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Buzzi et al.

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[54] **DEVICE FOR ASPIRATING AND ADMIXING ADDITIVES INTO A STREAM**

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[51] **Int. Cl.** **A62c 5/04**

[58] **Field of Search** 239/310, 311, 318, 335, 239/428.5

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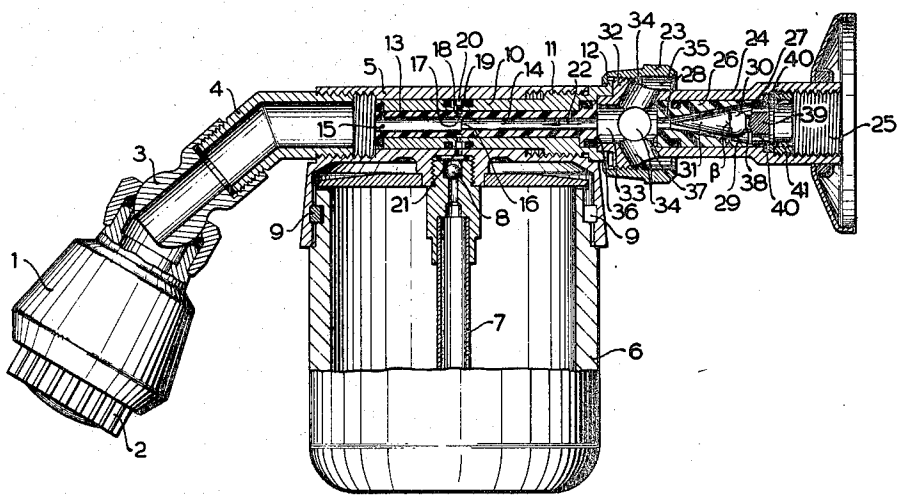
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[57] **ABSTRACT**

The additives are aspirated and admixed into a stream of liquid by means of an injector having a main bore, increasing in width in the flow direction, and suction bores communicating with the main bore. A liquid-return-flow interrupter is arranged at the inlet side of the injector and is in the form of a free jet air chamber communicating with the open air through corresponding openings and adapted to be bridged by the liquid concentrated into a fine jet by a nozzle bore. An acceleration chamber, converging in the flow direction, is arranged at the inlet end of the nozzle bore whose outlet end communicates with the free jet air chamber at the inlet side of the latter. An apertured disc is positioned at the inlet side of the acceleration chamber and is formed with a plurality of bores therethrough for flow of liquid to the acceleration chamber.

21 Claims, 6 Drawing Figures



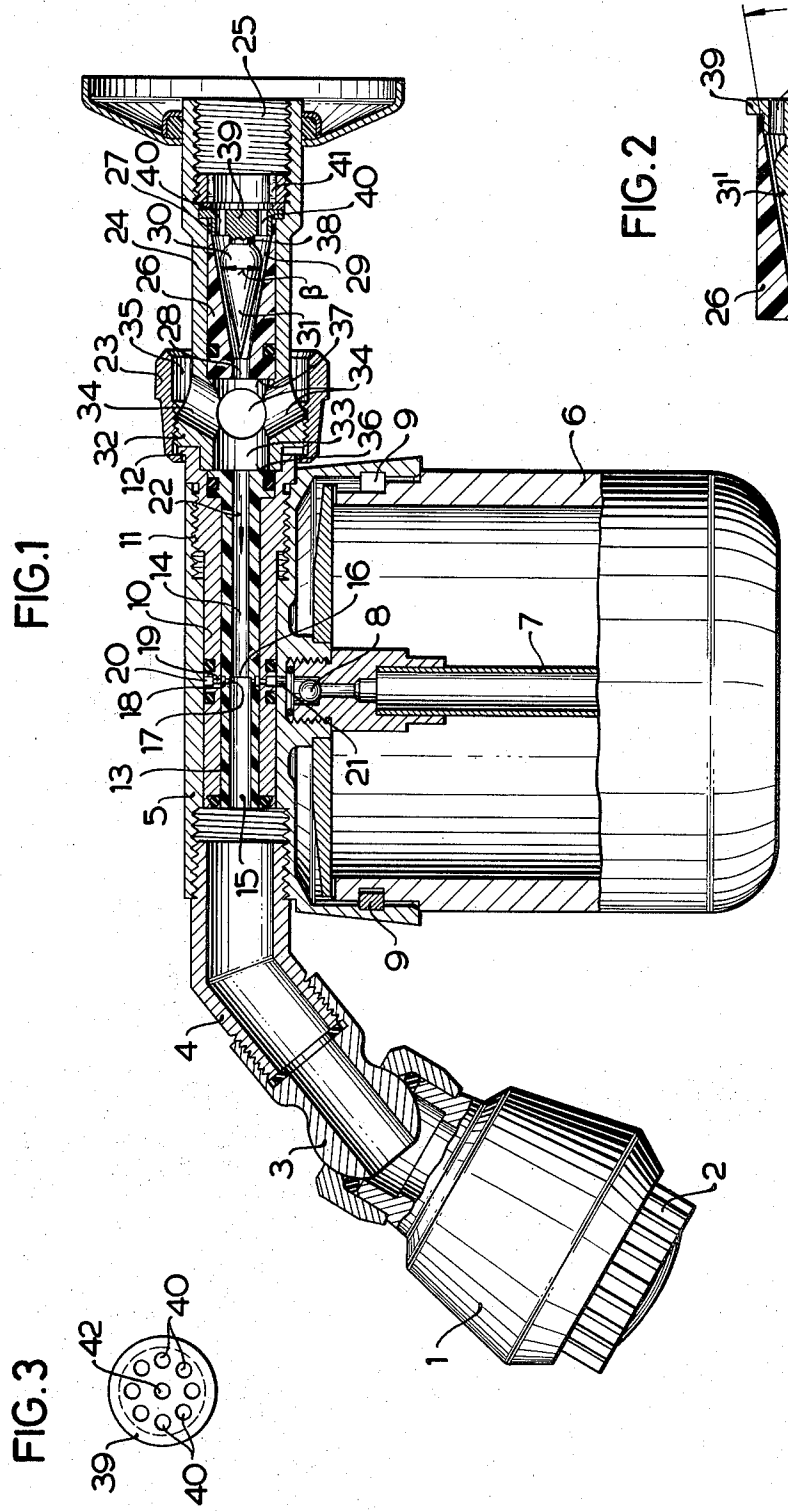


FIG.1

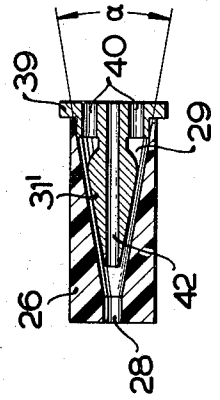


FIG.2

FIG.3

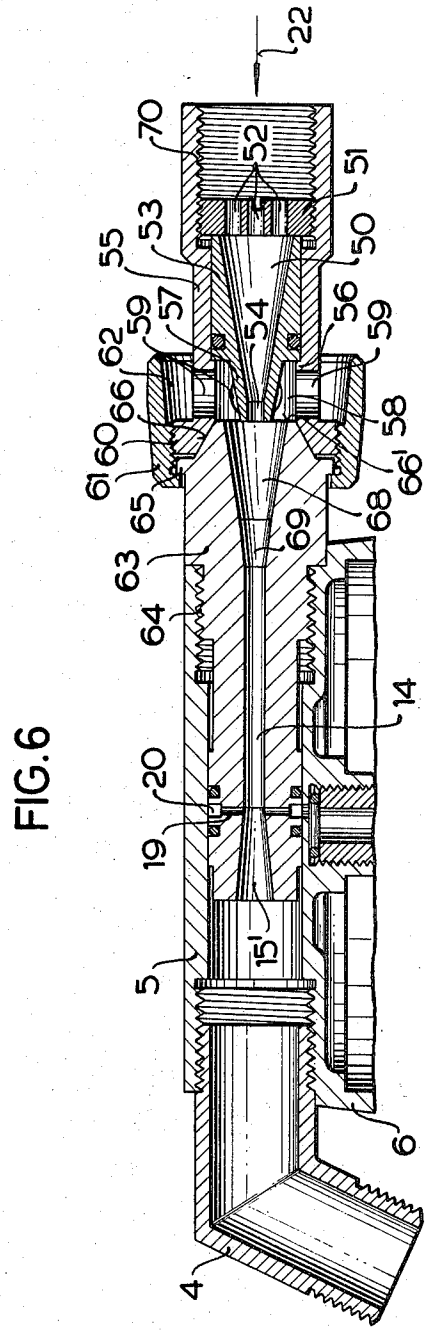


FIG.6

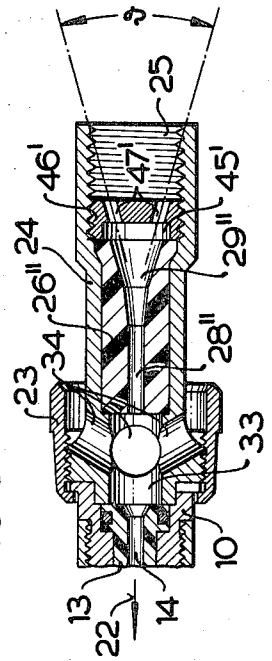


FIG.5

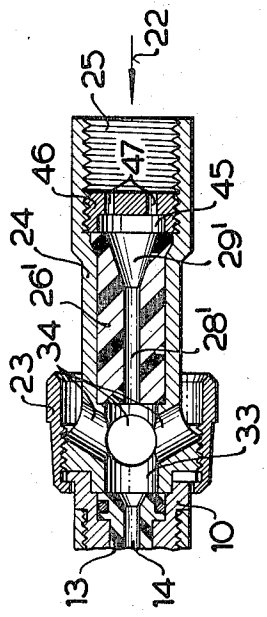


FIG.4

DEVICE FOR ASPIRATING AND ADMIXING ADDITIVES INTO A STREAM

FIELD AND BACKGROUND OF THE INVENTION

This invention is directed to a device for aspirating and admixing additives into a stream of liquid by means of an injector having a main bore increasing in width in the flow direction and suction bores communicating radially with the main bore. A liquid-return-flow interrupter, in the form of a free jet air chamber, communicating with the open air through openings, and adapted to be bridged by the liquid which is concentrated into a fine jet by a nozzle bore, is arranged on the inlet side of the injector.

Such devices serve, for example, to admix dosed quantities of liquid bath-water additives from a reservoir into the water jet of a shower. The free jet air chamber is provided to assure that, when water flows back from the shower conduit, no additive is aspirated into the pipe line so that it would pass into the main water supply system.

In a known device of this type, the means provided for the generation of the free jet, which latter has to bridge the length of the chamber with a minimum of losses, are too unfavorable to assure a perfect bridging of a length of the chamber as prescribed by the technical standards for free jet air chambers, and still obtain, on the outlet side of the chamber, a sufficiently strong suction effect. In addition, this known device permits only the use of entirely back-flow-free orifices, and is not usable with shower heads finely dividing the water jet.

SUMMARY OF THE INVENTION

The invention is directed to the problem of improving a device of the mentioned type by appropriate measures so that, on the one hand, a free jet path of at least 20 to 25 mm, which is a length complying with the present standards, bridges the free jet air chamber at normal water pressure without losses and, on the other hand, a good suction effect of the injector is assured despite the inevitable backwash when shower heads finely dividing the water jet are used.

In accordance with the invention, this problem is solved by providing an acceleration chamber, converging in the flow direction, at the inlet side of the nozzle bore which leads into the free jet air chamber, and by providing an apertured disc arranged on the inlet side of the acceleration chamber and formed with a plurality of bores or passages therethrough.

This simple measure results in a very strong acceleration and, at the same time, homogenization and suppression of turbulence of the water jet, with the effect that, even at a relatively low water pressure, an entirely loss-free bridging of a free jet air chamber, whose length complies with the present day standards, is assured and a sufficiently strong aspiration of the admixture is obtained.

In order to assure a particularly good and loss-free bridging of the free jet air chamber by the concentrated liquid jet, it is advantageous to dimension the passage bores in the apertured disc so that their diameter is smaller than their axial length. Especially in cases where the length of the acceleration chamber cannot be but very small, it is important to arrange, between the acceleration chamber and the apertured disc, a dynamic-pressure chamber whose diameter is larger than the diameter of the entrance to the acceleration chamber, and whose axial length is approximately equal to the thickness of the apertured disc.

Particularly during the phase of generation of the jet which has to bridge the free jet air chamber, for example, when turning on the water supply for the aspiration device, there is a danger or possibility that a part of the supplied liquid will accumulate in the free jet air chamber and perhaps escape and trickle off. In a preferred embodiment of the invention, this danger is eliminated by providing a chamber adjacent to the nozzle bore at the outlet end thereof and converging conically in the flow direction. The inlet side entrance diameter of this chamber is at least two times larger than the outlet side terminal diameter of a sleeve defining the nozzle bore. The chamber is at least 15 mm long, leading, on its outlet side, into a concentric bore provided in the injector, and communicating, on its inlet side, with a cavity which communicates, in turn, with the outer air through openings.

In another embodiment of the invention, the mentioned danger may be avoided by providing a laminator arranged concentrically in the acceleration chamber and also converging or tapering in the flow direction. Advantageously, the laminator is a drop-shaped or conical body with a rounded rear end, and its angle of divergence is larger than the angle of divergence of the acceleration chamber, so that the resulting decrease of the passage section is, at least approximately, continuous in the direction of the nozzle bore. This conformation advantageously permits obtaining not only a necessary flow velocity and a homogenous jet in the free jet air chamber but also a liquid flow entirely free from turbulence, which is of great importance for the bridging of free jet air chambers of greater length.

In another advantageous embodiment of the invention, the laminator is provided with a central axial through bore or passage. The generation of the jet in the nozzle bore is thereby very favorably influenced. It has been proved, by practical tests, that this measure assures a substantially increased independence of the actual or necessary water pressure in the supply pipe, so that, even with a low pressure, not only a loss-free bridging of the free jet air chamber is obtained but also a sufficient suction effect in the injector. Another advantage is the absence of the apex on the conical body of the laminator, which apex always is exposed to mechanical damage in stock keeping or, in other words, the fact that, for the time prior to its mounting into the acceleration chamber, the laminator is more immune to mechanical damage.

In accordance with another favorable feature of this embodiment, the laminator is fixed to the sleeve defining the acceleration chamber, on the inlet side concentrically and detachably, by means of a centric stud or hollow tenon, to a disc-shaped or star-shaped holder which is provided with several axially extending bores or passages therethrough.

The acceleration chamber and the nozzle bore advantageously are formed in a tubular piece which is inserted into the sleeve and which, preferably, is made of a synthetic material.

All of these measures result, on the one hand, in a less expensive and more simple manufacturing operation and assembly operation and, on the other hand, in considerable advantages with respect to maintenance

of the device, the use of synthetic material effectively reducing lime deposits or other contamination.

It is also important, for the construction of the device of the invention, that the diameter of the nozzle bore adjacent to the inlet side of the free jet air chamber is approximately equal to or only slightly larger than the diameter of the bore of the injector. The bore of the injector, in the zone of the radial suction bores through which the additive is aspirated, is widened by a step or shoulder, and the radial injector bores lead outwardly into an annular groove which communicates with the suction tube of the reservoir containing the admixture liquid. Thereby, on the one hand, a maximum suction effect is assured and, on the other hand, there is obtained the manufacturing advantage that, on the outlet side, the injector nozzle can be cylindrical.

Advantageously, the injector nozzle is formed in a tubular piece of synthetic material which is interchangeably mounted in a metallic tube. The tubular piece forming the injector nozzle, and the sleeve forming the nozzle bore, as well as the acceleration chamber, are disengageably threaded together in the zone of the free jet air chamber.

In the outlet part, beyond the inventive device, the aspirated additive intermixes with the water. Moreover, in this part, an intermediate zone, free from dynamic pressure, is formed, and a shower head, producing a certain backwash, can be connected without difficulty thereto and perform its function of dividing the water stream into a multitude of fine jets in the same efficient manner as a shower head to which the inventive device has not been connected.

An object of the present invention is to provide an improved device for aspirating and admixing additives into a stream of liquid by means of an injector.

Another object of the invention is to provide such a device producing a free jet path of at least 20 to 25mm in length.

A further object of the invention is to provide such a device producing a good suction effect of an injector in spite of the inevitable backwash when shower heads finely dividing the water jet are used.

Another object of the invention is to provide such a device including an acceleration chamber on the inlet side of a nozzle bore communicating with the inlet side of a free jet air chamber.

A further object of the invention is to provide such a device including an apertured disc arranged on the inlet side of the acceleration chamber and formed with a plurality of bore or passages therethrough.

For an understanding of the principles of the invention, reference is made to the following description of typical embodiments thereof as illustrated in the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the Drawings:

FIG. 1 is a longitudinal sectional view of a shower head with an injector nozzle, a reservoir for additives, a free jet air chamber and an acceleration chamber embodying the invention;

FIG. 2 is a longitudinal sectional view of an acceleration chamber with a laminator of a different shape;

FIG. 3 is a right hand elevation view of FIG. 2;

FIGS. 4 and 5 are longitudinal sectional views of the acceleration chamber and of an apertured disc positioned in advance thereof; and

FIG. 6 is a longitudinal sectional view of a variant of the embodiments of the invention shown in FIGS. 1 through 5.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawings, while FIG. 1 illustrates a complete shower head with a complete device embodying the invention for aspiration and admixing additives into shower-bath-water, the other figures represent only parts necessary to the explanation of the respective different embodiments.

Referring first to FIG. 1, and as alike in all other embodiments, the embodiment of FIG. 1 includes a shower head 1 with an adjustable sprinkling plate 2, shower head 1 being joined to a ball pivot 3 which is fixed to an angled pipe 4 mounted in a tubular head 5 of a liquid reservoir 6. Reservoir 6 contains liquid soap which is aspirated through a suction pipe 7 and a check valve 8 into head 5. Reservoir 6 and head 5 are interconnected with each other by a bayonet joint 9.

A metallic sleeve 10 is located in tubular head 5 of reservoir 6, sleeve 10 being secured in head 5 through a thread 11 and terminating in a flange 12. The sleeve includes a cylindrical insert 13 of synthetic material which is formed with a through-bore consisting of two parts 14 and 15 of different diameter. The diameter of the part 15, toward the outlet side, is larger than that of the part 14. The bores 14 and 15 act in the nature of an injection nozzle. At the step 16 between the two different diameter bores 14 and 15, several radially extending suction bores are formed to connect the interior of the bore 14-15 with a common annular groove 18 formed in the outer periphery of insert 13. Groove 18 communicates, through a plurality of radial bores 19 through sleeve 10, with an annular groove 20 formed on the outer periphery of sleeve 10, and further, through a bore 21 provided in the bottom part of head 5 and through check valve 8, with suction tube 7 of reservoir 6.

The shoulder 16 at the junction of bores 14 and 15 produces a sort of Venturi tube suction or aspirating effect so that, when water is flowing through bores 14 and 15 in the direction of arrow 22, liquid soap is aspirated from reservoir 6 and admixed with the water. In order not to disturb this suction effect, the inside diameter of angle pipe 4 and that of the bore through ball pivot 3 are intentionally at least twice the size of the diameter of bore 15.

A further sleeve 24 is held against flange 12 of sleeve 10 by a capscrew 23 whose inner diameter is substantially larger than the maximum outer diameter of sleeve 24. The inlet end 25 of sleeve 24 is connected to a water supply pipe which has not been shown. Sleeve 24 comprises an insert 26 of synthetic material which is of cylindrical form on its external surface and which is formed, at its inlet end, with a cylindrical bore 27 of relatively large diameter and, at its outlet end, with a cylindrical nozzle bore 28. The diameter of nozzle bore 28 is substantially smaller than that of bore 27.

The cavity 29, between bores 27 and 28, is of frustoconical form and serves as an acceleration chamber for the liquid flowing therethrough. A streamline body 31, of generally conical shape and with a hemispherical head 30, is located in chamber 29 and the distance of the conical surface of body 31, which terminates at a point, from the converging inner surface of insert 26,

increases continuously along its entire length in the direction 22 of the flow. Streamline body 31 serves as a laminator eliminating turbulence and producing an homogenous water jet issuing from nozzle bore 28 with high velocity.

At its outlet end, nozzle bore 28 leads into a free jet air chamber 33 located in the outlet part 32 of sleeve 24. Free jet air chamber 33 communicates, through several radial bores 34 and through cavity 35 formed between the outer circumference of sleeve 24 and the inner surface of cap screw 23, with the outer air. Considered in the axial direction, free jet air chamber 33 is limited on one side by the frontal surface 36 of insert 13 and, on the other side, by the frontal surface 37 of insert 26.

The structural parts are arranged so that nozzle bore 28 and bore 14 of the injector nozzle are exactly coaxial, the diameter of bore 14 being only slightly larger than that of nozzle bore 28, with the difference being about 0.1 to 0.3 mm. The distance between frontal surface 36 and frontal surface 37 is at least 20mm and must be freely bridged by the water jet discharged from nozzle bore 28 and entering bore 14. Owing to the small difference in diameter between nozzle bore 28 and bore 14, there is practically no pressure loss. This is of great importance for the suction effect desired for aspirating the liquid soap out of reservoir 6.

Streamline body 31 is fixed, by means of a stud 38, to a flange 39 formed with several passages or bores 40 through which water entering in the direction of arrow 22 passes into acceleration chamber 29. Flange 39 of streamline body 31 is secured in sleeve 24 by an annular screw 41 so that streamline body 31 is positioned, in acceleration chamber 29, exactly concentric with the latter.

Another embodiment of the streamline body is shown in FIGS. 2 and 3. In these figures, streamline body 31' differs differs from streamline body 31 merely by the fact that it is formed with a central axial bore 42 and does not converge in a point.

It should be pointed out that there is, of course, no necessity to provide bores 14 and 15, nozzle bore 28, acceleration chamber 29 and bore 27 in an exchangeable or interchangeable insert 13 or 26. On the contrary, these bores or cavities may, with the same good functional result, be formed directly in the sleeve 10 or the sleeve 24 but, in view of deposits and contamination, as well as the necessary maintenance, the embodiment illustrated in the present example is preferable.

It should furthermore be noted that the angle of divergence α of frustoconical acceleration chamber 29 is smaller than the angle of divergence β of streamline body 31 or 31', so that the passage in acceleration chamber 29 increases, in an at least approximately continuous manner, in the flow direction along the surface of streamline body 31 or 31'.

In the embodiments of the invention shown in FIGS. 4 and 5, the acceleration chambers are substantially shorter, in the axial direction, than the acceleration chamber 29 of the embodiment shown in FIGS. 1 and 2. Also, acceleration chambers 29' and 29'' of FIGS. 4 and 5, respectively, are not provided with a streamline body 31 or 31'.

In the embodiments of FIGS. 4 and 5, the same sleeve 24 is used as is used in the embodiment of FIG. 1. Consequently, with the length of the inserts 26' or 26'', of synthetic material, being predetermined, and with the acceleration chambers 29' or 29'' being shorter in the axial direction, the nozzle bores 28' or 28'' must necessarily be of greater length in the axial direction. Fortunately, the length of nozzle bores 28' or 28'' does not influence substantially the quality of the generated concentrated water jet which has to bridge the free jet air chamber 33. Instead, tests have proved that, for a nozzle bore 28' or 28'', a length which is greater than its diameter by approximately one third, as is the case with the nozzle bore 28 in FIG. 1, is entirely sufficient.

On the other hand, in the embodiments of the invention shown in FIGS. 4 and 5, it is important to provide a cylindrical dynamic pressure chamber 45 or 45', respectively, adjacent to the associated acceleration chamber 29' or 29'' on the inlet side of the latter, and enclosed by an apertured disc 46 or 46' formed with a plurality of cylindrical passages or bores 47 or 47' which are arranged in the same manner as are the bores or passages 40 in flange 39 of streamline body 31 or 31' of the embodiment of the invention shown in FIGS. 1 and 2. While the bores 47 in apertured disc 46 have axes parallel to each other, the axes of bores 47' of apertured disc 46' converge at an acute angle γ corresponding approximately to the conical convergence of the acceleration chamber 29''.

In the embodiment of the invention shown in FIG. 6, the acceleration chamber 50, which also is preceded by an apertured disc 51 with a plurality of bores or passages 52 therethrough, is also of conical form converging in the flow direction. The insert 53 in which acceleration chamber 50 and nozzle bore 54 are formed, is mounted in a sleeve 55 and pressed, by apertured disc 51 threaded into sleeve 55, against an annular rim or shoulder 56 in the interior of sleeve 55. Insert 53 is formed with a conical projection 57 in which is formed the cylindrical nozzle bore 54 and at least part of acceleration chamber 50, projection 57 extending freely into a cavity 58 of sleeve 55. Cavity 58 communicates with the outer air through openings 59. Adjacent to radial openings 59, in the flow direction 52, sleeve 55 is provided with a threaded flange 60 onto which a cap screw 61 is threaded. The inner diameter of cap screw 61 is substantially larger than the outer diameter of sleeve 55, so that an annular frontally open cavity is formed in the zone of radial openings 59 between the circumference of sleeve 55 and the inner surface 62 of cap screw 61.

Cap screw 61 joins sleeve 55 to a cylindrical body 63 which, in turn, is threaded, by means of a thread 64, into tubular head 5 of reservoir 6. Body 63, or the elements thereof, have functions similar to the functions provided, in FIG. 1, by sleeve 10, insert 13, bores 14 and 15, suction bores 17, 19 and annular groove 20. Cap screw 61 embraces an annular flange 65 of cylindrical body 63, and body 63 is centered, by its conical projection 66, in a conforming set of threaded flange 60.

Unlike those embodiments shown in FIGS. 1 through 5, where nozzle bores 28, 28' or 28'' are spaced from the frontal surface 36 by cylindrical cavity 33 in sleeve 24, in the embodiment of FIG. 6, nozzle bore 54 terminates in the plane of frontal surface 66' of body 63. The free jet air chamber is formed by a cavity 68 in cylindrical body 63 and which converges conically in the flow direction 22. The diameter of the entrance orifice of cavity 68 is approximately three times larger than the terminal diameter of projection 57 in which is formed

nozzle bore **54**, so that there is a sufficiently large communication passage between cavity **68**, in cylindrical body **63**, and the cylindrical cavity **58**, in sleeve **55**.

Between cavity **68**, which is 20 mm long in the axial direction, and bore **14**, there is provided a conical intermediate chamber **69** which receives the water jet from nozzle bore **54** and directs the same into bore **14**. Bore **14**, and also bore **15'** which, in the embodiment of FIG. **6**, is conical, are formed directly in cylindrical body **65** and not, as in the embodiments shown in FIGS. **1** through **5**, in an insert **13** of synthetic material. However, the function is the same as in the embodiments of FIGS. **1** through **5**.

It should be noted further that, as distinguished from the embodiments of FIGS. **4** and **5**, in the embodiment of FIG. **6**, no dynamic pressure chamber **45** or **45'** is provided between apertured disc **51** and acceleration chamber **50**. Instead, acceleration chamber **50** is substantially longer and its diameter, on the inlet side, is larger. However, the arrangement of the apertured disc **51** with the passages of bores **52** directly before acceleration chamber **50** is of importance in this embodiment also. Apertured disc **51**, as mentioned, is threaded into the inlet part of sleeve **55**.

Numerous test have shown that all of the described embodiments assure almost equally good operational results. However, the embodiment of FIG. **6** is preferable by reason of its simple construction. In this embodiment, it is also possible to manufacture apertured disc **51**, insert **53** and cylindrical body **63**, formed with the water-conducting bores **14** and **15**, of synthetic material, thereby largely avoiding lime deposits or similar contamination.

It furthermore is important, with respect to the thickness of the apertured disc **46**, **46'** or **51**, to dimension the passages or bores **47**, **47'** or **52**, respectively, so that their diameter is smaller than their axial length. In the present examples, the diameter of these passages or bores is half the length thereof.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. In a device for aspirating and admixing additives into a stream of liquid by means of an injector having a main bore, which increases in width in the flow direction, and suction bores communicating with the main bore, and a liquid-return-flow interrupter arranged at the inlet side of the injector, in the form of a free jet air chamber communicating with the open air through corresponding openings and adapted to be bridged by the liquid concentrated into a fine jet by a nozzle bore having a discharge end spaced axially from the inlet side of the injector by the interposed free jet air chamber, so that the fine jet traverses the free jet air chamber in laterally unconfined condition, the improvement comprising, in combination, means forming an acceleration chamber, converging in the flow direction, arranged at the inlet end of said nozzle bore which latter communicates with said free jet air chamber at the inlet side of said free jet air chamber; and an apertured disc positioned at the inlet side of said acceleration chamber and formed with a plurality of passage bores therethrough.

2. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **1**, in which the diameter of the passage bores of the apertured disc is less, by one third, than the axial length of said passage bores.

3. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **1**, including means forming a dynamic pressure chamber interposed between said acceleration chamber and said apertured disc; the internal diameter of said dynamic pressure chamber being greater than the entrance diameter of said acceleration chamber, and the axial length of said dynamic pressure chamber being substantially equal to the axial thickness of said apertured disc.

4. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **1**, including a sleeve having said nozzle bore formed therethrough; a second chamber adjacent the outlet end of said nozzle bore and having a conical internal periphery converging in the flow direction; the inlet side entrance diameter of said second chamber being at least two times larger than the outlet end terminal diameter of said sleeve; said second chamber communicating, on its outlet side, with a concentric bore forming at least part of the main bore of said injector; and means forming a cavity communicating with the outer air through openings and forming part of said free jet air chamber; said second chamber communicating, on its inlet side, with said cavity.

5. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **4**, in which the axial length of said second chamber is at least 15mm.

6. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **1**, including a laminator arranged concentrically in said acceleration chamber and having an external form converging in the flow direction.

7. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **6**, in which said laminator is a substantially conical body defining, with the interior surface of said acceleration chamber, an annular flow passage; the angle of divergence of said laminator being larger than the angle of divergence of said accelerating chamber, so that the cross-sectional area of said annular flow passage decreases at least substantially continuously in a direction toward said nozzle bore.

8. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **7**, in which said laminator is a drop-shaped body.

9. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **6**, in which said laminator is formed with an axial bore extending centrically therethrough.

10. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim **6**, including a sleeve enclosing said means forming said acceleration chamber; said laminator having a fastening element on its inlet end and being fixed in said sleeve, concentrically and detachably, by a holder engaging said fastening element and formed with a plurality of axial passages therethrough.

11. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in

claim 10, in which said fastening element is a center stud.

12. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 10, in which said fastening element is a hollow tenon.

13. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 10, in which said holder is disc-shaped.

14. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 10, in which said holder is star-shaped.

15. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 1, including a sleeve; and an exchangeable tubular piece inserted into said sleeve and having said acceleration chamber and said nozzle bore formed therein.

16. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 15, in which said tubular piece is made of synthetic material.

17. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 16, including a laminator positioned concentrically in said acceleration chamber and having an exterior shape converging in the flow direction; said laminator being made of synthetic material.

18. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 1, in which said injector main bore, adjacent the outlet side of said free jet air chamber, has a diameter approximately equal to the outlet diameter of said nozzle bore; said suction bores communicating radially with said main bore; the diameter of said main bore, in the zone of said radial suction bores, having a stepwise change to a larger diameter.

19. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 18, in which said main bore, adjacent the outlet side of said free jet air chamber, has a diameter slightly larger than the outlet diameter of said nozzle bore.

20. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 1, in which said injector comprises a tubular element of synthetic material interchangeably inserted into a metallic tube.

21. In a device for aspirating and admixing additives into a stream of liquid, the improvement claimed in claim 20, including a sleeve having said nozzle bore and said acceleration chamber formed therein; said sleeve and said metallic tube being threadedly connected to each other in the zone of said free jet air chamber.

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