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HYPODERMIC SYRINGE

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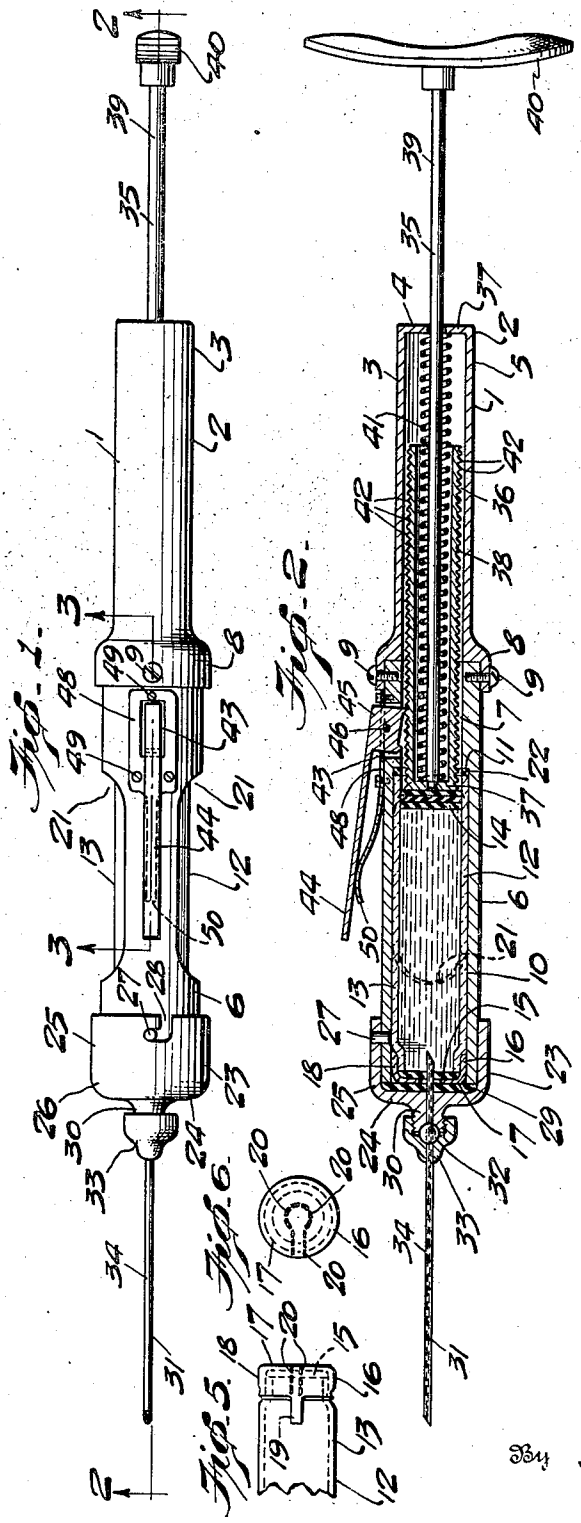


Fig. 1.

Fig. 2.

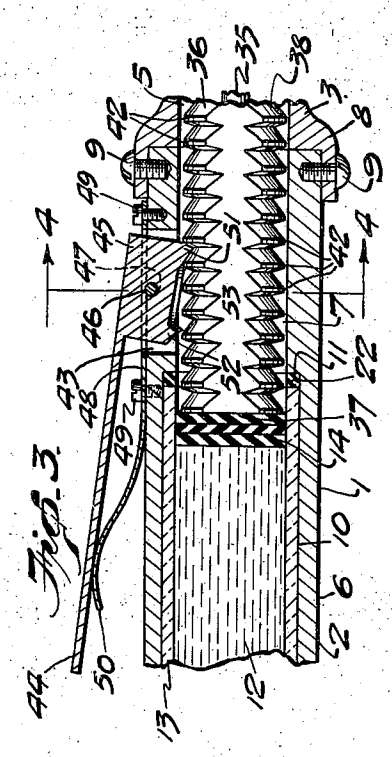


Fig. 3.

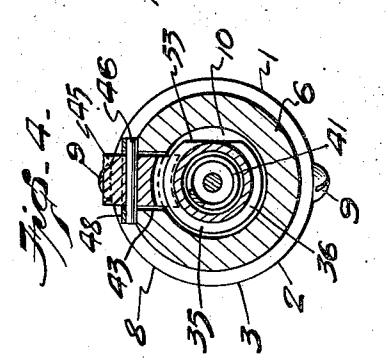


Fig. 4.

Fig. 5.

Fig. 6.

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HYPODERMIC SYRINGE

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4 Claims. (Cl. 128—218.1)

The present invention relates to a hypodermic syringe and more particularly to a type thereof which is selectively controlled.

It is well known in the art that if a fluid, such as a refrigerant or anesthetic of any nature or character, is injected into flesh in large quantities, such as by means of a constant or uninterrupted injection, it will result in the injury, rupture or destruction of tissue cells. To overcome this undesired condition during an anesthetization, an object of the invention is to provide a hypodermic syringe which may, at the option of the operator, be definitely and selectively controlled to eject one or more drops of fluid, such as ethyl chloride, novocaine or any other of such like refrigerants, at spaced, periodic, timed intervals so as not to rupture or destroy skin tissues.

Another object of the invention is the provision of an arrangement of instrumentalities forming a hypodermic syringe so that it must, for the successful operation thereof, be grasped in a pencil holding manner and, therefore, will be held adjacent a needle or cannula extremity thereof to materially reduce the moment or leverage arm of the needle or cannula and accordingly diminish or eliminate the possibility of breaking the needle or cannula as it is being inserted or after it has been inserted.

A further object of the invention is to provide, in a hypodermic syringe, a resiliently actuated plunger which is manually and selectively controlled to permit a periodic and successive movement thereof to provide for a mild, controlled flow of any anesthetic fluid to be expelled from the syringe.

A still further object of the invention is the provision of a container, cartridge, receptacle or ampule to be used in combination with a hypodermic syringe, said container or ampule being arranged and constructed so that a cannula piercing portion thereof may be maintained in a sterile condition until it has been emptied irrespective of the amount of careless or otherwise handling it has gone through.

These as well as numerous other objects of the invention will become apparent from the succeeding description of a device embodying a form of the invention considered together with the accompanying drawing, wherein:

Figure 1 is a front elevational view of an exemplification of the invention.

Figure 2 is a vertical sectional view taken along the lines 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is an enlarged, partially sectional, vertical view of the hypodermic syringe taken along the lines 3—3 of Figure 1, also shown partly in elevation to more clearly illustrate the invention.

Figure 4 is an enlarged horizontal sectional view taken along the lines 4—4 of Figure 2, looking in the direction of the arrows.

Figure 5 is a side elevational view of an ampule, cartridge or container used in combination and before being associated with the illustrated hypodermic syringe.

Figure 6 is an end elevational view of the ampule shown in Figure 5.

Referring now in detail to the drawing wherein like reference characters indicate like parts, the numeral 1 designates generally a hypodermic syringe of the type exemplifying the present invention. The hypodermic syringe is preferably provided with a two- or multi-part separable housing or barrel 2 comprising an upper section 3, cylindrical in formation, having one or a free end thereof partially restricted by an apertured end wall 4. The upper section has an axial bore 5 which is substantially constant for the entire extent thereof. Forming a component part of the casing, housing or barrel is a lower section 6, tubular in formation and having an upper extremity thereof provided with an axial bore 7 forming a continuation of and desirably of the same diameter as the bore 5 to thereby present a relatively smooth or uninterrupted inner surface extending a predetermined length of the barrel.

Since the housing is made in two parts or sections, it is desirous to not only arrange the sections so that they may be disassembled to obtain access to the interior instrumentalities of the hypodermic syringe for purposes which are very obvious, some of which may be to cleanse the syringe, facilitate its assembly, replace worn parts and the like, but it also becomes important to secure the upper and lower sections together to thereby form a rigid, unitary housing both sections of which are retained in true alignment. For the accomplishment of the above the extremity of the upper section, removed from the end wall 4, has an offset peripheral flange 8 circumambient or overlapping in engaging relation the associated or adjacent extremity of the lower housing, thereby preventing a transverse shifting or misalignment of the two sections. Spaced about the flange 8 and inwardly from the free extremity thereof are a plurality of screws or removable means 9 of any nature which extend through the flange and into the lower section to

prevent a longitudinal separation of the upper and lower sections.

Formed in the lower section and communicating with the bore 7 is an axial bore 10 preferably of greater diameter than the bore 7 and continuing throughout the remaining extent of the lower section, presenting at the juncture of the bores 7 and 10 a shoulder 11. Occupying and accommodated by the bore 10 is an ampule, cartridge or cylinder 12, preferably formed of a cylindrical section or container 13 of transparent material, such as glass. The ampule fits neatly into the bore 10 so that, during service, no abnormal, unwarranted or shear stresses will be created in or transmitted to the cylinder to break it, thus rendering it useless for the purpose intended. The glass container forms a receptacle for a refrigerant or anesthetic, prevented from escaping by means of a movable follower or stopper 14 positioned within and tightly engaging the cylinder adjacent one or the innermost extremity thereof, and a puncturable diaphragm 15 overlying and associated with the other or outermost extremity of the container. By this method, therefore, the refrigerant or anesthetic is not only confined within the container but air or any other impurities are arrested from entering the container to contaminate the contents thereof.

Telescoping the diaphragm extremity of the container and encasing the diaphragm to retain it in intimate contact with the associated extremity of the container is a removable cap or cover 16 having a plate or disk 17 which, when the ampule is not within a hypodermic syringe, completely overlies the diaphragm so that the latter may be retained in a sterile condition. The cap is held in container engaging position by means of an angularly disposed, continuous or annular flange 18 in clamping relation with the glass container. The cap may be formed of an aluminum alloy or any material which will not oxidize the diaphragm in case the latter is formed of a rubber compound. It may be found that the composition forming the cap cannot be easily pierced, and so as to expose a portion of the diaphragm to subject it to a puncturing action of a means to be hereinafter set out in detail, the free extremity of the flange 18 has, projecting away from the disk, a lip or tongue 19 presenting a holding or grasping means. In alignment with the edges of the tongue 19 are spaced and aligned perforations or indentures 20 which extend for the entire depth of the cap flange toward the disk and continue beyond the central portion of the disk where they merge to substantially weaken the material forming the cap within a restricted and confined area.

Accordingly, the diaphragm will, throughout a continuous handling of the ampule prior to use, be protected against contamination, and when it is desirous to insert an ampule within a hypodermic syringe the tongue may be grasped and the portion of the cap within the limits or confines of the indentures may be removed to leave an area of the diaphragm exposed to be easily pierced. From the immediately preceding it will be observed that the instant ampule may be freely handled without destroying the sterile condition of the puncturable diaphragm, and when it is desirous to place the ampule in service a portion of the cap is removed to expose a portion of the diaphragm immediately prior to assemblage of the hypodermic syringe and ampule.

The lower section of the housing is provided with diametrically disposed windows 21 so that the quantity of the contents of the ampule may be readily determined and the ampule may be grasped through the windows to insert it in or remove it from a housing or casing. So as to form a cushion or abutment to absorb and react against longitudinal stresses imparted to or created in the ampule, a gasket, washer or annular member 22 is interposed between the shoulder 11 and the associated extremity of the ampule, and may, if desired, be formed of rubber, cork or any fibrous compound. The gasket, when in service, is of any inside diameter substantially equal to the diameter of the bore 7 and inner diameter of the ampule forming container so that the housing, gasket and container may present a substantially constant, uninterrupted axial bore or duct extending throughout the major portion of the hypodermic syringe.

Associated with the free extremity of the lower section of the housing is a cup-shaped end or closure member 23 comprising a suitably apertured base 24 having, extending toward and telescoping an associated extremity of the lower section, a peripheral, ring-like or annular flange forming wall 25 longitudinally fluted, as at 26, on its outer surface to present a rough surface so that the closure member may be easily assembled with or removed from the housing. The end member is removably secured to the lower section so that the ampule may be inserted into or removed from the housing bore 10. As a means which may be utilized to form a housing-end member connection is a bayonet joint, commonly termed, formed by a pin 27 integral with and outstanding from an extremity of the lower section adapted to be threaded through and positioned or restricted in an angularly formed aperture 28 in the end member flange to thereby prevent an unwarranted removal or displacement of the closure member.

Interposed between the closure member base and the lower section is a filler block 29 made of rubber, cork or any fibrous compound and urged into bearing relation with the ampule cap to thereby retain the ampule in a predetermined position longitudinally of the hypodermic syringe. The filler block is preferably of a compressible material so that the intricacies formed in the cap by the removal of a section thereof may be occupied and thereby substantially equally distribute the longitudinal stresses transmitted to the ampule, as well as urge the portion of the diaphragm exposed by the removal of a portion of the cap against the container. Further, by forming the filler block of a compressible material the end member will be resiliently urged longitudinally of the hypodermic syringe to retain the closure member interlocked with the lower section or insure an unwarranted or accidental separation between the two.

The end closure is provided with an outwardly extending hub 30 apertured in alignment with the base aperture. Extending through the base and hub apertures and having an inner portion thereof in piercing relation with the diaphragm to extend therebeyond to the interior of the ampule, is a cannula or hypodermic needle 31 provided, intermediate its ends, with a rigidly formed sealing ball 32 seated in a correspondingly configurated recess in the hub. The hub is outwardly threaded to have, rotatably associated therewith, a tip 33 adapted to bear against the ball and retain it in bearing relation with the hub. The tip is also suitably apertured to accommodate the

outer portion 34 of the cannula. It will be noted from the preceding that the inner extremity of the cannula communicates with the interior of the ampule and that a leak-proof seal is maintained to prevent the escape of refrigerant or anesthetic from the ampule other than through the cannula as intended, as well as the diaphragm being maintained at all times in a sterile condition.

Since the refrigerant or anesthetic will not pass through the cannula when the latter is inserted for an application on account of the local tissue forming a barrier therefor, means has been provided to apply pressure to the refrigerant or anesthetic and thereby force it through the cannula. For the accomplishment of the above there is provided a plunger, designated generally by the character 35. The movement of the plunger is resiliently actuated and selectively controlled so that, irrespective of the skill of the operator, only a predetermined amount of refrigerant or anesthetic will be ejected from the discharge end of the cannula. Forming a component part of the plunger is a cylindrical casing or reciprocating member 36 adapted to move longitudinally of the hypodermic syringe and positioned within and substantially of slightly less diameter than the bores 5 and 7 of the housing to be guidingly received thereby. The casing is formed by a lower wall 37 having upstanding therefrom a tubular wall 38 to form a member closed at one end and opening toward the upper section end wall 4. The lower wall 37 is arranged to be in intimate contact with the ampule follower 14, and since the inner diameter of the ampule container is of a diameter substantially equal to the diameter of the bores 5 and 7, the casing is capable of moving through the ampule.

Disposed axially of the reciprocating member 36 and secured to the lower wall 37 thereof is a rod or stem 39 projecting through the aperture in the end wall 4 and extending therebeyond for a predetermined distance to have its outer or free extremity provided with a removably secured thumb piece or cross bar 40. Extending around the rod 39 and encased by the upper section of the housing and the casing is a compression member in the form of a helical or coil spring 41 bearing and reacting against the end wall 4 and casing lower wall 37 to be capable of urging the casing and consequently the follower, in an ampule emptying action, toward the cannula extremity of the hypodermic syringe. The casing tubular wall 38 is provided, for the entire length thereof, with successive indentures or convolutions 42 to present an outer serrated surface or a series of spaced downwardly facing abuments. Positioned intermediate the ends of the lower section is an elongated orifice or opening 43 communicating with the interior thereof to expose a corresponding area of the abutments.

Movably associated with the lower section is a rocking control lever 44 having a block portion 45 occupying the orifice 43 and provided with a preferably rigid, centrally disposed axle 46 extending therethrough. The block has, adjacent its outer extremity, a finger rest or support directed longitudinally of the hypodermic syringe toward the cannula extremity thereof and preferably terminating short and in the proximity of the annular flange 25. The axle is seated in transversely spaced cradles or bearings 47 in the lower section and retained therein by means of an overlying plate member 48 suitably apertured to accommodate the block portion. The plate is removably secured to the lower section by conveniently positioned holding means of any nature, such as the screws 49. It will, therefore, be noted that the control lever may rock about its axis when force is applied to the finger rest, but since an operator for the most successful operation of the hypodermic syringe cannot be expected to move the finger support inwardly and outwardly in a pumping action, the plate member 48 has an extension 50 of arcuate configuration and underlying the finger support in intimate relation. The plate member is desirably of a resilient material and hence adapted to maintain the finger rest in its outermost position spaced away from the lower section. Accordingly, when a pressure, which has urged the finger rest toward the lower section, has been removed the plate extension will, due to its resiliency, return the finger support to its outer or normal position, such as that illustrated in the drawing.

The block has longitudinally spaced or upper and lower teeth 51 and 52 respectively adapted to be alternately moved into and out of engagement with the abutments formed on the casing to thereby, as manipulated, progressively engage successive abutments and check the forces created by the coil spring. As will be noted, only one tooth at a time engages an abutment so that a rocking action may be imparted to the control lever, and one tooth may be moved into abutment engaging position while the other is being moved out of intimate contact with its engaged abutment. By reason of this construction and arrangement the movement of the plunger and consequently the flow of refrigerant or anesthetic through the cannula may be definitely and is selectively controlled. By this disclosed arrangement it will be noted that the successful operation of the hypodermic syringe necessitates a grasping thereof in a pencil-like manner adjacent the cannula extremity to materially diminish the bending moments or abnormal stresses which might otherwise be created in the cannula.

Extending longitudinally of the casing is a relatively flat or smooth surface 53 desirably formed inwardly of the casing from the outer limits or apices of the convolutions and interrupt their individual circular disposition. The flat surface 53 presents an unobstructed surface which may, upon an axial movement being imparted to the casing through the thumb piece and rod, be aligned with the control lever teeth to facilitate a rapid, longitudinal movement of the casing relatively to the housing and its associated structure and the withdrawal of the casing from an emptied ampule.

I claim:

1. In a syringe, the combination of an apertured barrel having an axial bore, an ampule positioned within said bore, a closure member removably secured to said barrel, resilient means interposed between said closure member and ampule to form a seal therebetween, a cannula extending through said closure member and resilient means and communicating with said ampule, a casing in said bore, spring means reacting against said casing and barrel adapted to urge said casing through said ampule, a series of abutments formed on said casing, means rockably mounted on said barrel and having a portion thereof extending through said barrel aperture, said portion comprising a pair of spaced teeth adapted

to alternately engage successive abutments so that, upon a manipulation of said means, the movement of said casing will be selectively controlled.

2. In a syringe, the combination of a barrel comprising upper and lower sections removably secured together, an axial bore in said upper section, an axial bore in said lower section equal in diameter to and communicating with said upper section bore, a bore of larger diameter in said lower section forming a continuation of the associated bore to present a shoulder therebetween, an ampule in said larger bore having an inner diameter substantially equal to said upper section bore, compressed means interposed between said ampule and shoulder, a closure member associated with the free extremity of said lower section and having a cannula communicating with said ampule, a compressed means interposed between said closure member and ampule forming a leak-proof seal therebetween, a casing of a diameter slightly less than said upper section bore and adapted to pass through said ampule, abuments outstanding from said casing and disposed longitudinally thereof, resilient means for urging said casing longitudinally of said barrel, and rockable means associated with said barrel and casing; said rockable means having spaced teeth adapted to alternately engage successive abutments for selectively controlling the movement of said casing.

3. In a syringe, the combination of an apertured barrel, an ampule positioned within said barrel, a casing within said barrel, a helical spring acting between said casing and barrel for urging said casing through said ampule, spaced abutments formed on and extending partially around said casing, a lever rockably secured to said barrel and having a block portion extending through said barrel aperture, resilient means acting between said barrel and lever for maintaining the latter in a predetermined position, spaced teeth on said block adapted to alternately engage successive abutments for controlling the movement of said casing and a smooth surface on said casing adapted to be aligned with and engaged by said teeth to facilitate a withdrawal of said casing from said ampule.

4. In a syringe, the combination of an apertured barrel, an ampule positioned within said barrel, a casing within said barrel, spring means acting between said casing and barrel for urging said casing through said ampule, spaced abutments formed on said casing, a lever rockably secured to said barrel and having a block portion extending through said barrel aperture, resilient means acting between said barrel and lever for maintaining the latter in a predetermined position, and spaced teeth on said block adapted to alternately engage successive abutments for controlling the movement of said casing.

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