March 29, 1955 A. J. PEDIGO 2,705,170

VALVED SPRAY NOZZLE

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Fig. 1.

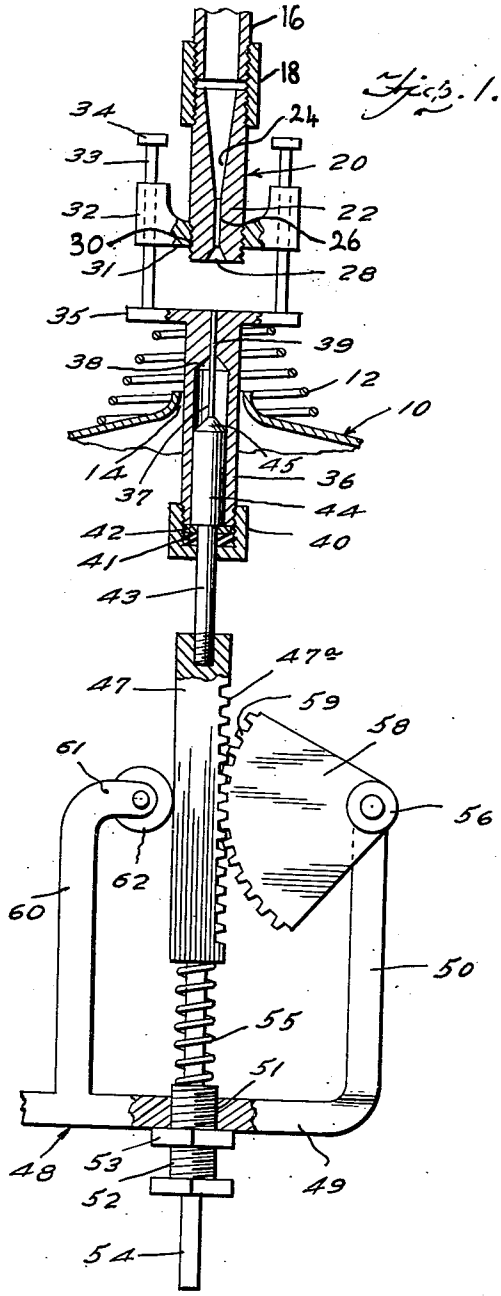
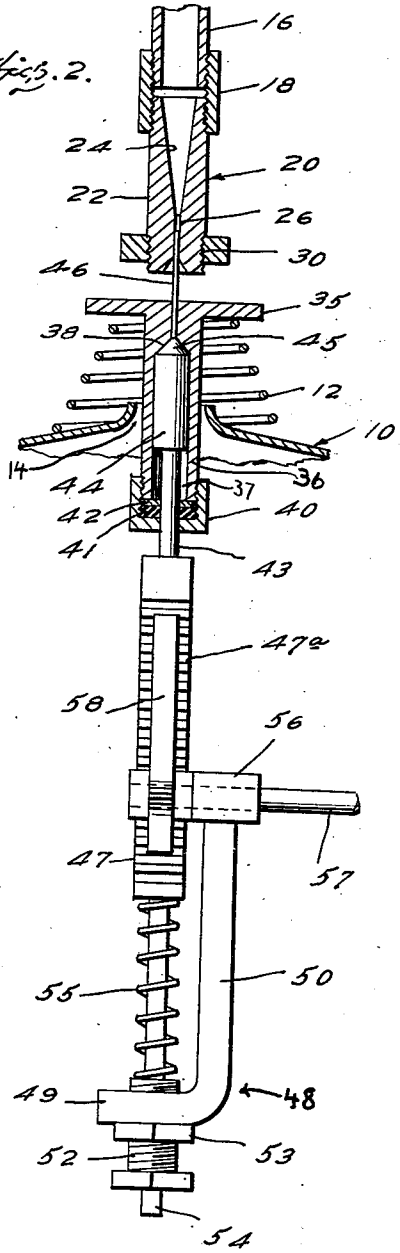


Fig. 2.



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VALVED SPRAY NOZZLE

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Original application May 6, 1952, Serial No. 286,339, now Patent No. 2,683,058, dated July 6, 1954. Divided and this application October 26, 1953, Serial No. 388,313

7 Claims. (Cl. 299—59)

This invention relates generally to the class of valves and is directed particularly to an improved combination valve and spray unit designed particularly for use in association with a refrigerator structure such as that forming the subject matter of my co-pending application Serial No. 228,680 filed May 28, 1951, now Patent No. 2,665,562, January 12, 1954, the present application constituting a division of my application Serial No. 286,339 filed May 6, 1952, now Patent No. 2,683,058, July 6, 1954, which was a continuation in part of application Serial No. 228,680.

A particular object of the present invention is to provide an improved valved nozzle construction wherein a novel means is provided for effecting the opening and closing of the valve nozzle.

Another object of the invention is to provide, in a manner as hereinafter set forth, an improved valved nozzle wherein the construction is such as to effect the opening and closing of the nozzle and at the same time effect the automatic clearing of the outlet aperture of any sediment which may have collected therein.

A further object of the invention is to provide an improved valved nozzle construction in combination with a spray or vapor forming means whereby upon the opening of the nozzle the ejected liquid will be dispersed in all directions from the outlet of the nozzle in the form of a spray.

A further and more specific object of the invention is to provide a valved nozzle construction of the character stated wherein the spray nozzle is closed by a reciprocating needle and a rack and sector gear are provided for effecting the reciprocation of the needle.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawing forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawing:

Figure 1 is a view partly in elevation and partly in longitudinal section of a valved nozzle and spray structure constructed in accordance with the present invention, the nozzle being shown in open condition.

Figure 2 is a view partly in elevation and partly in section of the structure showing the needle in the closed position in the valved outlet, the structure being turned 90° from the position shown in Figure 1.

Referring now more particularly to the drawing the numeral **10** generally designates a supporting body which, in the parent application hereinbefore referred to, comprises a cover for an air admission opening in the floor or bottom of an air circulating chamber. Such cover will, in the present specification, be referred to as the supporting body for a coil spring **12** which forms a part of the valve actuating mechanism and which, as shown, rests upon the top of the support and is disposed coaxially with an opening **14** in the support **10**.

The valved nozzle structure of the present invention comprises a water pipe **16** which is supported by any suitable means, not shown, preferably to have its outlet end directed downwardly, as shown, although it is to be understood that the invention is not limited to use where the nozzle is directed downwardly.

The pipe **16** is suitably threaded at its outlet end to receive an end portion of a coupling nipple **18**.

Threaded into the lower end of the coupling nipple **18** is a threaded end of a discharge nozzle which is generally designated **20** and which, as shown, comprises the elongate tubular body **22**, the axial passage of which is downwardly constricted through the major portion of its length as indicated at **24**, where it joins at its lower end with the narrow constant diameter bore **26** which opens into the outwardly flared mouth **28**.

The lower end of the nozzle **20** is threaded into the opening **30** formed through and midway between the ends of a bar **31**.

The bar **31** is formed to provide an upstanding tubular arm **32** forming a guide for a pin **33**.

The two pins **33** have, upon their upper ends, the heads **34**, which prevent the pins from escaping from the guides and the lower ends of the pins are connected with a disk **35** which is positioned across and in spaced concentric relation with the mouth **28** and bore **26** of the nozzle, as is clearly illustrated in the two figures.

The disk **35** overlies and rests upon the top end of the coil spring **12** as shown, which in turn rests upon the underlying body supporting body **10**.

Formed integrally with the disk **35** and extending downwardly from the underside thereof, is the stem **36**. This stem **36** extends downwardly through the opening **14** in the supporting body **10** and through the spring as shown.

The stem **36** has opening through its lower end, a bore or passage **37** which, near the top of the stem, is reduced in diameter as indicated at **38** to form a conical seat and then continues to and through the top of the plate **35**, as a reduced bore **39** which is approximately the same diameter as the bore **26** and is aligned with the latter.

The lower end of the stem **36** is externally screw threaded to receive a packing nut **40** in which is a packing **41** on which the lower end of the stem **36** is supported on the washer **42**.

Extending through the washer and packing is the valve stem **43** upon the upper end of which is carried the elongate cylindrical valve body **44**, which has a conical tip **45** for engagement upon the seat **38**. Extending upwardly from this tip is the valve needle **46** which slides in and through the bore **39** as illustrated.

Secured to the lower end of the stem **43** is one end of a toothed rack **47**, which extends downwardly from the valve stem as shown.

At one side of the rack **47** is a supporting bracket which is generally designated **48** and which may be mounted upon a suitable support in any suitable manner whereby the bracket will be held stationary.

The bracket **48** comprises a horizontal arm **49** from one end of which extends the upright or vertical arm **50** is in spaced parallel relation with the rack **47**.

The horizontal arm **49** has formed therethrough a threaded passage **51**, which is in line with the lower end of the rack **47** and threaded through this passage **51** is a guide sleeve **52**, which carries a binding nut **53** which bears against the under side of the arm **49** as shown.

Extending downwardly from the lower end of the rack **17**, is a guide rod **54**, which slides through the sleeve **52** and encircling this rod **54**, and interposed between the upper end of the sleeve **52** and the lower end of the rack **86** is the expansion spring **55**.

As will be readily apparent, the tension of the spring **55** can be changed by upward or downward adjustment of the sleeve **52**.

The upper end of the arm **50** is formed to provide the transverse shaft bearing **56**, through which extends an end of a shaft **57**.

The shaft **57** is turned by automatically controlled apparatus forming a part of the refrigerator structure as shown and described in my prior application for the opening and closing of the valve and it is not believed that an illusration and description of such control mechanism in the present application is required.

Carried upon the end of the shaft **57** which extends transversely of the rack **47** adjacent to the toothed side thereof, is a gear sector **58**, the teeth **59** of which are in engagement with the teeth **47a** of the rack as illustrated.

It will be readily apparent that when the gear sector **58** is turned in a direction to raise the rack **47**, the valve body **44** will slide upwardly in the passage **37** until the tapered upper end contacts the seat **38**. This projects the needle **46** out of the bore **39** toward and into the bore **26**.

When the upper end of the valve body engages the seat **38** the plate **35** will be elevated, which movement will occur simultaneously with the entrance of the needle into the bore **26**. Also it will be seen that as the needle enters the bore **26** any substance which may have adhered to the wall of the bore will be effectively scraped away and when the needle is withdrawn the liquid issuing from the nozzle will remove such substance.

Upon reverse rotation of the sector **58** the needle will be retracted and the plate **35** will be pulled downward until the pins **33** have been lowered to the stopping point by engagement with the top ends of the guides **32**.

In order to give complete stability to the structure, and particularly with the view to preventing slipping of the sector teeth **59** from engagement with the rack teeth **47***a*, there is provided an upright post **60** which is secured upon the arm **49**, which carries upon its upper end an inturned finger **61** which rotatably supports a roller **62**. This roller bears against the back of the rack **47**, as shown, in opposed relation to the sector **58**. Thus upon any sudden turning force being applied to the sector, which might tend to push the rack away from it, the roller **62** will oppose such movement and maintain the proper engagement of the rack and sector teeth.

While the nozzle passage **26** iwll be closed against the passage of water when the needle **46** is incompletely inserted, it is intended that the needle shall extend fully through the bore so as to insure the complete removal from the wall of the bore, of any substance which may have adhered to. Thus when the needle is withdrawn such substance will be discharged.

If an additional shutoff should be desired, for the mouth **28**, in association with the action of the needle closing the bore or passage **26**, this can be effected by suitably adjusting the relative positions of the parts so that the plate or disk will be caused to seat against the lower end of the nozzle when the valve element **44** is fully extended upwardly. However, some slight leakage of water past the end of the nozzle may be desired for preventing freezing when the valve is closed, where the structure is used in a refrigerator.

As will be apparent, when the valve nozzle is open, the water escaping will strike the plate **35** and be deflected laterally in the form of a spray and when the structure is used in a refrigerator of the character shown and described in the parent application hereinbefore referred to, the atmosphere of the refrigerator will be effectively humidified, as desired, to facilitate the functioning of the refrigerator structure in the desired manner.

I claim:

1. A liquid diffusing means, comprising a nozzle adapted to be connected to a liquid conduit and having a small axial discharge bore, a pair of guides carried at opposite sides of and by the nozzle and extending longitudinally thereof, a liquid deflection plate of flat disk form spaced from the outlet end of said bore and centered with respect thereto, guide pins carried by said plate and slidably engaged in said guides, a guide stem connected to the underside of the plate centrally thereof and having an axial stem passage opening at one end through the plate toward and in line with said bore, a needle slidably positioned in said stem passage for extension at one end from the passage into said bore, spring means beneath the plate and urging the same toward and retracting it from the nozzle, and means for retracting the plate against the resistance of said spring.

2. The invention according to claim 1, wherein the last means comprises a lost motion connection between said stem and the needle urging means whereby a predetermined extent of retractive movement of the needle couples the needle and stem for movemnt as a unit.

3. The invention according to claim 1, wherein the last means comprises a cylindrical body from one end of which the needle extends, the said passage being of enlarged diameter through an extent greater than the length of the cylindrical body whereby the latter body and needle have limited free movement in the passage, the needle when moved to the limit in one direction with the body being projected through the passage into the needle bore and the body when retracted to the limit with the needle in the passage engaging a part of the stem to move the stem, plate and needle as a unit.

4. The invention according to claim 1, wherein the said needle urging means comprises a tube rack connected at one end with the needle, a sector gear in toothed connection with the rack, and means for applying turning movement to the gear.

5. The invention according to claim 1, wherein the said axial passage in the guide stem is of enlarged diameter from a location intermediate the ends of the stem to and through the end of the guide stem remote from the plate, the said means for retracting the plate comprising an elongate cylindrical body slidably positioned in the portion of the passage of enlarged diameter, a valve stem extending from an end of the cylindrical body and through the end of the guide stem remote from the plate, said needle forming an axial continuation of the opposite end of the body, a cap secured to the end of the guide stem remote from the plate and having the valve stem slidably extended therethrough, a rack gear connected at one end to the valve stem, a guide means connected with the opposite end of the rack gear, a sector gear having toothed connection with said rack gear, and means connected with the sector gear for imparting rotary movement thereto, said rack gear when moved to a predetermined extent in one direction effecting the engagement of the cylindrical body with the cap to impart unitary movement to the plate, body and needle and to retract the needle from the nozzle bore, the said large portion of the axial passage being of greater length than the cylindrical body to permit limited free movement of the cylindrical body in the axial passage.

6. The invention according to claim 5, wherein the said guide means for the rack comprises a bracket, a guide sleeve carried by the bracket, a guide rod carried by the rack and slidably extending through the sleeve, and an expansion spring encircling the guide rod and interposed between the guide sleeve and the adjacent end of the rack and normally urging movement of the rack in a direction to project the needle toward the nozzle bore.

7. The invention according to claim 5, wherein the said guide means for the rack comprises a bracket, a guide sleeve carried by the bracket, a guide rod carried by the rack and slidably extending through the sleeve, an arm carried by said bracket and disposed in spaced parallel relation with the rack, a bearing on the arms supporting the sector gear shaft, a second arm carried by the bracket positioned on the opposite side of the rack from the first arm and in parallel relation with the rack, and a roller carried by the second arm and engaging the rack in opposed relation with the sector gear.

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