

[54] **ARMING CAP FOR BREECH LOADED SYRINGE**

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 [73] Assignee: **Sherwood Medical Industries Inc.**  
 [22] Filed: **Oct. 7, 1970**  
 [21] Appl. No.: **78,767**

[52] U.S. Cl. .... **128/218 PA, 29/235**  
 [51] Int. Cl. .... **A61m 5/00**  
 [58] Field of Search. .... **29/436, 428, 422, 235; 128/224, 218, 218 PA, 218 P, 218 R**

[56] **References Cited**  
**UNITED STATES PATENTS**

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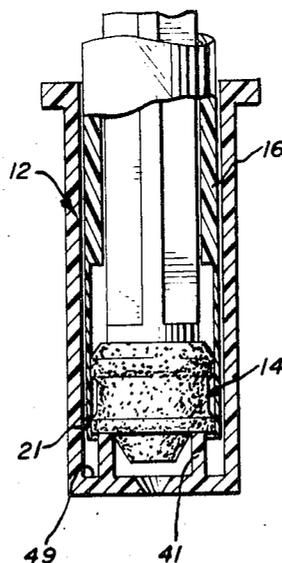
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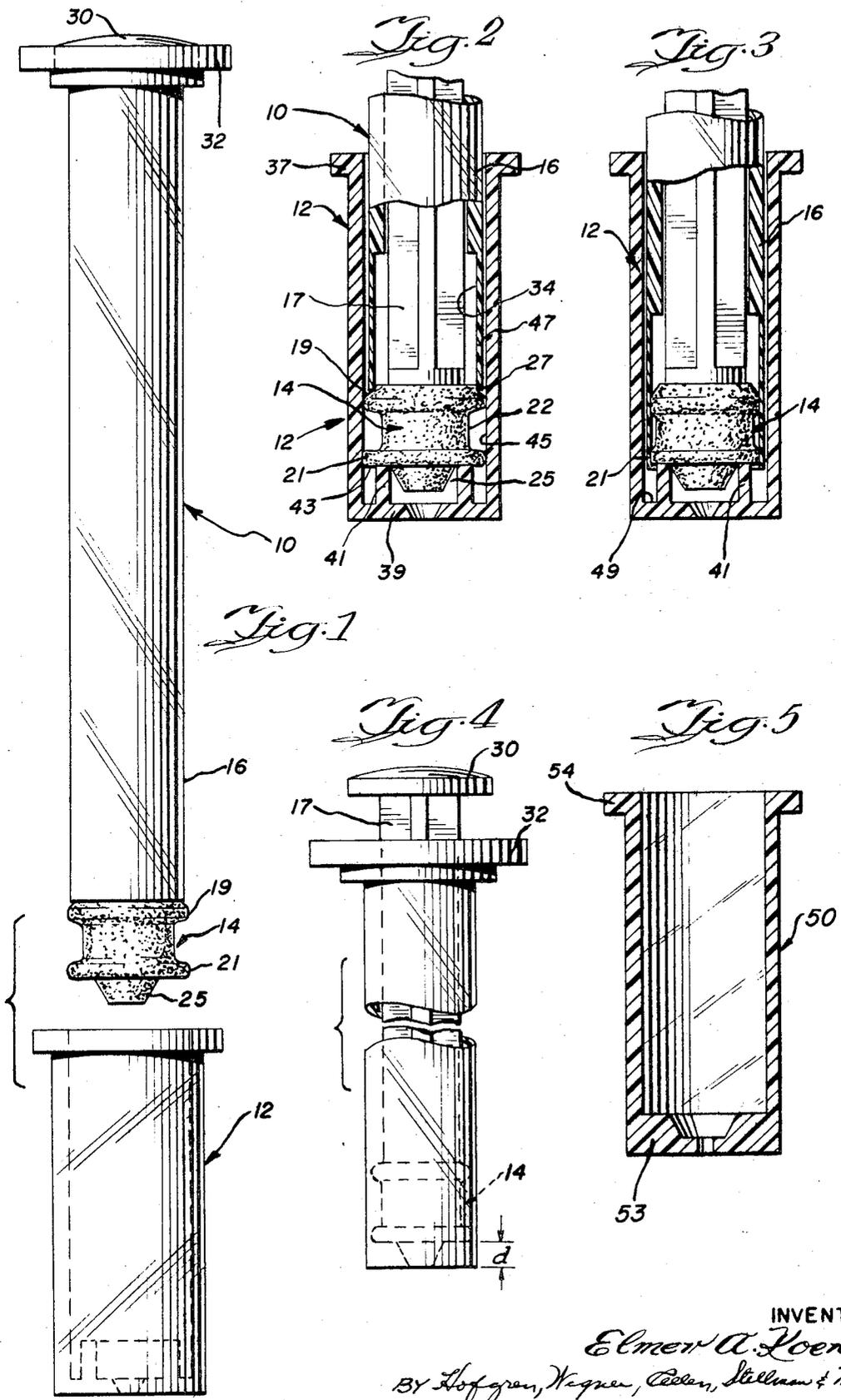
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[57] **ABSTRACT**

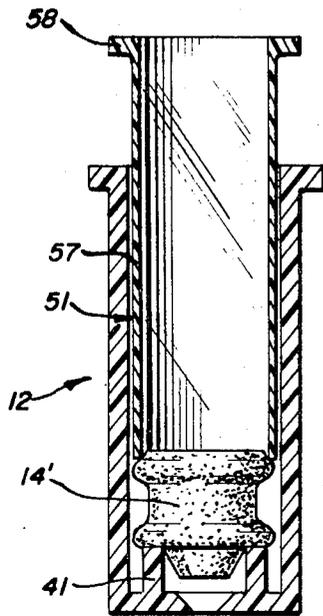
An arming cap for loading a resilient piston within a cylindrical part of a hypodermic syringe including a generally cylindrical member open at one end and having a diameter sufficient to loosely receive both the resilient piston and the cylindrical syringe part into which it is to be inserted, there being provided an annular projection at the closed end of the cap to arrest movement of the resilient piston so that the cylindrical syringe part may slide within the arming cap over the resilient piston to compress and encapsulate the same.

**6 Claims, 10 Drawing Figures**

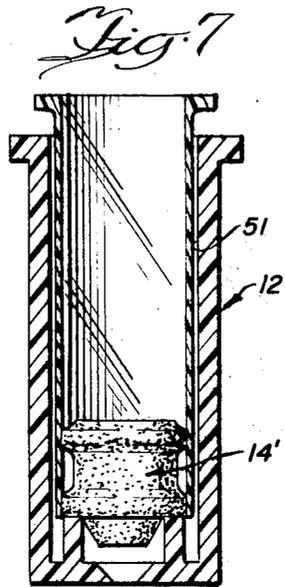




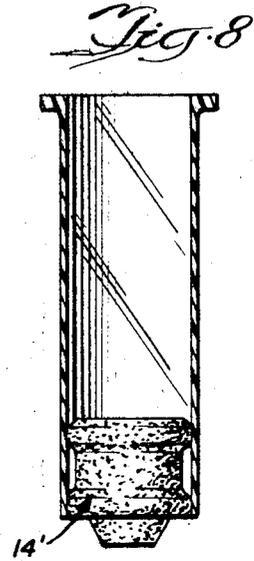
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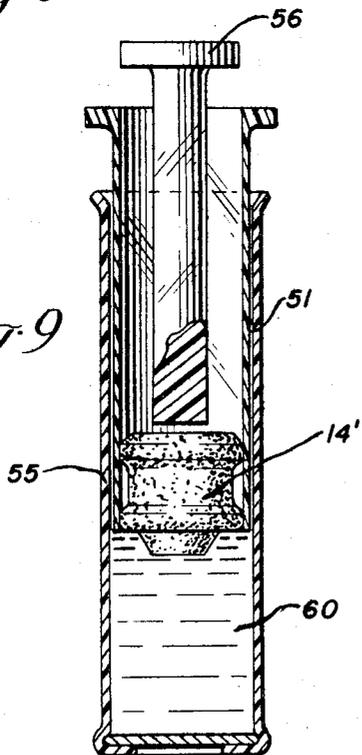
*Fig. 6*



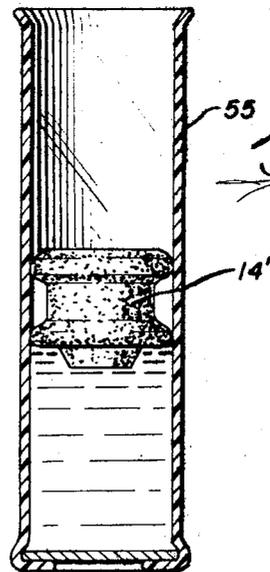
*Fig. 7*



*Fig. 8*



*Fig. 9*



*Fig. 10*

**ARMING CAP FOR BREECH LOADED SYRINGE****BACKGROUND OF THE INVENTION**

There have in the past been provided many types of hypodermic syringes that have resilient pistons slidable within the syringe barrel to dispense medicament from the barrel out the syringe needle. One type falling into this general syringe class is the piston syringe disclosed in the copending application of Marvin D. Stumpp and Elmer A. Koenig, entitled "Breech Loaded Syringe and Method of Breech Loading Syringes," Ser. No. 860,233, filed Sept. 23, 1969, now U.S. Pat. No. 3,588,194 assigned to the assignee of the present invention. Briefly, this prior syringe includes a unique plunger assembly that permits and facilitates the insertion of the piston within the syringe barrel to the level of the medicament within the syringe without the entrapment of air between the piston and the medicament. The plunger assembly includes a plunger having an annular resilient rubber piston on the end thereof with the piston in its relaxed state having a diameter somewhat greater than the diameter of the interior of the syringe barrel. For the purpose of reducing temporarily the outside diameter of the resilient piston to facilitate insertion within the cylindrical barrel, a sheath is provided around the plunger that slides axially over the piston and compresses the same to a diameter wherein the entire plunger assembly may be loosely inserted within the cylindrical syringe barrel.

After insertion of the plunger assembly within the syringe barrel to the point where the piston contacts the medicament, the sleeve or sheath around the piston is slid upwardly, or outwardly, with respect to the open end of the cylinder barrel, releasing the piston within the barrel without entrapping any air therein.

An apparatus for automatically filling syringes of this type and for withdrawing the sheath or sleeve to release the piston within the cylinder barrel is disclosed in the copending application of Edward R. Tascher and Elmer A. Koenig entitled "Syringe Filling Apparatus," Ser. No. 26,683, filed Apr. 8, 1970, now U.S. Pat. No. 3,662,517 assigned to the assignee of the present invention.

In this prior syringe construction, a difficulty has been found in initially inserting the resilient piston within the sleeve to the proper depth within the sleeve and also without causing any contamination of the resilient piston itself.

A similar problem has been found in loading pistons directly in the syringe barrels themselves in cases where the plunger assembly is not connected to the piston and these cannot be used for inserting the piston.

**SUMMARY OF THE INVENTION**

In accordance with the present invention an arming cap is provided that is constructed to facilitate the insertion of a resilient piston either within the sheath of a syringe plunger assembly or directly within the syringe barrel itself.

Toward this end the arming cap is generally a closed ended cylindrical member having in one embodiment an annular projection extending axially from the closed end thereof for positioning the resilient piston adjacent but spaced from the bottom of the arming cap.

The portion of the syringe into which the piston is to be inserted, whether it be the plunger sheath or a cylin-

drical sleeve, has a diameter somewhat less than the arming cap so that it may be slidably received therein.

Taking the case of the plunger assembly, it is introduced into the arming cap with the piston exposed. After the piston engages the annular projection at the end of the arming cap, arresting the piston, the sheath is moved further within the arming cap compressing the piston and encapsulating the same within the sheath. The plunger assembly is thereby fully armed with the piston within the sheath and the entire assembly is then ready to be loaded into a syringe barrel containing medicament in the manner described above. The arming cap thus facilitates the contamination free insertion of the piston within a syringe part. It may also serve to cover the piston end of the plunger assembly during transport and storage.

In the case of the arming cap being employed in conjunction with a sleeve to insert a separate piston directly into an associated syringe barrel, an arming cap is provided having an inside diameter that receives the sleeve, the sleeve not being a part of the plunger assembly. The piston is initially positioned in the bottom of the arming cap with its rearward end facing the open end of the arming cap. Thereafter, the separate sleeve is slid within the arming cap, radially compressing the resilient piston as it slides axially thereover, thereby positioning the piston within the sleeve. The sleeve is then inserted in the syringe barrel to the level of the medicament and thereafter a suitable plunger rod is employed to push the piston from the sleeve and into the syringe barrel without entrapping any air. In this case the piston serves as a stopper or cap over the open end of the syringe barrel or syringe cartridge until it is desired that the unit be used at which time a threaded or snapfit plunger assembly is inserted into the end of the resilient piston.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is an exploded view of a plunger assembly and arming cap according to the present invention;

FIG. 2 is a sectional view of the plunger assembly and arming cap according to FIG. 1 with the plunger assembly inserted within the arming cap;

FIG. 3 is a sectional view similar to FIG. 2 with the sheath of the plunger assembly partly inserted over the plunger piston;

FIG. 4 is a front elevation of the plunger assembly according to FIGS. 1 to 3 with the piston in its armed position within the plunger sheath;

FIG. 5 is a cross section of a modified form of the arming cap;

FIG. 6 is a cross section of a sleeve and arming cap according to another embodiment of the present invention just prior to insertion of the piston within the sleeve;

FIG. 7 is a cross section of the sleeve shown in FIG. 6 with the piston inserted within the sleeve;

FIG. 8 is a cross section of the piston within the sleeve;

FIG. 9 is a cross section of the sleeve with the piston being inserted within a syringe barrel; and

FIG. 10 is a cross section of the syringe barrel with the piston inserted therein.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 a plunger assembly 10 is shown which forms part of a hypodermic syringe of the type illustrated in the copending application of Ser. No. 860,233, now U.S. Pat. No. 3,588,194 cited above. An arming cap 12 is provided for inserting a resilient piston 14 of the plunger assembly 10 within a sheath or sleeve 16.

As seen more clearly in FIGS. 2 and 3, the plunger assembly 10 includes an internal plunger member 17 having a releasable fitting (not shown) at the end thereof which fits within and holds the resilient rubber piston 14. Rubber piston 14 has two annular lands 19 and 21 separated by a reduced portion 22. A frusto-conical projection 25 extends integrally from the end of the piston 14. Land 19 has a conical portion 27 that assists reception of the sleeve or sheath 16 as will appear more clearly below. At the upper end of the plunger member 17 is a flange 30 that fits within an annular flange 32 affixed to the cylindrical sheath or sleeve 16 (see FIG. 4).

The sleeve 16 is annular in configuration and has an annular recess or counterbore 34 at the lower end thereof for receiving the piston 14 in its retracted or "armed" position as shown in FIG. 4.

As noted above, the arming cap 12 is provided for assisting the loading of the piston within the counterbore 34 of sleeve 16. Cap 12 is generally cylindrical in construction having a flange 37 at the open end thereof and a bottom wall 39 closing the other end.

For the purpose of determining the degree of axial insertion of the piston 14 within counterbore 34 of sleeve 16, an annular axially extending projection 41 is provided extending upwardly and integrally from the bottom wall 39 of the arming cap.

During assembly or loading, the projection 41 engages the forward radial face 43 of the piston land 21 arresting the entire piston 14 and holding it in position as the sleeve 16 is slid thereover.

It should be understood that the interior of bore 34 is less than the outer diameter of the lands 19 and 21. Moreover, there is a slight engagement between the lands 19 and 21 and the interior wall 45 of the arming cap just sufficient to prevent the arming cap from falling off in this position of the parts shown in FIG. 2.

During arming of the piston 14 in the sleeve 16, the plunger assembly 10 is inserted into the arming cap 12 until the piston surface 43 engages the projection 41 at the lower end at the bottom of the arming cap. Thereafter sleeve 16 is grasped and pushed downwardly so that the reduced portion 47 thereof cams over piston surface 27 squeezing land 19 into the recess 34. Downward movement of sleeve 16 is continued until the sleeve portion 47 engages land 21 as shown in FIG. 3. The downward movement of sleeve 16 is continued, compressing land 21 inwardly and permitting full insertion of the piston 14 into recess 34.

Further downward movement of sleeve 16 is permitted until the end of sleeve portion 47 engages the inside wall surface 49 on the bottom of the arming cap 12. Thus, the length of the projection 41 determines the extent of insertion of the piston 14 within the sleeve recess 34, as represented by distance  $d$  in FIG. 4,

wherein the piston 14 is shown in its fully inserted position.

A somewhat modified arming cap 50 is shown in FIG. 5, generally similar to arming cap 12 except that no projection 41 is provided on the lower wall thereof. Cap 50 has an annular flange 54 at the upper end thereof and a bottom wall 53 at the lower end thereof.

A further modification of the invention is shown in FIGS. 6 to 10 wherein the arming cap 12 is employed to load piston 14' into a sleeve 51. By loading the piston within sleeve 51, the sleeve and piston may be inserted into a conventional syringe barrel such as shown at 55 in FIG. 9 to the level of medicament therein, and the piston released by suitable plunger 56 without entrapping any air within the syringe barrel. This embodiment is useful in syringe assemblies that do not have the composite plunger assembly shown in the FIGS. 1 to 4 embodiment of the present invention.

The sleeve 51 has a cylindrical portion 57 with a flange 58 at the upper end thereof. It should be noted that sleeve 51 performs the same general function as sleeve 16 in the FIGS. 1 to 4 embodiment.

In use of the FIGS. 6 to 10 embodiment, a piston 14' is first inserted within the arming cap 12, until it engages projection 41. The separate sleeve 51 is then inserted within the arming cap, and squeezed over the piston 14' compressing the piston radially inwardly loading the same within the sleeve as shown clearly in FIGS. 7 and 8.

The sleeve with the piston loaded therein is drawn from the arming cap and inserted into a syringe barrel 55 partly filled with medicament as shown at 60 in FIG. 9. The sleeve 51 has an outside diameter such that it is loosely received within the inside of the syringe barrel 55 permitting any air to escape along the outside of the sleeve as the sleeve with the piston is inserted within the syringe barrel. With the piston in engagement with the medicament within the syringe barrel, and with the piston still within the sleeve 51 as shown in FIG. 9, a plunger 56 is employed to hold the piston 14' as the sleeve 51 is drawn upwardly releasing the piston 14' within the cylinder barrel 55 as shown in FIG. 10, without the entrapment of any air between the piston and the medicament.

Thereafter, when use of the syringe barrel shown in FIG. 10 is desired, a suitable plunger assembly is connected to the piston 14' and the syringe barrel 55.

I claim:

1. An arming cap for loading a resilient piston within a smaller diameter portion of a sleeve for subsequent insertion into a syringe barrel, comprising: a cap member having an internal bore, said bore having a diameter sufficient to readily receive the piston, and stop means in the bore to arrest movement of the piston within the bore, said bore being adapted to receive within the bore a cylindrical sleeve to slide over and encapsulate the piston.

2. An arming cap as defined in claim 1, wherein said stop means includes an axially extending annular projection within the bore engageable with said piston to determine the degree of insertion of the piston within the cylindrical sleeve.

3. An arming cap as defined in claim 2 wherein the projection is constructed to engage the forward end of the piston.

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4. An arming cap as defined in claim 1 wherein the stop means is adapted to engage the forward end of the piston.

5. A syringe plunger and arming cap assembly, comprising: a plunger, a resilient piston on the end of the plunger, a sleeve surrounding said plunger and adapted to receive and compress the piston preparatory to loading the plunger into the barrel of a syringe, an arming cap for loading the piston within the sleeve, said cap being generally cylindrical in construction and having a bore with an internal diameter sufficient to readily receive the piston, said bore being of sufficient diameter to also receive the sleeve, and stop means in the arming cap for arresting movement of the piston and permitting the sleeve to slide over and compress the piston.

6. A syringe barrel and arming cap assembly, comprising; a syringe barrel having a generally cylindrical construction, a resilient piston adapted to be inserted in said barrel and having a relaxed outside diameter greater than the inside diameter of the cylindrical syringe barrel, a sleeve, an arming cap for inserting the piston within the sleeve including a generally cylindrical member having an inside diameter sufficient to loosely receive the piston, and stop means in the cap member for arresting movement of the piston, said arming cap being constructed to receive the sleeve and hold the piston while the sleeve slides over and compresses the piston, said sleeve having a diameter sized to slide easily within the syringe barrel so that the piston may be released therein.

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