

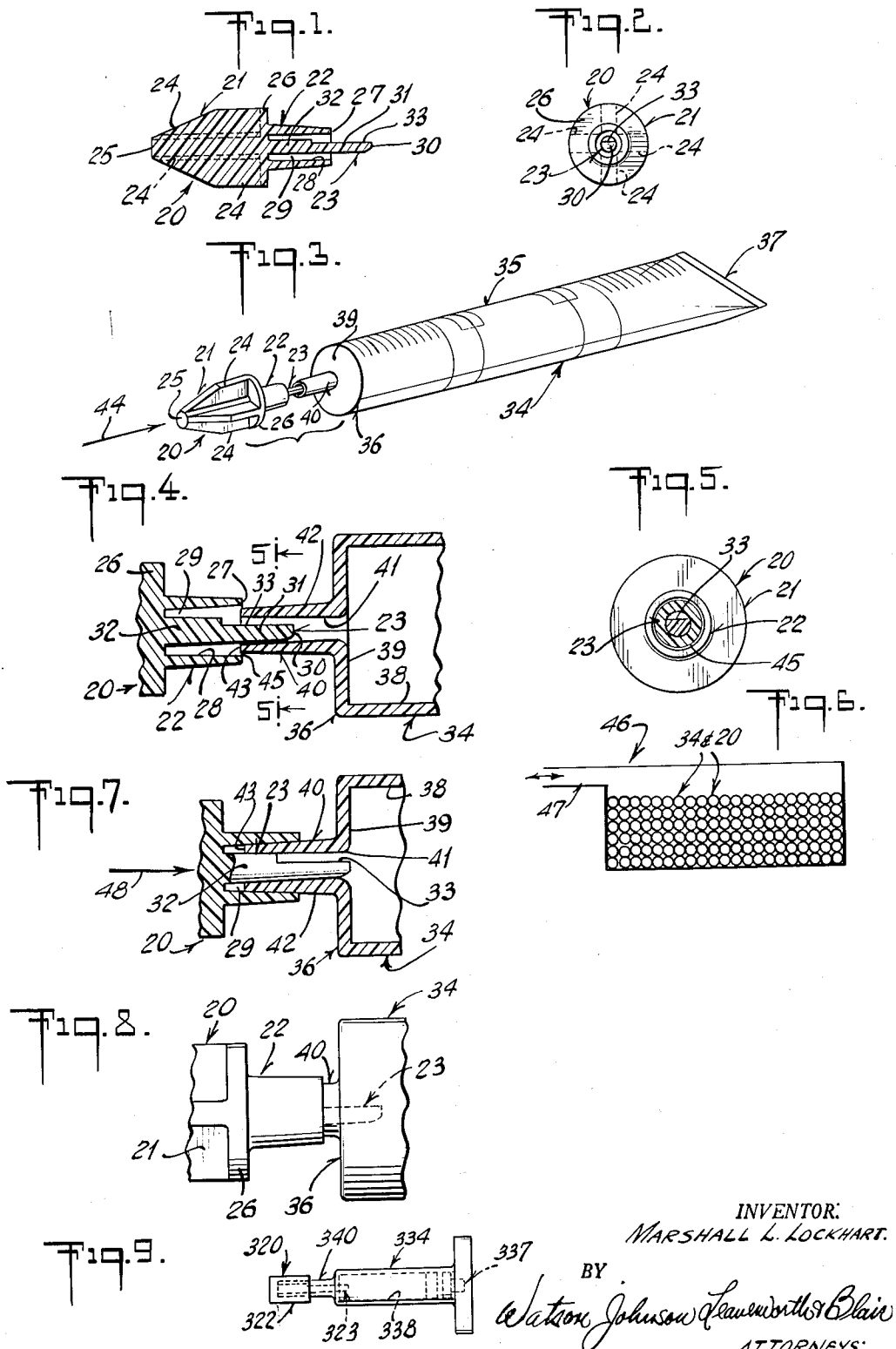
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MEDICAL CONTAINERS AND THEIR CLOSURES

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MEDICAL CONTAINERS AND THEIR CLOSURES 5

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1 Claim. (Cl. 150—0.5)

The present invention relates to medical containers or tubes and closures therefore, such as sampling tubes and their caps, as illustrated in my copending patent applications Serial Nos. 336,467 and 343,415, respectively filed February 12, 1953 and March 19, 1953.

As therein explained, such sampling tubes may be employed in the testing and analyzing of body fluids specimens, including whirling in centrifuges. Such caps are so designed as to adapt these tubes to improved mounting in the cups of such centrifuges. The present invention is directed to unique incorporation in such caps of novel features permitting ready practice of a simplified procedure of sterilization of the empty tubes, while being utilizable to advantage in other types of closures for a similar sterilizing purpose.

It may be desired to sterilize medical containers and tubes by loading large numbers thereof in evacuating tanks and then drawing a vacuum thereon to exhaust the air. Thereafter, formalin or other sterilizing gas may be fed into the exhausted tanks thoroughly to sterilize the interiors of the containers, after which they are suitably sealed or capped to maintain the sterile condition of their chambers until ready for use or loading.

The present invention has for a general object the provision of a unique closure for such a container whereby it may be easily mounted to the latter before such sterilization without interfering with the egress and ingress of fluids while permitting ready and effective sealing after sterilization by simple manipulation.

A more specific object is to provide in combination with such a container having an elongated hollow neck a plugging closure receivable in the neck passage which in one mounted position provides a flow passage communicating the container chamber with the external atmosphere, and which when simply pushed farther into the neck passage, efficiently seals off the chamber.

Another object of the invention is to provide in such closures an elongated plugging core and a hollow neck coaxially arranged thereabout snugly receptive therebetween of the container neck to close it off in an inner position of the closure, with the core having a tip section extending beyond the closure neck to be received in the container neck passage for frictionally anchoring the closure to the container in an outer position, the tip section being so formed or shaped as to provide a way for flow of fluids to and from the container chamber when the closure is in its outer anchored position.

A further object of the present invention is to provide structural embodiments of the device which may be readily constructed and permit efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combination of elements, and arrangement of parts, which will be exemplified in the construction hereinafter set forth, and the scope of the invention will be indicated in the claim.

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For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawing, in which:

Fig. 1 is an axial section of an embodiment of the closure of the present invention;

Fig. 2 is an end elevation of the closure shown in Fig. 1;

Fig. 3 is a perspective view of an embodiment of a medical container or tube which may be suitably closed by the closure of Figs. 1 and 2, and illustrating the mounting of the latter to the former;

Fig. 4 is an enlarged axial section, with parts broken away, of the head end of the container and back end of the closure illustrated in Fig. 3, indicating the approximate outer anchored position of the cap which permits fluid flow to and from the container chamber;

Fig. 5 is a sectional view taken substantially on line 5—5 of Fig. 4;

Fig. 6 is a diagrammatic view, to a reduced scale, of an exhausting and sterilizing tank shown with its front cover removed and loaded with a large number of assemblies illustrated in Figs. 3 and 4;

Fig. 7 is a sectional view similar to Fig. 4, but with the plugging element shown in side elevation, illustrating manipulation or push of the cap to its inner sealing position on the container neck;

Fig. 8 is a side elevational view, with parts broken away, of the structure illustrated in Figs. 4 and 7, showing the cap pushed completely to its inner sealing position on the container neck; and

Fig. 9 is a side elevational view of another type of medical container shown capped with an embodiment of the present invention.

Referring to the drawing, in which like numerals identify similar parts throughout, it will be seen that an embodiment of a closure 20 of the present invention may comprise a main body 21, an integral tubular neck 22, and a plugging core element 23, as illustrated in Figs. 1, 2, and 3. The body 21, neck 22, and core 23 preferably are made integral to form a one-piece cap, desirably molded from suitable elastic material, such as an elastomer, e. g., polyethylene composition, and preferably a translucent polythene.

In the form illustrated in Figs. 1, 2, and 3, the closure 20 may have the main body 21 thereof of cruciform shape, comprising a plurality, preferably four in number, of longitudinally-extending, substantially radial ribs 24—24. As shown, the radial ribs 24—24 may have sections thereof of substantially equal depth so that their outer edges lie substantially on the circumferential surface of a cylinder, and additional sections which progressively decrease in depth toward a circular end bearing surface 25, so that the outer edges of the latter sections are disposed substantially along the surface of an outwardly tapered cone or frustum thereof. The body 21 includes a circular end flange 26 with which the bases of the ribs 24—24 are merged and from which the neck 22 and the core 23 co-axially project. The tubular neck 22 has an outer end 27 circumambient of its bore 28, which is closed off by the body flange 26 to form a socket. The elongated plugging element or core 23 is located concentrically within the hollow neck 22 to provide between it and the wall of the bore socket 28 a circular space or slot 29. The outer end 30 of the elongated plugging element or core 23 preferably extends appreciably beyond the end 27 of the closure neck 22, for a purpose to be explained hereinafter.

The plugging element or core 23 preferably is defined into two sections, i. e., a tip section 31 and a base section 32, by means of structure which provides one or more fluid-flowing ways in the side thereof. Such a way may be provided by an axial socket and lateral port, but preferably is formed by flattening off one side of

the tip section, as illustrated at 33; and preferably such flattened tip section extends to a point a short distance inward of the outer end 27 of the neck 22 as illustrated.

The core 23 preferably is slightly tapered from its base to its outer end 30 so that its cross-section gradually increases from the outer end toward the body flange 26. Also, the bore socket 28 in the neck 22 preferably tapers inwardly slightly so that the intervening circular space 29 preferably is of wedge formation, for a purpose to be explained hereinafter.

The closure 20 is particularly adapted for use with a sampling tube 34, which in the form illustrated in Figs. 3, 4, 7 and 8 is especially adapted to use as a blood sampling tube. The tube 34 preferably comprises a flexible, elastic, plastic, collapsible tubular container, preferably formed of light-transmitting material, such as a polyethylene composition, preferably like that from which the closure 20 is molded. The elastic, plastic collapsible tube 34 preferably is provided with a substantially cylindrical flexible, elastic side wall section 35, closed at one end by head means 36, preferably molded integral therewith, and at the other end 37 by pinching of and sealing the opposite sides together to form a closed, collapsible, tube type of container structure having an internal chamber 38.

As indicated in Figs. 3, 4, and 7, the tube head means or portion 36 comprises a transversely-extending head wall 39, having a hollow, coaxially-extending tubular neck 40 molded integral therewith and provided with a passage or bore 41 in communication with the chamber 38. The bore 41 may be substantially cylindrical but preferably is slightly tapered inwardly to communication with the chamber 38 at its smallest cross-section to facilitate removal from the mold elements. As is best seen in Figs. 4 and 7, the outer surface 42 of the neck 40 is tapered outwardly to the outer end 43 of the container neck so as to be wedged into the space 29 of the cap 20, as will be more fully explained hereinafter.

In operation of the embodiment illustrated in Figs. 1 to 8 incl., a plant operator or factory hand may move the closure 20 in the direction of the arrow 44 of Fig. 3 coaxially of the container 34 with the outer end 30 of the plugging element or core 23 aligned with the container neck bore 41. The closure 20 preferably will be moved substantially to the position indicated in Fig. 4 relative to the container neck 40, which may be readily determined by substantial alignment of the end 27 of the closure neck 22 with the end 43 of the container neck 40. This will leave therebetween a circular vent space 45, since the diameter of the closure socket 28 provided by the bore of its neck at the outer end 27 preferably is substantially larger than the external diameter of the end 43 of the container neck 40. This difference in dimension is such that even should the end 43 of the container neck 40 be pushed into the end 27 of the closure neck 22 a short distance, such venting space 45 would be retained. Thus, mounting of the closure 20 to the container 34, as illustrated in Fig. 4, is not limited to critical relative positions, such as those shown therein, thereby making rapid assembly possible and practical, while avoiding premature closure of the containers.

The core 23 preferably is of such lateral dimension as to be snugly received in the container neck bore 41 when pushed to the position indicated in Fig. 4 so that it will be held in secure frictional engagement therewith. The core element 23 may even be slightly oversize with respect to the container neck bore 41, since the container neck 40 and the core are of elastic material, thus permitting the container neck to expand and possibly permitting the core to be slightly compressed. In such relative positions of the closure 20 and container neck 40 as illustrated in Fig. 4, the flat-off at 33 of the core tip section 31 provides a way communicating the con-

tainer chamber 38 with the cap space 29 which, in turn, communicates with the external atmosphere via the venting space 45.

Thus, as illustrated in Fig. 6, when a large number of such assemblies indicated in Fig. 4 are stacked on their sides in an evacuating tank, diagrammatically indicated at 46, the air from the chamber 38 of each container 34 may be exhausted in the following manner. The evacuating tank 46 preferably is of the open front type, as suggested in Fig. 6, so as to permit ready loading of the cap and container assemblies in the manner therein indicated. After the front of the tank is replaced to close it, the air is exhausted therefrom through the conduit 47. During the exhaustion of the air from the tank 46, the air in the chamber 38 of each container 34 flows out through the neck bore 41, the way provided by the flat-off at 33, the cap space 29, and the venting space 45. Thereafter, formalin gas is let in through the conduit 47 so that it flows into the chamber 38 of each container 34 back along the same path of egress of the air.

Then, upon the front of the tank 46 being removed, the operator can quickly and easily close each container 34 to seal it off with preservation of the internal sterile condition. This is accomplished merely by pushing each cap 20 further inwardly in the direction of the arrow 48 indicated in Fig. 7, so that the base section 32 of the plugging element or core 23 is received within the neck bore 41 securely to close it off. At the same time, the outer end 43 of the container neck 40 is wedged into the space 29 between the core 23 and the closure neck 22. As a result, a secure seal is effected with the closure 20 and the container neck 40 disposed in the relative inner closed positions illustrated in Fig. 8.

It is contemplated within the scope of the present invention to employ, in certain instances, a closure in the form of a plugging element having the features or operating characteristics of core 23. However, the telescoping of the cap neck 22 and the container neck 40 is employed in connection with the plugging element 23 and its reception in the container neck bore 41 to enhance the closing of the container and increase the security of the sealing thereof.

Of course, the present invention may be practiced for the secure closing and sealing of containers which are provided with necks having cross-sections other than circular; and the provision of the venting way, preferably by flattening off one side of the plugging core, is attainable by other equivalent means.

As indicated in Fig. 9, practice of the present invention is not limited to sampling tubes of the type illustrated in Fig. 3. For example, medical tubular containers in the forms of hypodermic syringe barrels, such as of the type illustrated in my copending application Serial No. 257,838, filed November 23, 1951, if provided with normally open outlet necks, may be capped in a similar manner with the caps manipulated relative thereto to permit similar sterilization. For example, an elastic, plastic, substantially cylindrical barrel 334 may have a tubular outlet neck 340 closed off by a cap structure 320 having a receptive neck 322 concentric of a plugging element 323. Chamber 338 of the barrel 334 may be closed off at the back end by any suitable piston plug structure, such as that indicated at 337. The closure cap 320 may be much like that of the embodiment of Figs. 1 to 8 incl. with, however, the tip section thereof, including the radial ribs 24-24, omitted.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above construction and different embodiments of the invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in

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the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claim is intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and and desire to secure by Letters Patent is:

A medical tube and closure therefor comprising, in combination; a container having a chamber and a projecting elongated neck of elastic plastic material, said container neck having a circular base at the container of certain outer diameter and an outer circular end of slightly less diameter and being uniformly tapered from the former to the latter with the provision of a longitudinally-extending core-receiving through bore communicating with the chamber; and a closure of elastic plastic material comprising a main body, an elongated generally cylindrical plugging element core integral with and extending from said body and an appreciably shorter elongated integral closure neck coaxially arranged about said core, said closure neck having a container neck-receiving circular socket flared slightly convergingly outward from its inner bottom end to its outer free edge wedgingly to receive said tapered container neck with appreciable face contact, said core having an outer end of a diameter appreciably less than the diameter of the container neck bore and being of a diameter at its base appreciably greater than that of the container neck bore and being

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substantially uniformly tapered toward its outer end, said core being defined into a tip section and a base section with one side of the tip section being longitudinally flattened off appreciably less than one-half of its thickness to retain a circumferential surface appreciably more than 180° thereof, said flattened tip section extending an appreciable distance beyond the outer free edge of said closure neck and having a portion thereof wedged snugly into the container neck bore securely holding said closure to said container neck, said tip section being of a diameter at its juncture with said base section greater than the diameter of the container neck bore to limit initial insertion into the latter to a portion of said tip section while attaining such securement with the flattened off side of said tip section providing a fluid passage through the container neck bore to and from the chamber, said base section being insertable by force applied to said closure body into the container neck bore securely to seal the latter with swell of said tapered container neck in the flared closure socket to appreciable face contact between the side wall of the latter and the outer tapered surface of said container neck to supplement the bore seal.

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