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DISPENSING DEVICE FOR LIQUID AND SEMI-LIQUID SUBSTANCES

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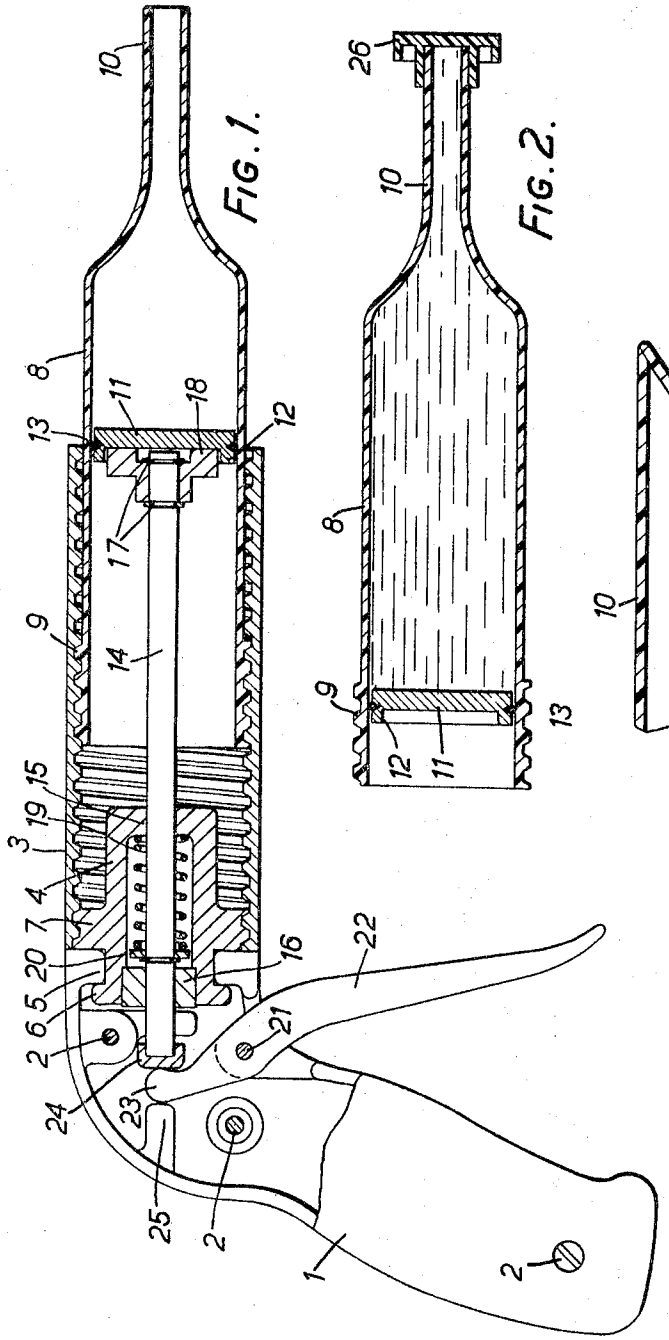

FIG. 1.

FIG. 2.

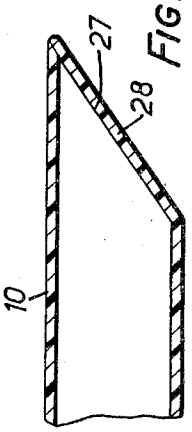

FIG. 3.

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DISPENSING DEVICE FOR LIQUID AND SEMI-LIQUID SUBSTANCES

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1 Claim. (Cl. 222—327)

This invention relates to dispensing devices for liquid or semi-liquid substances, which term is to be understood as including substances or mixtures of substances, which can be caused to flow through the application thereto of manually applied pressure, and is particularly but not exclusively applicable to dispensing devices for medicinal or curative purposes, for example devices for administrating doses of predetermined volume to farm or other animals.

For convenience, therefore, herein, the term "dose" will be used to refer to a predetermined volume of a liquid or semi-liquid substance delivered by the dispensing device irrespective of whether the substance is delivered for medical or for other purposes.

It is an object of the invention to provide a form of dispensing device for liquid and semi-liquid substances which, while being of simple form, will readily enable the volume of the dose delivered upon the operation of operating mechanism to be determined with a satisfactory degree of accuracy and varied as may be required.

A dispensing device for liquid or semi-liquid substances according to the present invention comprises a supporting structure, a reservoir for the substance to be dispensed carried by the supporting structure and in the form of a piston and cylinder assembly provided with a discharge opening or passage, operating mechanism arranged to cause axial movement of one of the two members constituting the piston and cylinder assembly relatively to the supporting structure and including an actuating member arranged to move between predetermined points upon actuation of an operating member and to cause such relative axial movement, and adjusting means comprising relatively rotatable parts provided with inter-engaging screwthreads of predetermined pitch so arranged that their relative rotation causes axial movement of the other of the two members constituting the piston and cylinder assembly relatively to the supporting structure.

Preferably the cylinder comprises one of the relatively rotatable parts so that the other of said relatively rotatable parts is rigid with the supporting structure while the piston is constituted by a "free" piston member disposed within the cylinder, and the actuating member is arranged to move axially of the cylinder and, when moved in the appropriate direction, to act on the piston to move the latter axially within the cylinder. In such a construction the screwthreaded part which is rigid with the supporting structure is conveniently internally screwthreaded and the cylinder conveniently comprises a tubular member having a cylindrical body part from one end of which extends a nozzle of smaller diameter than the body part and constituting the discharge passage, while its other end portion is provided with an external screwthread the base diameter of which is not less than the external diameter of the unscrewthreaded part of the body part whereby said unscrewthreaded part of the body part can enter the bore of the internally screwthreaded part rigid with the supporting structure.

The above reference to a "free" piston member is to be interpreted as meaning a piston member which is not attached to the actuating member but is arranged to be acted upon by it so as to be moved in the appropriate direction, i.e. towards the nozzle, upon operation of the actuating member.

The piston and cylinder assembly of a construction as referred to above may be disposable, in which case such piston and cylinder assemblies each with a filling of material to be dispensed may be supplied in the form of cartridges or refills.

Thus, according to another aspect of the invention a cartridge or refill for a dispensing device according to the invention comprises a tubular member having a cylindrical body part provided at one end with an external screwthread the base diameter of which is at least equal to the external diameter of the unthreaded portion of said body part, while from the other end of said body part projects a nozzle of smaller diameter than said body part, a free piston disposed within said body part so as to make a substantially fluid-tight seal with the bore therefore, and a body of liquid or semi-liquid substance to be dispensed disposed within the part of said tubular member between the piston and the exit of the nozzle.

In any event the nozzle of such a cartridge or refill may be closed by a removable closure member and/or by an automatic valve which will open under pressure applied to it by the substance within the cartridge, while the end of the cartridge remote from the nozzle may, in addition to being closed by the piston, be provided with a removable cap or covering.

Moreover in any case a dispensing device according to the invention will preferably be provided with indicating means including co-operating parts or markings respectively on the two relatively rotatable parts whereby an operator can determine when relative rotation between these parts through a determined angle or any one of a number of determined angles has been effected.

Thus a cartridge or refill according to the invention as referred to above will usually include one or more markings on the outer circumference of the body part for co-operation with a marking or indicator on the part with which it will be brought into screwthreaded engagement when embodied in a dispensing device according to the invention.

A dispensing device according to the invention is conveniently in the form of a pistol in which the supporting structure includes a handle corresponding to the stock of the pistol and a tubular internally screwthreaded part projecting from the stock in a similar manner to that of the barrel of the pistol, such tubular part comprising the internally screwthreaded part into which extends and from which projects the cylinder, which thus has an external screwthread engaging the screwthread of the internally screwthreaded part, the actuating member being arranged to be moved by a trigger-like operating member against the action of a spring.

One construction of dispensing device according to the invention and a form of cartridge or refill according to the invention for use therewith, together with a modification thereof, are illustrated by way of example in the accompanying drawings, in which:

FIGURE 1 is a sectional side elevation of the complete dispensing device,

FIGURE 2 is a similar view to FIGURE 1 of one form of cartridge or refill for use with the dispensing device shown in FIGURE 1, and

FIGURE 3 is a cross section on an enlarged scale showing a modification which may be applied to a refill otherwise similar to that shown in FIGURE 2.

In the construction of dispensing device shown in FIGURE 1 the device comprises a supporting structure consisting of a handle 1 formed in two similar parts clamped together by bolts, indicated at 2, and a tubular internally screwthreaded part 3 rigidly secured to the handle 2.

The part 3 is connected to the handle 1 by a tubular member 4 forming part of a guide assembly and provided adjacent to one end (hereinafter called its inner end) with an external annular groove in which lies an internal flange 5 formed in the handle 1 as shown. The extreme inner end of the part 4 thus comprises an external flange 6 as shown. The part 4 also includes a part 7 which is externally screwthreaded and engaged by the inner end portion of the internal screwthread on the tubular part 3.

Extending into and projecting from the outer end of the tubular part 3 is a cylinder member comprising a body part 8 having at its inner end an external screwthread 9 the base diameter of which is not less than the external diameter of the part 8 so that the part 8 can slide and rotate within the bore of the tubular part 3 as shown. The end of the cylinder member 8 remote from the screwthread 9 is formed as a nozzle 10, as shown, of smaller diameter than the body part 8, and there is disposed within the part 8 a free piston comprising a disc-like part 11 having a small axially extending flange 12 on one face thereof provided with a circumferential groove in which is disposed a resilient sealing ring 13, for example of the O-ring type.

Extending through the part 7 of the assembly guide is an actuating rod 14 which can slide axially relatively to the part 7 and is maintained substantially coaxial with the tubulr part 3 by reason of its making a suitably close sliding fit within a bore in the outer end part 15 of the part 7 and a bore in a guide socket 16 rigidly secured within the inner end of the bore of the part 7.

Secured, as by two circlips 17, to the outer end of the actuating rod 14 is a thrust member 18 arranged to act on the part of the inner face of the piston 11 within the flange 12, while a compression spring 19 is interposed between the inner face of the part 15 and a thrust washer 20 on the actuating rod 14 so as to urge the rod 14 always to the left in FIGURE 1. Pivotally connected at 21 to the handle 1 and projecting from it through a slot 1A is a trigger lever 22 the inner end 23 of which is arranged to act, through a pad 24, on the inner end of the actuating rod 14 and is normally held by the spring 19 acting on the rod 14 against a stop 25 rigid with the handle.

The trigger lever 22 is, as shown, arranged to be actuated by one or more fingers of the hand of an operator supporting the device by the handle 1 so as to move the actuating rod 14 to the right in FIGURE 1 from the position shown and this movement is limited by the engagement of the pad 24 with the lefthand face of the guide socket 16. Thus, for each actuation of the trigger lever 22 by an operator between its two limiting positions the actuating rod 14, and hence the thrust member 18, moves from one predetermined position to another predetermined position.

When the apparatus is in use the part of the interior of the cylinder member 8 between the end of the nozzle 10 and the adjacent face of the piston 11 is filled with the substance to be dispensed, and it will be seen that that volume of such substance which will be ejected upon each operation of the trigger lever 22 to move the actuating rod 14 between its two limiting positions will vary with variations in the distance which, before actuation of the trigger lever 22, separates the lefthand face of the piston 11 from the adjacent face of the thrust member 18. For convenience of illustration the parts are shown in the relative positions they would occupy if it was desired to eject the maximum volume of material of which the device is capable upon operation of the trigger lever 22, and it will be apparent that if, with the parts in the position shown, the trigger lever 22 is actuated and then released so as to eject such maximum quantity, the quantity which will be ejected upon the next actuation of the trigger lever 22 will depend upon the distance which the cylinder member 8 is moved to the left relatively to the part 9 by rotation of the part 8 relatively to the part 9 prior to such next actuation.

It will usually be convenient for the screwthread 9 to be of such pitch that one complete rotation of the part 8 relatively to the part 9 after an actuation of the trigger lever 22 will move the part 8 axially relatively to the part 9 somewhat less than the distance which would bring the face of the member 18 into engagement with the adjacent face of the piston 11. Thus, assuming, as would conveniently be the case, that the maximum does which would be used in practice is that resulting from one complete rotation of the part 8 relatively to the part 9, this will provide a certain "tolerance" ensuring against the unintentional ejection of some of the substance through the nozzle 10 by rotation of the part 8 slightly further than is required to provide for the ejection of the maximum dose.

As indicated above, when substantially all the substance has been ejected from the cylinder 8 by the piston 11, apart from a small remaining amount in the nozzle 10, the assembly consisting of the cylinder member 8 and the piston 11 can be removed from the tubular part 3 and disposed of, where upon a new piston and cylinder assembly constituting a refill, as shown in FIGURE 2, can be applied to the tubular part 9. As will be apparent this refill comprises a cylinder part 8 with the appropriate external screwthread 9 at one end and the nozzle 10 at the other, and the piston 11 disposed within its bore and at the position indicated, while the nozzle is closed by a removable cap 26 and the chamber within the assembly is substantially filled with the substance to be dispensed. The piston in the refill would be disposed in such position that when the refill is applied to the part 9 and screwed into this part to a suitable point, indicated for example by a circumferential line the piston would come into or nearly into engagement with the thrust member 18. The cap 26 would then be removed and the trigger lever 22 actuated so as to eject some of the substance, although since it would not be a predetermined quantity, preferably not for use as a "dose." The apparatus will then be in condition for dispensing measured "doses" in the manner referred to.

In the modification shown in FIGURE 3 which is a cross section through the end portion of the nozzle of a refill otherwise similar to that shown in FIGURE 2, instead of the end of the nozzle being closed by a closing cap 26, the nozzle 10 is formed in a manner known per se to provide an opening surrounded by a flat seating surface 27 inclined to the axis of the nozzle and normally closed by a flap 28 integral with the nozzle and constituting a valve which will open under the pressure applied to it by the substance to be ejected.

There may be assumed to be provided on the outer end of the part 3 of the dispensing device shown in FIGURE 1 a mark for example in the form of an arrow or groove, while the exterior surface of the body part 8 in FIGURE 1 and FIGURE 2 is provided with a series of markings in the form of longitudinally extending lines circumferentially spaced from one another by predetermined angles so as to indicate, in conjunction with the marking on the part 3 predetermined angles of rotation which may be imparted to the part 8 relatively to the part 3, these angles of rotation corresponding to different predetermined "doses." Moreover the longitudinal lines constituting the markings on the part 8 may be arranged to constitute two or more sets, the lines in the different sets being differently coloured or otherwise distinguished from one another and the lines in each set being equally spaced from one another but differently spaced from the lines in each of the other sets. Thus, by employing lines in one set or another as the indication of the amount of rotation to be imparted to the member 8 between the delivery of successive doses, an operator can provide for the delivery in succession of a series of doses each of a

determined volume selected from the two or more volumes to which the sets of lines relate.

What I claim as my invention and desire to secure by Letters Patent is:

Apparatus for dosing animals with liquid or semi-liquid substances including a cartridge in the form of a cylinder for the substances to be dispensed having a discharge passage at one end and an externally screw-threaded portion at its other end, a free piston arranged to slide within the cylinder to eject the substance through the discharge passage, the base diameter of said screw-threaded part being not less than the external diameter of the remaining part of said cylinder, a supporting structure in the form of a gun having an internally screw-threaded barrel portion engaging said screw-threaded portion on the cylinder whereby rotation of the cylinder relatively to the barrel portion causes axial movement of said cylinder relative to said barrel, an actuating member on said supporting structure and having predetermined movement axially of the cylinder independently of but capable of

acting on said free piston, and an operating member arranged to impart said predetermined axial movement to said actuating member, and a trigger-like member arranged to operate the actuating member.

References Cited by the Examiner

UNITED STATES PATENTS

1,039,980	10/1912	Lowe	222—386
1,870,497	8/1932	Dunlap	222—391
1,870,524	8/1932	McGahey	222—391
2,102,591	12/1937	Hagemeier	222—386
2,461,211	2/1949	Guthrie	222—326
2,646,906	7/1953	Jones et al.	222—327

FOREIGN PATENTS

930,316	1/1948	France.

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