May 14, 1957 J. L. JONES ET AL 2,792,160

METERING VALVE FOR POWDERED AND GRANULAR MATERIALS

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Fig. 1.

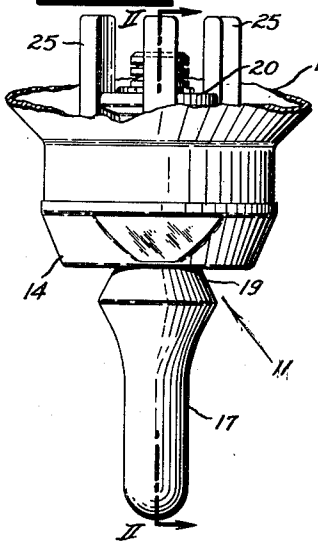


Fig. 2.

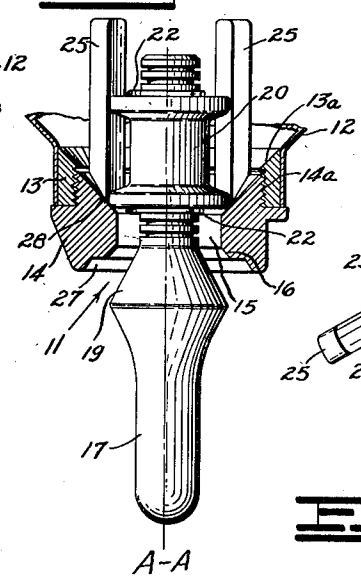


Fig. 3.

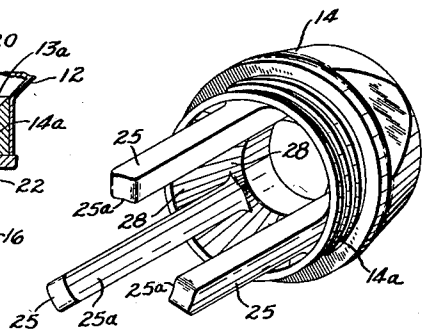


Fig. 5.

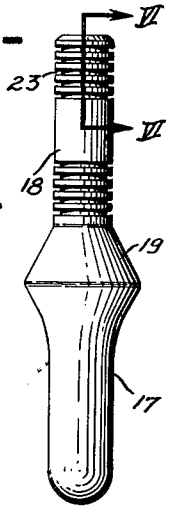


Fig. 4.

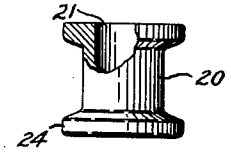


Fig. 7.

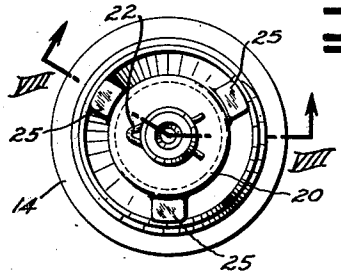


Fig. 6.

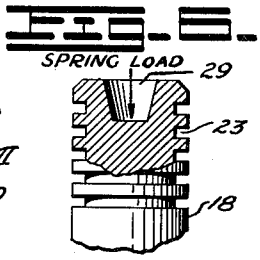
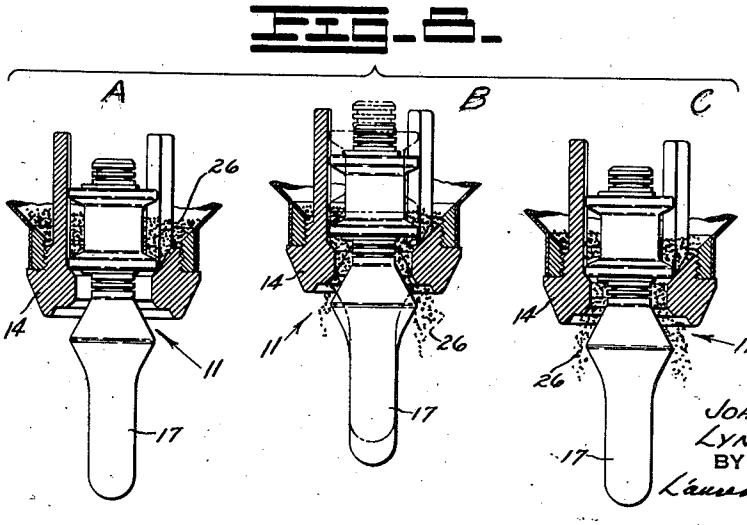


Fig. 8.



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METERING VALVE FOR POWDERED AND GRANULAR MATERIALS

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5 Claims. (Cl. 222—501)

The present invention relates to a metering valve and more particularly to a manually operated metering valve for powdered and granular materials.

Valves of various types have been adapted to the metering of powdered and granular material, but where such valves are employed in association with materials having a tendency to cake they have been complexly constructed in order to avoid caking. In particular, where granular or powdered soaps are dispensed, the caking problem is magnified and a substantially trouble-free simple valve has long been sought. Ruggedness of form, in order to take constant abuse from constant usage, simplicity of construction to avoid costly maintenance, and non-caking construction is desirable. Considerable study of washroom type dispensers and valves in operation has disclosed that most valves are subject to a relatively short useful life because of the fragile character of the operating parts and the rough treatment the valves normally sustain. The rough treatment, or battering of the valves in use, has resulted from the fact that full containers became caked and the flow plugged. The individual using the valve vents his frustration on the valve and the damage, if any, is thus aggravated.

Some dispensers, using valves of the jiggling type, have tended to stick in the open position thereby losing considerable material. This is particularly true where soap and soap substitutes constitute the material passing through the valve.

The cause for caking of the granular and powdered material moving through the valve was sought. Basically it appeared that water or moisture on the valve caused the caking and subsequently rendered the valves inoperable. It was not unusual for owners of such dispensers to require soaking of a stuck valve in water until the valve became free operating with the dissolving of the soap cake. The water and moisture may come from the meddlesome dabbling of users with the container contents of granular or powdered material. In such cases a lumpy "container cake" occurred which was troublesome but did not directly interfere with the operation of the valve. But valves more often than not were "frozen" and subsequently damaged by water spewed upwardly from the hands of the operator. In industrial installations where batteries of dispensers are positioned above washbowls an examination of the valves indicated that somehow water was moving upward through the valves despite the gravity flow positioning of dispensers and valves. Rough estimation indicated that greater than 80 percent of hand to valve contacts occurred when the hands of the workers were wet. A considerable number of workers were observed to cup their hands with water therein prior to jiggling contact with the valve actuators.

Upon removal of the valves from the containers inspection indicated that, over a single working shift, most of the valves showed signs of caking and water penetration, not from the container portion of the dispensers, but upwardly through the valve parts.

While jiggling valves have long been known in the dispenser art the present valve has as its principal object the avoidance of caking resulting from water being slopped or sloshed upwardly through the valve from the hands of the user.

Another object is to simplify the construction of metering type jiggling valves.

Another object is to provide a valve easily associated with a container yet which can be easily removed from its container for cleaning or repair.

Still another object is to provide a substantially durable valve capable of taking considerable abuse without damaging essential parts of the valve and being substantially wear resistant.

Other objects and advantages of the presently specified valve will become increasingly apparent to those skilled in the making of dispenser valves and the users thereof.

In the drawing:

Figure 1 is a side elevation view of a valve in accord with this invention and showing its mounting in a cut-away conventional container.

Figure 2 is a cross section elevation taken on line II—II of Fig. 1 and showing the inter-relationship of structural components with the valve actuator in its normal position.

Figure 3 is a perspective view of the valve body illustrating the spool guides.

Figure 4 is a perspective view of a spool used in conjunction with, and adjustable upon, the annularly grooved actuator shank.

Figure 5 is an elevation view of the valve actuator.

Figure 6 is a fragmental cross section view of the shank end of the actuator taken on line VI—VI of Fig. 5 and showing the spring seat.

Figure 7 is a top plan view of the assembled metering valve.

Figure 8, consisting of three parts, 8*a*, 8*b*, and 8*c*, is a schematic cross section elevation showing a full use cycle of the metering valve.

General description

Referring generally to the metering valve structure a metering valve **11** for powdered and granular material is inserted for gravity delivery in the base of a container **12**. Insertion in the container **12** is accomplished by means of an adaptor ring **13** press fitted into an opening in the container **12**. The valve body **14** is threaded into the adaptor ring **13** and the entire valve assembly **11** may be removed from the container by unscrewing the valve body **14** from the adaptor ring **13**. An axial opening **15** runs through the valve body **14** and is peripherally provided with a frusto-conical valve type seat **16**. A valve actuator **17** having an annularly grooved shank **18** is insertable through the opening **15** and is provided with an enlarged frusto-conical portion **19**, adjacent and below the cylindrical shank **18**, and which is matingly engageable with the seat **16**. A spool **20**, having an axial passage **21**, is freely fitted over the actuator shank **18** and adjustably retained by keepers **22** seated in the annular grooves **23** of the shank **18**. The flanges **24** of the spool **20** provide guided reciprocation of the spool **20** on the valve axis A—A, being positioned by the cylindrical space defined by the inner faces of the guideposts **25**. The guideposts **25** extend from and are integral with the valve body **14**.

Particular description

Referring more particularly to the drawing, a metering valve **11** is threadably inserted in a container **12**. By reason of the fact that gravity flow of the granular or powdered material **26** is intended, the positioning of the valve **11** is normally in the bottom of the container **12**. When the valve **11** is spring loaded it is conceivable that

other positioning may be used. It wil be seen, as the description proceeds, that the spring loading of the valve **11** is contemplated although in normal usage gravity operation is satisfactory. Attachment to the container **12** is accomplished by means of an adaptor ring **13** which is press fitted into the container **12**, the ring **13** being internally threaded and having an annular bevel **13***a* tapered downward toward the center of the ring **13**. The taper **13***a* is adapted to the contour of various containers **12** and in general an angle of between 20 degrees and 45 degrees is recommended.

The valve body **14** is provided with an external extension mating flush with the outside diameter of the adaptor ring **13** and is provided with male threads **14***a* on a thread shoulder for threadable engagement in the ring **13** as best illustrated in Fig. 2. A cylindrical opening **15** is provided through the valve body **14**. At the lower terminal end of the opening **15** the opening **15** is flared to provide a peripherally frusto-conical valve seat **16**. A beveled edge cylindrical countersink **27** is provided concentric with the opening **15** in the lower face of the valve body **14**. An annular outwardly flared shoulder **28** is provided in the upper end of the opening **15** which constitutes a continuous extension of the cylindrical taper **13***a* in the adaptor ring **13** when the valve **11** is mounted in the container **12**.

A valve actuator **17** (Fig. 5) consisting of a slenderly tapering and rounded lower portion expanding gradually to mate with a reversedly tapered frusto-conical upper portion **19** and including a solid cylindrical shank **18** is insertable through the opening **15**, the frusto-conical portion **19** mating with the valve seat **16** and obstructing further passage upwardly of the shank **18**. It will be seen that the portion **19** thus shrouds the opening **15** in the valve **11** while the valve **11** is in use. The shank portion **18** of the actuator **17** is provided with regularly spaced annular grooves **23**. The purpose of the grooves **23** will become increasingly apparent as the description proceeds. A spool **20** having an axial pasage **21** therethrough and having flanges **24** at either end is free fitted over the shank **18**. Keepers **22** are fitted circumferentially in the grooves **23** of the shank **18** above and below the spool **20** and thereby serve as retainers preventing axial movement of the spool **20** on the shank **18** unless adjustment of spool position is desired.

From the valve body **14** are upwardly extended integrally formed guideposts **25**. A plurality (three are illustrated best in Fig. 3) of guideposts **25** are provided, the the internal faces **25***a* of which are arcs conformed to a diameter permitting free running clearance of the flanges **24** of the spool **20**. In this manner the entire actuator assembly, as shown in Fig. 2, may be reciprocated while being simply held on the valve axis A—A by reason of the guideposts **25** caging the spool **20**. The alteration of the positioning of the spool **20** on the shank **18** is easily accomplished by a repositioning of the keepers **22** in the annular grooves **23**. The variation in spool positioning will be seen to vary the stroke of the actuator **17** and consequently vary or adjustably meter the flow of powdered or granulated material **26** delivered in any cycle of operation.

In Fig. 6 a cross section of the upper terminal end of the actuator shank **18** is shown to reveal the recess **29**, therein provided, if it should be desirable or necessary to utilize a spring return actuation of the valve **11**. While a spring has not been illustrated it will be readily appreciated that a spring, as indicated, urging the valve actuator **17** downwardly by pressure on the shank **18** so as to apply a force greater than gravity to the closure of the spool flange **24** against the shoulder **28**, is contemplated as a modification within the spirit of this invention. The use of tensional or compressional means are equally contemplated in this regard.

While it is not intended to restrict the materials from which the valve structure **11** is made, metal parts have proved the most satisfactory from both economic and operational viewpoints. The valves constructed from metal can be cheaply cast and more rigid tolerances are obtained which are not upset under rugged usage and wear. Excellent corrosion resistance was obtained using a chromium plate upon finished parts of brass or die-cast metal. Plastics have been used with excellent results but are less durable under heavy usage. A combination of metal and plastic has given encouraging results where the valve body **14** was made partly or wholly of plastic material and the valve actuator **17** and spool **20** were metal.

Some advantage is obtained by the greater specific gravity of the metal actuator **17** and spool **20** where gravity closure applications are contemplated. This advantage can be overcome where plastic actuators **17** are used simply by adding spring actuation units for closure.

Operation

In operation the valve **11** is inserted into the base of a container **12** and the container **12** is filled with granular or powdered material **26**, for example, soap. As schematically indicated in Fig. 8, part 8*a* the weight of the actuator **17** and attached spool **20** seats the lower flange **24** of the spool **20** against the tapering shoulder **28** thus positively colsing the opening **15** and preventing the escape of the powdered or granular contents **26**. In part 8*a* of Fig. 8 there is illustrated the upward movement of the actuator **17** and consequent upward movement of the spool **20** from the shoulder **28** with the beveled or expanded conical portion **19** of the actuator **17** closing against the valve seat **16**. This permits the filling of the space between the uppermost position of the spool **20** and the valve seat **16** with powdered or granular material **26**. Release of the actuator **17**, as shown in part 8*c* of Fig. 8, causes the discharge of the granular or powdered material **26** as gravity or spring pressure returns the actuator **17** and spool **20** to the normal position. It will be observed that the position of the spool **20** on the shank **18** determines the amount of granular or powdered material **26** trapped for discharge and that the spool **20** can be repositioned in order to meter the amount of powdered granular material **26** delivered by merely removing the keepers **22** and repositioning the spool **20** by clipping the keepers **22** in appropriate holding grooves **23** on the shank **18**.

It will be further noted that the enlarged portion **19** of the actuator **17** shrouds the opening **15** and that the valve seat **16** and lower portion of the valve body **14** is so arranged that upwardly splashed water is not admitted to the container **12**. Since water is not able to splashingly penetrate either the valve or container from the bottom, caking is substantially eliminated and a trouble-free valve is provided.

Having thus described a specific embodiment of the invention it will be understood that certain modifications are intended to fall within the spirit of the invention restricted only by the tenor of the appended claims.

We claim:

1. In a metering valve for powdered and granular materials, the combination including: an adaptor ring being threaded on its inner face and press fitted into an opening provided in a container; a threadably removable valve body positioned in said adaptor ring; a valve actuator having a shank portion axially through said valve body and having an expanded portion in mating frusto-conical relation with a seat provided in said valve body; a spool having flange portions on either end variably and axially positioned on the shank portion of said actuator; a shoulder in said valve body against which the lower flange of said spool seats defining an annular opening the inner diameter of which is the shank of said actuator and the outer diameter of which is the opening through said valve body; and a plurality of guideposts extending upwardly from said valve body permitting reciprocation

of said spool, the inner surface of said guideposts being arcs on a diameter concentric with the shank of said actuator and said spool.

2. In a metering valve for powdered and granular materials, the combination including: an adaptor ring being threaded on its inner face and having its upper surface conically tapered inwardly and being capable of press fitting into the bottom of a container; a threadably removable valve body being positioned in said adaptor ring and having an opening therethrough on its central axis; a valve actuator having a shank portion of smaller diameter than the opening in said valve body and axially through the opening in said valve body and having an expanded portion in frusto-conical relation with a seat provided at the lower end of the opening in said valve body; a spool having flanged portions on either end variably and axially positioned on the shank of said actuator; a tapered shoulder in said valve body being a continuation of the conically tapered surface of said adaptor ring and against which the lower flange of said spool seats closing an annular opening the inner diameter of which is the shank of said actuator, and the outer diameter of which is the opening through said valve body; a plurality of guideposts extending upwardly from said valve body the inner surfaces of which are arcs of a diameter concentric with the shank of said actuator and said spool caging said spool against lateral movement while permitting reciprocation of said actuator; and means urging said spool into normally closed position against said shoulder.

3. In a metering valve for powdered and granular materials as in claim 2, said means comprising a spring urging said spool against said shoulder.

4. In a metering valve for powdered and granular materials, the combination including: an adaptor ring being threaded on its inner face and press fitted into an opening provided in a container; a threadably removable valve body positioned in said adaptor ring; a valve actuator having a shank portion extending axially through said valve body and having an expanded portion integral with said shank portion external of said valve body in mating frusto-conical relation with an exterior seat provided in said valve body, said shank portion of said actuator having a series of grooves therearound near both the extreme end thereof and the expanded portion thereof and a pair of substantially U-shaped spring members insertable therein to position therebetween a spool; a spool

having flange portions on either end variably axially positioned on the shank portion of said actuator above said expanded portion between said pair of U-shaped members; a shoulder in said valve body against which the lower flange of said spool seats defining an annular opening the inner diameter of which is the shank of said actuator and the outer diameter of which is the opening through the said valve body; and a plurality of guideposts extending upwardly from said valve body permitting reciprocation of said spool, the inner surface of said guideposts being arcs on a diameter concentric with the shank of said actuator and said spool.

5. In a metering valve for powdered and granular materials having a single valve member, a valve body into which said valve member seats, the combination including: an adaptor ring threaded on its inner face and press fitted into an opening provided in a container; a threadably removable valve body positioned in said adaptor ring having a plurality of guide posts extending upwardly from said valve body; a valve actuator having a shank portion extending axially through said valve body and having an expanded portion integral with said shank portion external of said valve body in mating frusto-conical relation with an exterior seat provided in said valve body, said shank portion of said actuator having a series of grooves therearound near both the extreme end thereof and the expanded portion thereof and a pair of substantially U-shaped spring members insertable therein to position therebetween a spool; a spool having flange portions on either end variably axially positioned on the shank portion of said actuator above said expanded portion; and a shoulder in said valve body against which the lower flange of said spool seats defining an annular opening the inner diameter of which is the shank of said actuator and the outer diameter of which is the opening through the said valve body.

References Cited in the file of this patent

UNITED STATES PATENTS

427,165	Fickett	May 6, 1890
647,362	Beck	Apr. 10, 1900
1,305,476	McCord	June 3, 1919
1,525,828	Reeve	Feb. 10, 1925
1,988,865	Campbell	Jan. 22, 1935
2,054,881	Saunders	Sept. 22, 1936