

[54] **SPRING-BIASED METERING AND
NONMETERING TILT VALVE
WITHOUT COIL SPRING**

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239/337, 239/573**

[51] Int. Cl. **B05b 7/32**

[58] Field of Search **222/402.13, 402.16, 402.2,
222/402.21, 402.22, 402.23, 402.24, 454, 451, 453;
239/577, 579, 573, 337, 493**

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[57] **ABSTRACT**

A coil-springless biased tilt valve for spray dispensers, comprising a tubular valve housing having at its upper end a transverse resilient annular valve seat which is engageable by the valving shoulder of a tiltable stem disposed in the housing and extending upward through the opening of the valve seat. An upper hollow portion of the valve stem carries a depress but-

ton which is hollow and has a discharge orifice. An inverted metal mounting cup structure receives and carries the upper portion of the valve housing and also the resilient valve seat, said mounting cup having a central aperture through which the hollow upper portion of the valve stem extends and on which the stem fulcrums. Tilting of the valve stem about the fulcrum point unseats the valve shoulder thereof, enabling a discharge to occur from the interior of the valve housing through a side passage at the bottom of the upper hollow portion of the stem, adjacent the valve shoulder (and seat). The lower end of the valve housing has a socket, and the valve stem has a long, slender depending resilient portion the bottom tip of which is received in the housing socket, said slender resilient stem portion acting as a valve return spring to bias the valve stem to a normally upright position wherein the valve shoulder thereof fully engages the seat and shuts off flow from the valve housing. Surrounding the slender resilient depending stem portion is a tubular depending skirt which is essentially rigid, and which is engageable with a sidewall of the valve housing when the stem is tilted, thereby to limit the tilting movement to a degree which is less than that which could permanently deform the slender depending stem portion. Thereby the spring action of the depending stem portion is not impaired, since the portion is never stressed beyond its elastic limit. In several metering embodiments of the invention the bottom edge of the skirt slides on a curved annular shoulder in the valve housing. When the valve stem is not tilted there is little pressure of the skirt on the shoulder, so that leakage occurs therebetween. However, when the stem is tilted there is considerable pressure of the skirt on the shoulder, providing a seal or closed valve action which seals the valve housing from the contents of the container just as the second valve does in a conventional metering valve dispenser.

10 Claims, 17 Drawing Figures

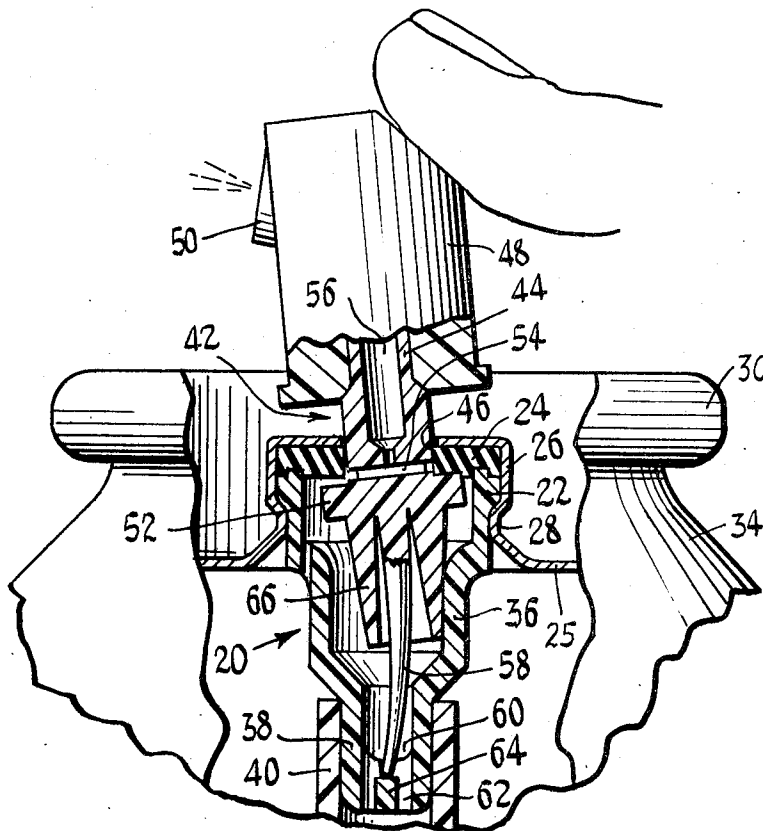


Fig. 1

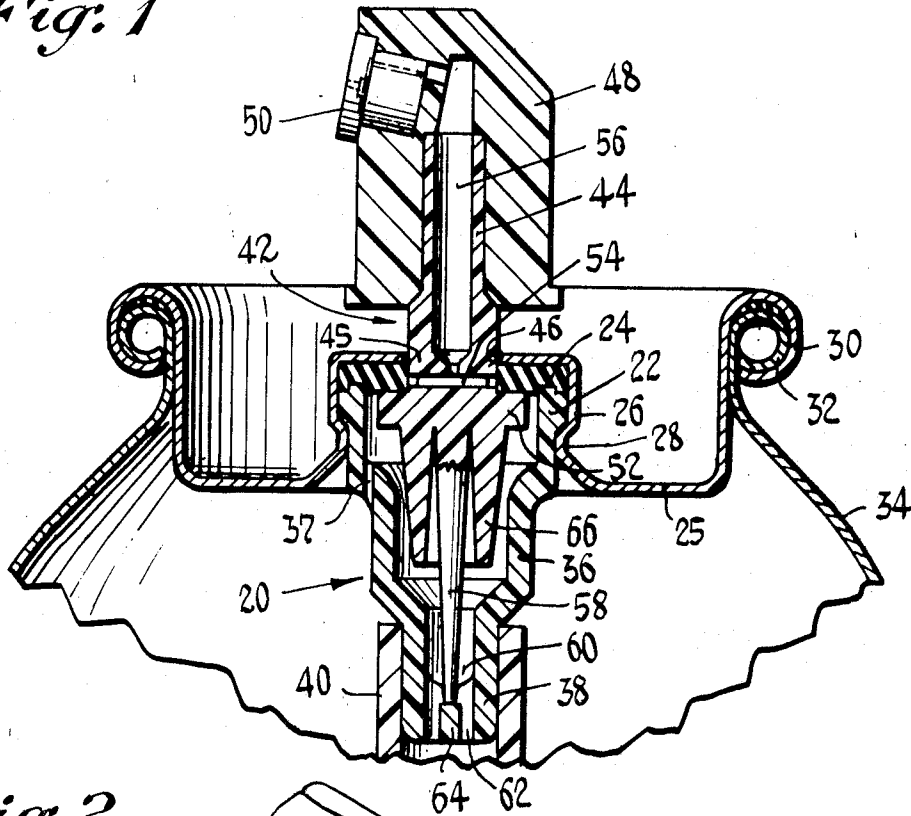
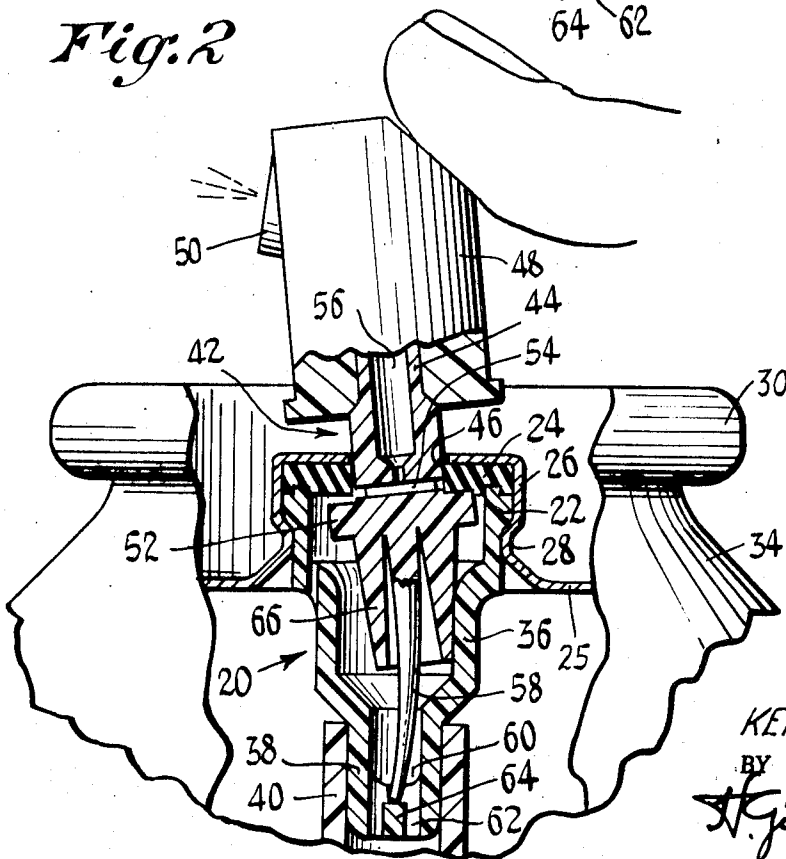
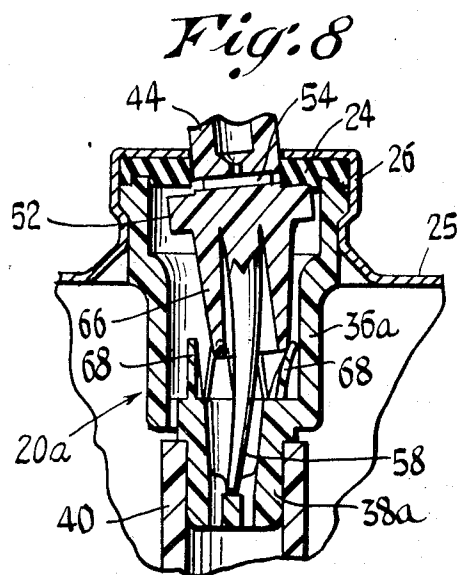
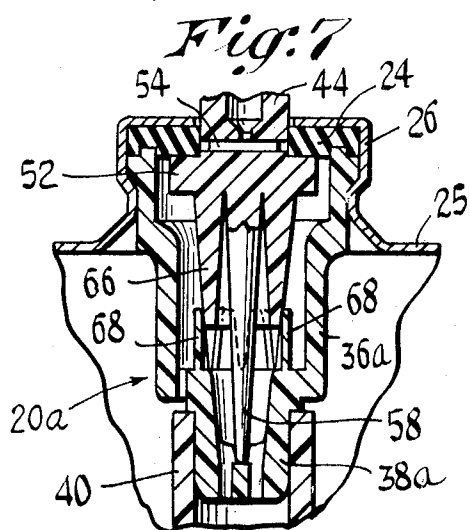
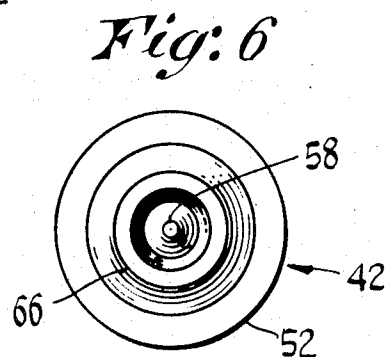
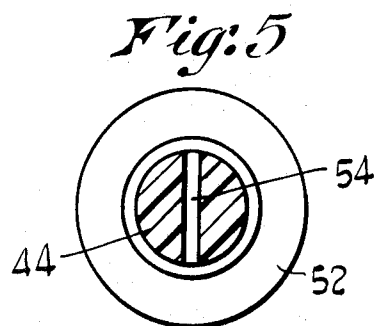
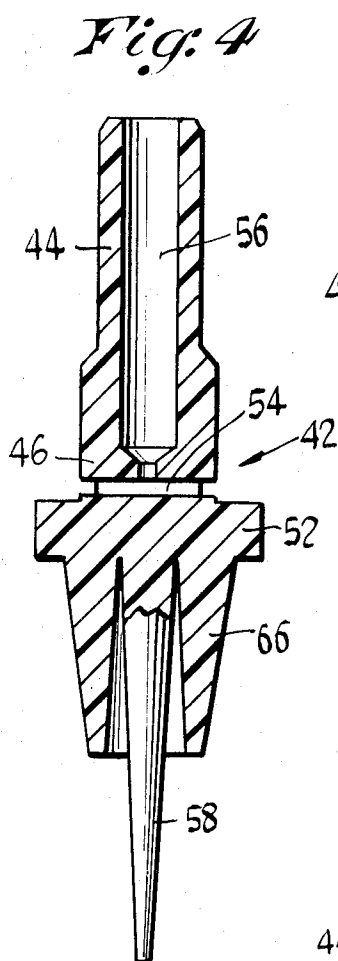
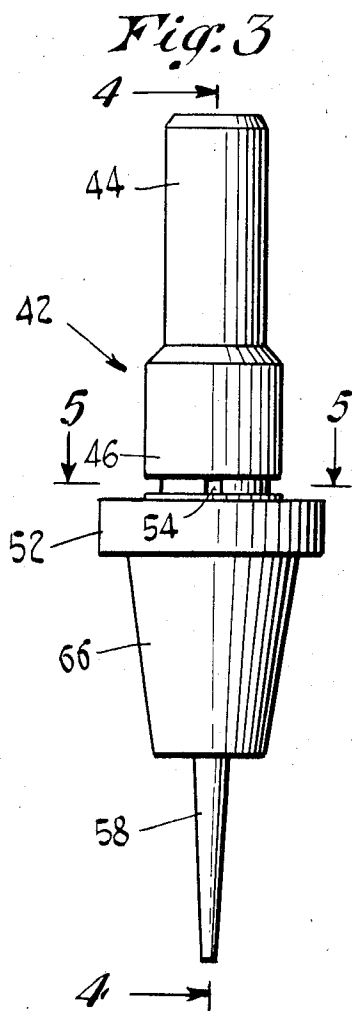


Fig. 2



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Fig. 9

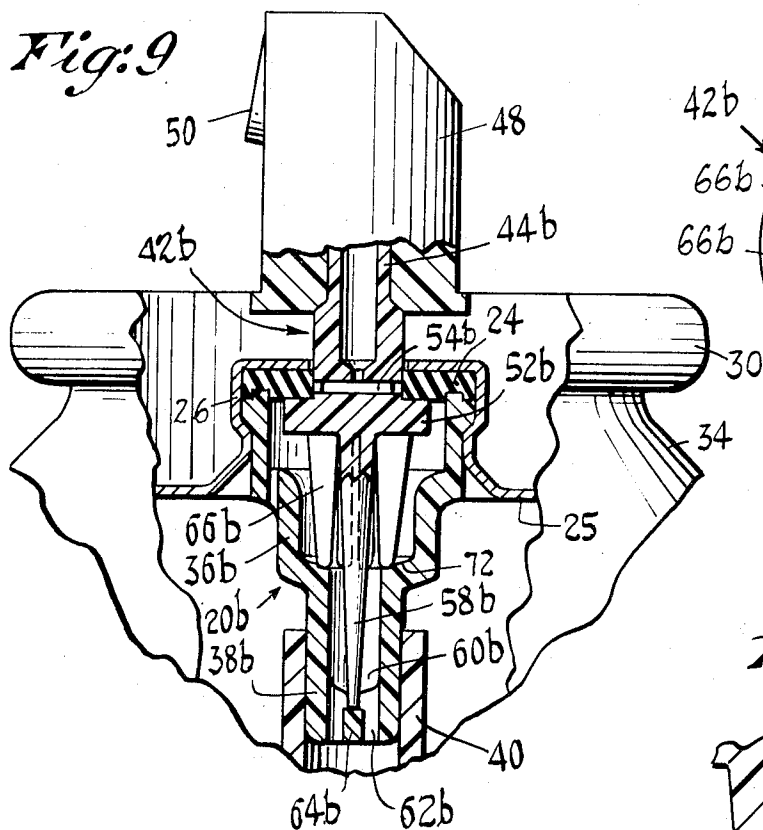


Fig. 11

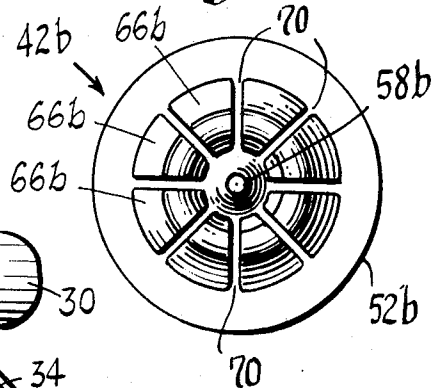


Fig. 12

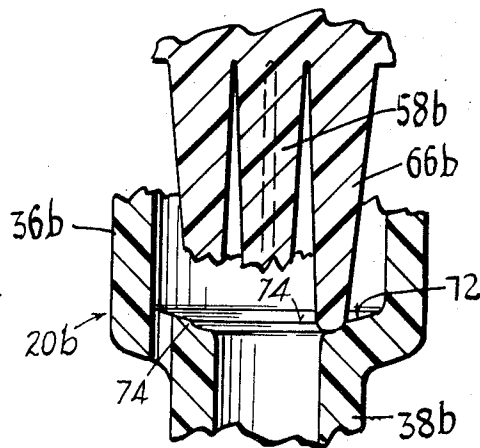
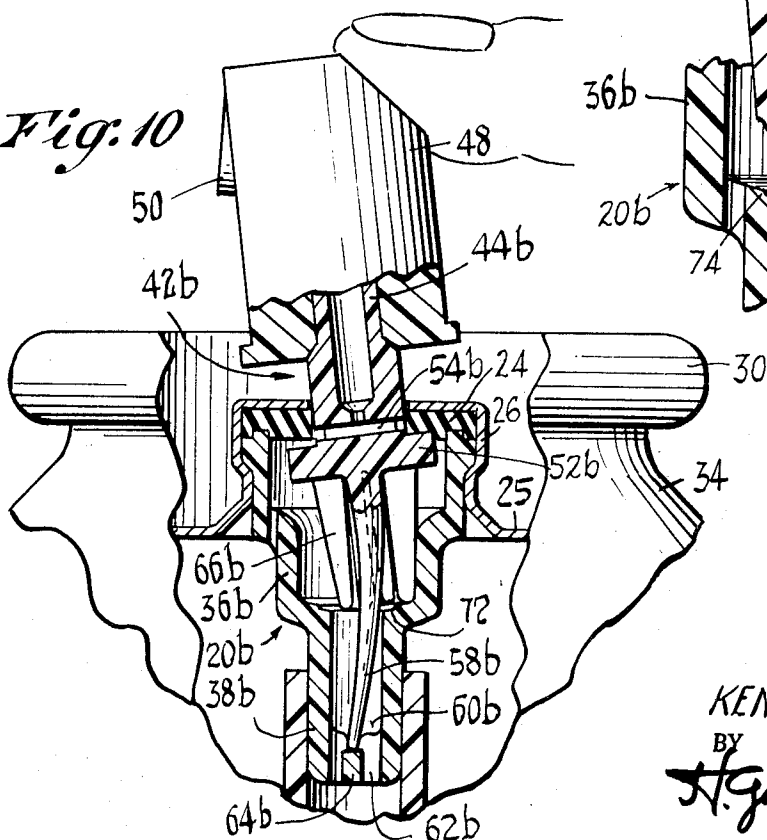


Fig. 10



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Fig. 13

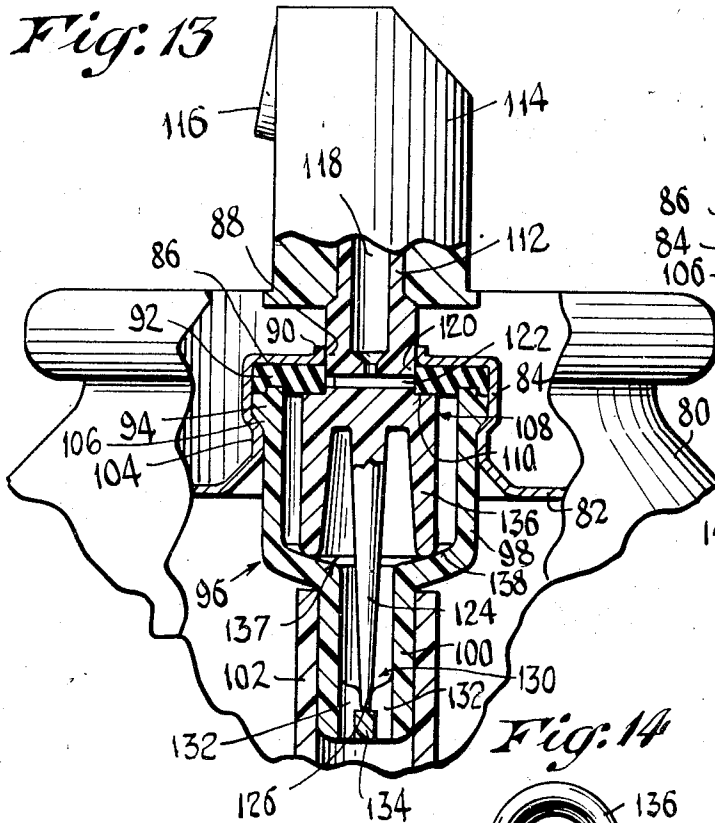


Fig. 16

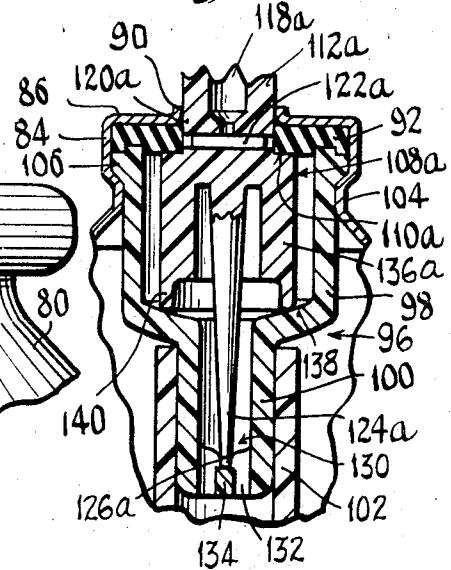


Fig. 14



Fig. 17

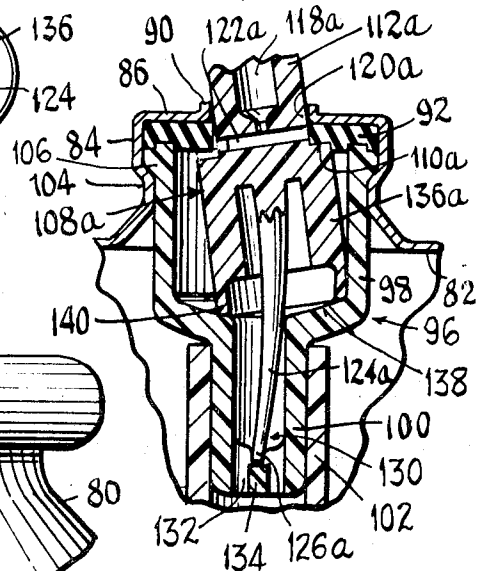
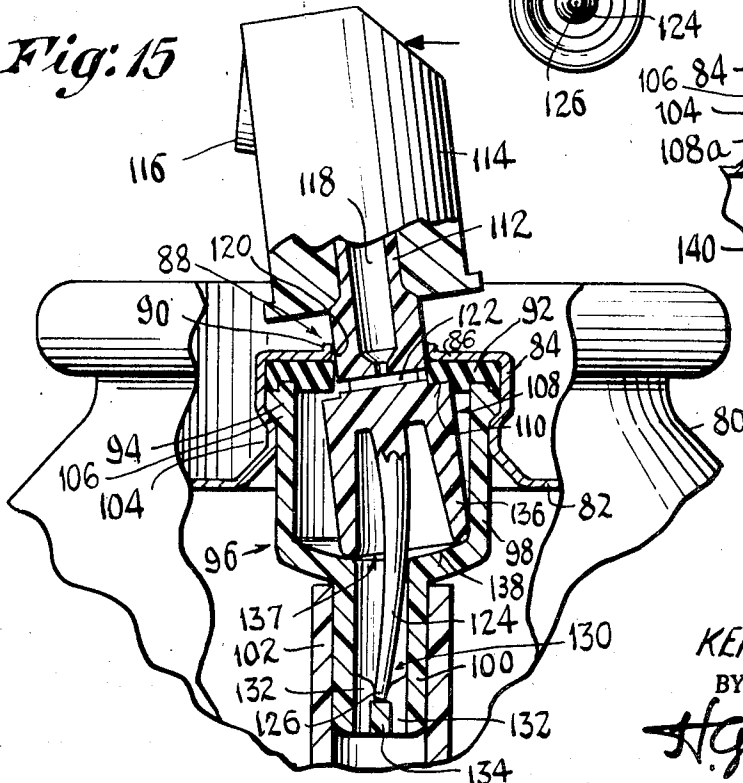


Fig. 15



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SPRING-BIASED METERING AND NONMETERING TILT VALVE WITHOUT COIL SPRING

CROSS REFERENCES TO RELATED COPENDING APPLICATIONS

1. Copending application of Wolf Steiman, Ser. No. 843,906, filed June 30, 1969, now U.S. Pat. No. 3,575,323, entitled "Tilt-Slide Action Aerosol Valve."

BACKGROUND

This invention relates to small metering valves, and to tilt-action valves such as are employed in aerosol and like spray devices; with respect to the latter the invention relates more particularly to biased tilt valves wherein there are no metal coil valve-return springs.

Biased tilt valves of the above type are found in U.S. Pat. No. 3,344,961 issued Oct. 3, 1967 to C. R. M. Graham, and U.S. Pat. No. 3,482,784 issued Dec. 9, 1969 to M. E. Webster. In these prior patents wherein coil-springless constructions are utilized, the resilience of plastic parts or portions of parts is relied on to provide the valve-return spring power. These prior valves have several drawbacks. For one thing, the stop elements which limit the tilting or depressing movement of the valve member were not sufficiently sturdy to prevent their deformation, and prevent malfunction of the valve if a strong actuating force were to be applied to the depress button. Such stop elements were located close to the fulcrum point of the valve stem whereby they experienced considerable unit forces even when moderate pressure was applied to the depress button (the latter being located more remote from the fulcrum point). Further, the resilient plastic members or portions which were depended on to effect the return of the valve member could be strained or forced beyond their elastic limits, whereby their intended functioning was impaired, resulting in leakage or malfunctioning of the valve.

Metering valves are found in U.S. Pat. No. 2,701,163 issued Feb. 1, 1955 to W. K. Teller et al., and U.S. Pat. No. 2,721,010 issued Oct. 18, 1955 to Philip Meshberg. In these prior metering valve patents a vertically or longitudinally movable valve stem is carried in a tubular valve housing and has an upper, poppet-type valve which constitutes the main flow-control means of the dispenser. On the lower portion of the vertically movable valve stem there is a second valve whose function is to shut off flow of liquid from the container into the interior of the valve housing, prior to opening of the upper or main valve. The metering discharge which occurs is constituted only of the pressurized fluid contained in the chamber of the valve housing. These prior metering valves have several disadvantages. For one thing, they require a straight line vertical depressing movement of the valve stem to effect the discharge, and are not capable of functioning with valves wherein the stem is tiltable instead of being longitudinally movable. In many circumstances it is easier for the user to tilt a valve stem than it is to depress the valve stem vertically. Moreover, with vertically movable valve stems a certain amount of jamming or resistance to movement can occur, whereas with tiltable valve stems there is not such a likelihood of jamming or malfunctioning due to resistance to sliding movement. In addition, the prior metering valves employ a multiplicity of parts, making for increased cost due to fabrication of the parts, as well as due to the assembly of multiple components. The assembling machines are complicated and expensive, since they must handle a large number of parts as compared with fewer parts involved with tilting type valves.

The prior metering valves also require metal coil springs whose function is to return the valve stem to its normal, closed position after the depressing force has been removed. These coil springs can be a contaminating factor, and under any circumstance they represent an added cost since they are usually plated or else made of stainless steel.

SUMMARY

The above drawbacks and disadvantages of prior nonmetering and metering valve constructions are obviated by the present invention, which has for one object the provision of an improved tilt valve, either metering or nonmetering, for aerosol and like devices, wherein the simplest possible valving and/or metering construction is had, wherein a resilient plastic member or portion intended to function as the valve return spring cannot be inadvertently deformed or forced beyond its elastic limit, thereby protecting such portion against malfunctioning, and wherein an especially effective and sturdy, movement-limiting or stop means is provided, said means being located relatively remote from the fulcrum point of the valve stem to reduce the unit forces which it experiences, thereby enabling the valve to better withstand both normal and abnormal forces which are applied to the depress button, all without likelihood of failure. This is accomplished by providing a tiltable plastic valve stem (which has the valving shoulder) with a sturdy, depending stop skirt engageable with side walls of the valve housing, and with a long slender resilient extension of appreciable length located inside said skirt and depending from the valve shoulder, the bottom of such extension being received in a stationary socket provided at the bottom end of a plastic valve housing in which the stem and skirt are tiltably carried. Measured from the fulcrum point of the stem, the slender resilient extension has a relatively great effective length enabling it to flex a considerable extent without exceeding its elastic limit. Surrounding the long slim stem extension, the shorter and thicker depending skirt of the plastic valve stem is adapted to engage the annular sidewall of the valve housing when the stem is tilted, thereby to constitute a positive stop means. The point of engagement of the stop skirt with the valve housing is relatively remote from the fulcrum point of the valve stem, thereby reducing the unit forces on the stop skirt which, in addition to its relatively rigid and sturdy construction, enables the skirt to withstand considerable force without failure and without likelihood of the slim extension being deformed past its elastic limit. The stop skirt is adapted to engage an annular shoulder in, as well as a sidewall of the valve housing when the stem is tilted, thereby to constitute not only a positive stop means but also a second valve which "closes" in response to the tilting movement of the stem. When the valve stem is vertical or not tilted, less forceful engagement occurs between the stop skirt and the annular shoulder of the valve housing. This engagement, however, supplements the action of the slender resilient extension or stem in maintaining engagement between the main valve shoulder and main annular valve seat at the upper housing portion. Leakage of fluid can now occur between the less forcefully engaged stop skirt and the annular shoulder it touches, whereby these act essentially as a normally open valve. However, the tilting of the valve stem increases the forces between the stop skirt and annular shoulder whereby a sealing action is now effected, constituting thereby a closed valve which prevents ingress of fluid from the container into the interior of the valve housing.

Other features and advantages of the invention reside in the provision of an improved coil-springless tilt valve as above set forth, which is especially simple in its construction, easily molded of plastic substance, economical to produce, and which has relatively few parts.

Still other features and advantages will hereinafter appear.

In the drawings illustrating several embodiments of the invention:

FIG. 1 is a fragmentary axial sectional view of a pressurized aerosol dispenser having incorporated in it the improved coil-springless tilt valve as provided by the invention. The valve is shown in the nontilted or nondischarging position.

FIG. 2 is a view like FIG. 1, but showing the valve in the tilted, discharging position.

FIG. 3 is a side elevational view, greatly enlarged, of the valve stem portion of the valve, showing the relatively long

resilient depending stem portion which acts as the valve return spring, and showing the relatively short stubby and rigid surrounding skirt portion which constitutes the stop means of the valve.

FIG. 4 is an axial sectional view taken on the line 4—4 of FIG. 3.

FIG. 5 is a transverse or horizontal sectional view taken from line 5—5 of FIG. 4.

FIG. 6 is a bottom plan view of the valve stem of FIGS. 3 and 4.

FIG. 7 is a fragmentary axial sectional view of a coil-springless tilt valve constituting another embodiment of the invention, the valve being shown in the nontilted, nondischarging position.

FIG. 8 is a view like that of FIG. 7, but showing the valve in the tilted, discharging position.

FIG. 9 is an axial sectional view of a coil-springless tilt valve constituting yet another embodiment of the invention, the valve being shown in the nontilting, nondischarging position.

FIG. 10 is a view like that of FIG. 9 but showing the valve in the tilted, discharging position.

FIG. 11 is a bottom plan view of the valve stem member of the valve of FIGS. 9 and 10.

FIG. 12 is a detail in section, greatly enlarged, illustrating cooperable portions of the valve housing and valve stop members of the valve of FIGS. 9 and 10.

FIG. 12 is a detail in section, greatly enlarged, illustrating cooperable portions of the valve housing and valve stop members of the valve of FIGS. 9 and 10.

FIG. 13 is a fragmentary axial sectional view of a pressured aerosol dispenser, having incorporated in it an improved tilting-type metering valve as provided by the invention. The valve is shown in the nontilted, nondischarging position.

FIG. 14 is a bottom plan view of the valve stem part of the metering valve.

FIG. 15 is a fragmentary sectional view like that of FIG. 13 but showing the valve in the tilted, discharging position with the interior of the valve housing shut off from the container contents.

FIG. 16 is a fragmentary axial sectional view of a metering tilt valve construction constituting another embodiment of the invention. The valve stem is in the nontilted, nondischarging position.

FIG. 17 is a view like that of FIG. 16, but showing the valve stem in the tilted, discharging position.

Referring first to FIGS. 1—6, the improved coil-springless tilt valve illustrated therein comprises a valve housing 20 of tubular construction, having a top rim portion 22 of enlarged diameter the top edge of which engages a resilient annular rubberlike valve seat 24 which latter is clamped against the portion 22 by a metal mounting cup 25 having an inverted central cuplike portion 26 which is crimped at 28 against the underside of an external annular shoulder of the portion 22 to retain the valve housing and valve seat member in the operative positions illustrated. The metal mounting cup 25 has an outward peripheral curl 30 engaged with an annular curl 32 of a pressurized metal container 34 in which the aerosol substance is carried.

The valve housing 20 has a stepped body 34 comprising an intermediate portion 36 and a lower portion 38, the latter frictionally supporting a dip tube 40 in the usual manner. The housing portions 22 and 36 and the valve seat 24 form an enclosure which defines a chamber of the housing, adapted to receive liquid passing upward through the dip tube 40, as is well understood in the art.

Tilttable in the valve housing 20 is an upright valve stem 42 having a tubular upper exterior portion 44 extending through a central opening 46 in the mounting cup 26. The engagement between the base 45 of the hollow stem portion 44 and the edges of the opening 46 provide a fulcrum point about which the valve stem 42 may be tilted.

Carried on the upper tubular or hollow portion 44 of the valve stem is a hollow depress button 48 having a discharge

orifice member 50 through which the discharging aerosol substance can flow.

The valve stem 42 has an annular valve shoulder 52 which is engageable with the underside of the annular resilient valve seat 24. Above the valve shoulder 52 is a transverse discharge passage 54 which communicates with a vertical bore 56 in the stem portion 44 so as to conduct aerosol substance from the interior of the valve housing 36 when the stem 42 is tilted in the manner illustrated in FIG. 2.

In accordance with the present invention, an improved construction of the valve stem 42 is provided, comprising a long slender depending resilient stem portion 58 which extends downward from the shoulder 52 an appreciable distance and at its bottom is received in a bottom socket 60 of the valve housing 20. The socket 60 comprises a spider having a plurality of webs 62 and a central or hub portion 64. The webs 62 engage side surfaces of the resilient extension 58 so as to hold the bottom tip of the extension captive and against lateral movement. As shown, the bottom tip of the extension 58 by its engagement with the hub 64 of the spider or socket 60, forcibly holds the valve shoulder 52 in engagement with the resilient valve seat 24. This constitutes a closed valve which prevents egress of aerosol substance from the interior of the housing 20 out through the upper hollow stem portion.

The valve stem 42 also has a sturdy stop means comprising a depending, substantially rigid stub skirt 66 which surrounds the upper portion of the slender resilient stem 58 and which has relatively thick walls, making it substantially unyielding. The depending stop skirt 66 is engageable with sidewall portions of the valve housing 20 as illustrated in FIG. 2, thereby providing a stop means to limit the tilting movement of the valve stem 42. It will be noted that the engagement between the stop skirt 66 and the sidewalls 36 of the valve housing occurs at points which are spaced downward from the shoulder 52 and are relatively remote from the fulcrum of the valve stem 42 located at the opening 46 in the mounting cup 26. Thus, unit forces on the stop skirt 66 are reduced and are commensurate with the tilting forces that may be applied to the depress button 48. Also, the slender resilient stem 58 has a considerable length whereby the flexing which it experiences is not such as to strain it beyond the elastic limit. Before the elastic limit is reached, the stop skirt 66 comes into action to prevent further tilting of the valve stem 42. Accordingly, there is had a more reliable protection of the slender valve spring element comprising the resilient stem portion 58, making the latter capable of many repeated flexings for the purpose of restoring the valve stem 42 to its upright sealing position after the external deflecting forces have been removed. The assembly comprising the valve housing 20, mounting cup 26, and stem portions 45, 52 and 66 constitute sturdy members or components whereby they can stoutly resist even excessive forces applied to the depress button 48. Accordingly, the present improved valve is not readily made to malfunction. Moreover, the spring action of the slender extension 58 is reliable in restoring the valve stem to the upright sealing position, and is operative at all times when the stem is in such position to maintain a continual force between the valve shoulder 52 and the valve seat 24, effectively preventing leakage of the valve.

It will now be understood that when the valve is in the position of FIG. 1, aerosol substance from the container 34 cannot flow up through the dip tube 40, valve housing 20 and out through the stem portion 44 and orifice 50 because of the blockage constituted by the valve shoulder 52 and valve seat 24. However, when a deflecting force is applied to the valve depress button 48 as illustrated in FIG. 2, the valve stem 50 can tilt whereby a portion of the valve shoulder 52 will be separated from the valve seat 24 enabling a discharge of the pressurized substance from the valve housing 20 to occur upward through the hollow stem portion 44 and out through the orifice member 50.

The valve housing 20 has a vapor passage 37 which is optional, and which when provided enables vapor from the

upper portion of the container 34 to mix with liquid in the valve housing 36 to provide an aerated fluid which will be discharged from the spray device.

Another embodiment of the invention is illustrated in FIGS. 7 and 8. In this embodiment parts which have already been described have been given like numerals, and those parts which are substantially similar have been given like numerals but with the suffix "a." In FIGS. 7 and 8, the valve housing 20a is provided with a plurality (here shown as 6 in number) of upstanding resilient spring fingers 68 which are engageable with the depending stop skirt 66 as illustrated in FIG. 7. The spring fingers 68 thus tend to centralize the stop skirt 66 and to maintain the valve stem 42 in its upright, nondischarging position. During tilting of the valve stem 42, the spring fingers 68 are deflected outward and engage the sidewalls of the valve housing portion 36a whereby a stop action is had, preventing further tilting of the valve stem 42. The spring fingers 68 aid the slim resilient extension 58 of the valve stem in restoring the stem 42 to its normal upright nondischarging position illustrated in FIG. 7, as will be understood.

Still another embodiment of the invention is illustrated in FIGS. 9-12. Components which have already been described above have been given like numbers in FIGS. 9-12, and those components which are substantially similar have been given like numbers but with the added suffix "b."

As with the embodiment of FIGS. 7 and 8, a supplemental centering means is provided for the tiltable valve stem, to supplement the action of the slim resilient stem portion 58 already described. In FIGS. 9-12, the valve stem 42b having the resilient, restoring depending portion 58b, is provided with a depending stop skirt comprising a plurality (here shown as 8) of separate segments 66b separated by radial slits or cuts 70. The valve housing 20b has a generally spherical seat 72 provided with an annular shoulder 74 which is normally engaged by the bottom tip portions of the stop skirt segments 66b (as illustrated in FIG. 12) when the valve stem 42b is in the vertical, nondischarging position. This engagement tends to maintain the valve stem 42b centralized in its vertical nondischarging position. The segments 66b are resilient and only slightly yieldable, being relatively stiff due to their short length and appreciable thickness. When the valve stem 42b is tilted, as illustrated in FIG. 10, some of the skirt segments 66b slide up past the shoulder 74 onto higher portions of the seat surface 72. In their so doing, the annular resilient valve seat 24 will be caused to yield, as has been shown in FIG. 2. Discharge of the aerosol substance will occur through the valve housing 20b. When depressing force is removed from the depress button 48, the action of the skirt segments 66b against the spherical seat 72 will supplement the action of the slender valve stem extension 58b in restoring the valve stem 42b to the perfectly vertical, nondischarging position. The skirt segments 66b constitute stops which limit the tilting movement of the valve stem 42b, as with the previous embodiments of the invention. In addition to functioning as stops, however, the skirt segments 66b also constitute restoring means tending to return the valve stem to the nondischarging position after deflecting force has been removed from it.

Referring now to the metering valve of FIGS. 13-15 there is shown the top wall portion 80 of a pressurized aerosol dispenser, carrying a metal mounting cup 82 of usual type, said cup including an upstanding central portion 84 constituting an inverted cuplike configuration. The portion 84 of the mounting cup includes a transverse top wall 86 having a central opening 88 the edges 90 of which have been drifted upward to provide an increased interior bore area of fulcrum surface. Carried in the cuplike portion 84 is an annular resilient valve seat member 92 underlying the wall 86 and at its underside engaged by the top rim portion 94 of a tubular valve housing 96 having a stepped body portion 98, 100, the latter being of smaller diameter and supporting a dip tube 102 which extends downward in the container 80. Crimped portions 104 of the mounting cup engage an annular shoulder 106 of the valve housing to retain the latter and the valve seat 92 in their operative positions illustrated.

Tiltable carried in the valve housing 96 is a valve stem 108 having an annular valving shoulder 110 normally engaged with the underside of the valve seat 92 to shut off the flow of fluid from the interior of the valve housing 96. The valve stem 108 has a hollow, upwardly extending shank portion 112 on which there is carried a hollow depress button 114 having a discharge orifice member 116. The shank portion 114 having a discharge orifice member 116. The shank portion 112 of the valve stem 108 has a central bore 118 communicating with the orifice 116 and thereby constituting a discharge passage for the aerosol substance. At the base portion 120 of the shank 112 there is a transverse discharge passage 122 disposed closely adjacent the valve shoulder 110. When the valve stem 108 is tilted as shown in FIG. 15, the shoulder 110 will at some points separate from the valve seat 92, enabling fluid to be discharged from the interior of the valve housing 96 through the transverse passage 122, bore 118 of the shank 112 and from the orifice piece 116.

Depending from the shank portion 112 of the valve stem 108 is a relatively long and slender, resilient extension or stem 124 which is preferably tapered, and which has its bottom end or tip 126 engaged in an internal socket 130 at the bottom end of the valve housing 96. The socket 130 comprises a spider having a plurality of radial webs 132 and a central hub 134, the latter forcibly engaging the bottom end of the resilient stem 124 and maintaining the valve shoulder 110 in intimate engagement with the valve seat 92 thereby to maintain the valve closed. The bottom tip 126 of the stem 124 is engaged by the webs 132 and laterally restrained thereby. When the valve stem 108 is tilted as illustrated in FIG. 15, the resilient stem portion 124 flexes in the manner indicated, and functions to return the valve stem to the upright, nondischarging vertical position of FIG. 13 upon removal of deflecting force from the depress button 114.

In accordance with the present invention there is provided a novel combined second valve and stop means, comprising a depending annular stop skirt or spool 136 which surrounds the upper portion of the resilient stem 124 and extends downward from the poppet shoulder 110 of the stem. Also, in the valve housing 96 there is provided a concave or spherical valve seat or shoulder 138 which is engageable with the bottom rim portion 137 of the depending skirt 136. As seen in FIG. 13, the valve seat 138 is lightly engaged by the skirt 136 and there does not exist any appreciable force tending to maintain an effective seal between these parts. Accordingly, leakage can occur due to the pressure of the fluid in the dip tube 102 and lack of opposing pressure in the upper portion of the valve housing 96. Such leakage will bring fluid into the upper portion of the valve housing until the pressure is equalized between all inside areas of the housing. When the valve stem 108 is tilted to effect a metered discharge, the skirt 136 and shoulder 110 (constituting in effect a spool valve) will be canted in the valve housing 96 as shown in FIG. 15 and a portion of the valve shoulder 110 will dig into the resilient valve seat 92. The canting of the spool valve 136 will cause increased pressure to exist between the bottom rim of the spool and the spherical seat 138 of the valve housing 96. During tilting of the valve stem 108 a fulcrum point exists somewhere in the neighborhood of the drifted portions 90 of the metal mounting cup 84.

The increased pressure of the spool 136 on the seat 138 will effect a seal therebetween, this constituting a closed valve and preventing ingress of fluid from the dip tube 102 into the upper portion of the valve housing 96. In consequence, the only discharge which will occur will be the pressurized fluid which already exists in the upper portion of the valve housing 96, within the annular walls indicated at 98. Upon release of the deflecting force from the depress button 114, the valve stem 108 will be returned to its perfectly vertical position, and leakage occurring at the bottom of the spool 136 will again equalize the pressures at all points within the valve housing 96.

It is to be noted that when such leakage can occur between the bottom of the spool 136 and the seat 138, this is aided by the pressure of the fluid against the undersides of the spool.

However, such fluid pressure in conjunction with the resilience of the valve seat 92 serves to more tightly close or seal the poppet valve comprising the shoulder 110 and the seat 92.

Another embodiment of the invention is illustrated in FIGS. 16 and 17. In these figures, parts which have already been described have been given like numerals, and those parts which are generally similar have been given like numerals but with the added suffix "a." In FIGS. 16 and 17 the spool valve portion 136a is shown as having thicker walls than the corresponding spool valve 136 of FIGS. 13-15, whereby it is stronger and less yielding. However, at the bottom portion of the spool 136a a thinner rim 140 is provided, whereby such rim can flex slightly and yield during tilting of the valve stem 108a.

It will now be seen from the foregoing that I have provided novel and improved metering and nonmetering coil-springless tilt valve constructions which are especially sturdy and resistant to excessive deflecting forces, and wherein the resilient plastic members are protected against excessive deformation beyond their elastic limits, all to the end that the valve is rugged and durable, and not likely to malfunction throughout an extended period of service. Very few components are involved, said components being easily economically molded in simple mold cavities, and being readily assembled into the operative valve structures. The metering valve action is reliable and effective inasmuch as the initial tilting of the valve stem immediately increases greatly the forces existing between the second or lower valve surfaces which are intended to shut off the flow of fluid. Accordingly, there is had in effect a sequential valve action, inasmuch as the lower valve will become effectively closed prior to opening of the upper valve 110 which permits the discharge from the dispenser. The combination valve and stop skirt which surrounds the slender, resilient, lower return-spring portion of the valve stem constitutes an effective stop member which cannot be easily, permanently deformed and which protects the slender member against permanent deformation while at the same time constituting an effective second valving means to provide for the metering action.

It will be understood that the yieldability of the annular valve seat 92 aids in permitting the necessary canting of the spool 136 to occur while at the same time causing such spool to press more forcibly against the lower valve seat so as to close the second or metering valve.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. A tilt valve construction for an aerosol dispenser comprising, in combination:
 - a. a tubular valve housing having a chamber for receiving liquid from a container,
 - b. a resilient, apertured valve seat constituting the upper wall of said chamber,
 - c. a valve part having a hollow shank portion extending through the aperture of the valve seat,
 - d. said valve part having an annular shoulder disposed in the liquid-receiving chamber of the housing and engageable with the resilient valve seat to close the aperture thereof,
 - e. said valve part having a side passage disposed adjacent the valve shoulder and communicating with the hollow of the shank portion,
 - f. tilting of the valve part unseating the shoulder thereof from the valve seat whereby liquid from the chamber can

flow into the hollow shank portion through the said side passage,

- g. spring means biasing the valve part to nontilted position,
- h. said valve part including a hollow, stop skirt depending from peripheral portions of the annular shoulder thereof and disposed in the valve housing, sidewall portions of said skirt being spaced downwardly from said shoulder and being engageable with sidewalls of said chamber of the housing for restricting the tilting movement of the valve part.
2. A valve construction as in claim 1, wherein:
 - a. said spring means comprising a slender resilient depending stem on the valve part, disposed in part within the stop skirt,
 - b. said valve housing having a tubular depending portion provided with an internal socket at its bottom, in which the bottom tip of the depending stem is received and confined.
3. A valve construction as in claim 1, wherein:
 - a. the side portions of the valve housing comprise internal upstanding resilient fingers molded integral with the housing.
4. The invention as defined in claim 1, wherein:
 - a. said skirt has a plurality of vertically extending slits forming separated segments,
 - b. said housing having an internal, annular, upwardly facing seat engaged by the bottom ends of the skirt segments to prevent appreciable downward vertical movement of the valve part.
5. A valve construction as in claim 1, wherein:
 - a. said valve housing has an annular valve seat shoulder engageable with the bottom end of the stop skirt,
 - b. tilting of said valve part causing a canting of the stop skirt in the housing and partial imbedding of the annular shoulder of the valve part in a localized area of said valve seat, and further causing increased sealing force between the stop skirt and the annular valve seat shoulder of the housing.
6. A valve construction as in claim 5, wherein:
 - a. the configuration of the annular valve seat shoulder is substantially spherical.
7. A valve construction as in claim 5, wherein:
 - a. said spring means comprising a slender resilient depending stem on the valve part, disposed in part within the stop skirt,
 - b. said valve housing having a tubular depending portion provided with an internal socket at its bottom, in which the bottom tip of the depending stem is received and confined.
8. A valve construction as in claim 5, wherein:
 - a. the stop skirt has a bottom rim of reduced thickness,
 - b. said bottom rim being yieldable in response to increased pressures thereon by the annular valve seat shoulder of the housing.
9. The invention as defined in claim 5, wherein:
 - a. the stop skirt is resilient and is deformed by the annular valve seat shoulder of the valve housing when the valve part is tilted.
10. A valve construction as in claim 2, wherein:
 - a. said socket of the valve housing comprises a spider having radial webs and a center hub,
 - b. the bottom tip of the slender stem engaging the hub and being positioned laterally by the webs.

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