

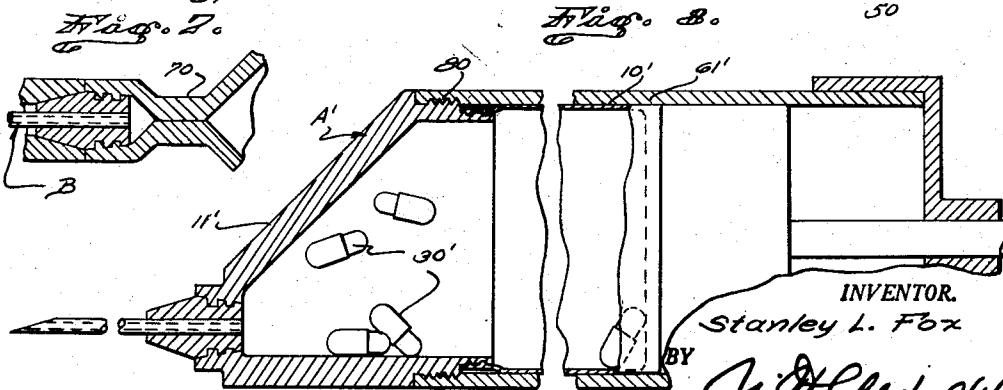
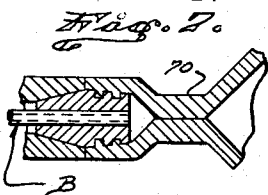
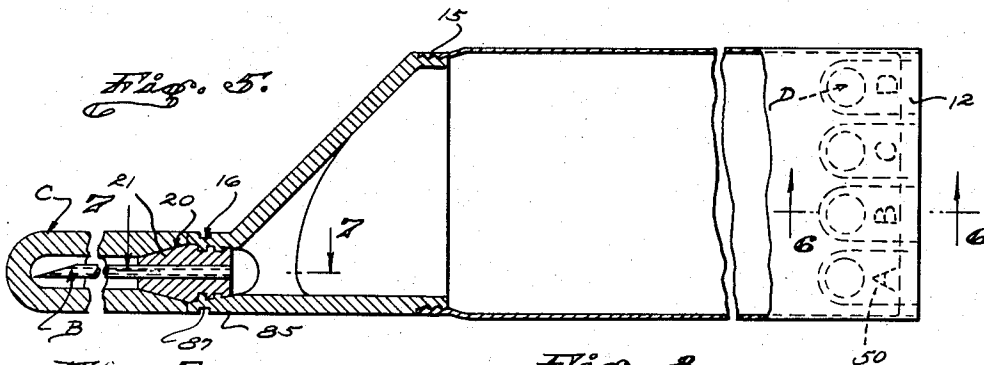
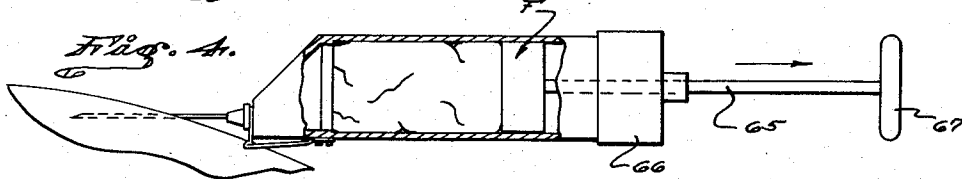
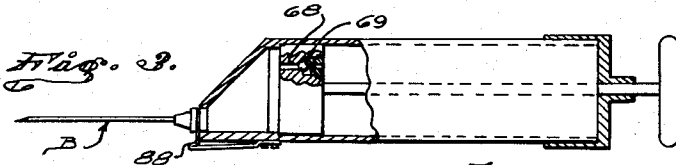
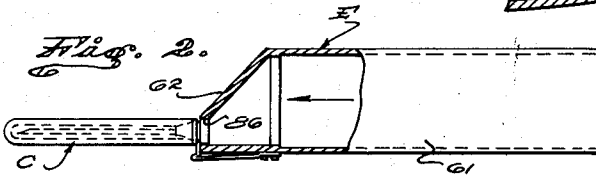
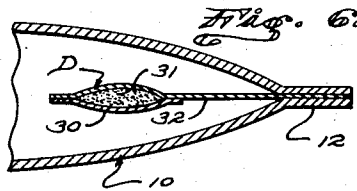
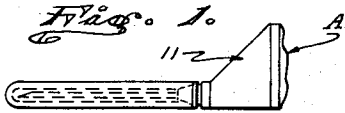
Sept. 28, 1954

S. L. FOX

2,690,179

SYRINGE

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UNITED STATES PATENT OFFICE

2,690,179

SYRINGE

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This invention is concerned with a syringe for handling fluids such as blood, materials for injection, dyes, culture media, preservatives, etc., and it is a general object of the invention to provide a syringe of simple, inexpensive construction which is highly practical and effective, which is easily and conveniently operated, and which has a very wide range of use.

Syringes are used extensively by the medical profession and heretofore such devices have been specially designed or developed for particular uses so that to perform various operations commonly desired or necessary a wide variety of devices must be at hand. For example, in the case of the taking and handling of blood specimens it is common to employ a syringe to take the blood sample and then materials are added to the sample. In some cases preservatives are added, in other cases dyes are added, in other cases culture media are added, etc. Ordinarily these various operations require considerable handling of equipment and involve exposure of materials, including the blood specimen, all with the result that there is constant danger of contamination.

Another object of the invention is to provide a syringe of the general character referred to which makes it possible to selectively add various materials or various quantities of a given material to fluid being handled while maintaining a complete seal against contamination.

It is another object of this invention to provide a syringe construction characterized by a container for handling fluid, whether a blood specimen or a fluid to be injected, which container has sealed within it, in separate vessels, suitable quantities of materials available to be selectively added to the fluid in the container, as circumstances require.

Another object of the invention is to provide a syringe of the general character referred to which has various materials present for immediate use, as desired, and which remain completely separated or sealed away from the fluid in the container of the syringe until or unless deliberately liberated.

The structure of the present invention provides a container characterized by a closed flexible or collapsible body formed completely of a chemically inert material. In one form the container is provided with a head and a needle is provided in communication with the body or to be established in communication with the body. The needle, if provided as a part of the unit formed by the container, may be carried by a mounting that is applied to the head of the container. The

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mounting may involve a simple needle-carrying fitting engaged with the head of the container. One or more charged vessels are preferably provided in the container and are charged with materials of predetermined character and in predetermined amounts, or both. The vessels when employed are subject to being broken or ruptured by force or pressure applied from the exterior of the container without injury to or rupture of the container itself. An actuating means is provided for varying pressure on the body and preferably involves a cylindrical case that carries the container so the needle projects in a manner to be usable, and a plunger that operates in the case to vary the pressure therein. The plunger when moved in one direction causes fluid to be drawn into the container and when moved in the opposite direction causes fluid to be forced from the container.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a side elevation of a container provided by the present invention showing the body thereof in collapsed condition and showing a needle carried thereby and sealed by a cap or closure. Fig. 2 is a view illustrating the container shown in Fig. 1 applied to the cylinder of the actuating means, part of the cylinder being broken away to show the engagement of the head of the container in the cylinder. Fig. 3 is a view similar to Fig. 2 showing the plunger of the actuating means in place in the cylinder ready to be operated so that fluid is drawn into the container through the needle shown uncovered for use. Fig. 4 is a view similar to Fig. 3, showing the needle applied and showing the plunger operated so that a substantial amount of fluid has been drawn into the body of the container. Fig. 5 is an enlarged detailed view of the container showing it partially in section and with the body of the container extended from the head thereof as it is when filled with fluid. Fig. 6 is an enlarged detailed sectional view taken as indicated by line 6—6 on Fig. 5. Fig. 7 is an enlarged detailed sectional view taken as indicated by line 7—7 on Fig. 5, and Fig. 8 is an enlarged detailed sectional view of another form of the invention.

The structure provided by this invention is particularly applicable to or practical for the handling of blood, fluids to be introduced into tissue or into a body, and materials incidental to or to be used in connection with such fluids. Since the

structure of the present invention is capable of various uses and can be employed to advantage in a wide variety of operation, I wish it understood that the specific structural details set forth and as the uses referred to, are to be considered merely as illustrative or for purpose of example, and not as restrictive of the scope of the invention.

Referring first to the form of the invention shown in Figs. 1 to 7, inclusive, the structure involves, generally, a container A, a needle B, a plurality of charged vessels D within the container, and operating means involving, generally, a cylindrical case E and a plunger F operating in the case. In the case illustrated the needle is a singular tubular element having only one sharpened end and it is shown normally carried by and combined with the container with the sharpened end projecting therefrom. In this case it is preferred to provide a sealing cap C that is normally engaged over the projecting portion of the needle and which is removed when the needle is used.

The container A may be merely a simple closed or sealed bag or envelope and it may be normally or initially collapsed or empty or it may be normally full or partially charged as with a suitable liquid. The container illustrated is characterized by a body 10 in the form of a cell or envelope of impervious, flexible material. In this particular case the container includes a head 11 on or sealed with the body 10 and the head is preferably formed of impervious material which is somewhat more rigid than the body.

In carrying out my present invention I prefer to form the container A entirely of one or more materials of the type popularly termed "plastic." The present invention contemplates that the material of the container be completely impervious, that it be flexible or supple for manipulation by the fingers or by simple hand-operated implements, and it is preferably transparent. For general use in the field indicated it is highly important in most cases that the container A be formed of a chemically inert material or plastic, that is, of a material that under normal conditions is for all practical purposes inert so far as the material or materials handled are concerned. When I use the term "inert" or "chemically inert" I mean to refer to or to include any material satisfying such conditions. The present invention contemplates that the container be a thermoplastic, that is, a material that can be fused or bonded by the application of a limited amount of heat. I prefer, in practice, to employ polyethylene as the material for the container A, such material being inert or chemically inert under ordinary conditions and when handling almost any ordinary or commonly used material or combination of materials encountered in the art under consideration. Further, such material is strong and yet readily flexible when made in a sheet of about one-thousandth to about thirty-two thousandths of an inch thick. A body of such flexible or supple construction is sensitive or responsive to slight pressure and responds to atmospheric pressure. This particular plastic is fusible or subject to being bonded by a degree of heat that can be easily generated, and it is available in a substantially clear or transparent state.

The body 10 of the container A in the case illustrated is an elongate tubular element with the head 11 sealed or bonded to one end while the other end is pinched together to be sealed and bonded at 12, as shown in Fig. 6 of the drawings.

It will be understood, of course, that the body 10 of the container may be of any suitable size or capacity and that its characteristics above named may be varied widely, as circumstances require.

The head 11 bonded or secured to the body 10 is preferably formed so that its wall is somewhat thicker than that of the body 10, with the result that it normally maintains a predetermined shape and it is preferably substantially conical in form, so that it has a large, round base portion 15 to which the body 10 is sealed or bonded, and a small end or apex 16 carrying the fitting that holds the needle B.

In the particular case illustrated the end of the body 11 that is joined or sealed with the head 11 surrounds the base portion 15 of the head and it may be merely tightly fitted thereon, or it may be permanently sealed or bonded thereto, as circumstances require.

The needle B illustrated in the drawings is of a type suitable for ventipuncture and in the particular case illustrated it is shown applied to the head 11 of container A by means of a suitable fitting 20 so it is in effect a part of the unit formed mainly by the container. The fitting is preferably formed of material corresponding to that of the container A. The fitting 20 is shown engaged in the small end or apex portion of head 11 where it may be sealed or bonded, as circumstances require. The needle B projects a substantial distance forward from the fitting 20 and has an open end available for use. The needle is tubular and is in communication with the interior of the container A through the fitting 20.

The closure or sealing cap C is normally engaged over the projecting portion of the needle and it preferably has sealing engagement with a projecting portion 21 of the fitting 20. In practice the cap may be applied over the needle at the time that the various elements are initially formed or assembled, or when they are sterilized or otherwise treated. The cap need not be removed to expose the needle until it is desired to use the needle and it may be immediately applied over the needle after use.

The charged vessels D that may be employed or provided in the container A may vary widely in form, number, character, etc. These vessels may be for supplying material to a charge initially carried in the container and which is to be discharged therefrom or may be for supplying material to a charge drawn into the container.

In the form of the invention illustrated there are several vessels D which are alike and which are anchored or made captive in the container to have a predetermined location therein. In this form of the invention each vessel D has an envelope portion 30 formed of a thin walled, impervious material, and this envelope portion is completely sealed to encase a body 31 of material of a predetermined nature. A tabe 32 extends or projects from the envelope 30 and is bonded to the container, preferably to the body of the container. In the particular case illustrated the tabs 32 are inserted at the end of the body 10 where the body is pinched together and sealed or thermally bonded. In practice it is preferred that the envelopes 30 and the tabs 32 be formed of the same supple material as the container A, in which event the tabs inserted at the sealed end of the body 10, as shown in Fig. 6, may be readily fused to or bonded with the body by the mere application of suitable heat and pressure.

The material 31 present in the envelopes 30 may vary in quantity and character, as circum-

stances require. For example, there may be a single or common material in each of the several envelopes, in which case a given quantity of such material may be present in each envelope or different quantities may be present in the several envelopes. In such case breaking or rupturing of one envelope 30 will liberate a given quantity of a particular material into the body 10 and if additional amounts of such material are desired other or additional envelopes may be ruptured. In a case where one of several different materials may be required, as conditions vary, the material 31 in the several envelopes may be varied so that by rupturing or breaking a selected envelope 30 the desired material may be released into the body 10 of the container. The rupturing of an envelope releases material without danger of contamination by pieces or particles of the ruptured envelope such as is likely to follow fracture or breaking of a glass container, or the like.

By locating the envelopes 30 in a series or in a predetermined order within the container and by having the several envelopes anchored in such order, the desired envelope may be broken by selection through merely determining its location in the body. As a separate means of determining the identity of envelopes 30 within the container A or to supplement the above mentioned means of identification, I preferably form the body 10 of the container of a transparent material and I suitably mark or designate the envelopes 30 as by marks, symbols, or devices visible through the wall of the body 10 or by suitably coloring the envelopes 30 so that they are readily distinguishable from each other. In the particular case illustrated suitable identifying indications or markings are shown at 50 applied to the tabs of the envelopes.

In practice it is preferred that the envelopes 30 be so formed as to be considerably weaker than the body 10 of the container A so that pressure applied to the exterior of the body 10 may be communicated to an envelope 30 in such manner as to rupture or break the envelope without in any way affecting or impairing the strength of the body 10. When the same material is employed in the construction of the envelopes as in the construction of body 10 the desired relationship can be gained by making the walls of the envelopes substantially thinner than those of the body 10.

For purpose of example and to facilitate an understanding of the nature and variety of the materials that can be employed in envelopes 30 within container A I will mention materials which may be commonly or advantageously used in connection with a blood specimen. Such materials may include anti-coagulants, preservatives, culture media, dyes, a wide variety of indicators, etc.

The operating means provided for handling the container and its attached parts, as hereinabove described, may, in practice, vary widely in form and construction. I have, for purpose of example, illustrated a simple form of operating means characterized by the case E and the plunger F.

The case is formed by a cylinder 61 closed at one end by a wall 62. The cylinder 61 is of such size as to suitably accommodate the body 10 of the container while the end wall 62 is shaped and proportioned to receive or accommodate the head 11 of container A. The wall 62 is provided with an opening or aperture which passes the apex portion of the head 11 so that the needle,

with the cap C thereon, may be arranged in position in the manner shown in Fig. 2.

The plunger F accurately fits the cylinder 61 so that it is sealed and slidable therein, and in practice it may have an operating stem 65 guided by a removable cylinder head 66 and provided with an operating handle 67. In the particular case illustrated the operating rod 65 is releasably engaged with the plunger F as by being threaded thereto, and it is engageable with either end or face of the plunger. The plunger is shown provided with an air passage 68 under control of a check valve 69 and it can be inserted in the cylinder so that the valve passes air in only one direction.

In practice the projecting or apex portion 85 of head 11 may fit tightly or snugly into the opening 86 provided in the wall 62 so that the head remains in place as a reduced pressure is established within the cylinder 61. If necessary a means may be provided for holding or retaining the head 11 in position in the cylinder or adjacent the wall 62. For example, the portion 85 of the head may be recessed at 87 and a clip or retainer 88 may be carried on the exterior of the cylinder to engage in the recess 87 and hold the head 11 securely in position.

From the foregoing description it will be apparent that a typical structure provided by the invention can be used in various purposes. For purpose of example, if a blood specimen is to be taken and it is desired to add one or more materials to such sample, the container A may be applied to the case E of the operating means in the manner illustrated in Fig. 2, the container being supplied in an exhausted or empty state, in which case the body 10 is fully collapsed and may be housed or received within the head 11. The plunger is inserted in the cylinder 61 behind the container to bear snugly against the head of the container and it is positioned so that the valve 69 passes air as the plunger is inserted. The sealing cap C may then be removed, rendering the apparatus ready for use on the patient.

To apply the needle the cylinder may be conveniently gripped and the handle 67 employed as means of thrusting the structure in a manner to suitably introduce the needle to the point where the blood specimen is to be taken. With the needle applied or introduced the handle 67 is withdrawn or moved away from the cylinder so that the plunger moves out, establishing a reduced pressure in the cylinder so that blood is drawn through the needle B and into the container, causing the body of the container to fill, as shown in Fig. 4.

In the case of a typical use of the apparatus the plunger is then removed from the cylinder and the container removed from the cylinder, whereupon the needle can be capped and the envelope 30 containing the material desired to be added to the blood sample is broken by pressure applied from the exterior of the body 10. It will be recognized that the material 31 from an envelope 30 is thus added to the blood specimen or sample without danger of contamination and with a measured or known quantity of material 31 in the envelope an exact quantity of such material is added to the specimen. The container can from this point on be handled or treated in any suitable manner, for instance, it may be immediately subjected to laboratory treatment or it may be stored, transported, etc.

If it is important or desired to hold the sample in a sealed condition as, for instance, for stor-

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age or for transportation, etc. the container A may be sealed by pressing the head 11 of the container A together at 70, as shown in Fig. 7, immediately adjacent the point where the head holds the fitting 20 and while the head is thus collapsed or pressed together at this point suitable heat may be applied, causing a sealing or bonding of the parts thus brought into contact with each other.

If the syringe is to be used for the application of fluid, as for instance, for the purpose of injecting material, then the body 10 of the container A filled or charged with the material to be injected is arranged in the cylinder 61 and the plunger, with the valve positioned to close as the plunger moves forward, is arranged in the cylinder behind the container. The needle can be handled in substantially the same manner as above described, and to feed fluid through the needle the plunger is thrust forward by forward pressure applied to the handle 67. It will be understood that if materials are desired to be added to that being injected the desired envelope or envelopes in the body 10 may be fractured or broken.

In the form of the invention illustrated in Fig. 8 of the drawings, the head 11' of the container A' is formed to be substantially rigid and the cylinder 61', instead of having an end wall 62 attaches to the base portion of the head 11' as by means of threads 80. In other respects the general relationship of the actuating means and container may be substantially the same as above described. In the form of the invention shown in Fig. 8 the envelopes 30' instead of being captive, or anchored, in the body 10' of container A' are loose or free, and may be in the nature of sealed or closed capsules to be identified or selected through variations in color, size, shape, etc.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. A device of the character described including, a closed impervious container of supple material, a manually rupturable supple material carrying vessel within the container and subject to being ruptured by manual pressure applied through the container, and a tubular needle providing communication with the container and projecting therefrom, the container being adapted to be deformed by the hand of a user sufficient to effect rupture of the said vessel.

2. A device of the character described including, a closed impervious container of supple material having a head, a rupturable material carrying vessel within the container and formed of the same material as the container and having a wall thickness substantially less than that of the container and subject to being ruptured by manual pressure applied through the container and such as will flex but not rupture the container, and a tubular needle carried by the head in communication with the container and projecting therefrom.

3. A device of the character described including, a closed impervious container of supple material and subject to being flexed but not ruptured by pressure applied directly thereto from the hand of a user, a plurality of supple rupturable material carrying vessels within the con-

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tainer and subject to being ruptured by pressure from the hand of a user applied through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom.

4. A device of the character described including, a closed impervious container of supple material and adapted to be freely flexed but not ruptured by the direct application of pressure to the exterior thereof by the hand of a user, a supple material carrying vessel within the container and subject to being burst by pressure applied by the hand of the user through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom, the container and the vessel being formed of chemically inert material.

5. A device of the character described including, a closed impervious container of supple material and subject to being flexed but not ruptured by pressure applied directly thereto from the hand of a user, a supple material carrying vessel within the container and subject to being burst by pressure applied thereto by the hand of the user and through the container, and a tubular needle in communication with the container and projecting therefrom, the container and vessel being of the same material and the wall of the vessel being substantially thinner than that of the container.

6. A device of the character described including, a closed impervious container of supple material and subject to being flexed but not ruptured by pressure applied directly thereto from the hand of a user, a supple material carrying vessel within the container and subject to being ruptured by pressure applied thereto by the hand of the user and through the container, and a tubular needle in communication with the container and projecting therefrom, the container and vessel being formed of the same chemically inert material, the wall of the vessel being thinner than that of the container.

7. A device of the character described including, a closed impervious container of supple thermoplastic material adapted to be freely flexed by pressure applied directly to the exterior thereof by the hand of a user but not subject to rupture by such pressure, a supple material carrying vessel within the container and subject to being ruptured by pressure applied thereto by the hand of the user through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom.

8. A device of the character described including, a closed container of supple material adapted to be freely flexed by pressure applied directly to the exterior thereof by the hand of a user but not subject to rupture by such pressure, a supple material carrying vessel within the container and subject to being ruptured by pressure applied by the hand of the user through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom, the container and the vessel being formed of polyethylene.

9. In combination, a closed container having a head and a supple body adapted to be flexed by pressure applied to the exterior thereof directly from the hand of a user and not subject to rupture by such pressure, a tubular needle carried by the head and projecting therefrom, a supple material carrying vessel within the body and adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container,

and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein, the cylinder having an end supporting the head of the container.

10. In combination, a closed container having a head and a supple body adapted to be flexed by pressure applied to the exterior thereof directly from the hand of a user and not subject to rupture by such pressure, a tubular needle carried by the head and projecting therefrom, a supple material carrying vessel within the body and adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container, and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein, one end of the cylinder being releasably connected to the head of the container.

11. In combination, a closed container having a head and a supple body adapted to be flexed by pressure applied to the exterior thereof directly from the hand of a user and not subject to rupture by such pressure, a tubular needle carried by the head and projecting therefrom, a plurality of supple material carrying vessels within the body each adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container, and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein.

12. In combination, a container having a head and a collapsible supple body adapted to be flexed by pressure applied to the exterior thereof directly from the hand of a user and not subject to rupture by such pressure, a tubular needle carried by the head and projecting therefrom, a plurality of supple material carrying vessels within the body each adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container, and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein, the vessels and container being formed of like chemically inert material and the walls of the vessels being thinner than those of the body.

13. A device of the character described including, a closed impervious container of supple material and of such wall thickness as to be deformable but not rupturable by pressure applied to its exterior by the hand of a user, a supple material carrying vessel anchored in a predetermined position within the container and formed of supple material and of such wall thickness as to be subject to being ruptured by pressure from the hand of a user applied through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom.

14. A device of the character described including, an impervious closed container of supple material adapted to be flexed but not ruptured by pressure applied directly thereto by the hand of a user, a plurality of separate supple material carrying vessels within the container in a predetermined arrangement therein and subject to being individually burst by pressure from the hand of a user applied through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom.

15. A device of the character described including a closed container of flexible material, a rupturable material carrying vessel within the container and subject to being burst by pressure applied through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom, the vessel having a rupturable envelope portion carrying a predetermined body of material and having a tab extending from the envelope and secured to the container and confining the said portion to a predetermined location in the container.

16. In combination, a closed container having a head and a supple body each adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container, a tubular needle carried by the head and projecting therefrom, a supple material carrying vessel anchored within the body and adapted to be ruptured by pressure from the hand of the user applied to the exterior of the body, and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein.

17. A device of the character described including, an impervious closed container of supple material adapted to be flexed but not ruptured by pressure applied directly thereto by the hand of a user, a supple material carrying vessel loose within the container and subject to being burst by pressure applied by the hand of the user through the container from the exterior thereof, and a tubular needle in communication with the container and projecting therefrom.

18. In combination, a container having a head and a supple body each adapted to be ruptured by pressure applied by the hand of the user at the exterior of the container, a tubular needle carried by the head and projecting therefrom, a supple material carrying vessel loose within the body and adapted to be ruptured by pressure from the hand of the user applied to the exterior of the body, and actuating means including a cylinder carrying the container, and a plunger operating in the cylinder to vary pressure therein.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
913,297	Krautschnneider	Feb. 23, 1909
921,130	Lockwood	May 11, 1909
937,029	Strong	Oct. 12, 1909
1,023,499	Bell	Apr. 16, 1912
1,782,938	Pletcher	Nov. 25, 1930
2,209,914	Gerber et al.	July 30, 1940
2,251,527	Smith	Aug. 5, 1941
2,300,066	Schwab	Oct. 27, 1942
2,418,392	Bender	Apr. 1, 1947
2,562,402	Winsten	July 31, 1951

FOREIGN PATENTS

Number	Country	Date
728,280	France	Apr. 11, 1932

OTHER REFERENCES

"Handbook of Plastics" by Simonds, Weith & Bigelow, 2nd edition, 1949. A copy is in the Scientific Library of the Patent Office. Pages 77, 78, 418, 419.