

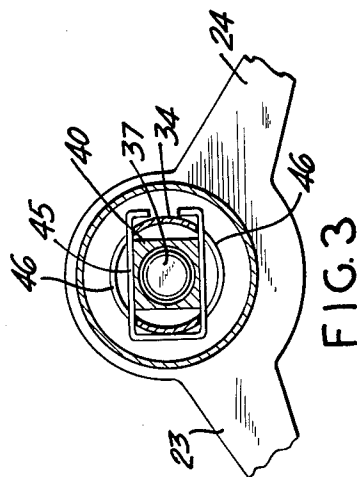
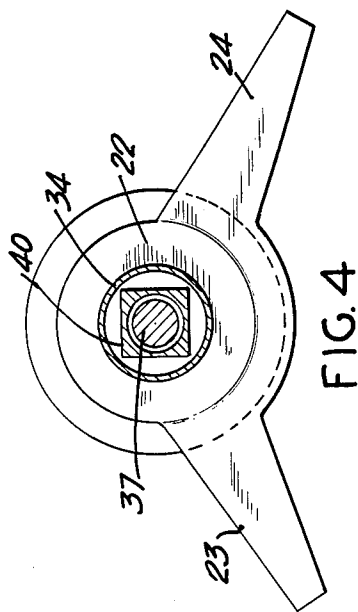
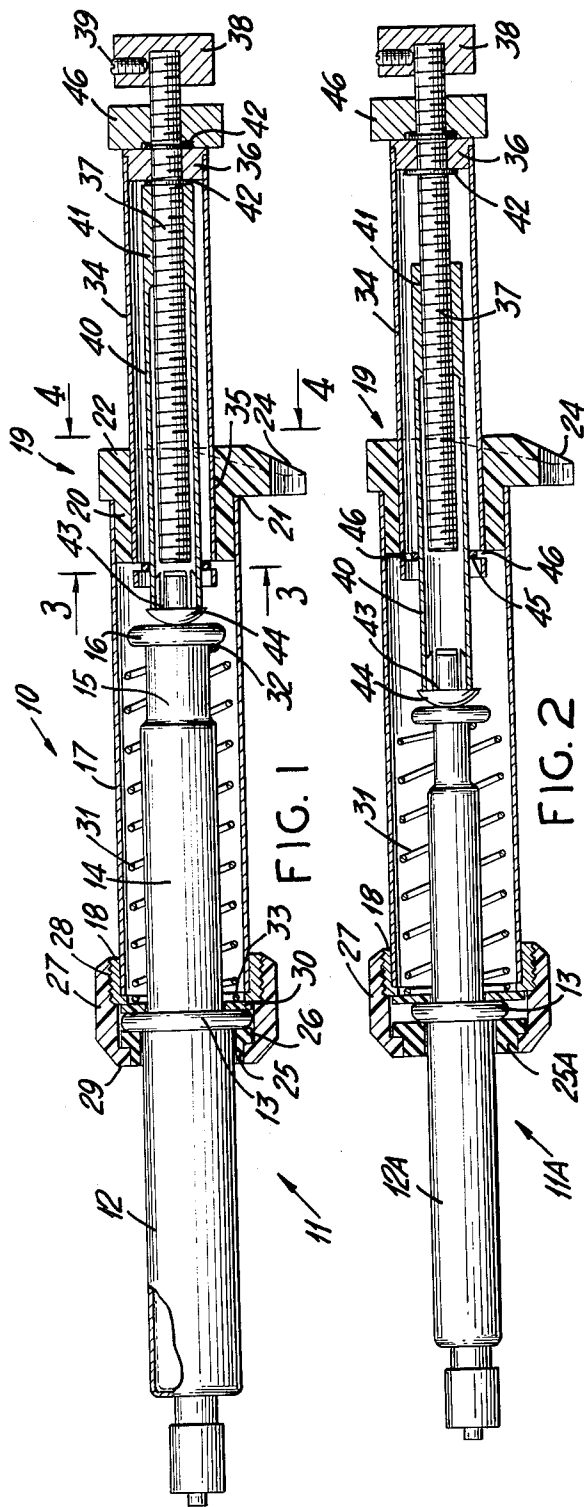
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VARIABLE CAPACITY DISPENSING DEVICE

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VARIABLE CAPACITY DISPENSING DEVICE

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This invention relates to automatic dispensing devices and more particularly concerns pipettes adapted to repeatedly dispense adjusted volumes of liquid therefrom.

An object of this invention is to provide improved barrel means for mounting thereon syringes of selected capacity and of the usual cylinder-piston type wherein the barrel includes improved means for adjusting the travel of the piston within the syringe cylinder to determine the volume of liquid to be dispensed from the syringe.

Another object of this invention is to provide in a device of the character described, adapter means for mounting thereon syringes of varying capacity, said adapter means being further operative to provide safety means to prevent glass breakage in the event that undue pressure is applied to the piston of the syringe so as to impact the outer end of the piston against the bottom of the syringe cylinder.

A further object of this invention is to provide improved means for adjusting the extent of the travel of a piston within a syringe cylinder so as to allow repeated operation of the syringe to deliver a selected volume of liquid.

Other objects of this invention are in part obvious and in part hereinafter pointed out.

In the drawing, FIG. 1 is a longitudinal sectional view showing the device embodying the invention, with the means for adjusting the travel of the syringe piston in one retracted position;

FIG. 2 is a view similar to that of FIG. 1, showing a syringe of smaller size than that of FIG. 1 mounted on the barrel portion of the device and with the piston travel adjusting means in a projected position thereof;

FIG. 3 is a transverse sectional view taken on the line 3—3 of FIG. 1; and

FIG. 4 is a transverse sectional view taken on the line 4—4 of FIG. 1.

Essentially, the device of the instant invention comprises barrel means adapted to have a piston-cylinder type syringe of a selected capacity mounted on one end thereof, with slide means on the barrel for reciprocating the piston within the cylinder, the slide means including piston abutting means which may be adjusted to determine its relative positions on the slide, whereby to determine the travel of the piston in the syringe cylinder, and hence the liquid volume delivered.

Thus, as shown in FIG. 1, 10 designates a barrel device embodying the invention, which device is adapted to have mounted at one end thereof, a conventional glass syringe generally indicated at 11. Such syringe 11 comprises the usual glass cylinder 12 having on its outer end a flange 13; and the usual glass piston 14 reciprocably mounted in cylinder 12, piston 14 having a neck portion 15 and head flange 16 at the outer end thereof.

The barrel device 10 comprises a tubular member 17 having an externally threaded ring 18 fixed to one end thereof; and combination finger grip and slide guide means 19 fixed at the other end thereof. Means 19, which may be of molded plastic, includes a short cylindrical portion 20 force fitted into the outer end 21 of member 17, and a slightly enlarged annular portion 22

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extending from cylindrical portion 20 which seats on the outer end 21 of tubular member 17. A pair of finger grip portions 23, 24 extend outwardly from annular portion 22 at an obtuse angle to each other.

Syringe 11 is mounted on tubular member 17 by means of an annular adapter member 25, formed of rubber or other resilient material. Adapter 25 has an I.D. equal to the O.D. of the cylinder 12 of syringe 11 of a given capacity, and has a flange portion 26. A barrel cap 27 having an internally threaded portion 28 may be screwed on threaded ring 18 of tubular member 17, said cap 27 further including an inwardly directed annular flange 29 for seating the flange portion 26 of adapter 25.

As shown in FIG. 1, the syringe cylinder 12 is passed through adapter 25, with flange 13 of the cylinder 12 seating on flange 26 of the adapter 25. A plastic washer 30 is placed over the exposed surface of cylinder flange 13 and the barrel cap 27 is screwed on to threaded ring 18, to mount syringe 11 on device 10. A spiral spring 31 encircling piston 14 and having an outer end 32 bearing against piston head flange 16 while the inner end 33 of said spring bears against washer 30, is effective to bias the piston 14 outwardly of syringe cylinder 12, while allowing said piston to be reciprocated within the syringe cylinder 12.

Means is provided for adjustably setting the travel of piston 14 within syringe cylinder 12 so as to allow syringe 11 to deliver a selected measured amount of liquid each time the piston 14 is reciprocated.

To this end, a cylindrical slide member 34 is slidably mounted in the bore 35 of guide means 19. A plug 36 is fixed in the outer end of slide 34, said plug 36 having a central opening therein to freely pass a threaded stem member 37 which is coaxially related to slide member 34. A knob 38 is fixed to the outer projecting end of stem 37 by a set screw 39.

An elongated tubular adjustment member 40 of square sectional outline has an internally threaded portion 41 at the outer end thereof, and is disposed coaxially within slide member 34, stem 37 being in threaded engagement therewith. A pair of C washers 42 on stem 37 and bearing against either side of plug 36 holds stem 37 against longitudinal movement relative to slide member 34 while allowing for free rotation thereof.

Adjustment member 40 is provided with a plastic abutment member 43 on the inner end thereof with a hemispherical surface portion 44 for bearing against the flange head 16 of piston 14. A key member 45, of bent wire and of rectangular outline, is snapped into opposed slots 46 formed in the slide member 34 adjacent the inner end thereof, the sides of said key member 45 abutting side portions of the adjustment member 40, FIG. 3 to prevent rotation of said member 40 relative to stem 37 or slide 34.

It will be apparent, that upon turning stem 37 in either direction, by means of knob 38, adjustment member 40 will be longitudinally advanced or retracted to locate abutment 43 in selected longitudinal positions within tubular member 17, thereby determining the limit of the outward travel of piston 14 relative to syringe cylinder 11. The selected position of abutment member 43 may be fixed, as by rotating a lock nut 46 on stem 37, until it tightly engages plug 36.

The device 10 may now be conveniently held with the thumb on knob 38 and two fingers respectively engaging finger grip portions 23, 24, to reciprocate slide 34 and thus

reciprocate piston 14 in syringe cylinder 12. The hemispherical surface 44 on abutment member 43 allows for any misalignment of the piston flange head 16 relative to adjustment member 40. If excessive pressure is applied to knob 38, causing the inner end of piston 14 to bottom on the inner end of syringe cylinder 12, the resilient adapter 26 is effective, through its compression, to avoid glass breakage.

Thus, slide 34 may be freely reciprocated in slide guide 19 with key means 46 acting as stop means to prevent the slide 34 from passing out of said guide; to operate conjointly with spring 31 to reciprocate piston 14. Thus, with adjustment member 40 set at a predetermined position by rotation of stem 37, a fixed amount of liquid may be dispensed from syringe 11 each time slide 34 is operated.

By providing adapters having inner diameters correlated to the outer diameters of syringe cylinders 12, the device 10 may have associated therewith syringes of varying capacities, as for example 1 cc.; 5 cc. and 10 cc. Thus, as indicated in FIG. 2, syringe 11A may be of a smaller capacity than that of syringe 11, in which case, adapter 25A has a smaller bore for passing the smaller syringe cylinder 12A.

It will be apparent that piston 14, as well as the flanged end 13 of syringe cylinder 12, is enclosed in tubular member 17, thereby avoiding deposit of deleterious matter on said piston and the outer end of the syringe cylinder.

Also, as shown in FIGS. 1, 2, the convolutions of helical spring 31 are relatively close to the inner surface of tubular member 17 with a relatively close annular spacing therebetween in contrast to the annular spacing between spring 31 and the piston 14 or 14A. Thus spring 31 is maintained in substantially concentric, spaced relation to said piston, to insure proper reciprocation of the piston in syringe cylinder 12.

As various changes might be made in the embodiment of the invention herein shown without departing from the spirit thereof, it is understood that all matter herein described or illustrated is not limiting except as set forth in the appended claims.

What is claimed is:

1. In combination with a dispensing device having a cylinder with a flange at one end thereof, a piston reciprocably mounted in the cylinder and spring means for biasing said piston outwardly of said cylinder; and means for reciprocating said piston comprising a tubular member, means on one end of said tubular member for detachably mounting the flanged end of said cylinder thereon, slide guide means on the other end of said tubular member, tubular slide means reciprocably mounted within said slide guide means, threaded stem means extending coaxially within said slide means, means on said slide means for rotatably mounting said stem means thereon while retaining said stem means against longitudinal movement relative to said slide means, an elongated adjustment member in threaded relation to said stem means, abutment means on said adjustment member for abutting the outer end of said piston, key means on said slide means engageable with said adjustment member for preventing relative rotation therebetween, and means on said stem means for rotating said stem means whereby to move said adjustment member longitudinally to selected positions to thereby limit the outward movement of said piston relative to said cylinder.

2. The combination as in claim 1 wherein said cylinder mounting means comprises an annular adapter of resilient material for passing said cylinder therethrough and seating the flange thereof thereon and cap means for seating said adapter and for engaging said one end of said tubular member, said adapter being compressible in response to impact of the piston relative to said cylinder during the reciprocation of said piston.

3. The combination as in claim 1 wherein said slide means is of circular cross section and formed with op-

posed slots in wall portions thereof, said adjustment member being of rectilinear outline and said key means comprises a member disposed in the slots of said slide member with rectilinear portions engaging rectilinear surfaces of said adjustment member.

4. In combination with a dispensing device including a cylinder, a piston reciprocably mounted in the cylinder and spring means about said piston for biasing said piston outwardly of the cylinder, and elongated tubular means for reciprocating said piston relative to said cylinder, said reciprocating means including an elongated, rotatable member disposed coaxially therein, means for abutting said piston and cooperative means on said abutting means and said rotatable member for imparting longitudinal movement to said abutting means to selected positions thereof in response to rotational movement of said rotatable member whereby to limit the movement of the piston outwardly of said cylinder.

5. In combination with a dispensing device including a cylinder, a piston reciprocably mounted in said cylinder and spring means for biasing the piston outwardly of the cylinder, and means for reciprocating said piston comprising a tubular member, means for mounting said cylinder on one end of said tubular member, said piston and spring means being disposed within said tubular member, slide means reciprocably mounted in the other end of said tubular member, abutment means mounted on said slide means for engaging the head of said piston, said abutment means including a rotatable member mounted on said slide means and an abutment member engageable with said rotatable member for longitudinal, non-rotatable movement relative thereto upon rotation of said rotatable member whereby to adjust the longitudinal position of said abutment member relative to said tubular member.

6. The combination as in claim 5, and including guide means on said other end of said tubular member for slidably mounting said slide means, and finger grip means extending from said guide means.

7. The combination as in claim 6, and including key means on said slide means engageable with said abutment member for preventing relative rotation therebetween, said key means being engageable with said guide means to retain said slide means in operative relation to said guide means.

8. The combination as in claim 5, wherein said cylinder includes an annular flange, and said cylinder mounting means comprises an annular adapter of resilient material having an annular flange and means for removably mounting said adapter on said one end of the tubular member, said cylinder passing through said adapter with its flange seated on the flange of the adapter, whereby upon reciprocation of the piston within the cylinder to an extent that the outer end of the piston engages the outer end portion of the cylinder in an impacting manner, said adapter will be compressed and thereby absorb the impact and avoid possible breakage of the outer end portion of the cylinder.

9. In combination with a dispensing device including a hypodermic syringe cylinder, a piston reciprocable in said cylinder, and a helical spring about the outer end of said piston for biasing said piston outwardly of said cylinder, means for reciprocating said piston comprising a tubular member enclosing the outer end of said piston and said spring, means on one end of said tubular member for mounting the outer end of said syringe cylinder, closure means on the other end of said tubular member, a passage in said closure means, slide means reciprocably mounted in the passage means of said closure means, said slide means having abutment means on one end thereof within said tubular member for engaging the outer end of said piston, the other end of said slide means projecting outwardly of the passage means in said closure means, rotatable means on said slide means for longitudinally adjusting the position of said abutment means relative there-

to, and means on the outer end of said slide means for rotating said rotatable means.

10. The combination as in claim 9 wherein the annular spacing between the convolutions of said helical spring and the opposed wall surface of said tubular member is less than the annular spacing between the convolutions of said helical spring and the opposed surface portions of said piston, whereby said helical spring is maintained in substantial concentricity relative to said piston.

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