

Sept. 4, 1962

R. E. FOGG

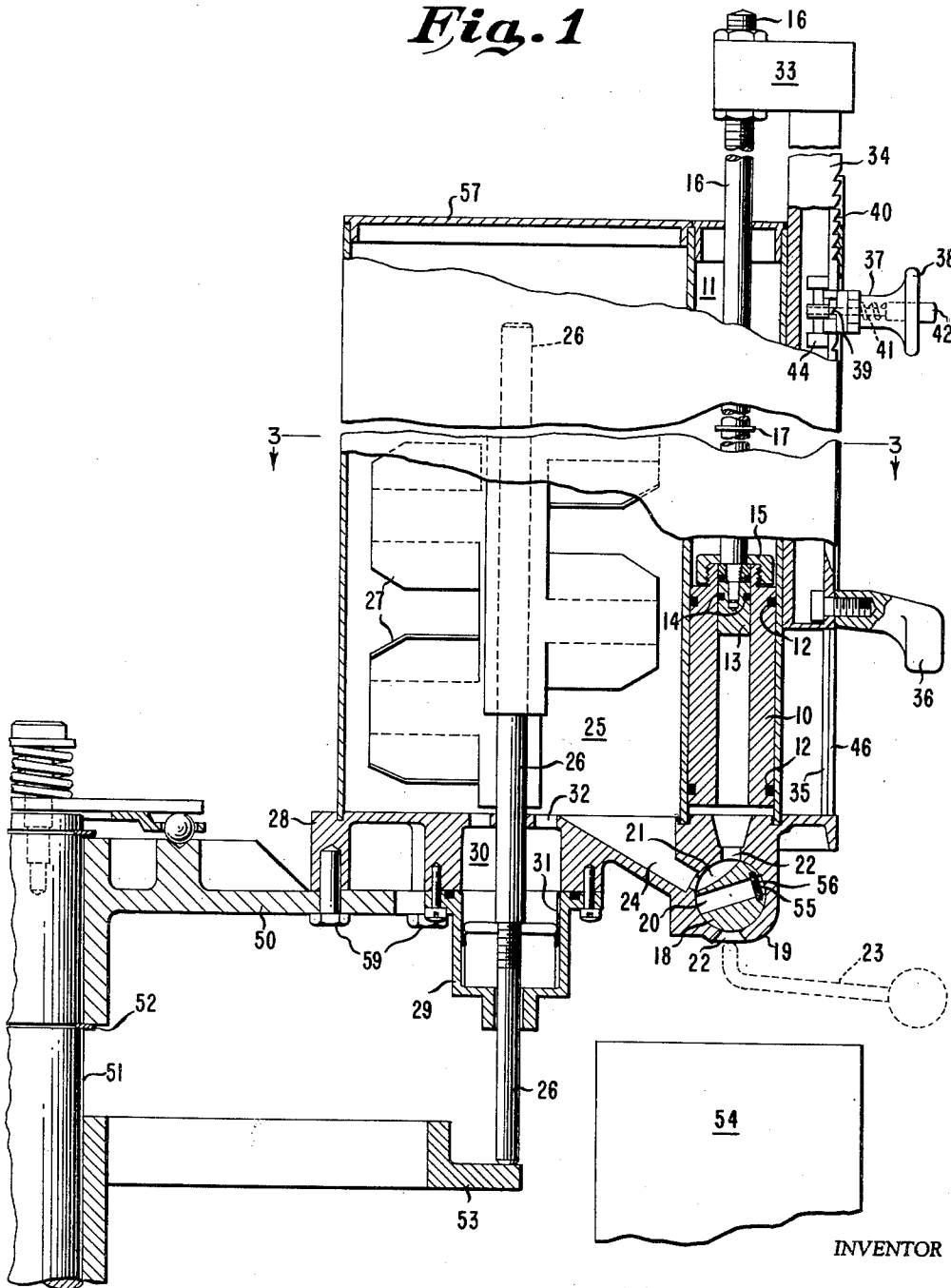
3,052,376

DISPENSING APPARATUS

Filed June 3, 1959

3 Sheets-Sheet 1

Fig. 1



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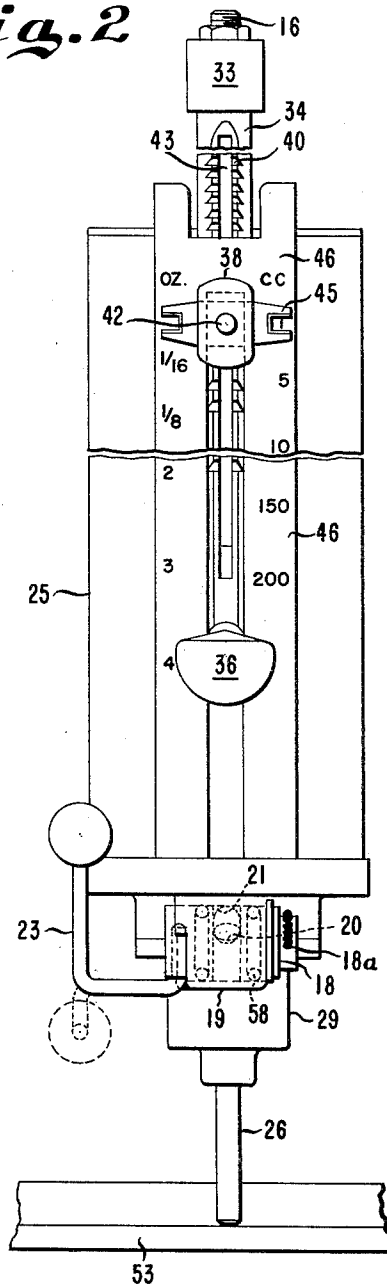
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Fig. 2



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Fig. 3

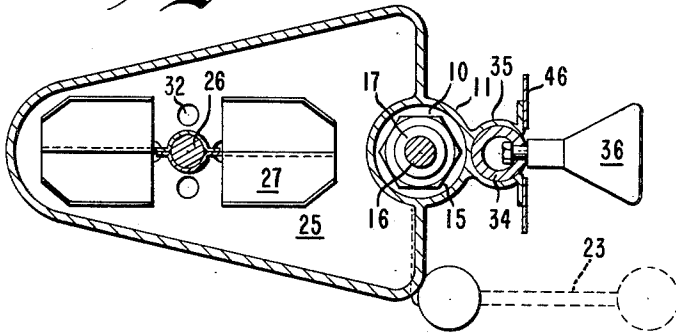
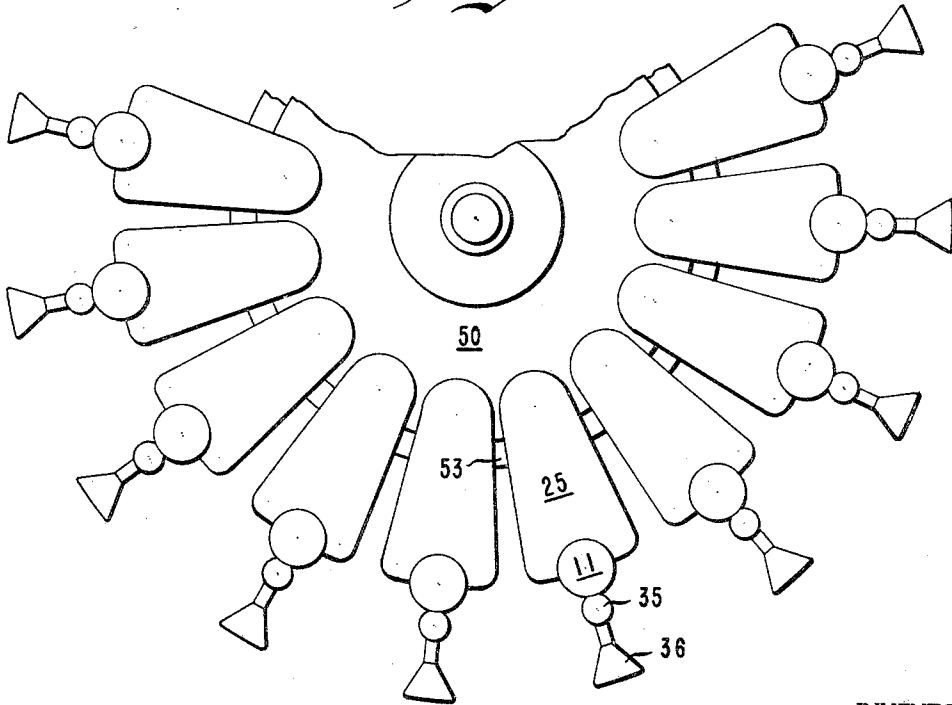


Fig. 4



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DISPENSING APPARATUS

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3 Claims. (Cl. 222-43)

This invention relates to an apparatus, and more particularly to an improvement in dispensing apparatuses especially adapted for dispensing mill bases, that is, "paint tinting colors," and other liquid and semi-solid materials.

In order to reduce inventories, it has become customary in recent years for retailers to tint coating compositions for each individual customer. This procedure also allows a wide selection of colors of coating compositions. Retailers have been supplied with tubes of mill base or "tinting color" the contents of which are added to the basic composition to be tinted which is usually white or clear. However, this procedure is inherently expensive, not precise and not well suited for tinting large volumes of coating composition. Various apparatuses have also been devised for dispensing mill bases; however, these known apparatuses are either not precise, unduly large and cumbersome or not adapted to dispense a large range of volumes of mill base. Also, many conventional dispensing apparatuses are difficult to charge and clean and do not maintain adequate agitation of the material to be dispensed.

I have found an improvement in dispensing apparatuses which solves the aforementioned disadvantage of known dispensing apparatuses and makes it possible to dispense a wide range of quantities of materials precisely and rapidly.

Broadly, this invention relates to an improvement in dispensing apparatuses which comprise a dispensing cylinder, a series of two or more telescoping pistons slidably mounted within the dispensing cylinder, means to move the pistons successively, the innermost piston first, away from the discharge end of the dispensing cylinder and means to force the pistons toward the discharge end of the dispensing cylinder. As just stated, the pistons in the series telescope, that is, they are slidably mounted within each other so that they can be moved relative to each other and to the discharge end of the dispensing cylinder.

A preferred embodiment of this invention is an improvement in dispensing apparatuses which comprise a dispensing cylinder, a first piston slidably mounted within the dispensing cylinder, a second piston slidably mounted within the first piston, means to move the first piston from the discharge end of the dispensing cylinder after the second piston has been displaced therefrom and means to force the first piston and the second piston toward the discharge end of said dispensing cylinder. This invention also includes dispensing apparatuses containing the aforementioned improvements and dispensing machines containing the dispensing apparatuses.

The invention is described in detail hereinafter by reference to a preferred embodiment shown in the accompanying drawings wherein:

FIGURE 1 is a cross-sectional side elevation of a dispensing apparatus of this invention;

FIGURE 2 is an end elevation of the dispensing apparatus;

FIGURE 3 is a cross-sectional plan view of the dispensing apparatus along lines 3-3 in FIGURE 1; and

FIGURE 4 is a plan view of a dispensing machine containing a plurality of dispensing apparatuses shown in FIGURES 1 to 3.

Referring to FIGURES 1, 2 and 3, piston 10 is slid-

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ably mounted within dispensing cylinder 11. Washers 12 provide a tight seal therebetween. Piston 13 is slidably mounted within piston 10, a tight seal therebetween being formed by washers 14. Nut 15 fastened to the upper portion of piston 10 is positioned to engage the upper portion of piston 13 when piston 13 has been withdrawn to the end of piston 10 opposite the discharge end of the dispensing cylinder 11. Thus, after piston 13 abuts against nut 15, further displacement of piston 13 from the discharge end of cylinder 11 also displaces piston 10. Shaft 16 fastened to piston 13 bears ring 17 which is positioned to abut against nut 15 when piston 13 has been displaced downwardly toward the discharge end of dispensing cylinder 11 within piston 10.

The cross-sectional configuration of pistons 10 and 13 and cylinder 11 is not critical; however, for ease of manufacture they are usually circular in cross-section. Usually, piston 13 has a diameter of about $\frac{1}{8}$ to $\frac{1}{4}$, and preferably about $\frac{1}{8}$ of that of piston 10.

Valve 18, rotatably mounted in housing 19 at the discharge end of dispensing cylinder 11, controls the feeding of material to and discharge of material from dispensing cylinder 11. Valve 18 bears passage 20 which passes therethrough and passage 21. Valve 18 is held in the position shown by spring 18a (FIGURE 2) except when material is being discharged from the dispensing apparatus. In this position, passage 21 connects the upper portion of passage 22 in housing 19 with passage 24 leading to reservoir 25, thereby allowing material to be dispensed to be withdrawn from reservoir 25 into cylinder 11. When valve 18 is in the position shown, handle 23 fixed thereto is positioned upwardly along the body of reservoir 25 as shown by the solid lines in FIGURES 2 and 3. When handle 23 is depressed as shown by the dotted lines in FIGURES 1, 2 and 3, passage 20 in valve 18 is moved into alignment with the upper and lower portions of passage 22 in housing 19, thereby allowing the material to be dispensed to be discharged from the dispensing apparatus.

Reservoir 25 contains an agitator comprising a shaft 26 bearing at least one, and preferably a plurality of impellers 27. Shaft 26 passes through the bottom 28 of reservoir 25 and out of the dispensing apparatus. In the embodiment shown in the drawings, the bottom 28 of reservoir 25 and housing 29 form a cavity 30, the lower portion of which is sealed by flexible gasket 31. Adjacent to shaft 26 in the floor of reservoir 25 are a plurality of holes 32. As shaft 26 is reciprocated up and down thereby agitating the material within reservoir 25, the material to be dispensed is drawn into cavity 30, then forced back through holes 32 thereby further agitating the material within reservoir 25. The agitation provided by material drawn into and ejected from cavity 30 through holes 32 is sufficient so that, with materials of low viscosity, all of shaft 26, except for the portion projecting through housing 29 and coupled to gasket 31, can be eliminated. Alternately, a conventional stuffing box or other suitable sealing means can be provided at the bottom 28 of reservoir 25, in which case holes 32 and cavity 30 can be eliminated.

The means for indicating and controlling the displacement of pistons 10 and 13 within dispensing cylinder 11, hence the quantity of material dispensed, is shown in FIGURES 1, 2 and 3. Shaft 16 is connected through hub 33 to shaft 34 which operates within slotted casing 35. (See FIGURES 1 and 3.) Handle 36 fixed to shaft 34 and part of slider 37 pass through the slot in casing 35. Slider 37 comprises knob 38 bearing ratchet 39 which is held in notches 40 in shaft 34 by spring 41 mounted on shaft 42. Shaft 42 passes through the slot in casing 35 and slot 43 in shaft 34 and is fastened to slider 44

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which abuts against the inner surface of shaft 34. Slider 37 also bears indicators 45 which are fastened thereto. Indicator card 46 is fastened to the surface of casing 35 and bears a slot in its surface corresponding to and overlying the slot in casing 35.

FIGURE 4 shows a plan view of a dispensing machine containing a plurality of dispensing apparatuses of this invention (shown in outline form) disposed on plate 50 which is rotatably mounted on the top of shaft 51 and held in position by ring 52. (Also, see FIGURE 1.) Wheel 53 slidably mounted on shaft 51 and reciprocated by a suitable prime mover (not shown) abuts against the lower portion of shaft 26 of the agitators in reservoirs 25.

Briefly, the operating procedure for the dispensing machine comprises first charging the material to be dispensed to reservoir 25. Next, wheel 53 is reciprocated thereby reciprocating the agitators in the reservoirs 25 within the dispensing apparatus. In the apparatus from which material is to be dispensed, handle 36 is forced downward until piston 10 and piston 13 are at the discharge end of dispensing cylinder 11. Handle 23 is held in the position shown by the solid lines in FIGURES 2 and 3 and passage 20 is positioned so that it communicates with the upper portion of passage 22 and passage 24 by spring 18a.

Slider 37 is positioned on indicator card 46 so that indicators 45 show the quantity of material desired to be dispensed. Ratchet 39 on slider 37 fits in the notch 40 in shaft 34 corresponding to this amount of material. Next, handle 36 is moved upward raising shaft 34 and slider 37 until slider 37 abuts against the top of the slot in indicator card 436, thereby preventing further upward movement of handle 36 and shaft 34.

As shaft 34 is displaced upward, shaft 16 and piston 13 also are moved upward a corresponding distance. This draws material to be dispensed from reservoir 25 through passages 24 and 21 and the upper portion of passage 22 into dispensing cylinder 11, or more precisely, into piston 10. If a small portion of material is to be dispensed, piston 13 is merely drawn partway up within piston 10 by handle 36 attached to shaft 34 which, in turn, is attached to shaft 16 through hub 33. If a large portion of material is to be dispensed, piston 13 is drawn upward until the top of piston 13 abuts against nut 15 at which time piston 10 is drawn upward. At this point, both pistons 10 and 13 draw the material to be dispersed into cylinder 11. FIGURES 1 and 2 show the position of pistons 10 and 13 just after piston 13 has engaged nut 15 and just before slider 37 comes in contact with the top of the slot in indicator card 46. It will be seen that the position of slider 37 on shaft 34 fixed the maximum displacement of shaft 34, hence the displacement of shaft 16 and pistons 10 and 13, and, correspondingly, the volume of material drawn into and dispensed from cylinder 11. This maximum displacement is the distance between slider 37 when handle 36 is fully depressed and the top of the slot in indicator card 46. Slider 37 in combination with the top of the slot in indicator card 46 or another suitable fixed stop thus provides means to preset the maximum displacement of the pistons 10 and 13 in dispensing cylinder 11.

After handle 36 is raised until slider 37 abuts against the top of the slot in indicator card 46, handle 23 is depressed as shown by the dotted lines in FIGURES 1, 2 and 3, thereby bringing passage 20 in valve 18 into alignment with the upper and lower portions of passage 22 in housing 19. Next, handle 36 is pushed downward, thus forcing shaft 16 and piston 13 downward and forcing the material to be dispensed contained within piston 10 downward through passage 22 into a suitable receptacle 54 which, for example, contains the base paint to be tinted. As shaft 16 and piston 13 move downward, ring 17 comes into contact with nut 15 forcing piston 10 downward until piston 13 and piston 10 rest at the bottom of dispensing cylinder 11 and the material contained within

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the cylinder is forced through passage 22 into receptacle 54.

Ring 17 on shaft 16 can be replaced by a latch or other device which locks piston 13 to piston 10 when piston 13 has been displaced within piston 10 away from the discharge end of dispensing cylinder 11. In this case, on the intake stroke, piston 13 moves upward until it locks with piston 10 whereupon pistons 10 and 13 both draw material to be dispensed into dispensing cylinder 11. On the discharge stroke, pistons 10 and 13 move downward simultaneously until piston 10 strikes the bottom of dispensing cylinder 11 whereupon piston 13 is unlocked from piston 10 and discharges material therewithin.

Various ancillary features may be incorporated in the apparatuses of this invention in addition to those described hereinbefore. For example, three or more pistons adapted to operate within each other as do the pistons 10 and 13 described in the preferred embodiments of this invention shown in the drawings can be used. In this case, the innermost piston is drawn upwardly until it abuts against a suitable fitting on the next outermost piston, whereupon this latter piston is drawn upwardly until it abuts against the next outermost piston and so forth. When material is discharged from such a modified dispensing apparatus, the innermost piston discharges the material there beneath until a suitable fitting thereon or on the shaft driving such piston abuts against the next outermost piston, whereupon this latter piston discharges the material there beneath until a suitable fitting thereon engages the next outermost piston and so on.

For ease and economy of manufacture, for maximum compactness, and to minimize the need for precise alignment of pistons 10 and 13 with passage 22 in housing 19, it is preferred to have pistons 10 and 13 operate entirely within cylinder 11 and, as shown in the drawings, telescope away from each other on the intake stroke. However, the pistons can telescope into or toward each other; for example, piston 13 can protrude into a cavity in housing 19 having a diameter substantially equal to that of piston 13. In this case, the head of piston 13 need not necessarily be withdrawn into piston 10 on the intake stroke. Also, in this case, the pistons can cooperatively engage through nut 15 as shown in the drawings or, for example, the lower portion of piston 13 can be enlarged so that it abuts against the bottom of piston 10 on the intake stroke.

Shaft 16 can be extended and used in place of shaft 34, in which case, indicator card 46 and a suitable casing such as casing 35 should be positioned above dispensing cylinder 11. Also, in this case, slider 37 would operate on and in responsive contact with notches in the extended shaft 16. Also, if desired, indicator card 46 can be eliminated in which case markings indicating the volume of material to be dispensed are placed directly on casing 35 and a suitable stop is provided at the top of casing 35 to limit the upward movement of slider 37.

In one preferred embodiment of this invention shown in the plan view in FIGURE 4, a plurality of dispensing apparatuses of this invention are disposed around the periphery of a rotatable circular plate 50. Dispensing machines employing this arrangement provide the maximum compactness coupled with a maximum number of dispensing apparatuses. This makes it possible to tint base paints to a maximum number of colors. Alternately, the dispensing apparatuses of this invention may be mounted singly, disposed in a line or arranged in any other suitable configuration.

FIGURES 1 and 2 show an embodiment of this invention wherein the outlet of passage 20 in valve 18 can be fitted with a variety of orifice plates 55 having one or a plurality of holes 56 having, for example, a round, square, triangular or oval cross-section. This improvement permits changing the shape of the discharge orifice to fit the particular rheological properties of the material being dispensed and thereby, for example, minimizing the mate-

rial retained in the outlet of dispensing apparatus. Alternately, orifice plate 55 can be placed in housing 19 or eliminated entirely.

The apparatuses of this invention can be fabricated from any of a wide variety of suitable and conventional construction materials including wood; iron and steel and alloys thereof; non-ferrous metals and alloys of, for example, aluminum, bronze, brass and zinc; moldable polymers and synthetic resins and the like.

The apparatuses of this invention are characterized by their ability to dispense a wide range of quantities of material precisely and rapidly. The precision of a dispensing apparatus of this type increases with the magnitude of the linear displacement per unit volume of material dispensed. For example, when small volumes of material are dispensed with the apparatuses of this invention shown in the drawings, only piston 13 operates drawing the material to be dispensed upward within piston 10 then ejecting it therefrom. Since piston 13 is of relatively small diameter, there is a relatively large displacement thereof per unit volume of material dispensed, hence small variations in the absolute position of piston 13 have little effect, percentage-wise, on the amount of material dispensed. When large volumes of material are dispensed by the apparatuses of this invention shown in the drawings, both piston 13 and piston 10 operate. Since, in this latter case, large volumes of material are dispensed, small variations in the relative position of pistons 13 and 10 have little effect, percentage-wise, on the quantity of material dispensed. Hence, the apparatuses of this invention have high precision over a wide range of volumes. By varying the length of outer pistons, for example, piston 10, and the diameters of the pistons, the precision and maximum capacity of the dispensing apparatuses of this invention can be varied to suit each particular need. For example, by increasing the diameter of pistons 10 and 13 and dispensing cylinder 11, the capacity of the dispensing apparatuses can be increased. Correspondingly, by increasing the length of piston 10 or by decreasing the diameter of piston 13 and, correspondingly, the inner diameter of piston 10, the precision with which material can be dispensed can be increased. Since large volumes of material can be dispensed with the apparatuses of this invention, the speed with which large quantities of mill base and the like can be dispensed is greatly increased.

The apparatuses of this invention can be easily fabricated. For example, reservoir 25 dispensing cylinder 11 and casing 35 can be extruded through a single die as a single unit. Also, the apparatuses of this invention can be easily charged since there is no agitator motor or other agitating means obstructing the top of reservoir 25, and the material to be dispensed can be charged directly thereto after removing top 57 of the reservoir 25, even while the apparatuses are being used and the agitators are in operation. The apparatuses of this invention can be easily cleaned. For example, merely by loosening the nuts on hub 33, pistons 10 and 13 and shaft 16 can be removed for cleaning. Valve 18 which is held in position by O-rings 58 shown in FIGURE 2 can be removed merely by exerting pressure on the left side of the valve as shown in that figure. The whole dispensing apparatus can be removed for cleaning and repair merely by removing bolts 59 shown in FIGURE 1.

Although the improved apparatuses of this invention are particularly suitable for dispensing mill bases and the foregoing description is largely directed thereto, the utility of the improvements of this invention is not limited to this field. For example, the improved apparatuses of this invention can be used to dispense foodstuffs, chemical reagents and other liquid or fluid semi-solid materials which must be dispensed precisely and rapidly.

The following example is intended to illustrate the utility of this invention and not to limit it in any way.

Example

A dispensing machine similar to that shown in the accompanying drawings is charged with mill base. Each of the 15 dispensing apparatuses on the machine has a reservoir 25 having a capacity of about 2½ quarts; a piston 10 having an outer diameter of about 1⅞ inches, an inner diameter of about ⅞ inch and a length of about 3⅞ inches; a piston 13 having a diameter of about ⅞ inch and a dispensing cylinder 11 having a diameter of about 1⅞ inches and a length of about 12 inches. Each dispensing apparatus has a maximum dispensing capacity of about 256 milliliters per cycle.

A mill base comprising the following materials is charged to each dispensing cylinder:

	Percent by weight
Dehydrated castor oil	15
Wetting agent	10
Soya lecithin	10
Solvents (xylene and mineral spirits)	35
Calcium carbonate extender	5
Prime pigment	25

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A different prime pigment, for example, "Monastral" blue and "Monastral" green (proprietary products of E. I. du Pont de Nemours and Company), potassium chromate, carbon black and the like, is used in the mill base charged to each dispensing apparatus.

Wheel 53 is reciprocated thereby reciprocating the agitators in each of the dispensing apparatuses and thoroughly mixing the mill base therein. Handle 36 is forced down thereby forcing pistons 10 and 13 to the bottom of dispensing cylinder 11. Slider 37 is set at 1 milliliter, corresponding to about ¼ ounce of mill base. Next, handle 36 is raised as far as possible, that is, until slider 37 contacts the upper end of the slot in indicator card 46, thereby drawing mill base through passages 24 and 21 and the upper portion of passage 22 and into piston 10. Next, handle 23 is depressed so that passage 20 connects the upper and lower portions of passage 22, then handle 36 is forced down expelling the material contained within the dispensing cylinder out through passages 22 and 20 into a receptacle 54. The procedure is repeated at various settings corresponding to 1 to about 250 milliliters.

The complete cycle time takes about 10 seconds at a 1 milliliter setting and about 30 seconds at a 256 milliliter setting. The precision with which material is dispensed is about 1% at 1 milliliter and about 0.1% at 256 milliliters. With the dispensing machine charged as just described, almost a limitless range of colors, tones and shades of coating compositions can be prepared by discharging the appropriate quantity of mill base from one or a combination of the dispensing apparatuses to a conventional white coating composition contained in receptacle 54.

I claim:

1. An improved dispensing apparatus which comprises a dispensing cylinder, a first piston slidably mounted within said dispensing cylinder, a second piston slidably mounted within said first piston, means for moving said first piston from one end of said dispensing cylinder into which material to be dispensed is drawn and from which said material is discharged, after said second piston has been displaced therefrom, means for forcing said first piston and said second piston toward said end of said dispensing cylinder, means for indicating and controlling the displacement of said first piston and said second piston, a reservoir communicating through a passageway with said end of said dispensing cylinder and an agitator disposed within said reservoir comprising a shaft reciprocatable along its axis, bearing at least one impeller and extending through the bottom of said reservoir.

2. An apparatus of claim 1 wherein the floor of said reservoir adjacent said agitator shaft contains at least one

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aperture, the floor of said reservoir and a housing fixed thereto forming a cavity beneath the portion of said floor bearing said aperture and a flexible gasket fixed to said shaft and said housing.

3. An improved dispensing apparatus which comprises a dispensing cylinder, a first piston slidably mounted within said dispensing cylinder, a second piston slidably mounted within said first piston, means for moving said first piston from one end of said dispensing cylinder into which material to be dispensed is drawn and from which said material is discharged, after said second piston has been displaced therefrom, means for forcing said first piston and said second piston toward said end of said dispensing cylinder, a rotatable valve containing a passage there-through for allowing discharge of said material from said dispensing cylinder, said valve having a second passage

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therein for allowing passage of said material from a reservoir to said dispensing cylinder, said reservoir being positioned for feeding material through said valve to said dispensing cylinder, and means for indicating and regulating the displacement of said first and second pistons within said dispensing cylinder.

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