

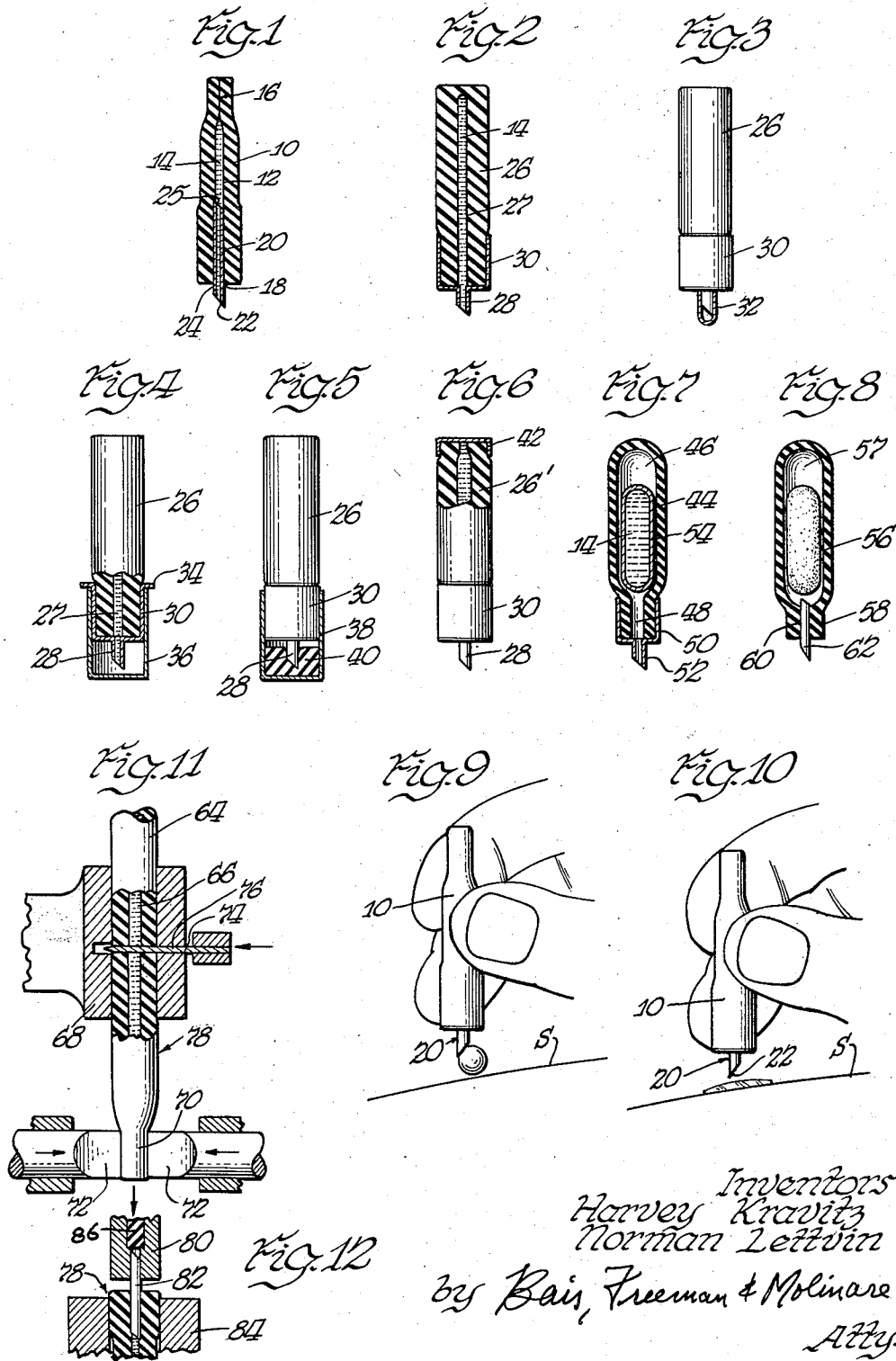
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MEANS AND METHOD FOR VACCINATING

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MEANS AND METHOD FOR VACCINATING

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This invention relates to a method of vaccinating people and to an instrumentality by means of which said method of vaccination may be practiced.

The present method of vaccinating against smallpox has been used for many, many years—approximately from the turn of the century. In the practice of the referred to method, vaccine is provided in a sealed glass tube and a scarifying instrument, a long needle, is provided in a second sealed glass tube. In addition to these two sealed glass tubes, a rubber dispensing bulb having a bore completely therethrough is provided for use in assisting the discharge of vaccine from the first glass tube.

In using this equipment, the glass tube containing the vaccine is slipped into the bore in the rubber bulb with both ends of the glass tube protruding beyond the rubber bulb. Then the ends of the vaccine-containing glass tube are broken off. Then the rubber bulb is moved over one of the open ends of the remaining center section, the physician places one finger over the opening in the bulb and then squeezes the bulb to force the vaccine fluid from the glass tube out through the other severed end thereof. The fluid forced out through this glass tube is deposited onto the skin of the person who is to be vaccinated.

After the vaccine has been deposited onto the skin of the patient, the physician then takes the glass tube containing the scarifying instrument therein, breaks the glass tube and extracts the scarifying instrument, and uses it to scarify the portion of the skin to which the vaccine is applied.

This entire procedure consumes considerable time and is very inefficient for the simple reason that many times, in the breaking of the vaccine-containing glass tube, the glass tube is broken at the wrong point and a second vial of vaccine must be used. Also, when extracting the scarifying instrument from the second glass tube—because said scarifying needle is very thin—it may be dropped by the physician and a second scarifying instrument must be used. All of these difficulties come about by the use of these glass tubes within which are provided the vaccine and scarifying instrument.

Further, since the same dispensing bulb may be used over a long period of time, the bulb is usually unsanitary and, by the use thereof, there is always the possibility of infecting the patient.

A further problem arises in vaccinating young children in that small children are often terrified by the appearance of the elongated scarifying needle. Although the scarifying procedure is not painful, the child resists any attempts to apply the needle to his skin and, by moving his arm, may often cause the physician to scarify over a substantially large area. This often results in undesirably large or disfiguring scars which are the result of the vaccination "taking." Furthermore, the time delay between the application of the vaccine to the skin of the child and the subsequent scarifying of the skin to which the vaccine is applied, is sufficient to apprise the child of the fact that something is going to happen; and during this time

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delay the child develops an increase in fear and resistance to the subsequent event of scarification. In any event, the present method of vaccinating leaves much to be desired, as it is inefficient and often results in disturbances disquieting to both the physician and the patient.

The problem of mass vaccination, besides being complex because of the number of people involved, is further complicated by the inefficiency of the system above noted. Mass vaccination takes place in army installations and in large cities when there is a case of smallpox reported. Only a few years ago, the entire city of New York was vaccinated because a person died from smallpox in that city. A more efficient vaccinating system than the one described above would have materially reduced the problems which accompanied such mass vaccination.

Thus it is an object of this invention to provide a new and improved method of vaccinating people.

It is another object of this invention to provide a method of vaccinating people in a more efficient manner than has heretofore been known.

A further object of this invention is to provide a new and improved method of applying the amount of vaccine desired onto the skin of the person being vaccinated.

Another object is to provide an instrumentality for accomplishing the objects set forth above.

A further object is to provide a vaccinating instrument which is a novel combination vaccine-dispenser and scarifying instrument.

And a further object of this invention is to provide an apparatus for vaccinating people which is more sanitary than that presently used.

Still another object of this invention is to provide a novel vaccinating instrumentality which is characterized by its simplicity of construction and its ease and inexpensiveness of production.

Still a further object of this invention is to provide a novel method for making a vaccinating instrumentality which serves as a combination vaccine-dispenser and scarifying instrument.

Further objects and advantages of this invention will become apparent as the following description proceeds and the features of novelty which characterize this invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

A preferred embodiment of the invention is shown in the accompanying drawing, in which:

Figure 1 is a longitudinal cross-section view of one form of the novel apparatus employed in the novel vaccinating procedure described herein;

Figure 2 is a longitudinal cross-section view of a modified form of apparatus;

Figure 3 is an elevation view of the vaccinating apparatus shown in Figure 2, provided with one type of protecting cap for the needle portion of the apparatus;

Figures 4 and 5 show modified forms of protecting caps for the needle portion of the vaccinating apparatus;

Figure 6 is an elevation view partly in cross section showing a modified form of closure for the tubular container of vaccine;

Figures 7 and 8 are longitudinal cross-section views of other modified forms of the vaccinating apparatus;

Figure 9 is a view illustrating a step in the novel vaccinating procedure utilizing the type of apparatus shown in the previous figures;

Figure 10 is a view illustrating a typical position of the vaccinating apparatus during the vaccination procedure at a time later than that shown in Figure 9; and

Figures 11 and 12 are diagrammatic illustrations of typical apparatus used in the novel method of producing some of the forms of the novel vaccinating apparatus illustrated herein.

Referring now to the drawings, there is shown in Fig-

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ure 1 a vaccinating apparatus comprising a tubular container 10 having a bore, recess, or chamber 12 therein which is filled with vaccine 14. The container 10 is made of any suitable flexible resilient material, such as any of the well known plastics which are used for tubing, and which are non-reactive to the vaccine to be enclosed therein, and usable in the manner herein described. One end of the container is flattened and sealed as indicated at 16, in any appropriate manner such as by means of heat. The recess or bore 12 opens through only one end of the container 10 as at opening 18.

Inserted through opening 18 into container 10 is a hollow needle 20 which is adapted to serve both as a dispensing means and scarifying means. The greater portion of the length of needle 20 is inserted into the longitudinal bore 12 and serves to reinforce or rigidify the portion of the container 10 adjacent the dispensing opening 18 therein. This reinforced section affords grasping thereof without squeezing any of the vaccine from the container 10.

The portion of the needle which extends from the container 10 is made as short as possible. However, the portion of the needle extending from the container 10 must be sufficiently long to provide a beveled tip 22 which provides a sharp tip for the purpose of scarifying, and a cylindrical portion 24 between the beveled tip 22 and the container 10. If it is desired to mount a protecting member or cap on the needle in the manner as shown in Figure 3, then a greater portion 24 should extend outwardly of the container to afford means for mounting said protecting cap thereon.

The needle 20 is of slightly greater diameter than the bore 12 and in this way the resilient material of container 10 frictionally retains the needle 20 in position. The inner end of needle 20 may be beveled at 25 so as to provide for ease in inserting the needle 20 into container 10.

In the form shown at Figure 2 there is a tubular container 26 having a bore 27 therein filled with vaccine 14. A dispensing and scarifying hollow needle 28 is secured to a cup-shaped member 30 which clamps onto the open end of the tubular container 26 so as to frictionally retain the cup-shaped member and the needle on the container. The clamping of the walls of the cup-shaped member against the outer walls of the flexible container 26 does not pinch off the bore of the container because the incompressible fluid substantially resists such attempt. The bore in the hollow needle 28 is aligned with opening of the recess or bore 27 in container 26.

In Figure 3, a vaccinating instrumentality is shown similar to the one in Figure 2, and provided with a protecting cap 32 for the dispensing and scarifying needle portion of the apparatus. This protecting cap 32 may be made of resilient material and is adapted to be slipped over the beveled tip of the needle and to frictionally engage the cylindrical portion 29 of the needle extending between the container and the beveled tip of the needle.

Figure 4 shows another form of protecting cap for the dispensing and scarifying needle-like instrumentality in the type of apparatus shown in Figure 2. In this particular form the cup-shaped member 30 is provided with an outwardly extending flange portion 34, and the protecting cap 36 is a cup-shaped member which slips over the walls of the cup-shaped member 30 and is retained thereon by frictional engagement. The flange 34 serves to engage the edge of the cap 36 and limit the extent to which cap 36 may be slipped onto cup-shaped member 30 and thus protects the tip of the needle from damaging engagement with the base of the cap 36. The flange 34 affords means for grasping the vaccinating apparatus with one hand while removing cap 36 with the other hand.

In the protecting cap shown in Figure 5, a cup-shaped protecting cap 38 is slipped over the cup-shaped member 30 of the vaccinating apparatus. The bottom of the cup-shaped protecting cap is filled with a sterile, resilient, non-capillary filling 40 into which the tip of the needle

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28 may be buried, which filling serves both to protect the tip of the needle and to seal the opening in the needle.

In the modification shown in Figure 6, another means is disclosed for sealing the closed end of the container 26' and may include a cup-shaped member 42 which is clamped onto one end of the container 26'. The clamping engagement of the cup-shaped member 42 with the resilient material of the container 26' serves to fully seal that end of the container.

In the vaccinating apparatus shown in Figure 7, there is provided a resilient, flexible container 44 having an enlarged recess or chamber 46 formed therein and having a single opening 48 leading to said chamber 46. Secured to the container 44 by any appropriate means is a cup-shaped member 50 having a dispensing and scarifying needle-like instrumentality 52 extending therefrom similar to that shown in Figure 2. Positioned in the recess or chamber 46 is a frangible or rupturable capsule 54 filled with vaccine 14. The frangible or rupturable capsule 54 is adapted to be opened by manual pressure applied through the walls of container 44. The frangible or rupturable capsule may be formed of any appropriate material, such as a plastic material or a gelatin. The capsule may also be treated, as is well known, to prevent vaccine losses therethrough in storage, and to prevent chemical reaction between the capsule and the vaccine.

In the modified form shown in Figure 8, the container 56 is similar to the container shown in Figure 7, except that container 56 has a solid portion 58 provided with bore 60 therethrough and a hollow needle 62, of the type shown in Figure 1, frictionally retained in bore 60. One end of needle 62 extends outwardly of container 56 to serve as the scarifying means, while the other end of needle 62 extends into chamber 57, as shown, and may operate, if desired, to pierce the rupturable capsule therein.

In using the novel vaccinating apparatus above described, the vaccinating apparatus is held in one hand between the thumb, first and middle fingers as shown in Figures 9 and 10. By resting the heel of the hand on some support, such as a portion of the body adjacent that to which the vaccine is to be applied, a fairly steady arrangement is obtained. The tip of the needle is spaced slightly from the surface of the skin which is indicated at Figures 9 and 10 by the letters S. By either bending or squeezing the flexible portion of the container which is filled with vaccine, the person applying the vaccine is able to squeeze out a drop of vaccine through the bore of the needle and form a drop in the manner as shown in Figure 9. If the needle is very thin, it is difficult to form and hold large drops on the outside thereof, and, therefore, the size of the needle must be such as to afford good retention thereon of drops of vaccine of a magnitude which the physician would find desirable to work with.

The size of the drop that can be formed is dependent in part on the viscosity of the vaccine, the surface tension of the vaccine, and the size and condition of the surface of the needle from which the drop is suspended. After a drop of selected size has been formed on the outside of the needle, the drop is moved into engagement with skin surface S which causes the drop to be transferred from the needle onto the surface of the skin as shown in Figure 10. At that point the needle's position is directly above the dispensed vaccine as shown in Figure 10 and vaccination can be accomplished merely by jabbing the needle into the portion of the skin to which the vaccine is applied so as to scarify that portion of the skin. Three or four jabs should be sufficient to accomplish scarification although, theoretically, only one good jab is required. It can readily be seen that such dispensing and scarification is much more rapid and simpler than the procedure heretofore practiced.

In the use of the apparatus shown in Figures 7 and 8, the rupturable or frangible capsule is first ruptured by sufficient pressure through the walls of the container, or

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by piercing with the inner end of needle 62, and thereafter the dispensing and scarification takes place in the same manner as previously disclosed.

It will be seen that the size of the recess or chamber in the apparatus may be made as large as it is necessary to carry the required amount of vaccine therein. In the apparatus disclosed, usually more vaccine should be provided than is required to be dispensed because some of the vaccine will remain within the container. However, the person dispensing the vaccine has a certain amount of control of the dispensing procedure that previously did not exist. For example, because of the fact that the container is sealed, there are rather large forces tending to retain the vaccine within the container and therefore when the container is squeezed the vaccine will not just squirt out of the dispensing needle. By carefully applying pressure to the walls of the container, one drop at a time may be squeezed out of the container depending upon the amount of vaccine that should be applied. Thus, a real feel is provided which assists the operator in dispensing the correct quantity of vaccine.

In order to prevent the vaccine from flowing out of the open end of the dispensing needle under the force of gravity and in order to provide additional resistance to dispensing under the squeeze of the physician, the opening or aperture through which the vaccine is dispensed is made fairly small, and is of such size that the combination of capillary forces at the opening of the dispenser, and the forces within the fluid itself which normally resist flow, such as the forces of viscosity and surface tension, cooperate to retain the fluid within the container despite the fact that forces of gravity may be acting upon the fluid to cause it to flow out therefrom. Furthermore, the degree of resiliency of the walls of the container may also be varied to provide sufficient resistance where necessary to provide for accurate dispensing of vaccine therefrom under normal pressures which can be developed by the fingers of a physician.

In Figures 11 and 12, a typical apparatus is disclosed which may be used in forming some of the modified forms of apparatus disclosed herein. For example, Figure 11 discloses a tube 64, whose bore 66 is filled with vaccine, extending through a support member 68 and having the free end of the tube 70 extending beyond the support 68. Means, including members 72, are provided for flattening and heat sealing the free end of the tube 64. Thereafter a knife 74 extending through slot 76 in support 68 is thrust forward and severs a segment generally indicated at 78 from the length of vaccine-filled tubing 64. The segment 78 may then be manipulated as desired without the vaccine flowing out therefrom because, as pointed out above, the size of the opening in the tubing is such that the capillary forces, and inherent forces in the fluid which resist flow, resist the forces of gravity which may tend to cause the flow of vaccine from the segment 78. Thus we have a method of forming containers which are filled initially and thereafter may be manipulated to form the final product.

In Figure 12, there is shown diagrammatically a type of apparatus which is used in the finishing operation with the segment 78 formed in Figure 11. In Figure 12, there is shown a needle inserting means 80 which is inserting a hollow needle 82 into the open end of the sealed segment 78 which is supported by a jig 84, or the like. Suitable resilient means 86 are provided where pressures may be applied to the tip of the needle 82 during the inserting of said needle 82.

Instead of using the apparatus disclosed in Figure 11 to seal the free end of the tube 64, any appropriate means can be used to apply a closure member—like cup-shaped member 42 shown in Figure 6—to the free end of the vaccine-filled tube 64 prior to the severance of a segment such as 78 therefrom.

It will be understood that the vaccinating apparatus

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described herein is to be used only once and is then discarded. Since the needle portion of the apparatus is covered before use thereof, the sterility thereof is maintained and the possibility of infections resulting from use of the apparatus is practically non-existent. The construction of the apparatus is so simple that the costs of manufacture of the apparatus should be very low.

Thus, it can be seen that there has been provided a novel and greatly improved technique of vaccinating people, and there has also been provided an instrumentality for practicing the improved technique, which instrumentality is very simple in construction and operation and is more sanitary than instrumentalities used heretofore.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention, and, therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim as new, and desire to secure by Letters Patent of the United States, is:

1. A method of manufacturing a vaccinating instrumentality comprising the steps of providing a length of flexible non-permeable tubing filled with liquid vaccine, sealing one end of said length of vaccine-filled tubing, then severing a segment of desired length of said vaccine-filled tubing, said segment including said sealed end, and then securing a hollow dispensing-scarifying instrumentality to the other end of said segment so that access to the vaccine in said tubing segment may be had only through said hollow dispensing-scarifying instrumentality.

2. A method of manufacturing a vaccinating instrumentality comprising the steps of providing a length of flexible non-permeable tubing filled with liquid vaccine, sealing one end of said length of vaccine-filled tubing, then severing a segment of desired length of said vaccine-filled tubing, said segment including said sealed end, and then forcing a length of hollow needle into the free end of said segment tubing and leaving a sharpened end of said hollow needle protruding from said segment tubing.

3. A method of manufacturing a vaccinating instrumentality comprising the steps of providing a length of flexible non-permeable tubing filled with liquid vaccine, sealing one end of said length of vaccine-filled tubing, then severing a segment of desired length of said vaccine-filled tubing, said segment including said sealed end, providing a hollow dispensing-scarifying instrumentality and aligning its bore with the bore of said tubing at the open end of said segment, and then securing said dispensing-scarifying instrumentality to the free end of said flexible tubing segment by frictional sealing engagement thereof with the walls of said segment.

4. A device for vaccinating people comprising a flexible non-permeable container enclosing a chamber having liquid vaccine therein, said container having an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the forces tending to keep the liquid from flowing out through said opening are greater than any natural forces which tend to make the liquid vaccine run out of said container, a hollow needle in communication with said opening and projecting outwardly of said container, and the outwardly projecting portion of the needle being sharpened to afford use thereof as a scarifying instrumentality.

5. A device for vaccinating people comprising a flexible non-permeable elongated container enclosing a chamber having liquid vaccine therein, said container having at one end thereof an opening therethrough communicating with said chamber, said opening being sufficiently small so that the capillary force on the liquid vaccine is greater than any gravity forces which may tend to make the liquid vaccine run out of said container, a hollow needle in communication with said opening and

projecting outwardly of said container, reinforcing means including a member relatively rigid with respect to said flexible container extending coextensively over the portion of the length of said container adjacent the outwardly extending portion of the needle, said container adapted to be grasped by the reinforced length thereof, and the flexible portion of the container adapted to be manipulated by a finger of the hand grasping said container to force a quantity of liquid vaccine out through said needle.

6. A device for vaccinating people comprising a flexible non-permeable container enclosing a chamber having liquid vaccine therein, said container having an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the capillary force on the liquid vaccine is greater than any gravity force which may tend to make the liquid vaccine run out of said container, a hollow needle in communication with said opening and projecting outwardly of said container, and the size of said needle being sufficient to afford temporary retention thereon of a drop of vaccine squeezed therethrough.

7. A device for vaccinating people comprising a flexible non-permeable container enclosing a chamber having liquid vaccine therein, said container having an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the capillary force of the fluid vaccine is greater than the forces which tend to make the liquid vaccine run out of said container, a hollow needle in communication with said opening and projecting outwardly of said container, said portion of the needle projecting outwardly of said container being short relative to the length of said container, said needle having a beveled outer tip, and a portion of the cylindrical length of said needle extending outwardly from said container between said container and said beveled tip.

8. A device for vaccinating people comprising a flexible non-permeable tubular container having a bore therethrough filled with liquid vaccine, a rigid hollow needle-like member, the bore of which is aligned with the bore in said tubular container, extending from one end of the tubular container, a rigid closure member clamped onto the other end of said tubular container in an air-tight seal, said rigid closure member and rigid hollow needle-like member being spaced to provide that a portion of said flexible tubular container, between said rigid closure member and rigid needle-like member, is squeezable to permit dispensing of vaccine from said container through said needle-like member.

9. A device for vaccinating people comprising a flexible, resilient, non-permeable substantially tubular container having a bore therein filled with liquid vaccine, said bore opening through only one end of said tubular container, a hollow needle in communication with said bore and projecting outwardly of said container, a portion of the length of said needle being inserted in said bore of the tubular container, and the size of said needle being greater than the initial bore of said tubular container, whereby the bore of said resilient container must stretch to receive said needle and said needle being frictionally retained therein.

10. A device for vaccinating people comprising a flexible non-permeable container enclosing a chamber having liquid vaccine therein, said container having an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the capillary force on the fluid vaccine is greater than

any gravity force which may tend to make the liquid vaccine run out of said container, a hollow needle in communication with said opening and projecting outwardly of said container, said needle having a beveled outer tip, a portion of the cylindrical length of said needle extending outwardly from said container between said container and said beveled tip, and a resilient sealing cap slipped over the beveled portion of the needle and resiliently grasping the cylindrical portion of the needle.

11. A device of the character described comprising a flexible non-permeable container enclosing a chamber adapted to have a liquid therein, said container completely enclosing said chamber except for an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the forces tending to keep the liquid from flowing out through said opening are greater than any natural forces which tend to make the liquid run out of said container, said flexible container adapted to be squeezed to dispense liquid therefrom through only said outlet opening, and scarifying means carried by said container adjacent the outlet opening thereof and projecting outwardly of said container.

12. A device of the character described comprising a flexible non-permeable container enclosing a chamber, said container completely enclosing said chamber except for an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the forces tending to keep the liquid from flowing out through said opening are greater than any natural forces which tend to make the liquid run out of said container, said flexible container adapted to be squeezed to dispense liquid therefrom through only said outlet opening, scarifying means carried by said container adjacent the outlet opening thereof and projecting outwardly of said container, and a rupturable capsule, filled with liquid to be dispensed, disposed in the chamber of said container.

13. A device of the character described comprising a flexible non-permeable container enclosing a chamber, said container completely enclosing said chamber except for an outlet opening therethrough communicating with said chamber, said opening being sufficiently small so that the forces tending to keep the liquid from flowing out through said opening are greater than any natural forces which tend to make the liquid run out of said container, said flexible container adapted to be squeezed to dispense liquid therefrom through only said outlet opening, scarifying means carried by said container adjacent the outlet opening thereof and projecting outwardly of said container, a rupturable capsule, filled with liquid to be dispensed, disposed in the chamber of said container, and piercing means for said capsule carried by said container and extending into the chamber thereof.

14. A device of the character described as set forth in claim 11 including means carried by said container for sealing the outlet opening thereof, and for protecting the scarifying means projecting outwardly from said container.

References Cited in the file of this patent

UNITED STATES PATENTS

2,179,501	Dorsett	Nov. 14, 1939
2,551,339	Ryan	May 1, 1951
2,615,446	Lingenfelter	Oct. 28, 1952
2,618,263	Lakso et al.	Nov. 18, 1952
2,642,064	Lawshe	June 16, 1953
2,676,591	Fox	Apr. 27, 1954