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M. DANN ET AL

2,870,766

CARTRIDGE FOR METERING SYRINGE

Filed June 6, 1956

2 Sheets-Sheet 1

Fig. 1

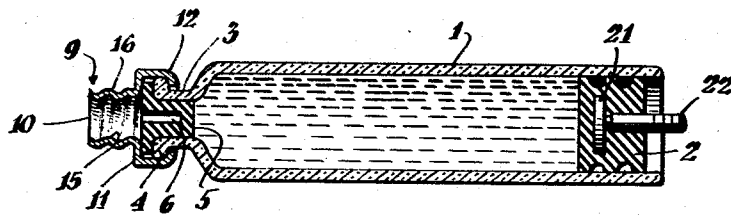


Fig 2

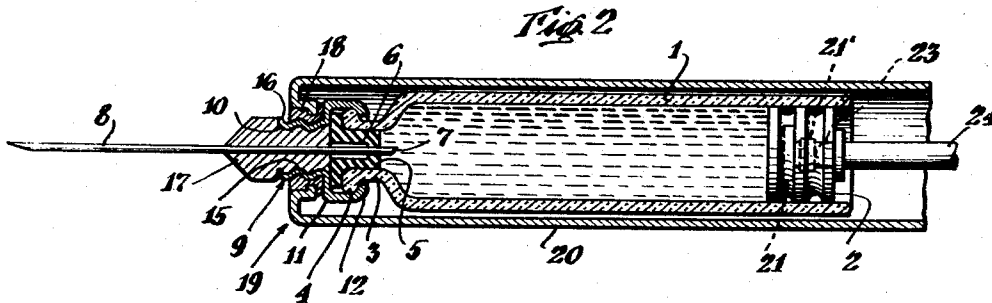
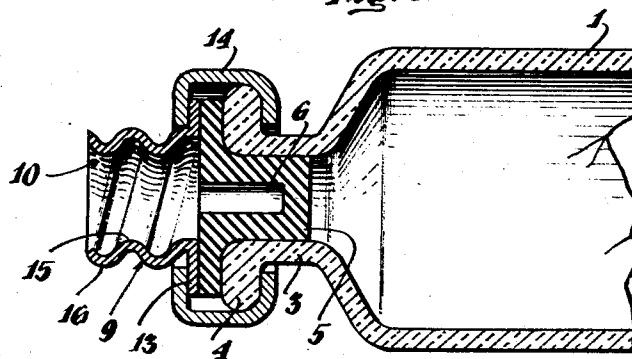


Fig. 3



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Fig. 4

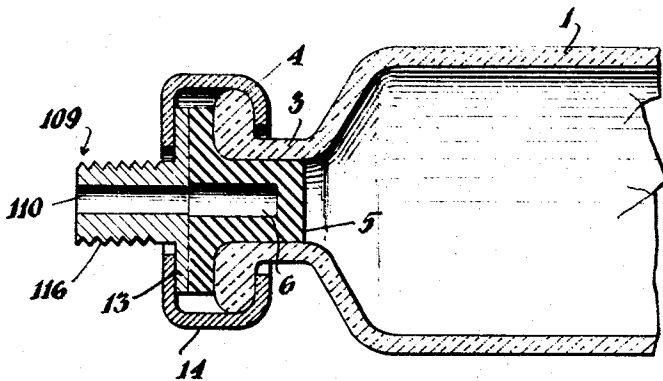
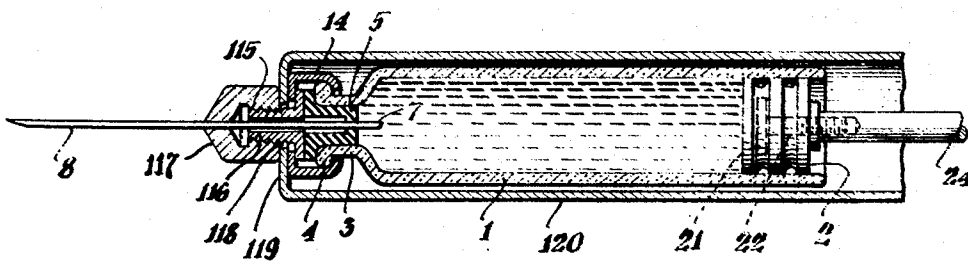


Fig. 5



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CARTRIDGE FOR METERING SYRINGE

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11 Claims. (Cl. 128—218.1)

This invention relates to a syringe cartridge, and more particularly to a cartridge suitable for use with a metering or multiple-dose syringe. The cartridge comprises an ampule having an unrestricted opening at the proximal end and a restricted opening at the distal end, a slideable plunger at the proximal end, and a penetrable closure at the distal end secured to the ampule by a nipple and ferrule; the ferrule may be integral with the nipple in the form of a skirt.

Since such syringes are used largely in veterinary practice and must be adapted to injection of a drug, e. g. penicillin, into animals of varying size, such as horses, cattle, dogs and poultry, interchangeability of needles must be provided for. Also, since such syringes must be capable of delivering accurately metered doses of different sizes by regulation of plunger travel, provision must be made for securing the cartridge firmly in the syringe without longitudinal lost motion. The tolerance in the lengths of glass ampules is such that it is difficult to ensure sufficiently rigid mounting without breakage merely by providing fixed metal abutments in the syringe body at each end of the ampule. Spring-loaded abutments or rubber washers to provide resilience add to the expense and complexity of the syringe and are uncertain and inaccurate.

It is the chief aim of this invention to provide a cartridge for the above described purposes having exceedingly simple and economically produced means for securing it in a syringe body and for connecting an injection needle in operable position with it. It is a further object to provide means of this kind which ensure rigid mounting of the cartridge in the syringe body and of an injection needle in the cartridge so that no longitudinal lost motion can interfere with accurately metering injected doses by regulation of the longitudinal travel of the syringe push rod acting on the cartridge plunger. An additional object is to provide means of this kind permitting ready interchangeability of needles.

According to this invention a cartridge is provided comprising an ampule closed at its proximal end by a movable plunger and at its distal end by a resilient closure, provided with a nipple having a projecting threaded portion, and having means securing the nipple and closure liquid-tight to the ampule. The ampule is preferably of transparent glass, but may be made of plastic or even metal. In a preferred form the distal opening is externally beaded and closed by a penetrable water-impervious washer or stopper of rubber, neoprene or similar material; the nipple is provided with a flange and held in place by a member crimped around the bead of the ampule as described in detail below. The flange of the nipple may be of sufficient width so that it may be crimped or rolled around the bead of the ampule opening to secure the ampule closure in place, or the flange may be narrower and the nipple held in place by a separate ferrule. Crimping and rolling are functionally equivalent in this case.

In one form of this invention the hole in the distal end of the syringe barrel is threaded to receive a nipple made

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of sheet metal which can readily be rolled, stamped, pressed or otherwise formed into the desired shape. The nipple consists of a tubular neck and an outwardly extending flange at one end; the neck is provided with a helical corrugation forming an internal female thread and a complementary external male thread of the same pitch, the difference in diameter of the threads being twice the thickness of the material from which the nipple is made. The internal thread is adapted to receive and mate with the threaded hub of an injection needle, and the external thread is adapted to enter and mate with the threaded opening in the distal end of a syringe body.

Such a nipple has the advantages that it is compact in size, holds needle, ampule and syringe in rigidly spaced relationship, is cheaply fabricated from a single piece of sheet material, and requires no machining.

In another embodiment of this invention the nipple is made with a central bore large enough to receive the proximal end of a double-pointed injection needle, the body of the nipple is externally threaded to mate with internal threads of a hub in which the needle is fixed, and the nipple is secured to the ampule by a crimped or rolled ferrule, retaining the resilient closure in place. This type of cartridge may be used in a syringe having in the distal wall of the barrel an unthreaded hole large enough to permit the nipple to pass but smaller in diameter than the needle hub. When the ampule is in place, the needle inserted and the hub screwed home on the nipple, the ampule is secured against longitudinal movement by pressure of the cartridge on the inside and the needle hub on the outside of the distal wall of the syringe barrel.

The following detailed description is intended to be illustrative only and not to limit our invention, the scope of which is defined in the appended claims.

In the drawing,

Fig. 1 is a sectional side view of a cartridge embodying one form of the invention,

Fig. 2 is a sectional side view of such a cartridge in place in a syringe body with an injection needle mounted in operable position, and

Fig. 3 is a sectional side view on a larger scale of the distal end of a cartridge embodying a modification of the invention.

Figs. 4 and 5 are sections of an alternative embodiment of the invention.

The cartridge comprises a cylindrical glass ampule 1, having an unrestricted opening at the proximal end closed by a slideable rubber plunger 2. The distal end of the ampule is contracted to a relatively narrow neck 3, having an external bead 4 surrounding the opening in the neck. This opening is closed by stopper 5 of rubber or neoprene, having a recess 6 molded in it to facilitate puncture of the proximal end 7 of a double-cannula needle 8 when the latter is mounted in operable position. Instead of a stopper, a flat washer may be used to close the ampule.

In the embodiment shown in Figs. 1-3, the stopper 5 or washer is retained securely in position by nipple 9. The latter is formed with a neck portion 10 and an outstanding flange 11 which is of sufficient width to be crimped or rolled around bead 4, as at 12, thus exerting pressure on stopper 5 and securely sealing the ampule. Alternatively the flange may be narrower, as shown in Fig. 3 at 13; a separate ferrule 14 is then crimped or rolled around bead 4 and flange 13 to secure nipple and stopper.

Nipple 9 is formed of sheet metal such as brass or aluminum. The neck 10 is provided with a helical corrugation which forms an internal female thread 15 and a complementary external male thread 16. The internal thread 15 is adapted to receive and hold securely the

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threaded hub 17 of needle 7—8, while the external thread 16 mates with and is held securely by the threaded hole in filler piece 18 fixedly mounted in the distal end 19 of syringe body 20, as shown in Fig. 2.

The plunger 2 is of special construction. In order to avoid inaccuracies in the metered doses delivered by regulated travel of the plunger, distortion of the latter due to pressure of the actuating push rod 24 must be avoided. This is accomplished by provision of a rigid plate, e. g. of brass, molded in the plunger, indicated at 21. This plate differs from the conventional metal insert in having a diameter at least 75% and preferably 84% to 85% that of the plunger and being spaced from the distal face of the plunger not more than 15% of the plunger length. Plate 21 may be provided with a threaded connecting piece 22 as in Fig. 1 for attaching the syringe push rod, or this may be omitted as in Fig. 2. In the latter case, the plate may be provided with a stud 21' and the plunger is provided with a recess 23 to receive the end of push rod 24 and permit it to bear directly on plate 21. Push rod 24 may be actuated in any known way by mechanism (not shown) to advance it a desired limited distance at each injection.

The helical corrugation in the sheet metal or other material of nipple 9 produces threads 15 and 16 having more resilience than threads machined in solid stock. Accordingly ampule 1 may readily be screwed home in the syringe 20 with a jam fit allowing no end play of the ampule when the syringe is used. This permits repeating metered doses with more than usual precision. The structure of the plunger 21 described above contributes to this. However even with a conventional plunger a good part of the advantages of our invention may be realized.

In the modification shown in Figs. 4 and 5 parts identical with those in Figs. 1—3 are identified by the same numbers and parts analogous but different are identified by numbers increased by 100.

In Figs. 4—5, ampule 1, plunger 2, neck 3, bead 4 and stopper or washer 5 are identical with those shown in Figs. 1—3. Nipple 109 is formed with a flange 13 and an externally threaded neck 116, having a bore 110 of sufficient diameter to permit free passage of needle portion 7. The nipple and stopper are firmly secured to the ampule by ferrule 14 crimped around flange 13 and bead 4.

The syringe barrel 120 is similar to barrel 20 except that the hole 118 in distal end closure 119 is not provided with a thread; it is of sufficient diameter to permit free passage of neck 116 but smaller than the diameter of needle hub 117. Needle 8 is fixedly mounted in hub 117 provided with an internal thread 115 mating with thread on nipple 116.

In employing this embodiment of the invention, the user inserts the cartridge in barrel 1 of the syringe and closes the syringe. He then pierces stopper 5 with the proximal end 7 of needle 8 and screws home hub 117 by means of thread 115 mating with the threaded neck of nipple 116. The end closure 119 of barrel 120 is thus compressed between hub 117 and ferrule 14 (or the nipple flange if ferrule is integral with nipple), thus firmly securing the cartridge against lengthwise movement in the barrel. This ensures accurate metering of doses by control of the longitudinal travel of push rod 24 and plunger 2.

From the above description it will be seen that a cartridge has been devised with means for attaching it to a multiple-dose veterinary syringe which is extremely simple and cheap to produce and provides for a high degree of reproducibility in delivering metered doses of various sizes. In our embodiment the formation of complementary internal and external threads of the nipple by means of a single helical corrugation also permits forming a nipple that is light and of small over-all diameter.

The ampules of this invention are customarily dispensed filled with a therapeutic solution ready for use.

The term "distal" in this application refers to a direc-

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tion towards the needle end of the syringe or ampule, and "proximal," towards the plunger end.

We claim:

1. A cartridge adapted to be used in a metering injection syringe in combination with a double-pointed injection needle provided with a threaded hub, said cartridge comprising: an elongated ampule containing an injectable material, closed at one end by a movable plunger and at the other by a penetrable closure, a nipple having a projecting threaded portion adapted to pass through a hole in the distal wall of a metering injection syringe and mate with a threaded needle hub, means rigidly securing the nipple and penetrable closure leak-tight to the ampule, and further means adapted to secure the distal end of the cartridge rigidly to the distal end of the syringe barrel against longitudinal movement, said further means comprising a threaded member effective to hold said nipple firmly against the distal wall of the syringe when the cartridge and needle are in operating position in the syringe.

2. A cartridge as defined in claim 1 in which the threaded nipple is provided at its proximal end with a flange bearing on the penetrable closure of the ampule and the means securing the nipple to the ampule is crimped around and in contact with a bead at the distal end of the ampule.

3. A cartridge as defined in claim 1 in which the plunger is of resilient material and contains a rigid disc engageable with the plunger rod of a metering syringe, said disc having a diameter not less than 75 percent of the plunger diameter and spaced from the distal end of the plunger but not more than 15 percent of the plunger length.

4. In combination, a cartridge, a double-pointed injection needle having a threaded hub, and a metering syringe, said metering syringe having a barrel with a distal wall provided with a hole having a diameter less than the outside diameter of the needle hub, the cartridge comprising an elongated ampule containing an injectable material, closed at one end by a movable plunger and at the other by a penetrable closure, a nipple having a projecting threaded portion passing through the hole in the distal wall of the syringe barrel and mating with the threaded needle hub, means rigidly securing the nipple and penetrable closure leak-tight to the ampule, the needle being mounted on the cartridge with its proximal point piercing the cartridge closure and communicating with the injectable material therein, the needle hub being screwed home on the cartridge nipple by means of the mating threads, the distal wall of the barrel being held firmly between the needle hub and the cartridge to secure the cartridge against longitudinal movement in the barrel.

5. In an ampule closure for use with an ampule having a distal opening provided with an external bead and contained in a metering injection syringe, which closure comprises a penetrable sealing member having a diameter greater than the distal opening of the ampule but less than the diameter of said bead and means for retaining the sealing member in liquid-tight contact with said bead, the improvement in which the means for retaining the sealing member consists of a nipple having a flange and a neck, the flange lying in a plane perpendicular to the axis of the neck and being provided with crimping means adapted to be pressed rigidly against the distal surface of the sealing means and the proximal surface of said bead, and the neck being provided with a helical corrugation forming an external and an internal thread of the same pitch.

6. The improvement as defined in claim 5 in which the flange of the nipple is integral with the means for retaining the sealing member in position.

7. As an article of manufacture an ampule for use in an injection syringe designed to deliver successive metered doses, the ampule comprising a cylindrical body closed at one end by a movable plunger and contracted at the other end to a beaded opening, a penetrable sealing member closing the beaded opening, a nipple having a flange and

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a neck, the flange lying in a plane perpendicular to the axis of the neck being adapted to be pressed rigidly against and retain the sealing member in position, means for pressing the flange rigidly against the sealing member and the latter against the beaded opening of the ampule, the neck of the nipple being provided with a helical corrugation forming an external thread adapted to mate with a threaded opening in the distal end of the syringe and an internal thread adapted to receive and mate with the threaded hub of an injection needle.

8. An article as defined in claim 7 in which the flange of the nipple is crimped or rolled around the beaded opening of the ampule, thus constituting the means for pressing the sealing member against the beaded opening of the ampule.

9. An article as defined in claim 7 in which the means for pressing the flange against the sealing member and the latter against the beaded opening of the ampule is a ferrule crimped or rolled around the bead of the ampule opening.

10. An article as defined in claim 7 in which the movable plunger contains a rigid disc spaced from the distal end of the plunger but not more than 15 percent of the

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plunger length, the disc having a diameter of 84-85 percent the diameter of the plunger.

11. A nipple adapted to secure an ampule having an external bead surrounding its open distal end in a variable dose injection syringe and to secure an injection needle having a threaded hub in operable connection with the interior of the ampule, said nipple comprising a hollow cylindrical neck and a circular outstanding flange lying in a plane perpendicular to the axis of the neck, the neck being provided with a helical corrugation forming an internal and an external thread and the flange being provided with crimping means adapted to be crimped about the bead on the ampule in contact with the proximal surface of the bead and to apply pressure thereto and to a sealing member mounted on the ampule.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,870,766

January 27, 1959

Morris Dann et al.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 10, for "grass" read -- brass --.

Signed and sealed this 16th day of June 1959.

(SEAL)

Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents