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A. AKERS

3,466,902

FLUID NOZZLE

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FIG. 1

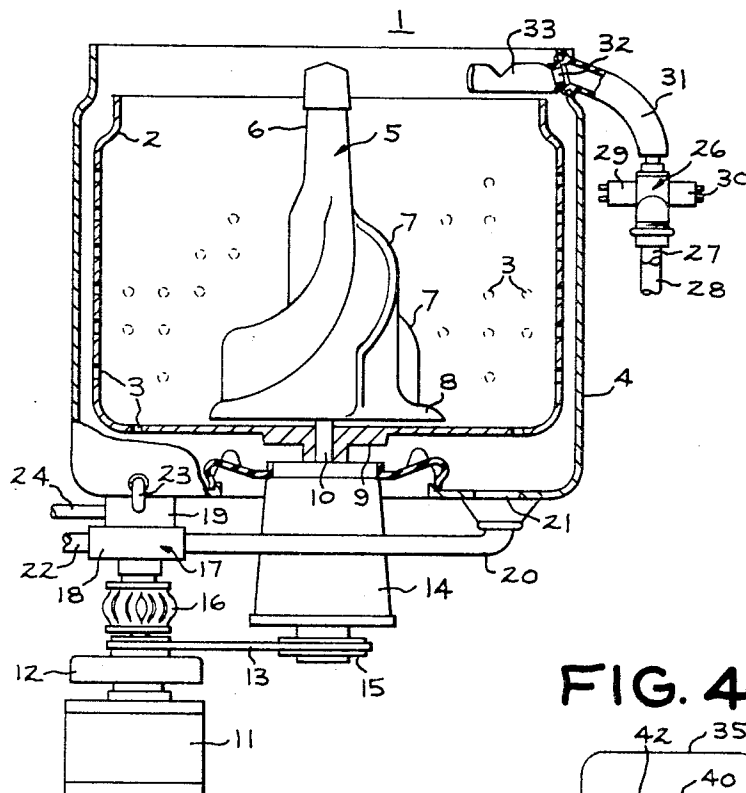


FIG. 2

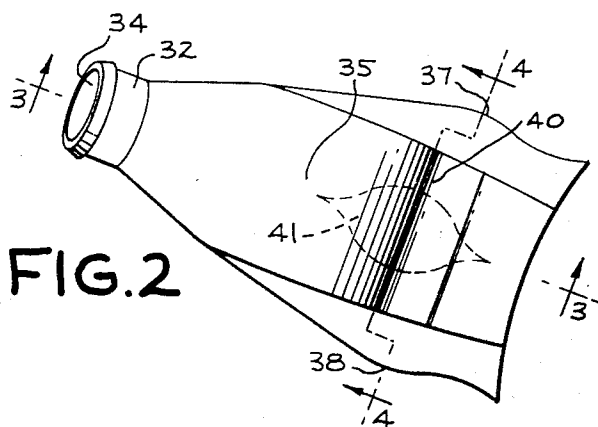


FIG. 3

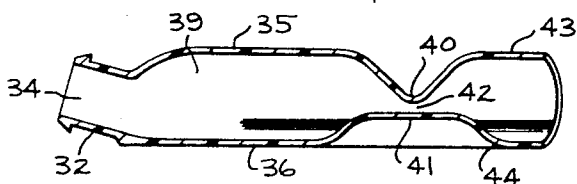


FIG. 4

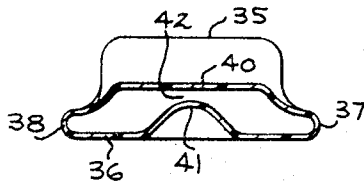
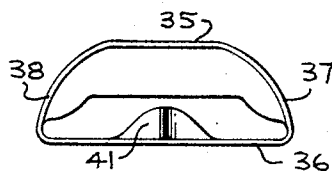


FIG. 5



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3,466,902

FLUID NOZZLE

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8 Claims

ABSTRACT OF THE DISCLOSURE

A nozzle for a stream of fluid has an expansion chamber and a limited area passage for a central portion of the stream of fluid downstream of the expansion chamber. The sides of the nozzle direct peripheral portions of the stream into its central portion downstream of passage.

BACKGROUND OF THE INVENTION

Prior art fluid nozzles for use in machines such as automatic washers have not been completely satisfactory. Many manufacturers prefer to have the inlet water for such machines enter the top of the fabric receiving basket. This prevents air from being trapped in the fabrics as the water rises in the basket. Most of these machines have relatively small loading openings and a centrally disposed agitator structure which limit the entry area for the fluid. Also, the available water pressure varies substantially from installation to installation, as well as from time to time at any particular installation. These factors give rise to many problems not entirely solved by prior art nozzles. For instance, the trajectory of the stream of inlet water should be controlled so as to project into the basket adequately at minimum pressure and not to strike the agitator structure with such force as to cause excess splashing at maximum pressure. The stream should be gentle, regardless of the pressure to prevent excess splashing at any pressure. This is particularly true in machines designed to have a filter or auxiliary wash basket mounted in the center of the main basket. Such machines are often designed for the inlet stream to strike such attachments under all normal supply pressures and there should not be excess splashing at any pressure.

Many other uses for fluid nozzles involve the desirability of controlling the force and trajectory of the stream of fluid.

An object of this invention is to provide a new and improved fluid nozzle.

Another object is to provide such a nozzle which emits a gentle stream of fluid.

A further object is to provide such a nozzle which will emit a stream of fluid of controlled trajectory despite large variations of the inlet pressure.

SUMMARY OF THE INVENTION

A nozzle for a stream of fluid includes an inlet and an expansion chamber downstream of the inlet. A limited area passage for a central portion of the stream is provided downstream of the expansion chamber. Means are provided to direct peripheral portions of the stream into its central portion downstream of the passage, thereby to provide a gentle stream of fluid of controlled trajectory despite large variations of the inlet pressure.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a partial, schematic, front elevational view of a clothes washing machine including a nozzle which incorporates one embodiment of the present invention;

FIGURE 2 is a plan view of the nozzle of FIGURE 1;

FIGURE 3 is a view taken along lines 3—3 of FIGURE 2;

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FIGURE 4 is a view taken along line 4—4 of FIGURE 2; and

FIGURE 5 is an end view of the nozzle of FIGURE 2, look into the outlet.

Referring now to FIGURE 1 of the drawing, there is shown, in schematic form, an agitator-type washing machine including a nozzle incorporating one embodiment of the present invention. The machine 1 includes a clothes basket 2 having perforations 3 over its side and bottom walls and disposed within an outer, imperforate tub or casing 4, the basket 2 and tub 4 together forming fluid and clothes containing means. The entire structure generally is mounted within a suitable appearance and protective cabinet, which, in this case, has been omitted for purposes of simplicity. At the center of basket 2 there is provided a vertical axis agitator 5 which includes a center post 6 and a plurality of curved vanes 7 extending out from the center post and connected together at their base by a flared skirt 8. Both basket 2 and agitator 5 are movably mounted. Conventionally, the basket is mounted for rotation and the agitator is mounted for some type of oscillatory movement which will effect agitation of the fabrics in the basket. In one conventional structure, basket 2 may be secured to a hollow shaft 9 and the agitator may be secured to a shaft 10 which extends up within shaft 9 in rotatable relation thereto.

Basket 2 and agitator 5 are driven from a reversible drive motor 11 through a drive system including a clutch 12 mounted on the motor shaft. Clutch 12 allows the motor to start without load and then pick up the load as it comes up to speed. A suitable belt 13 transmits power from the clutch 12 to a transmission assembly 14 through a pulley 15. Thus, depending upon the direction of motor rotation, pulley 15 of transmission 14 is driven in opposite directions. Transmission 14 is so arranged that it supports and drives both shafts 9 and 10. When motor 11 is rotated in one direction the transmission causes agitator 5 to be oscillated through shaft 10. Conversely, when the motor is driven in the opposite direction, the transmission rotates basket 2 and agitator 5 together at high speed through shafts 9 and 10 for centrifugal extraction fluid from the fabrics.

In addition to operating transmission 14 through clutch 12, motor 11 also provides a drive through a flexible coupling 16 to a pump structure generally indicated at 17, which may include two separate pump units 18 and 19, both operated simultaneously in the same direction by motor 11. Pump unit 18 has an inlet which is connected by a conduit 20 to an opening 21 formed in the lowermost point of tub 4. Pump unit 18 also has an outlet connected by a conduit 22 to a suitable drain (not shown). Pump unit 19 has an inlet connected by a conduit 23 to the interior of tub 4 and an outlet connected to a conduit 24. Conduit 24 is arranged to discharge liquid through a suitable filter (not shown) back into tub 4 and basket 2.

A valve 26 is adapted to supply hot and cold water to the machine, the valve being connected to hot and cold water sources (not shown) by conduits 27 and 28. The valve 26 has solenoids 29 and 30 so that energization of solenoid 29 permits passage of hot water through the valve, energization of solenoid 30 permits passage of cold water through the valve, and energization of both solenoids permits mixing of hot and cold water in the valve and passage of warm water therefrom through an outlet conduit 31 extending from the valve. The outlet end of the conduit 31 is received in an appropriate opening adjacent the upper edge of tub 4 and a necked portion 32 of a nozzle 33 is received in the end of the conduit 31. Thus the conduit 31 and nozzle 33 form a continuous path for the fluid emitted from the valve 26. From the

water inlet nozzle 33 the fluid passes into the container means formed by the tub 4 and basket 2.

In such machines it is advantageous for the stream of fluid exiting from the nozzle 33 to be gentle and of a predetermined trajectory, regardless of wide variations in the pressure of the stream entering the nozzle. Nozzles constructed in accordance with the present invention are designed to provide these results.

Referring now to particularly FIGURES 2 through 5 the nozzle 33 of FIGURE 1 will be described in more detail. The necked portion 32 defines an inlet 34 to the nozzle and may be of a number of configurations in order to properly connect to the conduit 31. Downstream of the inlet 34, the nozzle 33 is formed from two sets of generally opposing walls. In the particular nozzle illustrated the first of these sets includes a top wall 35 and a bottom wall 36 while the other set includes a first side wall 37 and a second side wall 38. Downstream of the inlet 34 these sets of walls diverge to form an elongated expansion chamber 39 having a cross-sectional area substantially larger than that of the inlet 34.

Downstream of the expansion chamber one set of opposed walls converge to form a limited area passage for a central portion of the stream of fluid. In the particular case illustrated the top wall is formed with an indentation or inwardly projecting portion 40 which extends substantially transverse to the stream of the fluid and the bottom wall 36 is provided with an indentation or inwardly projecting portion 41 extending generally longitudinally of the stream of fluid and in register with the indentation 40 to form a limited area passage 42. In the area of the limited area passage 42 the other set of walls, 37 and 38, continue to diverge so that the stream of fluid will be provided with a generally elongated cross-sectional configuration.

Downstream of the limited area passage 42 the top and bottom walls 35 and 36 again expand or diverge as indicated at 43 and 44. In this area the side walls 37 and 38 are most widely spaced adjacent one of the walls, in this case bottom wall 36, and generally curve inwardly toward the other wall, in this case 35.

With the nozzle configuration described a stream of fluid entering the inlet 34 will expand and slow down as it passes through the elongated expansion chamber 39. This will tend to cancel out to some substantial extent the differences in stream velocity as a result of differences in inlet pressure. Then, as the stream passes by the indentations 40 and 41 the reduction in the cross-section area will cause the stream to accelerate. The limited area passage 42 serves to further control the speed of the stream by substantially controlling the velocity of the center portion of the stream.

Downstream of this area, the redivergence of the first set of walls will then allow the stream to slow down and, the curvature of the walls 37 and 38 directs the peripheral portions of the stream over and into the controlled velocity center portion. This folding of the peripheral portions of the stream into its center further assists in establishing a uniformity of speed and cause some turbulence within the stream, which results in a gentle flow exiting from the outlet end of the nozzle.

The foregoing is a description of an illustrative embodiment of the invention, and it is applicant's intention in the appended claims to cover all forms which fall within the scope of the invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. In a washing machine including container means to receive fluid and items to be washed with the fluid and power means for effecting washing of the items; a nozzle for directing a stream of fluid into the container means, including:

(a) an inlet and an expansion chamber downstream of said inlet;

(b) a limited area passage for a central portion of the stream downstream of said expansion chamber;

(c) and means for directing peripheral portions of the stream into its central portion downstream of said passage;

(d) thereby to provide a gentle stream of fluid of controlled trajectory despite large variations of the inlet pressure.

2. A nozzle for a stream of fluid including:

(a) an inlet and an expansion chamber downstream of said inlet;

(b) a limited area passage for a central portion of the stream downstream of said expansion chamber;

(c) and means for directing peripheral portions of the stream into its central portion downstream of said passage;

(d) thereby to provide a gentle stream of fluid of controlled trajectory despite large variations of the inlet pressure.

3. A nozzle for a stream of fluid:

(a) said nozzle including an inlet;

(b) a housing extending downstream of said inlet and including two sets of opposed walls;

(c) said housing forming an enlarged expansion chamber downstream of said inlet;

(d) one set of said walls converging downstream of said expansion chamber to form a limited area passage for a central portion of the stream of fluid;

(e) the other set of said walls being formed downstream of said passage to direct peripheral portions of the stream into its central portion;

(f) thereby to provide a gentle stream of fluid of controlled trajectory despite large variations of the inlet pressure.

4. The nozzle as set forth in claim 3 wherein said other set of walls diverge in the same area as the first set of walls converge; thereby to provide the stream with a generally elongated cross-sectional configuration.

5. The nozzle as set forth in claim 3 wherein, downstream of said passage, said other set of walls are widest spaced adjacent one of said one set of walls and generally curve inwardly toward the other of said one set of walls.

6. The nozzle as set forth in claim 3 wherein one of said set of walls includes an inwardly projecting portion disposed substantially transverse of the stream of fluid and the other of said one set of walls includes an inwardly projecting portion disposed generally longitudinally of the stream of fluid and in register with said projecting portion of said one wall; thereby to provide said passage.

7. The nozzle as set forth in claim 3 wherein said one set of walls diverge downstream of said passage.

8. A nozzle for a stream of fluid:

(a) said nozzle including an inlet;

(b) a housing extending downstream of said inlet and including two sets of opposed walls;

(c) said housing forming an enlarged expansion chamber downstream of said inlet;

(d) a first of one of said sets of walls having an inwardly projecting portion disposed substantially transverse of the stream of fluid, downstream of said expansion chamber; and a second of said one of said sets of walls having an inwardly projecting portion disposed generally longitudinally of the stream of fluid and in register with said portion of said first wall to form a limited area passage for a central portion of the stream of fluid;

(e) the other of said sets of walls being divergent in the area of said passage to provide the stream with a generally elongated cross-sectional configuration;

(f) said one set of walls diverging downstream of said passage;

(g) said other set of walls, downstream of said passage, being widest spaced adjacent one of said first set of walls and generally curving inwardly toward the other

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of said first set of walls to direct peripheral portions of the stream into its central portion;
(h) thereby to provide a gentle stream of fluid of controlled trajectory despite large variations of inlet pressure.

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5 WILLIAM I. PRICE, Primary Examiner

U.S. Cl. X.R.

137—801; 239—552, 553.5, 590.5