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SYRINGE STRUCTURE

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The present invention relates generally to the field of dispensing devices, and more particularly to an improved multiple dosage syringe that automatically indicates when each of a number of doses of predetermined volume has been dispensed therefrom. The present application is a continuation-in-part of our Patent No. 2,764,981 entitled Multiple Dosage Syringe, which issued October 2, 1956.

In the dairy industry, cows frequently are infected by mastitis, a disease which is combated by the injection of certain fluid materials into the teats by means of a syringe. A present practice in marketing such fluid materials is to package four disposable syringes filled therewith in a suitable box, with each syringe being discarded after use. Such disposable syringes are normally formed of a synthetic plastic material such as polyethylene, or the like.

Disposable syringes of the type above described are convenient to use and assure that but a predetermined quantity of fluid material will be administered as a dose. However, one very real disadvantage of such disposable syringes resides in the fact that the dosage cost to the dairyman is unduly high.

The primary purpose in devising the present invention is to provide a disposable syringe that is not only as convenient to use as previously available plastic devices, but one that provides a lower per dose cost to the dairyman in that the cost of each syringe is prorated over four doses rather than one.

A major object of the present invention is to furnish a multiple dosage syringe that automatically indicates when a dose of predetermined volume has been dispensed therefrom, and one that in structure is but slightly more complicated than the structure of those disposable syringes employed heretofore in the administration of single doses.

Another object of the invention is to furnish a multiple dosage syringe that so operates as to impart a signal to the feel of the user that a dose of predetermined volume has been dispensed therefrom in the dark or in poorly illuminated areas.

A further object of the invention is to supply a syringe that permits single, double, triple or quadruple doses to be discharged therefrom by simple manual operations on the part of the user.

A still further object of the invention is to provide a multiple dose syringe that lowers the per dose cost of the fluid material dispensed thereby to the extent that this mode of administration will create an ever increasing demand therefor.

These and other objects and advantages of the invention will become apparent from the following description of a preferred and certain alternate forms thereof, and from the drawings illustrating same in which:

Figure 1 is a perspective view of a preferred form of the invention;

Figure 2 is a fragmentary, perspective view of the plunger, showing one of the dosage indicating devices forming a part thereof;

Figure 3 is a fragmentary, perspective view of the plunger shown in Figure 2 showing one of the dosage

indicating devices deformed to permit forward movement of the piston into the barrel;

Figure 4 is a fragmentary, perspective view of a first alternate form of dosage indicating device;

Figure 5 is a fragmentary, perspective view of a second alternate form of dosage indicating device;

Figure 6 is a longitudinally extending, vertical cross-sectional view of a third alternate form of dosage indicating device shown mounted on a plunger with the plunger slidably mounted in a barrel;

Figure 7 is a longitudinally extending, vertical cross-sectional view of a fourth alternate form of dosage indicating device mounted on a plunger, with the plunger slidably mounted in a barrel; and,

Figure 8 is a transverse cross-sectional view of the device shown in Figure 7, taken on line 3—3 thereof.

Referring now to the drawing for the general arrangement of the preferred form of the invention, as well as the four alternate forms thereof, it will be seen that each includes an elongate barrel A in which a plunger B is slidably mounted. Plunger B has a piston D mounted on one end thereof that is disposed within the confines of barrel A. When piston D is moved forwardly in barrel A by means of plunger B, fluid contained in the barrel is discharged through a suitable projecting tubular member or hollow needle C. In structure, the barrel A includes an elongate tubular shell 100 that is provided with an outwardly extending ring-shaped flange 112 situated on the rearward end thereof. The forward end portion of shell 100 tapers inwardly to develop into a short tube 114, on the exterior surface of which threads are formed.

The rear end of tubular member C terminates in a nut 116 which is adapted to removably engage and be supported on the threaded tube 114. When nut 116 and tube 114 are so engaged, barrel A and tubular member C are held together as a rigid integral unit. Barrel A, as well as tubular member C, are preferably molded as a one-piece unit from one of the numerous commercially available transparent synthetic resins that are suitable for such purposes.

The plunger B, as may best be seen in Figure 1, includes a member 120 that is slidably mounted within the confines of shell 100, and is sufficiently long to project from shell 100, even when piston D is at its forwardmost position therein. Plunger B (Figures 1, 2 and 3) is defined by four normally disposed legs 124, 126, 128 and 130. In transverse cross section the four normally disposed legs 124, 126, 128 and 130 of plunger B form plural longitudinal recesses 124', 126', 128' and 130'. The rear extremity of plunger B terminates in a transversely positioned handle 132 that is preferably in the shape of an annular plate, but may take any desired configuration.

The leg 130 as best shown in Figures 1 and 2, is formed with a number of longitudinally spaced, upwardly projecting stops 134. Each stop 134 is of such height and width as to retard forward movement of the plunger B when a particular one of the stops is moved to a position where it encounters the exterior face of flange 112. Leg 130, as well as legs 124, 126 and 128, are preferably formed of a synthetic plastic material of such rigidity as to maintain the shape in which it is molded, yet has sufficient resiliency as to permit each of the stops 134 to be deformed from the upright position shown in Figure 2 to a position substantially normal to leg 130, as seen in Figure 3. Each of the stops 134 when deformed to the position shown in Figure 3 is adapted to slide under the circular hole 136 formed in flange 112, and thus permit inward movement of plunger B until a succeeding one of the stops 134 encounters the exterior face of the ring-shaped flange. The forwardmost stop 134 (Figure 1)

holds plunger B in such a position that barrel A may contain a multiple dosage of medicant to be dispensed therefrom. When it is desired to discharge a single dose of medicant from the interior of barrel A, the stop 134 is disposed adjacent the exterior face of the ring-shaped flange 112 and is bent downwardly from its upwardly projecting position shown in Figure 2 to the substantially horizontal position shown in Figure 3 by the use of the thumb or forefinger. It will be apparent from the above description that the number of doses that can be discharged from the tubular member C and the quantity of each dose is dependent upon the number of stops 134 and the spacing thereof on leg 130.

A first alternate form of the invention is shown in Figure 4 and differs from the preferred form only in the structure and design of the plunger E. The plunger E is of the same general elongate shape as plunger B, and is formed from four normally disposed legs 124a, 126a, 128a and 130a. Leg 130a is formed with a number of longitudinally spaced transverse bores 140, with each bore being of such size as to snugly support a transversely positioned pin 142. Each pin 142 is of such length as to extend outwardly from leg 130a a distance sufficient to permit the pin to strike the rear surface of flange 112 and prevent forward movement of the plunger E. When it is desired to discharge a dose of medicant from the invention, the forwardmost pin 142 is slidably removed from its supporting bore 140 by the use of the thumb or forefinger, and the plunger E then advanced to discharge the dose. Each pin 142 is slidably removed from the bores as above mentioned, with the number of removed pins determining the number of doses of medicant discharged from tubular member C. The first alternate form of the invention differs primarily from the preferred form in that the leg 130a can be made from a rigid plastic material rather than one having the resilient characteristics required in the preferred form of the invention.

A second alternate form of the invention is shown in Figure 5 that is of the same general construction as the preferred form with the exception that a plunger F is used in conjunction therewith. The plunger F comprises a number of normally disposed elongate legs 124b, 126b, 128b, and 130b. Legs 130b have a number of longitudinally spaced, downwardly extending recesses 144 formed therein, with each recessed portion being adapted to slidably receive an inverted U-shaped stop 146. The stop 146 is formed with two downwardly extending legs 148 and 150 that are connected by a web 152. Web 152 projects upwardly above leg 130b to the extent that the forward face of the web contacts flange 112 when the plunger F is advanced forwardly to discharge a dose of medicant from the invention. A dose of medicant can only be discharged from barrel A by removing the forwardmost stop 146 from its position on plunger F. Removal of stop 146 is a simple operation, and is achieved by merely flipping or slipping the U-shaped stop from its mounted position in the recess 144. The number of stops 146 that are removed as the stops are advanced forwardly towards flange 112 determines the quantity of medicant that can be discharged from the tubular member C.

A third alternate form of the invention is shown in Figure 6. This form of the invention is identical to the preferred form other than the third alternate form includes a plunger G that is formed from four normally disposed legs 124c, 126c, 128c, and 130c. These legs have groups of longitudinally spaced, vertically aligned slots 154 formed therein, with each group of slots being adapted to removably support a resilient band 156, as shown in Figure 6. Band 156 when disposed in one of the groups of slots 154 impedes forward movement of plunger G by contacting the rearward face of flange 112. However, upon sufficient pressure being exerted on the plunger G, the resilient band is displaced from the slot

154 in which it is disposed and is rolled back on the plunger to assume a position in the rearwardly disposed group of slots 154. When so disposed, the band impedes forward movement of plunger G and can only be displaced from the slots upon application of greater pressure to the band than was used in causing it to roll from one group of slots to the next rearward group of slots.

A fourth alternate form of the invention is disclosed in Figures 7 and 8, which is identical to the preferred form of the invention except for the structure of a plunger H used in conjunction therewith. Plunger H, as can best be seen in Figure 7, is formed from four normally disposed legs 124d, 126d, 128d and 130d. A number of elongate recesses 160 are formed on the outer portion of leg 130d. Each recess 160 is defined by a horizontal edge 160a and two longitudinally spaced vertical edges 160b and 160c that are formed in leg 130d. Each two adjacent recesses 160 defines a rectangular tooth 162 therebetween, which tooth has a horizontal outer edge 162a.

A number of recesses 170 are provided in the outer portion of leg 126d. Each recess 170 is defined by a horizontal edge 170a and two longitudinally spaced vertical edges 170b and 170c formed in leg 126d. Recesses 170 are so disposed as to be directly opposite teeth 162. Each two recesses 170 defines a tooth 172 therebetween, and each of these teeth has a horizontal outer edge 172a. Teeth 172 are oppositely disposed from the recesses 160 formed in leg 130d.

A rigid ring 180 is provided that acts as a stop to prevent further forward movement of plunger H after a single dose of medicant has been discharged from the invention. Ring 180 is of such size as to provide a body portion 182 of greater size than the diameter of the bore formed in barrel A. An opening 184 is formed in ring 180. Opening 184 is defined by a lower concave edge 186, an upper concave edge 188, and two rectangular slots 190 and 192 disposed between the extremities of edges 186 and 188. Slots 190 and 192 are so spaced as to slidably accommodate legs 124d and 128d. The two edges 186 and 188 are so spaced that the plunger H can only be advanced forwardly when edge 186 is in contact with a recess edge 170a and edge 188 adjacent tooth edge 162a, or when edge 186 is adjacent tooth edge 172a and edge 188 is in contact with recess edge 160a. Slots 190 and 192 permit ring 180 to be moved upwardly and downwardly relative to legs 124d and 128d.

When it is desired to discharge a dose of medicant from this form of the invention (Figure 7), the stop ring 180 must be moved upwardly until the edge 186 thereof contacts edge 170a of one of the recesses 170. In such a position, edge 188, as can best be seen in Figure 8, is disposed above tooth edge 162a, and the plunger H can be advanced forwardly the length of one recess 170. Further forward movement of plunger H is prevented by the edge 170c of one of the recesses 170 as it contacts the lower portion of ring 180.

Upon it being desired to dispense another dose of medicant, ring 180 is pressed downwardly to bring edge 188 of the ring into contact with edge 160a of one of the recesses 160. Edge 186 of ring 180 is then disposed below edge 172a of one of the teeth 172, and the plunger H can be moved forwardly to dispense another dose of medicant from the invention. For this fourth alternate form of the invention to operate as above described, the recesses 170 must be of greater length than the teeth 162 to which they are oppositely disposed.

The operation of the preferred and alternate forms of the invention have been described in detail and need not again be repeated herein.

Although the forms of the invention herein shown and described are fully capable of achieving the objects and providing the advantages hereinbefore mentioned, it is to be understood that they are merely examples of the presently preferred embodiments of the invention and that

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we do not mean to be limited to the details of construction herein shown and described other than as defined in the appended claims.

We claim:

1. A syringe capable of containing a plurality of liquid doses which automatically signals to the user's sense of touch when a dose of predetermined volume has been discharged therefrom, including: an elongate barrel adapted to hold said doses; tubular means mounted on one end of said barrel through which each of said doses can be discharged from said barrel; a piston slidably mounted in said barrel; an elongate member affixed to said piston and extending outwardly from the end of said barrel opposite that on which said tubular means is mounted, with the transverse cross section of said member being such that at least one longitudinally extending recess is defined in said member; and a plurality of longitudinally spaced stops supported on said member that project outwardly a sufficient distance therefrom to permit each of said stops to strike the end of said barrel opposite that on which said tubular means is mounted when said elongate member is moved in a liquid discharging direction, with each of said stops being formed of a sufficiently resilient material that when each of said stops is sequentially positioned adjacent said end of said barrel opposite that on which said tubular means is mounted said stop can be bent by manual application of pressure thereon to be substantially disposed in said recess to permit said elongate member and piston to move further into said barrel.

2. A syringe as defined in claim 1 wherein said member and stops are formed as an integral unit from said

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resilient material but said member is of such transverse cross section and length that it tends to maintain a rigid elongate shape in longitudinal alignment with the interior of said barrel in which said piston is mounted.

3. A syringe as defined in claim 2 wherein said elongate member comprises at least one longitudinally extending leg that is separated from the balance of said member by two longitudinally extending recessed portions, with said stops projecting from said leg, which stops are bendable by manual application of pressure thereon to be substantially disposed in either of said recessed portions.

4. A syringe as defined in claim 3 wherein said elongate member is defined by a plurality of longitudinally extending legs integrally joined at their innermost portions, with each two of said legs defining a longitudinally extending recess therebetween.

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