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CARTRIDGE SYRINGE

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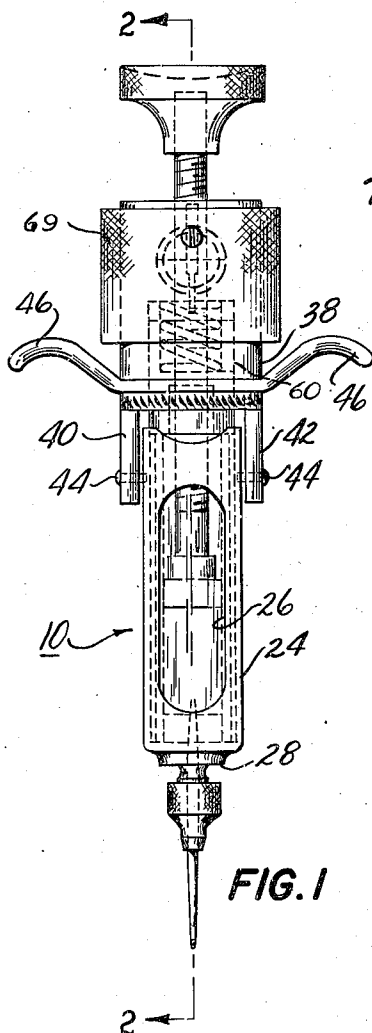


FIG. 1

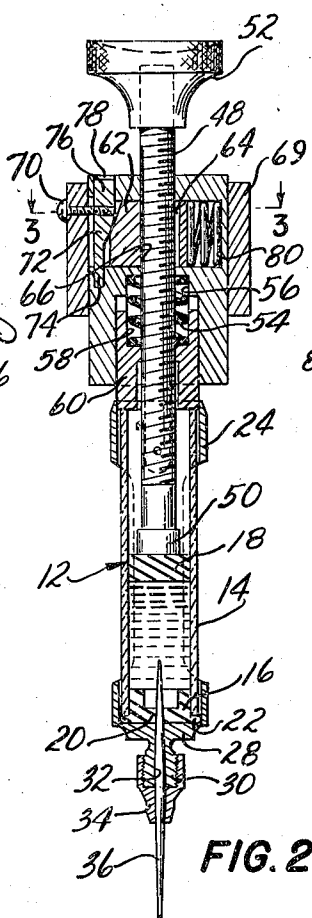


FIG. 2

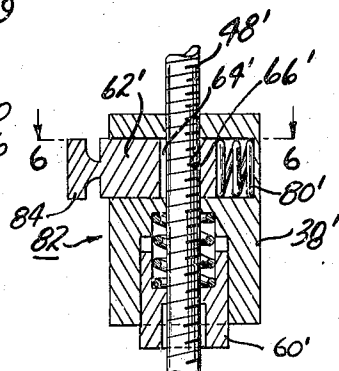


FIG. 5

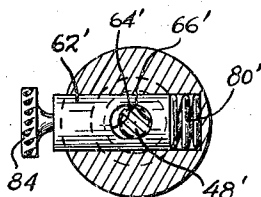
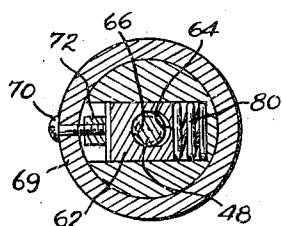


FIG. 6



UNITED STATES PATENT OFFICE

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5 Claims. (Cl. 128—218)

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This invention relates to hypodermic syringes of the type designed to be used with cartridges, the latter being fluid-containing replaceable cylinders hermetically closed by a plunger at one end and a rubber vaccine cap at the other.

Cartridge syringes have proven to be particularly useful in the diagnosis of allergies by intracutaneous testing for hypersensitivity. The procedure employed is to provide a large number of cartridges filled with different diagnostic antigens. The cartridges are loaded, in turn, into a cartridge syringe and a series of superficial injections of the different antigens made into the cutis. Each cartridge contains a far greater quantity of an antigen than is required for a single injection. For instance, a typical cartridge has 1 cc. of an antigen, whereas the test intracutaneous injection properly is of an amount between about 0.01 cc. and 0.02 cc., only sufficient to produce a barely visible welt or elevation in the skin surface. Accordingly, the cartridges are used over and over again until their contents are exhausted. The difficulty with the foregoing procedure has been that in actual practice with conventional cartridge syringes, the clinician has not found it possible to control the injection of an antigen with the degree of accuracy required. Usually, far too much of an antigen was injected causing undue discomfort to the patient, the raising of a rather large welt and the too rapid consumption of the antigen.

It is an object of my invention to provide a cartridge syringe of such construction that it can be used by a clinician of average skill to make an injection of the required minute amount of the antigen with a reasonable degree of accuracy.

It is another object of my invention to provide a cartridge syringe which, despite its ability to accurately dispense minute quantities, can be set rapidly to make an injection from a partially empty cartridge.

It is a further object of my invention to provide a cartridge syringe in which the initial pressure for overcoming the static friction between plunger and the walls of a cartridge can be applied smoothly.

It is another object of my invention to provide a cartridge syringe of the character described in which extensive movement of a manually actuable operating member is required in order to dispense a relatively tiny quantity of the fluid contained in a cartridge.

It is an additional object of my invention to provide a cartridge syringe having all the foregoing attributes and which yet comprises rela-

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tively few and simple parts, is inexpensive to manufacture and is rugged and efficient in use.

The invention accordingly consists in the features of construction, combinations of elements and arrangements of parts which will be exemplified in the constructions hereinafter described, and of which the scope of application will be indicated in the claims.

In the accompanying drawings, in which are shown various possible embodiments of this invention:

Fig. 1 is a front view of a cartridge syringe constructed in accordance with my invention;

Fig. 2 is a sectional view therethrough taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken substantially along the line 3—3 of Fig. 2;

Fig. 4 is a top view of the syringe;

Fig. 5 is a fragmentary view similar to Fig. 2 of a modified form of syringe; and

Fig. 6 is a view taken substantially along the line 6—6 of Fig. 5.

Referring now in detail to the drawings, and more particularly to Figs. 1-5, 10 denotes a cartridge syringe embodying my invention and adapted to be used with a cartridge 12 of conventional construction. Said cartridge comprises an open ended glass cylinder 14, which is hermetically closed at one end by a cap 16 of self-sealing material, such as rubber, and at the other end by a plunger 18 of resilient material, which also may be rubber. The term "self-sealing" as used herein denotes the ability of the material of the cap to close hermetically a small hole left in it by the passage therethrough of a slender element, such as a hypodermic needle. The cap has a thin zone 20, which is adapted to be pierced by a hypodermic needle. The cap also has a flange 22, which abuts against one end of the cylinder 14 to prevent the cap from being forced into the cartridge when once properly positioned.

Cartridges are furnished to the clinician in sterile, full, hermetically closed condition, a typical cartridge, such as is used with a cartridge syringe embodying my invention, having a content of approximately 1 cc. of an antigen.

The cartridge is slidably received in a tubular metallic barrel 24 which may have its sides provided with large openings 26 through which the cartridge can be manipulated, particularly when it is desired to remove the same. The lower end of the barrel is closed off by a bottom wall 28 having an integral threaded tip 30. An elongated passageway 32 runs through said tip 30, and wall 28 into the interior of the barrel. The tip 30 is

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adapted to receive an internally threaded cap 34 which carries a double-pointed hypodermic needle 36, one of the tips of the needle projecting through the passageway 32 into the barrel where it is adapted to pierce the thin zone 20 of the cartridge and the other of the tips extending away from the syringe for therapeutic use.

A yoke fitting 38 is pivotally mounted above the upper open end of the barrel, said fitting having a pair of spaced depending legs 40, 42 rotatably secured to the side walls of the barrel adjacent its open end by screws 44. The yoke rigidly carries a pair of laterally protruding finger grips 46 and slideably receives a rod 48 which at its lower end has a fixed piston 50 adapted to engage the plunger 12 in the cartridge. A manually actuable operating knob 52 is mounted on the upper end of said rod. A portion of the rod is encircled by a helical spring 54 one end of which is seated in a recess 56 in the yoke and the other end of which is seated in a recess 58 in a sleeve 60 slideably mounted on the rod below the yoke. Said sleeve is of such size that it can be slidably received in the open end of the barrel and abut against the upper end of the cartridge cylinder 14.

As thus far described, the syringe is of conventional construction and is used in the following manner: To load the syringe, the rod 48 is pulled back axially until the piston 50 engages the underside of the sleeve 60, forcing said sleeve into the yoke against the pressure of the spring 54. This action retracts the sleeve from the barrel and permits the yoke to be swung around the pivot pins 44 until it clears the upper end of the barrel thus exposing said end. A cartridge containing a desired antigen then is thrust into the barrel with the cap 16 foremost and is pressed upon the interiorly disposed tip of the needle 36 causing said tip to pierce the thin zone 20. When the cartridge is seated in the barrel, the plunger 18 (if the cartridge is full) will be disposed adjacent the top end of said barrel. Now the rod 48 again is pulled back to compress the spring 54 and the yoke 38 swung to realign the rod 48 with the barrel. This will position the piston 50 directly above the plunger 18 and upon release of said piston the spring 54 will push the sleeve 60 back into the barrel to lock the yoke in erect position and secure the cartridge firmly in place. Pressure then is applied to the knob 52 axially of the rod 48, forcing the plunger 50 towards the needle and causing the antigen to be ejected from the external needle tip.

In ordinary allergy diagnosis, only a slight amount of the antigen is required to be injected. But when once sufficient pressure has been applied to overcome the static friction between the plunger 18 and the side walls of the glass cylinder 14, movement of the plunger cannot be checked rapidly enough to prevent extrusion of too much of the antigen.

Pursuant to my invention, I have included in the cartridge syringe means to overcome this difficulty by imparting a fine or vernier movement to the piston 50 and, in addition, by optionally rendering said vernier actuating means effective. To this end the syringe includes the following additional elements: The rod 48 has a running thread formed thereon extending from approximately the knob 52 to approximately the piston 50. The yoke is provided with means to optionally mate with said running thread so that upon turning the rod 52, the same will slowly advance in an axial direction towards the hypodermic needle. Said last named means includes

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an element 62 having an opening 64, which is transversely elongated to a degree sufficient to freely pass the rod 48, i. e., to permit free axial movement of said rod therethrough. Said opening has a surface 66 covering about 180° on which there is formed a female screw thread adapted to mesh with the male thread on the rod 48. The member 62 is mounted for shifting movement in a direction transverse to the longitudinal axis of the rod 48 whereby said element may be moved between two extreme positions, in one of which (illustrated in Fig. 2) the threaded surface 66 meshes with the threaded rod 48 and in the other of which said surface 66 is clear of the rod and the rod, therefore, is free to be axially translated upon simply axially pushing or retracting the knob 52. However, when the surface 66 engages the rod, the rod cannot be axially pushed but can only be moved by rotating the same.

With this construction one complete revolution of the rod 48 will dispense a certain small quantity of the antigen, the actual quantity dispensed being a function of the pitch of the thread on the rod. For example, if the cartridge contains 1 cc., if the total movement of the plunger 18 for discharge of the cartridge is equal to 1¼" and if 28 threads are provided to the inch, then, for each complete revolution of the rod 48, approximately 0.035 cc. will be dispensed. Accordingly, a clinician, to inject from about 0.01 cc. to 0.02 cc., turns the knob 52 through from about one-third to two-thirds of a revolution. To facilitate ascertaining the angle through which the knob is turned, I may provide a suitable marker as, for example, an arrow 58 on the knob.

Means also is included to expedite transverse shifting of the element 62 and, preferably, to maintain said element in either of the aforementioned extreme positions. As shown in Figs. 1 and 2, such shifting means includes a collar 69 slidable on the yoke and affixed by a screw 70 to a cam 72 disposed within the yoke. Said cam has a sloping surface on which a mating sloping surface of the element 62 rides so that when the cam is moved downwardly, the element 62 will shift from the left towards the right as viewed in Fig. 2. Said cam is slidably mounted in the yoke having a lower end 74 of reduced section slidably received in a well of matching cross section, and a larger upper end 76 which likewise slides in a matching opening 78 in order that the cam may be removed if desired upon undoing the screw 70. The element 62 is urged toward the cam by a spring 80. With this arrangement, movement of the collar 69 downwardly will positively shift the element in a direction to cause the threaded surface 66 to engage the threaded rod 48, and movement of the collar upwardly permits the spring 80 to return the element 62 to a position in which the rod 48 is free to be shifted axially without rotation thereof.

If a partially filled cartridge is inserted (as will ordinarily be the case) the syringe, after being opened by retraction of the piston 50 and sleeve 60, with the collar 69 in its uppermost position, has the cartridge placed in the barrel. The yoke member then is swung back and the sleeve 60 permitted to lock the yoke and cartridge in position; next the rod 48 is axially shifted towards the cartridge until the piston 50 rests lightly on the plunger 18. The syringe can now be set for vernier movement by shifting the collar 69 down so that no time will be lost in slowly moving the piston towards the plunger.

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In Figs. 5 and 6 I have shown a modified form of cartridge syringe 82 embodying my invention. Said syringe is essentially the same as syringe 10 and similar parts are indicated by similar numerals primed. Said syringe only differs from the syringe 10 in that a modified means is provided to shift the element 62' from one to the other of its extreme positions. The element has an opening 64' through which the rod 48' is freely translatable. One side 66' of the opening is threaded to mesh with the threads on the rod 48' and a spring 80' biases the element to a position in which said surface 66' engages the threads on the rod. The element 62' rigidly carries an externally accessible manually manipulatable knob 84 which, when pressed towards the yoke 38', will move the element 62' inwardly against the pressure of the spring 80' disengaging the rod 48' and threaded surface 66' so as to leave the rod free to be axially translated.

It will thus be seen that I have provided cartridge syringes which achieve the several objects of my invention and which are well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein described or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

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

1. A cartridge syringe comprising means to removably hold a cartridge in the form of a cylinder having a cap at one end and a plunger at the other, a double pointed needle one point of which is disposed within said cartridge holding means and is adapted to pierce the cartridge cap, a piston adapted to bear against the cartridge plunger, a rod on one end of which the piston is carried, means to mount said rod for free reciprocation axially of the cartridge cylinder, a manually actuatable operating member, means operable upon rotation of said member through one revolution to move the rod axially a short distance, and means to optionally render said last named means effective, said rod being free to be axially shifted when said last named means is ineffective.

2. A cartridge syringe comprising means to removably hold a cartridge in the form of a cylinder having a cap at one end and a plunger at the other, a double pointed needle one point of which is disposed within said cartridge holding means and is adapted to pierce the cartridge cap, a piston adapted to bear against the cartridge plunger, a threaded rod at one end of which the piston is carried, means to mount said rod for free re-

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ciprocation in a direction axially of the cartridge cylinder, a member adapted to matingly engage the threads of said rod, and means to move said member toward and away from said rod whereby when said member engages said rod said piston will be moved axially a short distance upon each revolution of the rod and when said member is clear of said rod said rod can be freely shifted axially of the cartridge cylinder.

3. A cartridge syringe comprising means to removably hold a cartridge in the form of a cylinder having a cap at one end and a plunger at the other, a double pointed needle one point of which is disposed within said cartridge holding means and is adapted to pierce the cartridge cap, a piston adapted to bear against the cartridge plunger, a threaded rod at one end of which the piston is carried, means to mount said rod for free reciprocation in a direction axially of the cartridge cylinder, a member having threads adapted to mesh with the threads on said rod, and means to mount said member for movement in a direction transverse to the longitudinal axis of the rod from a position in which the threads on said member are clear of the threads on said rod to a position in which the threads on said member mesh with the threads on said rod whereby said piston can be axially moved either by rotating the rod when the member engages the same or by pushing or pulling the rod when the threads of the member are clear of the same.

4. A cartridge syringe as set forth in claim 3 wherein means is provided to resiliently urge the threaded member towards its thread clearing position said threaded member including a portion adapted to be pressed manually against said resilient means and thereby to move said threaded member to its thread meshing position, whereby said threaded member will be in its thread clearing position when idle.

5. A cartridge syringe as set forth in claim 3 wherein means is provided to resiliently urge the threaded member towards one of the mentioned positions and wherein a manually actuatable member is provided to shift said member toward the other of the mentioned positions.

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