United States Patent [19]
Bruno

[11] 3,734,410
[45] May 22, 1973

[54] PULSATING SPRAY HEAD

[75] Inventor: **Leonard Bruno**, Farmingdale, N.Y.

[73] Assignee: **Stanadyne, Inc.**, Windsor, Conn.

[22] Filed: **Sept. 30, 1971**

[21] Appl. No.: **185,271**

Related U.S. Application Data

[63] Continuation-in-part of Ser. Nos. 15,719, March 2, 1970, abandoned, and Ser. No. 125,093, March 17, 1971, abandoned.

[52] **U.S. Cl.** **239/102**, 239/381, 239/568, 239/590.3

[51] **Int. Cl.** **B05b 1/34**

[58] **Field of Search**.....239/101, 102, 499, 239/505, 512, 524, 504, 553, 553.3, 596, 590, 590.3, 590.5, 586, 575, 568, 583, 562, 570, 552, 451, 452, 453, 454, 455, 456, 381

[56] **References Cited**

UNITED STATES PATENTS

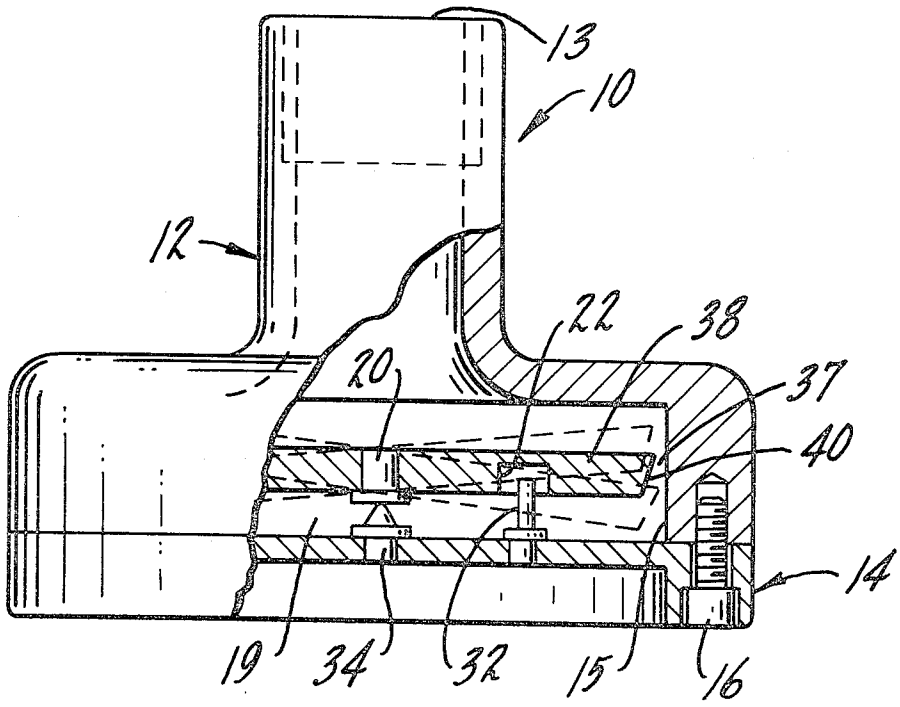
881,842 3/1908 Bender .....239/381 X

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Michael Mar
Attorney—Howard T. Markey, Alfred H. Plyer, Jr., James G. Staples et al.

[57] **ABSTRACT**

A spray head which attaches to a shower or hose to provide a pulsating spray. An oscillating plate installed in the spray head provides the pulsations in the fluid flowing through the spray head.

13 Claims, 9 Drawing Figures



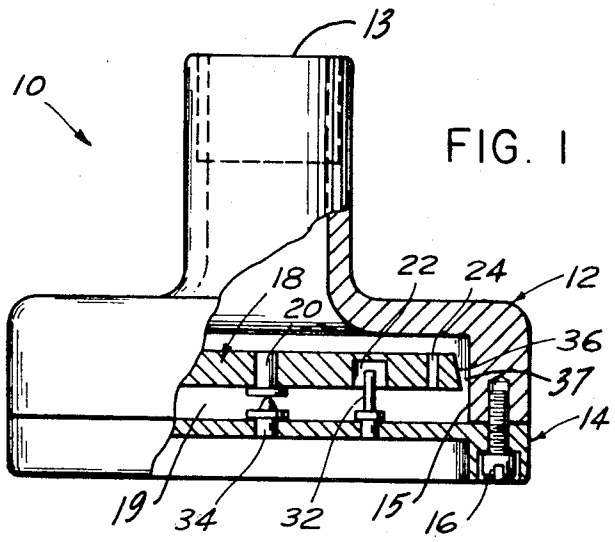


FIG. 1

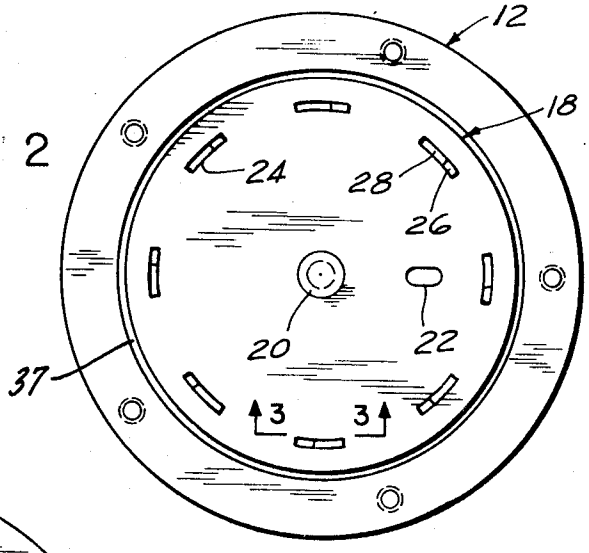


FIG. 2

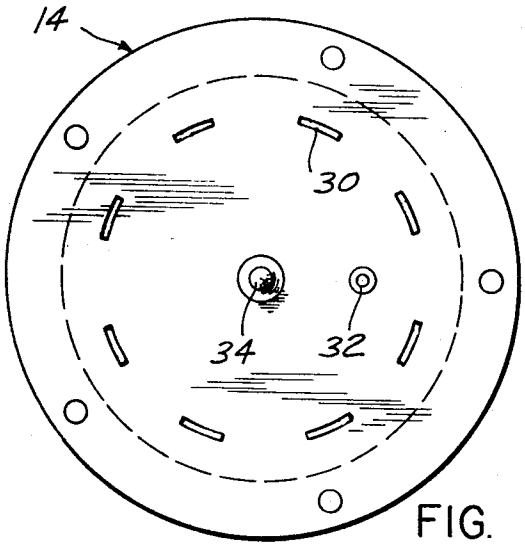


FIG. 4

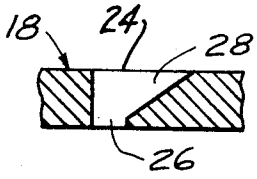


FIG. 3

Fig. 5.

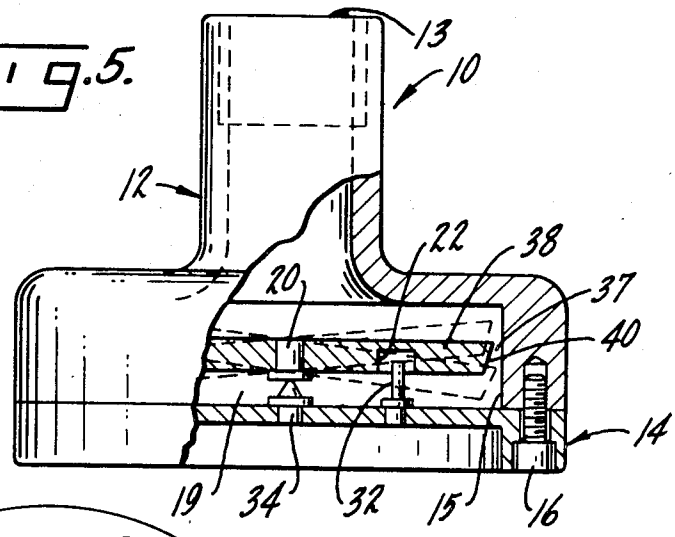


Fig. 6.

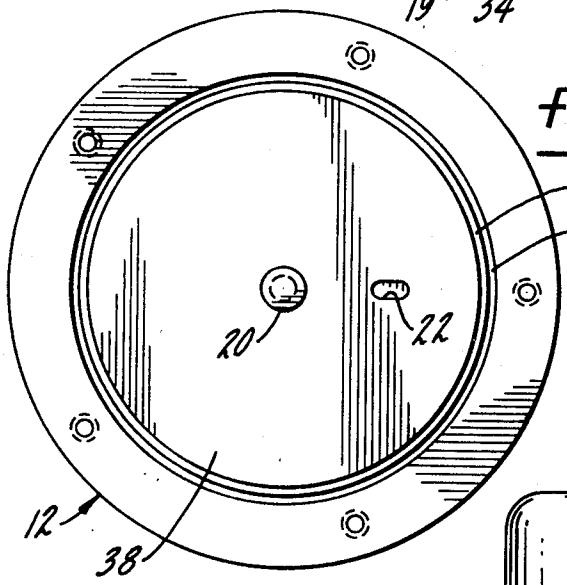
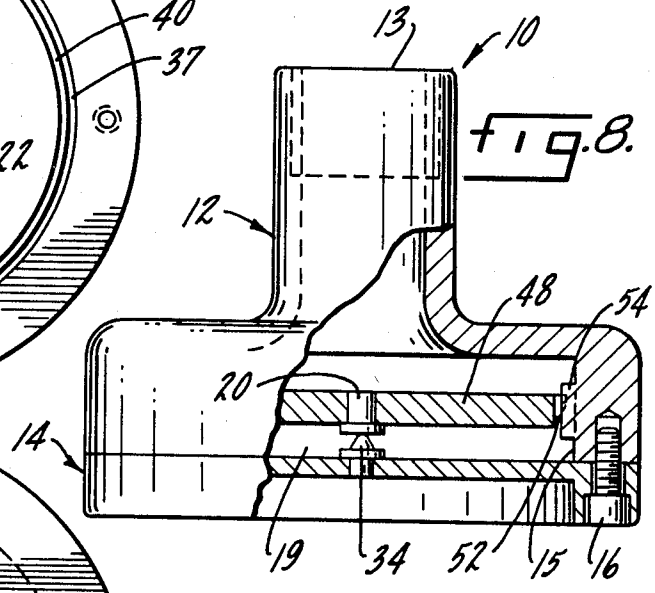


Fig. 8.



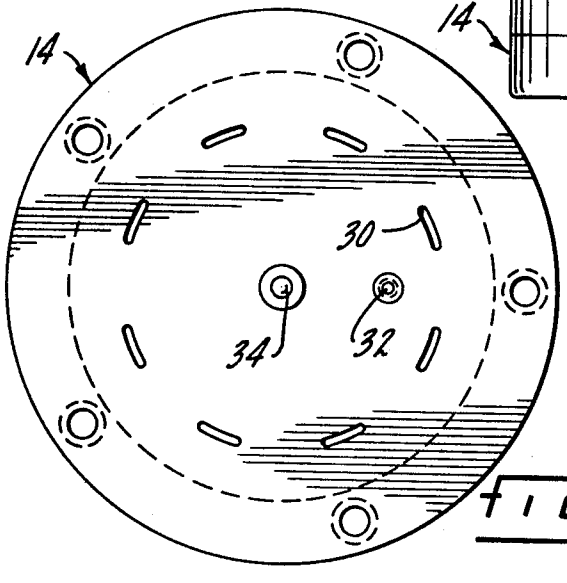


Fig. 7.

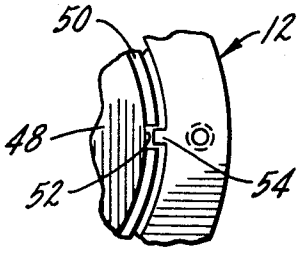


Fig. 9.

PULSATING SPRAY HEAD

This is a continuation-in-part of my copending applications Ser. No. 15,719, filed Mar. 2, 1970 now abandoned, and Ser. No. 125,093 filed Mar. 17, 1971, now abandoned.

SUMMARY OF THE INVENTION

This invention is concerned with a spray head which attaches to a source of fluid under pressure to provide a pulsating fluid spray. It is particularly concerned with a spray head used as part of a shower or hand-held spray.

An object of this invention is a pulsating spray head in which the pulsations are brought about by a plate which oscillates in the spray head.

Another object is a pulsating spray head having an oscillating plate located therein and in which the oscillations of the plate are caused by the flow of fluid through the spray head.

Other objects may be found in the following specification, claims and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is illustrated more or less diagrammatically in the following drawings wherein:

FIG. 1 is an elevational view of one form of spray head of this invention with parts broken away and others shown in cross-section;

FIG. 2 is a bottom view of the spray head with the bottom cover removed;

FIG. 3 is an enlarged, partial cross-sectional view taken along line 3—3 of FIG. 2;

FIG. 4 is a top view of the spray head cover of FIG. 1;

FIG. 5 is an elevational view of a modified spray head of this invention with parts broken away and others shown in cross-section and with alternate positions of the oscillating plate shown by dashed lines;

FIG. 6 is a bottom view of the spray head of FIG. 5 with the bottom cover removed;

FIG. 7 is a top view of the bottom cover of the spray head of FIG. 5;

FIG. 8 is an elevational view of yet another modified form of spray head with parts broken away and others shown in cross-section; and

FIG. 9 is a partial bottom view of the plate and housing of the spray head of FIG. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

One form of the invention is shown embodied in the spray head 10 in FIGS. 1–4 of the drawings. Spray head 10 includes a housing 12 having an inlet 13 and a cover 14 fitted over an outlet 15. The cover is fastened to the housing by screw fasteners 16. A disc or generally flat circular plate 18 is positioned in the housing between the inlet 13 and the outlet 15, forming a chamber 19 between the plate and the cover 14. A bearing stud 20 extends through the plate from the outlet side thereof. A hole 22 is formed in the plate in the outlet facing side thereof. Water passages 24 extend through the plate. These passages are arranged in a circular pattern located near the outer edge of the plate. As is shown most clearly in FIG. 3, the passages enlarge from their inlet openings 26 to their outlet openings 28.

As shown in FIG. 4, outlet passages or openings 30 extend through the cover 14, with these openings being of rectangular cross section and arranged in a circular pattern near the periphery of the outlet 15. A stud 32 is affixed to the cover 14 in alignment with the hole 22 in the plate 18. As is shown in FIG. 2, the stud 32 extends into the hole 22. The plate is supported on a post stud 34 affixed to the cover 14, with the bearing stud 20 of the plate resting on the tip of the post stud. The circumferential edge 36 of the plate 18 tapers from a smaller diameter at the inlet side of the plate to a larger diameter at the outlet side of the plate. An annular passage 37 is formed between the edge of the plate and the inside of the housing.

A modified form of spray head is shown in FIGS. 5, 6 and 7 of the drawings. In this modified form, the plate 38 is imperforate and its outer edge 40 is tapered from a larger diameter at the inlet side to a smaller diameter at the outlet side.

Yet another modified form of spray head is shown in FIGS. 8 and 9 of the drawings. In this modification, the disc or plate 48 is also imperforate and is provided with an outer beveled edge 50 which reduces in diameter in the direction of the outlet 15. A slot 52 is formed in the beveled edge and a rib 54 formed integrally with the housing fits into the slot in the manner shown in FIG. 9.

It should be noted that in all the embodiments of the invention the plates or discs 18, 38, and 48 are supported on post studs 34 through means of bearing studs 20. This means of support for the plates and the spacing between the plates and the housing 12 provided by the annular passage 37 permits each plate to move transversely of its post stud during oscillations. It should also be noted that the points of the post studs are somewhat flattened to facilitate this transverse movement.

The use, operation and function of this invention are as follows:

The spray head 10 of this invention may be connected to a conventional water pipe (not shown) to serve as a shower head or may be connected to a hose to function as a hand spray. In either arrangement, water will enter the housing 12 through the inlet 13 and impinge on the plate or disc. In the spray head shown in FIGS. 1–4 of the drawings, the water will not only flow around the outer edge 36 of the plate and through the annular passage 37, but it will also flow through the passages 24 formed therein. Since the plate 18 is supported only on the post stud 34, and is free to move to positions located slightly off-center relative to the axis of this post stud, the flow of water around the plate and through the passages 24 will cause the plate to move off-center and to oscillate about the post stud 34. As the plate 18 oscillates, the water pressure on the inlet and outlet sides thereof will vary and the plate will, in effect, alternately pump water through the openings 30 on one side and then on the other side of the cover 14. The alternate pumping of the water will cause pulsations in the water flow out of the spray head 10.

The plate 18 will be prevented from rotation by engagement of the stud 32 with the portion of the plate surrounding the hole 22 in which the stud is seated. Oscillations of the plate will be somewhat dampened on one side by the stud 32, but the main dampening effect is caused by the flow of water between the plate and the housing which acts as a water bearing for the plate to

prevent the plate from hitting the housing during oscillations.

While the exact reason for the oscillating phenomenon is not fully understood, it is believed that several factors are involved. First, the width of the annular space 37 between the plate and the inside of the housing is important. A width of 0.010 inch has been found to be satisfactory, but this will vary depending upon the diameter of the plate. A much greater width will permit too great a quantity of fluid to flow around the plate.

Second, the plate should be mounted so that it can move laterally of the post stud during oscillations. In other words, the plate should be mounted so that it can move eccentrically about its support.

Third, the distance or spacing between the bottom of the plate and the top of the outlet cover is important. This distance or spacing determines the volume of the chamber 19 between the plate and the cover. If the volume of this chamber is too great, sufficient fluid will not be able to flow into it during oscillations of the plate. It may be that the volume of this chamber can be varied if the width of the annular spacing between the plate and the housing is also varied so that these dimensions remain generally proportional.

A fourth factor is the ratio of the area of the passages 30 in the outlet cover 14 to the area of the outlet 15. The chamber 19 between the plate and the outlet cover acts somewhat as a reservoir to hold fluid until it is pumped out by the oscillations of the plate. The fluid stored in this reservoir also exerts force against the plate to dampen its oscillations. If the area of the openings is too large, fluid will not be retained in the chamber to be pumped by the plate. The location of the passages should also be considered. When they are located near the periphery of the outlet, the maximum effect of the pumping action of the oscillating plate will be best utilized.

In the spray head of the type shown in FIGS. 5–7 there are no passages in the plate 38. In this form of the invention, as in the first form, the plate 38 is mounted so that it can move off-center or eccentrically relative to the post stud 34. The flow of water around the plate 38 and the subsequent changes in static and dynamic pressures of the water as the water passes through the annular passage 37 and into the chamber 19, brings about oscillations of the plate and the pulsating action of the water. As in the previous embodiment, the stud 32 which fits in the opening 22 in the plate prevents rotation of the plate about the post stud 34 during oscillations.

In the form of spray head shown in FIGS. 8 and 9, the rib 54 in slot 52 functions to prevent rotation of the plate 48 during its oscillations about the stud post 34.

Whereas several preferred embodiments of the invention have been shown and described, it should be understood that many modifications, changes and alterations may be made to the spray head of this invention without departing from the fundamental theme thereof. Therefore the scope of the invention should be limited only by a liberal interpretation of the appended claims.

I claim:

1. A pulsating spray head for attachment to a source of fluid under pressure including:
- a housing having an inlet and an outlet,
- a cover mounted over said outlet with said cover having openings formed therein,
- a plate located in said housing between said inlet and said cover, and
- means mounting said plate for oscillation in said housing, including generally central cooperating pivot means on said plate and cover.

2. The spray head of claim 1 further characterized in that said means mounting said plate for oscillation also permits the plate to shift transversely of said means during oscillations.

3. The spray head of claim 1 further characterized in that said plate is of generally circular configuration and has a diameter slightly less than the internal diameter of said housing to provide an annular passage between said plate and said housing.

4. The spray head of claim 1 further characterized in that a plurality of passages are provided through said plate.

5. The spray head of claim 1 further characterized in that means are provided to prevent rotation of said plate during oscillations.

6. The spray head of claim 5 further characterized in that said means to prevent rotation of said plate includes a slot member and a stud member, with said stud member riding in said slot member, with one of said members formed in said plate and the other in said cover.

7. The spray head of claim 5 further characterized in that said means to prevent rotation of said plate during oscillations includes a groove and a rib riding in said groove with one of said groove and rib being formed on said plate and the other being formed on said housing.

8. The spray head of claim 1 further characterized in that said openings in said cover are arranged in a circle.

9. The spray head of claim 1 further characterized in that said openings in said cover are arranged in a circle located radially inwardly of said annular passage.

10. The spray head of claim 1 further characterized in that the area of said openings in said cover is relatively small in relation to the area of said outlet.

11. A pulsating spray head for attachment to a source of fluid under pressure including:
- a housing having an inlet and an outlet,
- a cover mounted over said outlet with said cover having openings formed therein,
- a plate located in said housing between said inlet and said cover, and
- means mounting said plate for oscillation in said housing including a pivotal support member and pivotal pad means, with one of said pivotal support member and pad means being attached to said plate and the other being attached to said cover.

12. The spray head of claim 11 further characterized in that said pivotal support is somewhat flattened to permit transverse shifting of said pivotal pad and said pivotal support relative to each other.

13. A pulsating spray head for attachment to a source of fluid under pressure including:
- a housing having an inlet and an outlet, a cover mounted over said outlet with said cover having openings formed therein,
- a plate located in said housing between said inlet and said cover,
- means mounting said plate for oscillation in said housing, and
- means to prevent rotation of said plate during oscillation including a groove on one of said plate and housing and a rib on the other, with said rib projecting into said groove.

* * * * *