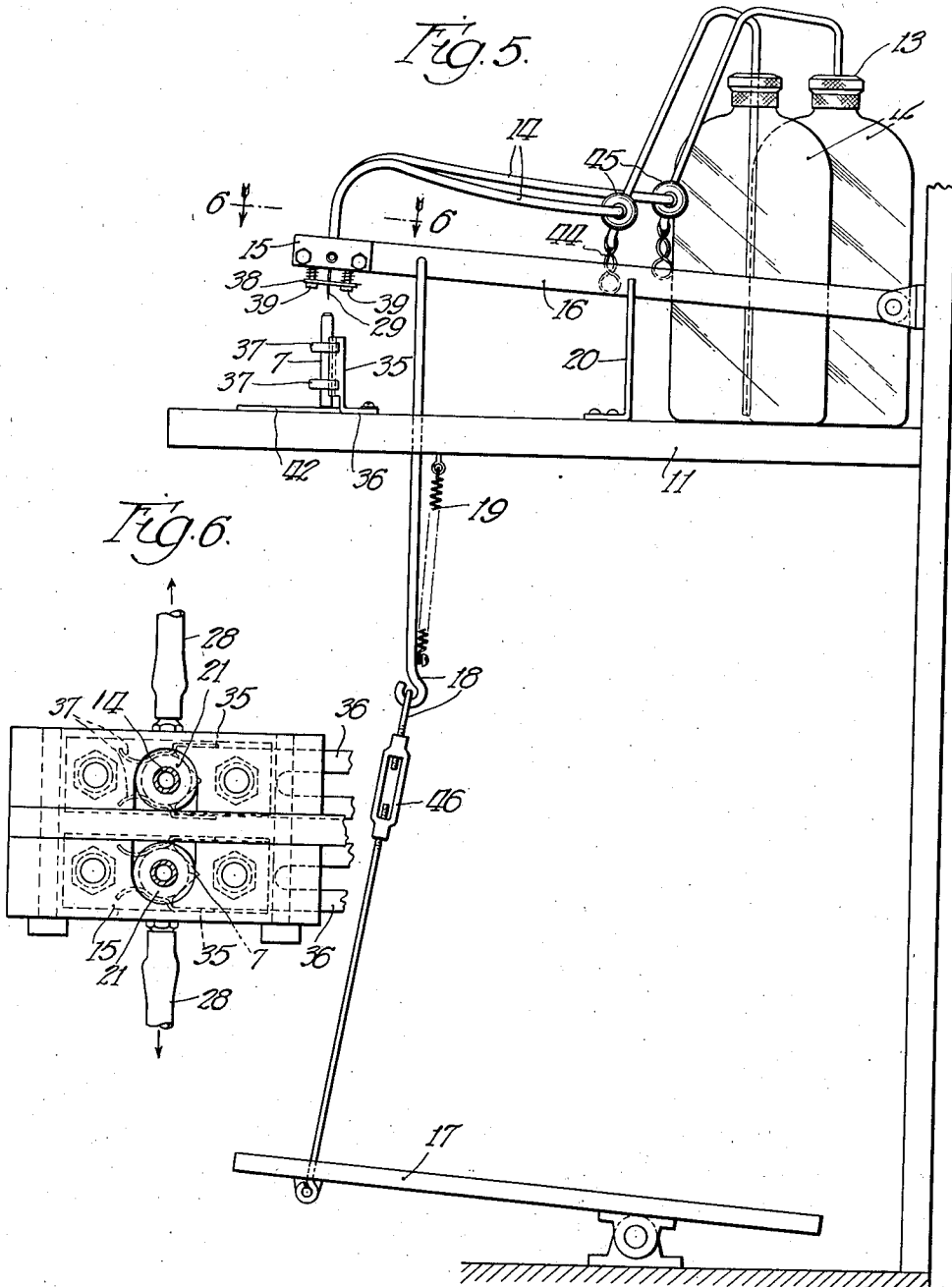
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2 Sheets-Sheet 2.



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UNITED STATES PATENT OFFICE

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FILLING APPARATUS

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This invention relates to the filling of syringe cartridges and aims to provide a practicable method and means by which empty sterilized and sealed cartridges may be filled with sterile fluid under aseptic conditions, whereby sterile medicament packages are provided.

The invention may be understood by reference to one illustrative apparatus shown in the accompanying drawings, in which:

Fig. 1 is a front elevation, omitting certain operating parts;

Fig. 2 is an enlarged vertical section of a filling member shown in the act of filling two cartridges, also shown in section;

Fig. 3 is a greatly magnified longitudinal section through one of the filling needles;

Fig. 4 is a side view of one of the cartridges;

Fig. 5 is a side elevation of the apparatus; and

Fig. 6 is an enlarged section on line 6—6 of Fig. 5, showing the filling member in plan.

It is to be understood that the apparatus shown in the drawings merely exemplifies one embodiment of the invention, and that in the following explanation of the specific apparatus the described details of structure and organization are merely exemplary.

The cartridge shown comprises a glass tube 7 having stoppers 8 and 9 in its opposite ends constituting sealing closures. These stoppers are preferably of highly resilient rubber of a character which will not affect the medicament deleteriously. In use in a syringe, the stopper 9 is pierced by a hollow needle or canula, while the opposite stopper or plug 8 is forced inwardly to expel the medicament through such needle or canula. It will be observed that the stopper 9 consists of a flanged plug with an inwardly facing axial recess, the flange of the plug overlying the end of the glass cartridge tube. This particular cartridge embodies subject-matter for which applications by other inventors are pending.

To prepare it for the filling process, the cartridge is sterilized so that it may hold its charge indefinitely without contamination. First, the tube 7 is sterilized; then the plugs

8 and 9 having been previously sterilized are inserted either manually or by mechanical means. Lastly, the closed receptacle is sterilized. Thus an empty, sealed aseptic container is provided, ready for filling.

The principal parts of the filling apparatus are shown in Figs. 1 and 5. On a support 11 are shown two vessels 12, each open to atmospheric pressure, but each provided with filters 13 to keep out bacteria and other impurities, and each containing a supply of the medicament to be packaged, and connected by a conduit 14 with a filling member 15. The filling member shown is a "duplex" member, i. e., it is constructed so as to fill two cartridges simultaneously; but obviously, it is within the scope of the invention to provide means for filling any other number of cartridges in a single operation.

The illustrative process employs a partial vacuum for withdrawing air from the cartridges, thereby creating a suction sufficient to cause the medicament to pass from vessels 12 into the cartridges to fill them. Hence the cartridges are best held upright on support 11 so that the air may be withdrawn from the top, thereby preventing needless flow of the medicament into the suction line. As shown in Fig. 5, the filling member 15 is mounted on a swingable arm 16 extending over the support 11 and moved downwardly by a treadle 17, for example, connected to the arm 15 by a linkage 18. To hold the filling attachment normally above the cartridges and to restore it to an out-of-the-way position after filling, a spring 19 may be attached to the support 11 and linkage 18 as shown. A guide 20 for the arm 16 is also shown.

The filling member 15 is best shown in Figs. 2 and 6 and consists of a casing bolted or otherwise secured to the end of the swingable arm 16 and enclosing two like filling attachments 21, either of which may be removed and used individually in manual filling of the cartridges. Each filling attachment 21 has an axial passage 22 through which passes a conduit in the form of a fine needle-like tube 23, joined at one end to a screwed-in nipple 24 to which one of the tubes 14 is connected by rubber tubing form-

ing part of the conduit 14. The nipple 24 may seal its end of the axial passage 22 by means of a gasket 25. To the interior of the filling attachment another screwed-in nipple 26 is connected, preferably with a gasket 27 interposed. A tube 28 leads from each nipple 26 to a source of vacuum, e. g., a vacuum tank and pump (not shown).

Referring to Figs. 2 and 3, each tube 23 forms a medicament conduit extending entirely through the filling attachment 21 and into a filling needle whose outer wall is formed by a hollow tube 29 of small diameter, but sufficiently large to enclose tube 23 and form therewith an annular passage 30 connected with the source of vacuum. The fine tube 29 is secured at one end to the attachment 21, as shown in Fig. 3, and has a suction port 31 at an intermediate point. To facilitate piercing of the rubber plugs 9, a removable hard metal piercing point 32 is fast to the lower end of tube 29. As shown, the piercing point 32 is fitted within the end of tube 29 and closes the same except for a passage 33 communicating with the bore of canula 23. The medicament is discharged through transverse passages 34 providing two lateral discharge ports, which may be at right angles to passage 33 or inclined downwardly as shown. A separate plug-piercing member is advantageous in that it may be of special material well adapted for the severe service to which it will be subjected, and may be replaced when too blunt for further service without replacing the entire filling attachment.

While the above described apparatus will fill cartridges satisfactorily, certain refinements add materially to the facility with which the apparatus may be used.

Referring to Figs. 1 and 5, on support 11 are two upright receptacle stands 35 for the cartridges during filling. Each stand 35 is V-shaped in cross-section, as shown in Fig. 6, to accommodate the round walls of the cartridges, and each has a base 36, slotted so as to be adjustable relative to the needles of the filling attachments, which should pierce the plugs 9 near the centers thereof. To render manual holding of the cartridges unnecessary, each stand may have spring clips 37 designed partially to embrace a cartridge.

Because the cartridge bodies are made of glass, it is preferable to interpose resilient clamping means between the filling attachments and the cartridges. According to Figs. 1 and 2, there is a plate 38 underneath each filling attachment, each supported on two bolts 39 carrying springs 40. Each plate 38 has a perforation 41 for the filling needle (Fig. 2). As the swingable arm 15 moves down, the needles first enter the respective plugs, following which the plates 38 engage the tops of the cartridges, which in this instance are cushioned by the flanges of the

rubber plugs 9. The piercing of the plugs 9 by the needles results in compression of the springs 40, thereby holding the plates 38 yieldingly clamped on the ends of the cartridges.

As the filling needle must be of sufficient diameter to provide adequate passageways both for the inflowing medicament and the outflowing air, and must also have sufficient rigidity to prevent bending, it cannot be extremely small in diameter; and hence after the cartridges are filled and the needle is moved out of the cartridges it tends to draw the pierced plug out of the end of the tube, especially if the plug is not tight fitting due to a slight variation in the glass tube, or because the plug itself is of sub-standard size. If the plug were drawn out, the medicament would be exposed to the atmosphere, and its sterility would be lost, necessitating discarding the receptacle and its medicament. The spring pressed plate 38 positively prevents such withdrawal, by forcing the plug inwardly simultaneously with the outward pull of the filling needle.

To prevent atmospheric pressure on the slidable plugs 8 from moving said plugs upwardly in the tubes 7 during the filling process, which would reduce the interior volume of the cartridges and render them unsalable, a temporary sealing means is provided, herein a rubber cushion 42 (Fig. 2) laid over the support 11, so that the tubes stand on the cushion 42 during filling. Pressure from the swinging arm 15 will thrust the ends of the tubes sufficiently far into the cushion to seal them and wholly prevent any upward movement of the slidable plugs. When the parts are constructed and arranged properly, this sealing action will result even though the ends of the tubes are quite uneven. The rubber cushion also prevents chipping of the edges of the glass tubes due to a heavy thrust from the swingable arm.

While the suction lines 28 could be directly connected with a vacuum tank, it is preferable to interpose a trap to collect any medicament entrained by the suction through port 31. Such a trap is illustrated by the bottle 43 (Fig. 1). Flow of the medicament through tubes 13 may be controlled by valves in the form of pinch-cocks 44, while entrance of impurities into the medicament-reservoirs 12 from back flow through the tubes 13 may be prevented by removable filters 45 (Fig. 1). And in order to adjust the position of the treadle, and thereby the stroke or extent of movement of the arm 16, a turnbuckle 46 (Fig. 5) may be provided.

In using the apparatus, after the sterile, empty cartridges have been positioned, the operator pushes down on the treadle 17, causing the filling needles to puncture the plugs at the ends of two cartridges. As soon as the exhaust ports 31 are within the recesses

of the plugs 9, the vacuum lines withdraw air from the respective cartridges and the medicament impelled by atmospheric pressure within the reservoirs 12, immediately starts flowing into the cartridges, so that within a second or two they are filled completely, not even a bubble of air remaining, unless desired. Then by releasing the treadle, the spring 19 (aided by springs 40) removes the filling needles, whereupon the plugs 9 immediately and automatically seal the cartridges. After inspection the cartridges are labeled, boxed and then marketed.

The plugs 9 are flanged not only to make it impossible for the filling needle to force them into the cartridges (which would prevent filling as the ports 31, 34 would be sealed by the plugs), but also to cushion the edges of the tubular glass bodies of the cartridges, which may be somewhat uneven and hence apt to chip. The inwardly facing recesses of the cartridge plugs 9 are advantageous during the filling operation because they permit withdrawal of the air from the extreme top of the sealed cartridge while the medicament is introduced from a lower point. The recesses also very greatly facilitate piercing of the plugs, and likewise make withdrawal of the filling needle easier.

The pointed end 32 of the filling needles does not act as a punch on the rubber plug but merely thrusts the rubber aside, as it were, so that no particle of rubber is cut and left floating in the medicament, which would be a merchandising objection. As will be understood from Fig. 3, the lateral downwardly inclined passages 34 throw streams of medicament against the inner walls of the cartridge tubes (not against the bottom), thus preventing foaming, which is undesirable because of the relatively large amount of medicament in the form of foam which would be sucked out through the lines 28, and would necessarily have to be recovered after treatment. So as to prevent any considerable portion of the medicament from being carried out by suction as soon as it issues from passages 34, the intake and discharge ports are spaced apart rather far, and the discharge is directed in a generally downward path.

Obviously the present invention is not restricted to the particular embodiment herein shown and described, nor is it necessary that all the features of the invention be used conjointly; they may be employed advantageously in various combinations and sub-combinations as defined in the claims.

What I claim is:

1. An apparatus for filling sealed syringe cartridges, embodying a hollow needle to pierce a resilient cartridge closure and through which sterile fluid is introduced into the cartridge, in combination with cartridge-holding means and needle-holding means in

operative relationship and movable one toward and from the other to cause the needle to pierce the cartridge closure and to be withdrawn therefrom, and a spring-pressed plate associated with the needle to engage the cartridge closure and the spring of which is compressed as the needle is thrust through the closure so that while the needle is being withdrawn the plate yieldingly bears upon the closure and resists tendency to withdraw the closure from the cartridge.

2. In an apparatus for filling syringe cartridges, a needle to pierce a resilient cartridge closure, comprising concentric tubes and a terminal part interfitting with one of said tubes and abutting the other tube, the terminal part having a passage communicating with the bore of the inner tube, and the outer tube having a lateral orifice to admit air to the passage between the tubes.

3. An apparatus for filling sealed syringe cartridges, embodying a hollow needle to pierce a resilient cartridge closure and through which sterile fluid is introduced into the cartridge, in combination with cartridge-holding means and needle-holding means in operative relationship and movable one toward and from the other to cause the needle to pierce the cartridge closure and to be withdrawn therefrom, said cartridge holding means comprising a support on which the cartridge stands and means including a resilient clasp for holding the cartridge in position on said support.

4. An apparatus for filling sealed syringe cartridges, embodying a hollow needle to pierce a resilient cartridge closure and through which sterile fluid is introduced into the cartridge, in combination with cartridge-holding means and needle-holding means in operative relationship and movable one toward and from the other to cause the needle to pierce the cartridge closure and to be withdrawn therefrom, said cartridge-holding means comprising an elastic seat for the end of the cartridge opposite said closure and means for holding the cartridge in position on said seat to be pierced by the needle.

5. A device for use in filling sealed syringe cartridges comprising a needle to pierce a resilient cartridge closure having an axial passage for introducing fluid and a surrounding passage for conducting off air, the latter passage having a lateral inlet orifice above the discharge end of the needle, said needle embodying fine concentric tubes providing said passages, the inner of which tubes extends for a substantial distance beyond the end of the outer tube opposite the discharge end of the needle, a holder to which said needle is attached having a nipple for attachment of a fluid supply pipe, the said extension of the inner tube of the needle being fitted in the bore of said nipple, said holder having a passage surrounding said extension

and in communication with the outer tube of the needle, and a nipple for attachment of an air exhaust pipe in communication with said passage.

- 5 6. An apparatus for filling sealed syringe cartridges, embodying means including fine pointed piercing means to pierce a resilient closure of the cartridge for exhausting air from the cartridge and introducing sterile fluid into the cartridge, and means preventing the action of atmospheric pressure on the opposite end of the cartridge during such exhaust action so as to prevent the inward movement of the cartridge closure or plug
10 opposite that pierced by the needle, said last named means comprising a base of elastic material such as rubber engaged by and sealing the butt end of the cartridge during the exhausting and filling action.

- 15 20 In testimony whereof, I have signed my name to this specification.

CLIFFORD E. BRE MILLER.

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