June 25, 1946. A. O. DRAVINER 2,402,741

SPRAY HEAD

Filed Oct. 3, 1944 2 Sheets-Sheet 1

Fig. 1.

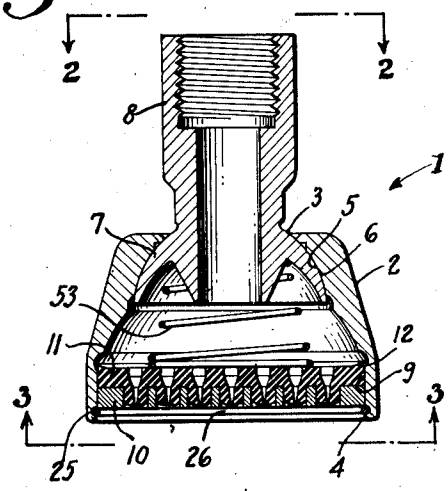


Fig. 2.

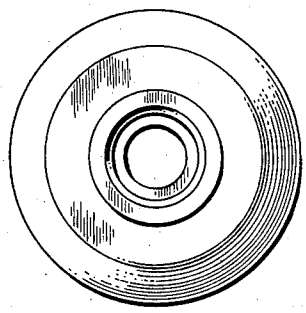
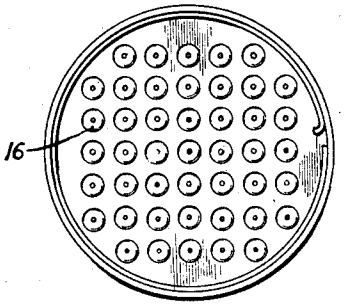


Fig. 3.



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SPRAY HEAD

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Fig. 4.

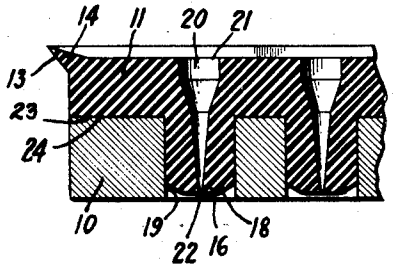


Fig. 5.

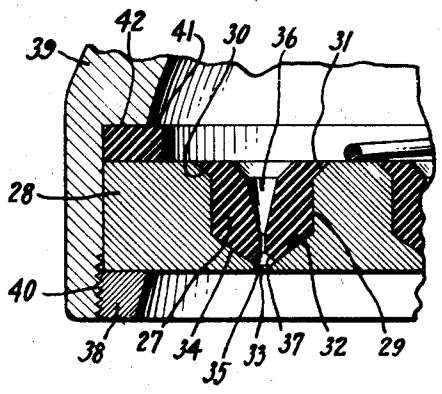
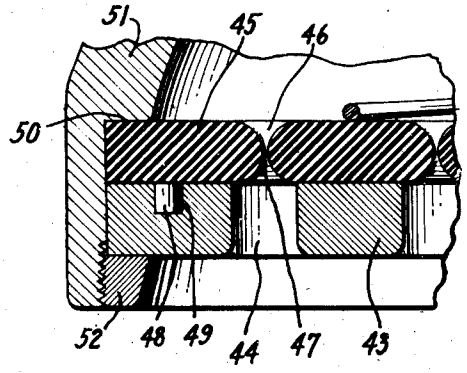


Fig. 6.



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UNITED STATES PATENT OFFICE

2,402,741

SPRAY HEAD

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Application October 3, 1944, Serial No. 556,931

12 Claims. (Cl. 299—141)

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The invention relates to a spray head and has for an object to provide a spray head or nozzle wherein the size of the fluid passage through the spray head or nozzle automatically expands and contacts in accordance with the fluid pressure, whereby a stream of water issues with considerable force from the nozzle even though the water pressure is comparatively low.

With the usual type of spray head having a metal nozzle wherein the nozzle openings have a fixed size, if the valve is turned to reduce the water pressure on the spray head to a low value, to conserve water or for any other purpose, the various streams from the nozzle openings issue with a very small force and all of such streams merge together at a short distance in front of the spray head and continue from that point practically as a solid stream. The invention overcomes this defect by providing a spray head or nozzle arrangement wherein the size of the fluid passage through the nozzle is quite small when the fluid pressure is low and automatically increases as the fluid pressure increases.

Another object of the invention is to provide a spray head having an array of fluid passages and orifices which are self-cleaning by automatically overcoming stoppage of the water orifices due to liming or corrosion of the orifices or due to sediment lodging in the orifices.

Another object of the invention is to provide a spray head having a flexible joint with the pipe connection so that the spray head can be oriented to different positions, and wherein the flexible joint is in the form of a ball and socket connection which is sealed against leakage by fluid pressure in the spray head.

Another object of the invention is to simplify the construction and assembly of the spray head by eliminating screws, nuts, packings, or gaskets and to provide a construction wherein those elements are not necessary.

For further details of the invention, reference may be made to the drawings, wherein:

Fig. 1 is a longitudinal sectional view of a spray head according to the present invention.

Fig. 2 is an end view of the spray head of Fig. 1, looking in the direction of the arrows on the line 2—2 of Fig. 1.

Fig. 3 is an end view of the spray head of Fig. 1, looking in the direction of the arrows on the line 3—3 in Fig. 1.

Fig. 4 is an enlarged sectional view of the nozzle of the preceding figures, with parts broken away.

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Fig. 5 is an enlarged sectional view of a modification, with parts broken away.

Fig. 6 is an enlarged sectional view of a further modification, with parts broken away.

Referring in detail to the drawings, the spray head 1 comprises a casing 2 which may be frustoconical in shape as illustrated, the smaller end of casing 2 comprising an inlet 3 and the larger end comprising an outlet 4. The inside of the casing around the inlet 3 is provided with a concave spherical surface 5 which mates with and surrounds an inner convex spherical surface 6 on a flange 7 of the pipe connection 8. The pipe connection 8 is fitted into the casing 2 through the outlet 4, the outlet 4 being large enough to pass the flange 7 and the inlet 3 being large enough to pass the pipe connection 8, but not the flange 7. The curved fitting surfaces 5 and 6 may be ground together to form an accurate fit and they constitute a ball and socket connection to provide for angular adjustment of the casing 2 with respect to the pipe connection 8.

The casing 2 at the outlet 4 is provided with a cylindrical bore 9 in which fits a supporting disk 10 of rigid material such as metal. On top of disk 10 is supported a nozzle disk 11 of elastic material such as rubber, which also fits in the bore 9. At the rear of the cylindrical bore 9 the casing 2 is provided with a seat 12 which converges towards the outlet 4 to meet the cylindrical bore 9. On the seat 12 fits the tapered portion 13 of an elastic flange 14 which is integral with the elastic disk 11.

Flange 13 is larger than bore 9, but it can be compressed by hand and worked into position by insertion from the outer end of bore 9, i. e., the lower end of bore 9 as seen in Fig. 1. At the inlet side of seat 12, the casing 2 is cut away or provided with a recess to allow the compressed flange 13 to expand and fit on the seat 12.

Outwardly projecting from the disk 11 is an array of nozzles, two of which are shown in detail in magnified form at 15 in Fig. 4. The construction of all of the nozzles is the same and each of them such as 15 comprises an elongated body portion 18 having a cylindrical periphery which slidingly fits in a cylindrical bore 19 in the disk 10. Through the body of the elastic disk 11 and through each nozzle such as 15, extends a fluid passage 20 which, at its rear end, opens into the interior of casing 2 and which tapers in size from its inlet end 21 to its outlet 22 which is an expansible orifice. The outlet 22, when there is no fluid pressure on the nozzle, may have a diameter of the order of 5 or 10 thousandths

of an inch, assuming that the spray head is to be employed as a shower bath fixture, with water pressure ranging from zero to about sixty pounds per square inch. The size of the fluid passage **20** may vary depending upon the elasticity of the material chosen for the disk **11** and upon the pressure of the fluid supply. The result of tapering the passage **20** from a larger opening at the inlet **21** to a smaller opening at the outlet **22** results in the thickness of the body **18** increasing in a direction along the nozzle toward the outlet **22**. The purpose of this is to provide elastic material which will permit the nozzle such as **16** to elongate and to thereby vary the size of the passage **20** through the body portion **18** as well as orifice **22** automatically in proportion to an increase in the fluid pressure. The array of nozzles **16** is supported for such elongation and for increase in size of fluid passage **20** and orifice **22** by the rigid disk **10** which has a corresponding array of bores **19** in which the array of nozzles fit.

When the nozzles are not elongated, due to fluid pressure, preferably the length of each nozzle is such that it is shorter than the bore **19**, as indicated in Figs. 1 and 4. Due to fluid pressure, the nozzles such as **16** elongate and the outlet end thereof may then extend flush with the outer face of the rigid disk **10**, or in fact, may protrude beyond it.

The front side **23** of the elastic disk **11** fits on and is supported by the flat inner surface **24** of the rigid disk **10**. The disks **10** and **11** instead of meeting on a flat surface could meet on a curved surface if desired. As the body of the elastic disk **11** extends laterally of the array of nozzles, and as this laterally extending body portion is supported by rigid disk **10**, the latter provides a lateral support for the nozzles.

In order to removably lock the disks **10** and **11** in the outlet **4**, the outer end of casing **2** is provided with a groove **25** in which fits a removable spring lock ring **26**.

Instead of having the array of nozzles integral with the disk **11**, each nozzle may be a separate element as indicated at **27** in Fig. 5. In this case, the rigid disk **28** is provided with an array of bores such as **29**, and each such bore is provided at its inlet end with a tapered seat **30** to receive a correspondingly tapered flange **31** on the spray element or liner **27**. Also each bore such as **29** adjacent its outlet end is provided with an inwardly projecting tapered seat **32** having a central outlet **33**. The outlet end of nozzle **27** is tapered as indicated at **34**, to fit on the seat **32**. The bore **36** of the nozzle **27** converges towards the outlet and then flares outwardly as indicated at **37**, whereby the body of the nozzle **27** is thickest adjacent its expansible orifice **35** formed at the junction of the inwardly tapered bore **36** and the outwardly tapered bore **37**, and the fluid pressure in the bore **36** compresses this thickened portion to increase the size of the bore **36** and the orifice **35**, in accordance with the fluid pressure.

Each of the jet forming nozzles **27** are made of elastic material such as rubber and they may be removable from their respective bores **29** or may be cemented therein if desired.

The disk **28** which may be of metal is held in place between a lock ring **38** fastened in the front end of casing **39** by screw threads **40**. At the back of plate **28** is arranged a gasket seal **41** which fits in a recess **42** in the body **39**.

In the modification shown in Fig. 6, the rigid

disk **43** is provided with an array of apertures such as **44**, and on top of disk **43** is arranged a disk **45** of elastic material such as rubber having a corresponding array of apertures **46**, each aperture **46** converging on a curve towards the outlet for about one-half of the length of the aperture **46** resembling the hole at the center of a doughnut, that is, it resembles the inner part of a torus, a surface of revolution generated by revolving a semi-circle about the axis of the aperture **46**, thereby forming an expansible orifice **47**. Due to fluid pressure on the inlet side of the disk **45**, the aperture **46** and its outlet orifice **47** enlarges in accordance with the fluid pressure.

In order to properly align the apertures **46** with the apertures **44**, a suitable interlock is provided, such as a lug **48** on disk **45** which fits in an aperture **49** on disk **43**. Disk **45** forms its own gasket and has the same outside diameter as disk **43**, and both thereof are held in a recess **50** in the outlet end of the body **51** by a screw threaded lock ring **52**.

In all forms of the invention, the fluid pressure inside of the casing **2** in Fig. 1, as well as casing **39** in Fig. 5 and casing **51** in Fig. 6, is sufficient to hold the ball and socket **5**, **6** together without leakage, whereby it is not necessary to use a spring such as **53** in Fig. 1. However, a spring such as **53** may be used to hold the casing such as **2** on the pipe connection such as **8**, during the time when there is no fluid pressure in the casing. The spring such as **53** at its lower end rests on the jet forming members such as disk **11** in Fig 1, and its upper end rests in a recess formed by a flare under the flange **7**, this flare serving to guide the upper end of the compression spring **53** to its proper position as shown in Fig. 1, when the spray head is assembled.

In all forms of the invention it is understood that where reference is made to the formation of a spray, that the jet from each nozzle is a solid stream, and it is a multiplicity of these needle-like solid streams which form the spray. Also in all forms of the invention, the jet forming passage in the elastic member preferably converges towards the outlet to facilitate its expansion or contraction in accordance with the fluid pressure.

Also, in all forms of the invention, the nozzles are substantially self-cleaning as they are elastic and expand to permit the discharge of particles of sediment that would ordinarily clog a conventional type of spray head. Also, the increase in length and size of the fluid passage through the nozzle, when acted on by fluid pressures of various amounts, serves to break up any lime encrustation, the broken up pieces being expelled through the orifices.

Various modifications may be made in the invention without departing from the spirit of the following claims. For example, instead of employing an array of nozzles, use may be made of a single one of the nozzles shown in Figs. 1, 5 and 6 and its size may be varied or chosen to suit the requirements.

I claim:

1. A spray head comprising a casing having an inlet and an outlet, a nozzle member of elastic material in said outlet, said nozzle member having an array of elastic nozzles, a supporting member at the outlet side of said nozzle member, said supporting member supporting said nozzle member and having apertures into which said nozzles fit, and means for retaining said supporting member in said casing outlet.

2. A casing having an inlet and an outlet, a nozzle member of elastic material in said outlet, said nozzle member having a nozzle and a body portion extending laterally therefrom, said body portion and nozzle having a fluid passage extending therethrough, a disk supporting the front of said body portion, said disk having an aperture in which said nozzle extends and fits when not subjected to fluid pressure, the wall of said aperture substantially preventing expansion of the outside diameter of said nozzle while permitting said nozzle to elongate and said passage to expand under pressure in said inlet.

3. An elongated nozzle of elastic material, said nozzle having a fluid passage therethrough, and a casing having an elongated aperture having a side wall fitting over the side of said nozzle, said aperture being open at the end of said nozzle for elongation of said nozzle and enlargement of said fluid passage under fluid pressure in said nozzle.

4. An elongated nozzle of elastic material, said nozzle having a fluid passage which decreases in size toward the outlet of said nozzle, and means supporting said nozzle for elongation and increase in size of said fluid passage without radial expansion of the outside diameter of said nozzle under fluid pressure in said nozzle.

5. A spray head comprising a casing, an elongated nozzle of elastic material, said nozzle having a wall which increases in thickness and a conical bore which converges towards the outlet end of said nozzle, a supporting plate having a bore in which said nozzle fits, and means removably supporting said plate and said nozzle in said casing.

6. A casing having an inlet and an outlet, said casing having a circular seat therein adjacent said outlet, said seat converging towards said outlet, a nozzle member having an integral elastic peripheral flange, and means supporting said nozzle member in said outlet with said flange on said seat.

7. A spray head comprising a casing having an inlet and an outlet, said casing at said outlet having a circular bore, a nozzle member of elastic material fitting said bore, said nozzle member having an array of elastic nozzles, a disk of rigid material fitting said bore in front of said nozzle member and having an array of apertures in which said nozzles fit when not subjected to fluid pressure, said nozzle member resting on and being supported by said disk, and means for retaining said disk in position in said casing.

8. A spray head comprising a casing having an inlet and an outlet, said outlet having a cylindrical bore, a circular seat around the rear of said bore, said seat converging toward said outlet, a disk of elastic material having a peripheral body portion fitting said bore and an outwardly extending flange fitting said seat and also having an array of elastic nozzles projecting therefrom, a disk of rigid material fitting said bore in front of said elastic disk, said rigid disk having an array of bores in which said nozzles fit, and means for retaining said rigid disk in said outlet.

9. A spray head comprising a plate having an array of spray apertures, and a single piece of elastic rubber having a nozzle lining each of said apertures.

10. A spray head comprising a plate having an array of spray apertures extending therethrough and a nozzle of elastic material lining each of said apertures, each of said nozzles having a bore converging from the inlet end towards the outlet end of the nozzle.

11. A spray device comprising a plate having a spray aperture, a nozzle of elastic material supported by said plate, said nozzle having a bore converging from the inlet end towards the outlet end of said nozzle, said nozzle bore being substantially coaxial with said plate aperture, the thickness of the elastic body of the nozzle increasing along the bore as the bore converges, said plate supporting said nozzle for expansion of the nozzle bore by fluid pressure in the bore without substantial forward movement of the inlet end of said nozzle bore.

12. A spray device comprising a plate having a spray aperture, a nozzle of elastic material supported by said plate, said nozzle having a bore converging from the inlet end towards the outlet end of said nozzle, said nozzle bore being substantially coaxial with said plate aperture, the thickness of the elastic body of the nozzle increasing along the bore as the bore converges, said plate supporting said nozzle for expansion of said bore by compression of the elastic nozzle body around the bore without substantial forward movement of the inlet end of said nozzle.

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