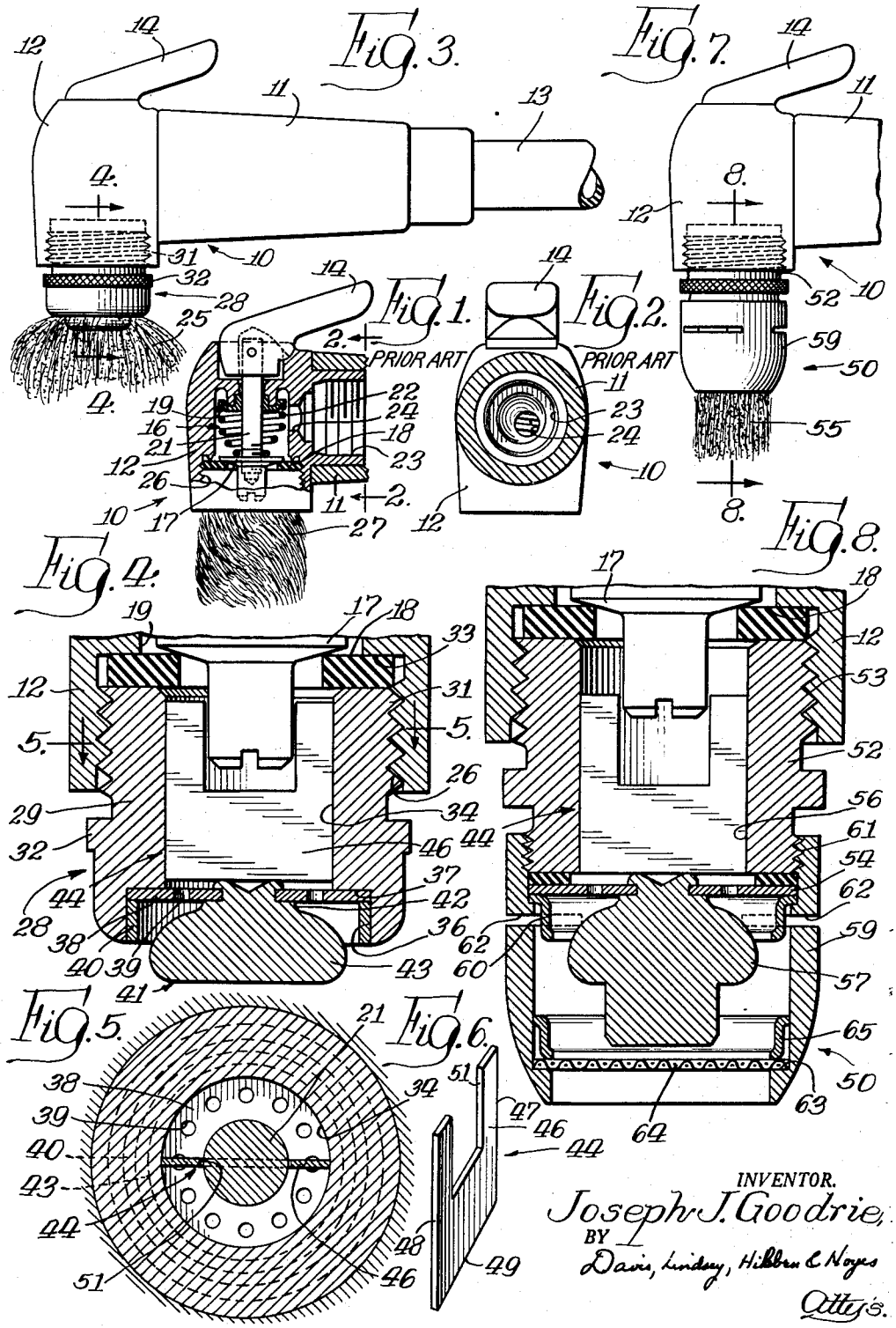
Nov. 29, 1960 J. J. GOODRIE 2,962,226

AERATING SPRAY HEAD

Filed April 3, 1957



INVENTOR.

Joseph J. Goodrie,

BY

Davis, Lindsey, Hibben & Noyes

Attys.

United States Patent Office 2,962,226
Patented Nov. 29, 1960

2,962,226

AERATING SPRAY HEAD

Joseph J. Goodrie, Chicago, Ill., assignor to Wrightway Engineering Co., Chicago, Ill., a corporation of Illinois

Filed Apr. 3, 1957, Ser. No. 650,342

1 Claim. (Cl. 239—431)

This invention relates to improvements in spray devices, and more particularly to novel aerator spray heads for kitchen sinks and the like.

Kitchen sinks are frequently provided with flexible hose and spray head arrangements which are particularly useful for rinsing dishes, vegetables, etc. The spray head of such an arrangement is usually connected by its hose to a water line through a pressure responsive diverter valve located at the main water faucet fixture of the sink. By manipulating a valve in the spray head, the pressure responsive diverter valve is actuated so that the water stream can be selectively directed either through the main faucet outlet in the ordinary manner or through the spray head for providing a water spray for rinsing purposes. Of course, other uses are also made of the diverter type spray arrangements.

Although devices of this type are highly useful for the foregoing and other purposes, their use is frequently accompanied by severe splashing of water which thereby causes inconvenience to the housewife or other users. This difficulty with splashing is especially pronounced in localities having high water pressure mains. For example, the usual domestic water pressure is of the order of 30 pounds per square inch, but there are certain areas where the pressure is as high as 70 or 80 pounds per square inch, and excessive splashing is unavoidable when conventional spray devices are used with high water pressure. Therefore, the usefulness of such spray devices is seriously impaired.

Aerating devices of various types are now widely used on water faucets and the like for producing a soft, bubbly, non-splashing stream. Furthermore, my copending United States application Serial No. 451,547, filed August 23, 1954, now U.S. Patent No. 2,858,120, issued October 28, 1958, relates to a special aerating device for use with a spray head similar to the type above discussed and which produces a divergent spray pattern of aerated water having highly desirable, non-splashing characteristics. Other aerating devices that produce coherent streams of aerated fluid having the soft, bubbly, non-splashing characteristics desired may also be used in conjunction with such spray heads.

However, I have found that when such aerating devices are used in conjunction with spray heads, as described above, the efficiency and effectiveness of the aerating devices is often somewhat less than that of similar aerators used in conjunction with ordinary water faucets or the like. I have discovered that this loss of effectiveness and efficiency results from a swirling action that is often imparted to the stream of effluent fluid by the spray head. Although this swirling action may possibly be a desirable feature in ordinary spray heads, it is responsible for a substantial reduction in the effectiveness and efficiency of aerators used in conjunction therewith.

Accordingly, a primary object of the present invention is to provide a novel aerating spray head for kitchen sinks or the like which provides substantially improved performance.

Another object of the invention is to provide a novel improved aerator that may be used in conjunction with spray heads or the like and which includes means for counteracting and inhibiting any swirling motion of the effluent fluid that may be caused by the spray head.

A further object of the invention is to provide novel structure in an aerator for inhibiting, or counteracting, swirling in effluent fluid as the same flows through the aerator.

Still another object is to provide a novel baffle for use in an aerator to accomplish the foregoing objects.

Other objects and advantages of the invention will become apparent from the subsequent detailed description taken in conjunction with the accompanying drawing wherein:

Fig. 1 is a sectional view of a typical spray head showing its valve mechanism and showing, somewhat diagrammatically, the manner in which the water emerges therefrom with the swirling or twisting motion above described;

Fig. 2 is a sectional view of the spray head taken along line 2—2 in Fig. 1;

Fig. 3 is an elevational view of the spray head including one form of an aerator embodying the present invention;

Fig. 4 is an enlarged scale vertical section of the aerator portion of the spray head taken along line 4—4 of Fig. 3;

Fig. 5 is a horizontal sectional view taken along line 5—5 in Fig. 4;

Fig. 6 is a perspective view of a preferred form of a baffle employed in the aerating spray device shown herein;

Fig. 7 is a view similar to Fig. 1 showing a spray head including an aerator of another type embodying the present invention; and

Fig. 8 is a view similar to Fig. 4 showing a vertical section of the aerator portion of the device shown in Fig. 7 and taken along line 8—8.

Referring first to Figs. 1, 2 and 3, of the drawing, an ordinary spray head of the diverter type used on kitchen sinks and the like is illustrated. The spray head is indicated generally by the numeral 10 and has an elongated main body portion 11 of tubular form and a control valve portion 12 perpendicular to the main body portion. A flexible rubber hose 13 is connected at the inlet end of the main body portion. The hose 13 is adapted to extend and be connected to a faucet fixture on the sink and communicates with a pressure responsive diverter valve therein in the usual manner. The valve portion 12 has a manually depressible finger lever or trigger 14 that extends therefrom for manipulating internal valve mechanism shown generally at 16 in Fig. 1. The valve mechanism 16 comprises a disk-like valve member 17 that cooperates with a valve seat 18 which, in this instance, is a rubber washer mounted at the outlet of the spray head in a manner to be described hereinafter. The valve mechanism is disposed in a bore 19 in the control valve portion 12, and in addition to the valve member 17, includes a rod or valve stem 21 that is pivotally connected at one end to the lever 14 and is rigidly secured adjacent its other end to the valve member 17. The valve member 17 is held in normally closed position against the seat or washer 18 by a coil spring 22 disposed around the rod 21 in the bore 19. The axis of the bore 19 is generally at right angles to the axis of the tubular portion 11 and its bore designated at 23. The bores 19 and 23 are interconnected by an opening 24 that is substantially smaller than the bore 23 and is

located off center or eccentric with respect to the central axis of bore 23, as is shown in Fig. 2. Down-stream from the valve member 17, the valve portion 12 is counter-bored larger in diameter than the bore 19 upstream therefrom and is provided with internal threads, as at 26, to accommodate various types of accessories. The lower end of the valve stem or rod 21 projects somewhat below the lower surface of the valve member 17 and into the counterbored portion. For various reasons including the eccentric location of the hole 24, the water that passes through the head 10 emerges therefrom with the swirling or rotational motion shown diagrammatically at 27 in Fig. 1.

An aerator embodying the features of the present invention, shown generally at 28 in Figs. 3 and 4, is threadedly secured to the outlet of the spray head 10. The aerator 28 is of the type shown in my aforementioned copending application Serial No. 451,547 that produces a divergent, soft, bubbly spray such as indicated at 25 in Fig. 5. The aerator includes a tubular sleeve or casing 29 having external threads 31 at its inlet end that threadedly engage the internal threads 26. A peripheral knurled portion 32 is provided around the exterior of the casing 29 in order to facilitate the connection of the casing 29 to the spray head 10. The valve seat or rubber washer 18 is clamped in position between the upper end of the tubular casing 29 and an internal shoulder 33 formed at the upstream end of the threads 26 by the counterbore.

The tubular sleeve or casing 29 has a central axial bore 34 that connects with the bore 19 and carries the effluent fluid when the valve member 17 is in open position. The lower or outlet end of the casing 29 is provided with an axial counterbore 36 that defines a shoulder 37 at the downstream end of the bore 34. Seated against the shoulder portion 37 is a disk 38 having a plurality of apertures or openings 39. The disk is held in position by a ring 40 that frictionally engages the side wall of the counterbore 36. In this case the apertures 39 are arranged in a circular pattern around the central axis of the casing as shown in Fig. 5. The total area of the apertures 39 is relatively small compared to the cross-sectional area of the bores 34 and 19 and the opening 24 and thus, in cooperation with the casing 29, the disk 38 serves to define a pressure chamber upstream therefrom. The fluid pressure that builds up in this chamber causes the stream of effluent fluid to be divided into a plurality of discrete, high velocity jets as it passes through the apertures 39. The disk 38 also cooperates with the casing 29 to define a breakup and mixing zone downstream from the disk and in the counterbore 36. A depending break-up or mixing plug, indicated generally at 41, is carried centrally below the disk 38 in the break-up and mixing zone. The plug 41 has the generally mushroom-like configuration shown in Fig. 4 with a restricted neck portion 42 immediately below the apertured disk 38 and then an abrupt, radially extending enlargement or bottom portion 43 that serves as the primary water jet breakup element. The enlarged portion 43 is disposed in alignment with and downstream from the apertures 39 so that the water jets formed by the apertures 39 will impinge thereon. The impingement of the jets on the plug 41 causes them to be broken apart, deflected in all directions, and intimately mixed with air that enters the breakup zone through the annular opening between the ring 40 and the plug 41. The side walls of the ring 40 redirect the deflected fluid, and since the break-up plug 41 projects below the casing outlet and is thus partially exposed, a divergent spray pattern is imparted to the effluent aerated fluid. For further details of the aerator device 28 as thus far described, reference is made to my aforementioned U.S. Patent No. 2,858,120.

In order to inhibit or counteract the swirling motion that is created in the spray head 10, as mentioned above,

an axially extending baffle, shown generally at 44, is disposed in the pressure chamber upstream from the apertured disk 38. A preferred form of the baffle 44 is shown in perspective in Fig. 6. In this instance, the baffle 44 comprises a thin rectangular plate 46 of non-corrosive metal or other suitable material. The width of the plate 46 is approximately equal to the diameter of the bore 34 in the casing 29 so as to provide a snug frictional fit therein. The plate 46 has straight side edges 47 and 48 and a straight bottom edge 49. Its upstream edge is cut-out or notched, as at 51, to provide clearance for the lower end of the rod or valve stem 21 when the valve member 17 is in closed position. As shown in Fig. 4, the plate 46 is disposed in the bore 34 so that its bottom edge 49 is closely adjacent the perforated disk 38 and the opposite side edges 47 and 48 are in engagement with the inner periphery of the casing. As previously mentioned, the plate 46 preferably has sufficient width to insure a press fit in the bore 34 of the casing 29 during assembly thereof so that its edges 47 and 48 frictionally engage the inner periphery of the casing and hold the plate 46 in fixed position in the bore 34 without the necessity of welding, soldering, or other such securing operations.

As shown in Fig. 5, the plate 46 forms a partition across the bore 34 along a diameter thereof and thus it divides the pressure chamber into two approximately equal parts. When thus disposed, the plate 46 presents its flat faces so that they will counteract or inhibit any swirling in the stream above the disk 38 without any marked diminution of flow through the casing.

In operation, upon depression of the trigger 14, the valve member 17 is raised from the washer or valve seat 18 and fluid is released to pass through the aerator 28, usually with a swirling action. As the swirling water reaches the pressure chamber above the disk 38 its swirling components of motion spend themselves against the faces of the baffle 44 while the axial components of motion remain unaffected thereby. Thus, the flow is, in effect, straightened out before the fluid reaches the apertures 39, and the overall effectiveness and efficiency of the aerating process in the device 28 is improved.

Figs. 7 and 8 illustrate a second form of aerator, shown generally at 50, that may be used in conjunction with a spray head of the character above described. The aerator 50 comprises the subject matter of my prior U.S. Patent No. 2,761,662 and need not be described in great detail here. This form of aerator, instead of producing a divergent spray pattern, produces a generally coherent stream of aerated water having the bubbly, non-splashing characteristics desired, e.g. as shown at 55 in Fig. 7. In general, this latter aerator has much in common with the aerator previously described and is connected to the spray head 12 by a tubular casing 52 having external threads 53 on its inlet end engaging the internally threaded spray head outlet. Like the device 28, this device 50 also is provided with a perforated disk 54 which cooperates with the inner bore 56 of the casing 52 to provide a pressure chamber on the upstream side of the disk 54 and to provide a mixing and break-up zone downstream thereform. The disk 54 also divides a stream of fluid passing therethrough into discrete jets as above described and carries a depending break-up and mixing plug 57 having a radially extending enlargement that is positioned so that the jets of fluid formed by the openings in the disk 54 will impinge thereon and be deflected, broken up, and mixed with air. The device 50 includes an outer tubular element 59 which is threadedly connected in end-to-end relation, as at 61, with the connector casing 52 and completely surrounds the break-up and mixing plug 57. Furthermore, a plurality of radial slots 62 and provided in the side wall of the element 59 to serve as the air inlets through which air is drawn into the casing for mixing with the fluid in the break-up and mixing zone. A depending skirt 60 is spaced inwardly from the bore of the tubular element

59 and extends below the slots 62 for shielding the latter and preventing splashing of water outwardly therethrough. At the outlet end of the tubular element 59 is provided an inwardly extending flange 63 that forms a restricted discharge outlet for the aerated stream. The flange 63 supports a screen 64 that further softens the stream of aerated fluid as it issues from the aerator, the screen 64 being held in place by a clamping collar 65 frictionally fitted in the bore of the element 59.

Again in order to avoid the determintal effect swirling has on the functioning of the aerating device 50, a baffle 44 is employed. As clearly seen in Fig. 8, the baffle 44 is mounted in the upper casing member 52 above the disk 54 in the same general manner as previously described in the connection with Fig. 4. As before, the baffle 44 tends to straighten out the flow path of the water stream from the spray head 10 and by counteracting any whirling or rotational condition in this stream the effective operation of the aerating device 50 is greatly enhanced.

From the foregoing, it is evident that this invention, while using the same general principles of operation employed in aerating spray heads heretofore known, in addition provides structure that counteracts and inhibits any swirling tendency in fluid passing through the aerator so that maximum effectiveness and efficiency of the aeration process is insured.

Although the invention has been described in connection with certain structural embodiments thereof, it is understood that various modifications and equivalent structure may be resorted to without departing from the scope of the invention as defined in the appended claim.

I claim:

In combination, a spray head of the type that tends to impart a swirling motion to a fluid stream passing therethrough, said spray head having an inlet and an outlet and including a valve for regulating the flow of fluid therethrough, a tubular casing having an inlet at one end connected to the outlet of said spray head and having an outlet at the other end including fluid break-up and mixing means for aerating the fluid passing therethrough, said valve being carried by a movable valve stem the lower end of which projects through the outlet of said spray head and into the inlet of said casing when said valve is in closed position, a perforated element extending transversely across said casing intermediate the inlet of said casing and said fluid break-up and mixing means, said element cooperating with said casing to define a pressure chamber at the inlet side of said element, said element also dividing the fluid stream into a plurality of small discrete jets as the fluid passes therethrough to said break-up and mixing means, and baffle structure comprising a generally rectangular plate member extending across a diameter of the chamber and extending axially from a point closely adjacent said perforated element to a point adjacent the inlet of said casing with opposite edges of said plate member in tight frictional engagement with the inner periphery of the casing along lines parallel to the longitudinal axis of the casing to divide said chamber into sections in axial flow alignment with the perforations in said element, whereby said swirling motion is counteracted, and said plate member being provided at its upstream edge with a notched portion to provide clearance for the projecting lower end of said valve stem.

References Cited in the file of this patent

UNITED STATES PATENTS

273,397	Russell	Mar. 6, 1883
883,176	Davis	Mar. 31, 1908
1,795,807	Terry	Mar. 10, 1931
1,976,062	Estep	Oct. 9, 1934
2,120,620	Mowery	June 11, 1938
2,395,621	Funke	Feb. 26, 1946
2,633,343	Aghnides	Mar. 31, 1953
2,717,614	Palivos	Sept. 13, 1955
2,738,963	Goodrie	Mar. 20, 1956
2,744,738	Hjulian	May 8, 1956