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Pareja

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[54] **JET AGITATOR ASSEMBLY**

[75] Inventor: **Ramon Pareja,** Minneapolis, Minn.

[73] Assignee: **Lear Siegler, Inc.,** Santa Monica, Calif.

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[52] **U.S. Cl.** **259/4,** 137/604, 259/95

[51] **Int. Cl.** **B01f 5/02,** B01f 5/10

[58] **Field of Search** 259/4, 95, 96; 137/563, 137/604; 417/198, 151, 431; 239/142, 432, 487, 568

[56] **References Cited**

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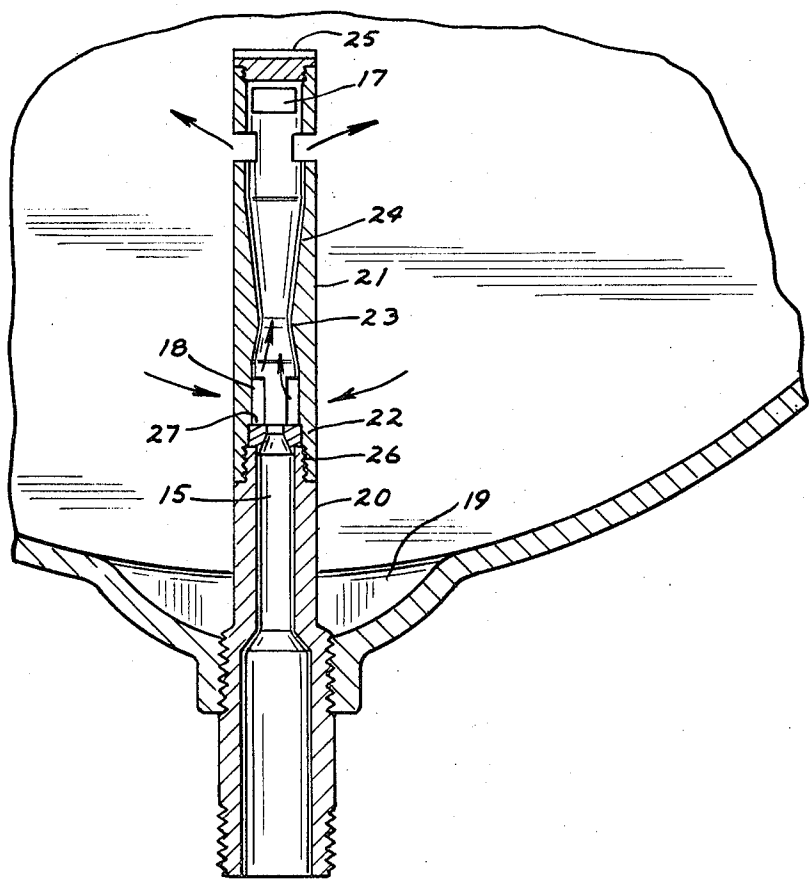
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Primary Examiner—Edward L. Roberts
Assistant Examiner—Alan Cantor

[57] **ABSTRACT**

Venturi mixer means comprising a hollow cylindrical body with a rearward inlet port and a forward outlet port, and with replaceable orifice means being disposed rearwardly adjacent said inlet port. Venturi throat means having a throat area greater than the area of the orifice means are disposed forwardly of the orifice, with a plurality of radially disposed inlet openings being formed within said body between the orifice and the throat. The forward outlet port is preferably formed of a plurality of radially disposed openings for enhancing fluid agitation.

5 Claims, 4 Drawing Figures



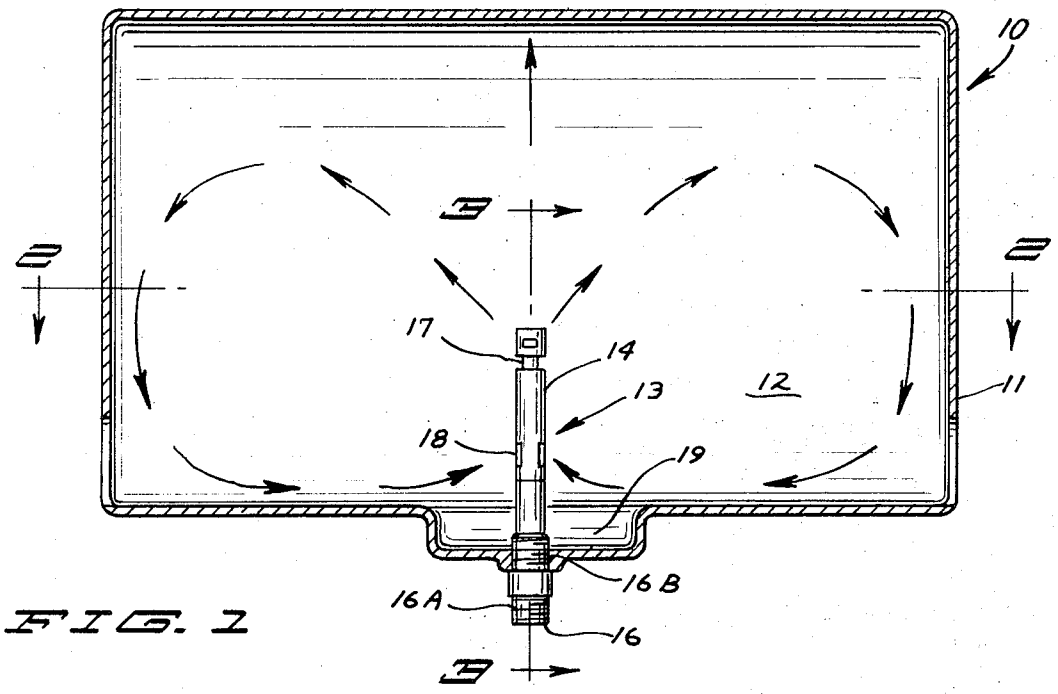


FIG. 1

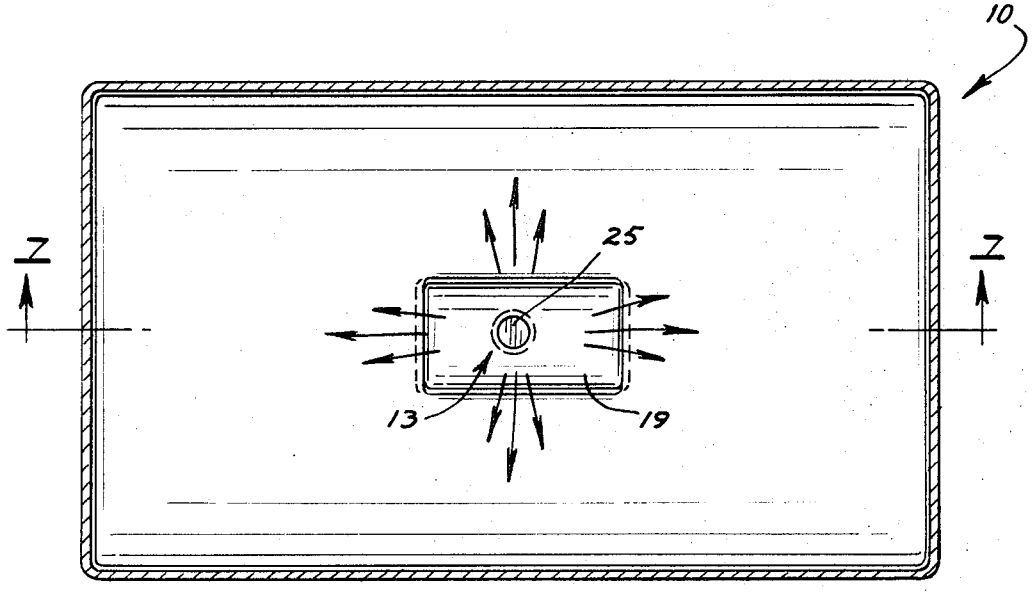


FIG. 2

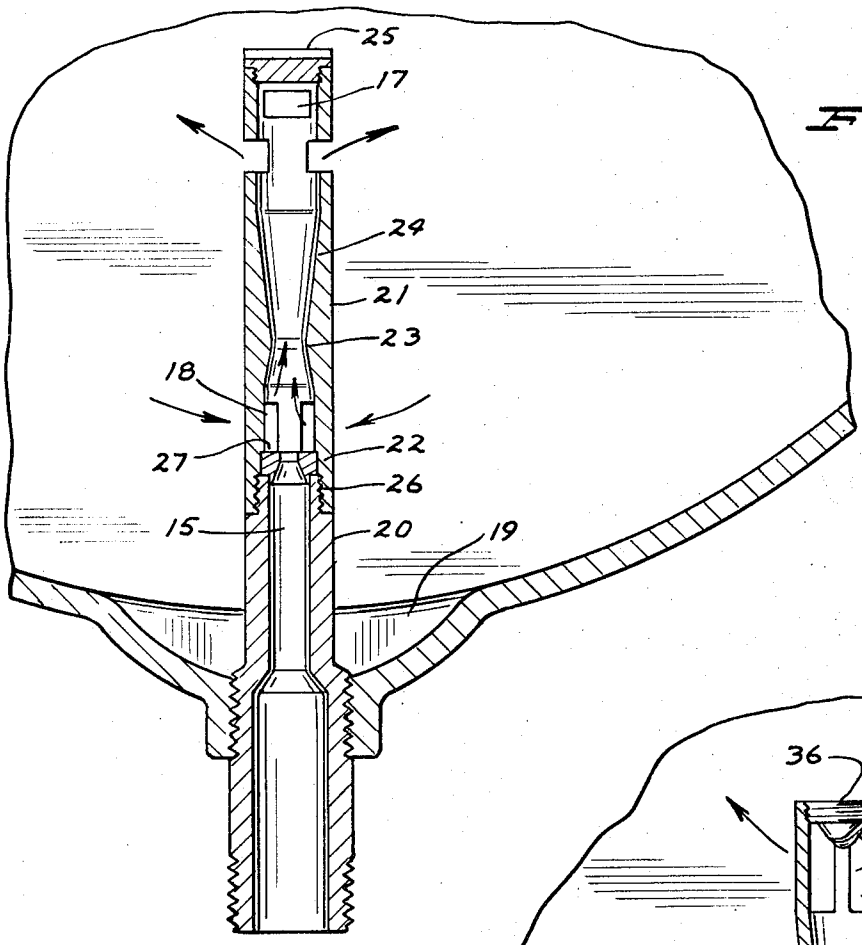

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19

FIG. 3

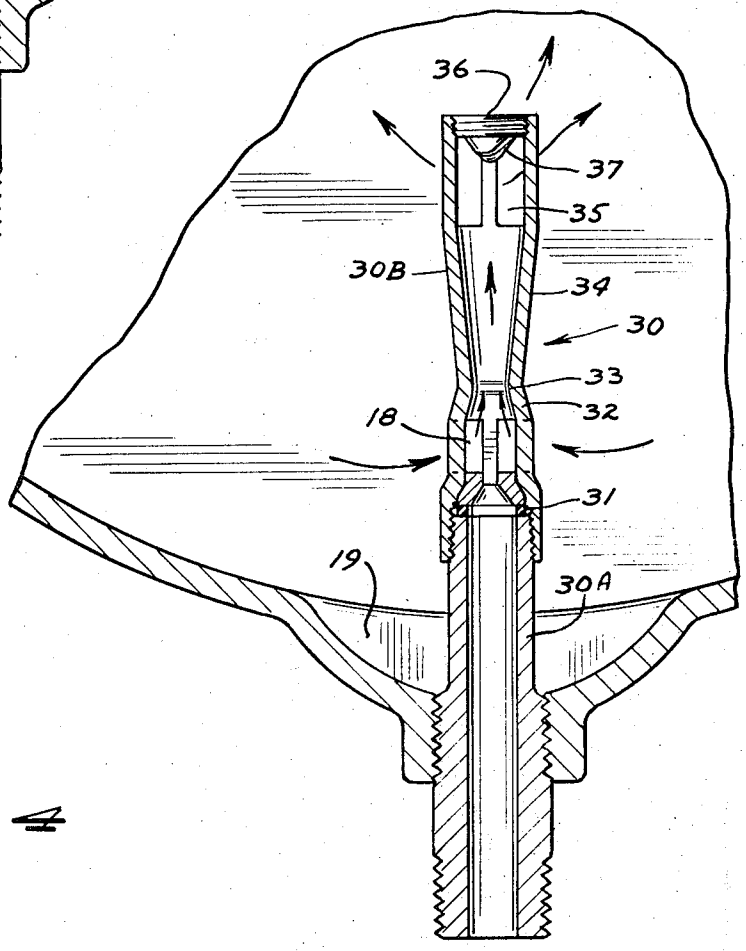

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37
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30B
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30
33
32
18
31
19
30A

FIG. 4

JET AGITATOR ASSEMBLY

BACKGROUND OF THE INVENTION

The present invention relates generally to Venturi mixer nozzles, and more particularly to Venturi mixer nozzles utilized to provide agitation within a fluid storage tank. Venturi-type mixer nozzles of the present invention are normally employed as bypass mixer nozzles in fluid systems.

Wettable powders are frequently employed for use as active ingredients for a variety of applications, including, for example, agricultural herbicides, insecticides or fungicides, as well as other industrial uses. Whenever wettable or water soluble powders are mixed into solution, there is a tendency for certain of the dissolved or suspended solid particles to settle out from the solution and collect at the bottom of the tank or container. In order to enhance the accuracy and pedictability of the application, these wettable powders or water soluble powders should be maintained in substantially homogeneous suspension at all times. In order to accomplish this result, the solution should be constantly agitated.

In a typical application, a sprayer is mounted on a vehicle, with a pump being utilized to transfer the fluid from the storage tank or vessel to the spray nozzles. Normally, agitation is provided through a bypass of a portion of the solution being pumped from the tank to the spray nozzles to allow the bypass solution to return to the vessel or tank where it is discharged through a Venturi nozzle. The Venturi nozzle will normally be positioned near the bottom of the container to assist in drawing the settling or precipitating particles and surrounding liquid into the Venturi whereupon it is discharged with force sufficient to accomplish the desired agitation.

At the present time, these Venturi nozzles normally are formed of a single self-contained Venturi unit with a bore extending through the body thereof, thus providing an inlet and an outlet. Inlet openings or "windows" are provided adjacent the Venturi throat in order to permit the surrounding fluid to enter the agitator nozzle and pass through the system, thus enhancing the agitation capability of the structure. Thus, the Venturi mixer nozzles are provided with a pressure inlet which derives its pressure from the bypass of the system pump, an aspirating inlet which is in communication with the fluid being agitated, and an outlet which accommodates flow from the combined inlets.

In order to assure the flow of liquid from that portion retained within the tank, an orifice is provided which controls the fluid flow from the pressure source.

While these systems have been generally acceptable and widely used in the past, it has been found that, pursuant to the present invention, the outlet openings in the mixer nozzle should be radially disposed, thus enhancing the agitation of the fluid within the tank, and reducing the tendency toward stratification. Furthermore, the area of the outlet ports is sufficiently large so as to accommodate the flow of fluids entering the nozzle from the pressure source as well as the aspiration source.

SUMMARY OF THE INVENTION

In the structure of the present invention, the nozzle body is preferably formed in two axially elongated segments, with the orifice being retained in position against the shoulders of a counterbore formed in one of the segments.

Therefore, it is a primary object of the present invention to provide an improved hollow cylindrical Venturi mixer nozzle having an inlet at one end, an outlet at the other end, and an aspirating inlet therebetween, with the outlet being formed of a plurality of radially spaced openings.

It is a further object of the present invention to provide an improved elongated cylindrical Venturi mixer nozzle having a body formed of a pair of mating segments having a bore extending therethrough, and with counterbore means being formed adjacent the ends of one of the segments for providing retention shoulders to receive and retain a flow controlling orifice therewithin, and with the outlet from the system being in the form of radially spaced openings.

It is yet a further object of the present invention to provide an improved Venturi mixer means which is adapted to be received within a storage tank or vessel, and when in operation, provide agitation for the system to avoid stratification of the retained liquid.

Other and further objects of the present invention will become apparent to those skilled in the art upon a study of the following specification, appended claims, and accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of the improved Venturi mixer nozzle means of the present invention, with the nozzle means being shown mounted within a typical storage vessel, and with the storage vessel being illustrated in section, the section being taken along the line and in the direction of the arrows 1—1 of FIG. 2;

FIG. 2 is a horizontal sectional view taken along the line and in the direction of the arrows 2—2 of FIG. 1;

FIG. 3 is a detail sectional view of the nozzle structure illustrated in FIG. 1, and on a slightly enlarged scale, with a portion of the storage tank being broken away; and

FIG. 4 is a view similar to FIG. 3, and illustrating a slightly modified form of the Venturi mixer nozzle means of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With attention being directed to FIGS. 1 and 2 of the drawings, the agitation system generally designated 10 is disposed within the tank 11, the interior of which is shown at 12. The Venturi mixer nozzle means generally designated 13 is shown mounted within the tank 11, the nozzle means including a body 14 with a throughbore 15 extending therethrough. Bore 15 is in communication with inlet 16 and each pair of arcuately and axially spaced outlet ports 17—17. A plurality of inlet openings 18—18 are arranged along the body 14 of the Venturi mixer nozzle means 13, with the details of these openings being discussed more fully hereinafter. A sump dish 19 may be provided, as indicated.

As is illustrated in FIGS. 1 and 3, pipe-to-hose coupling threads are provided as at 16A, and a threaded shank portion is provided at 16B in order to threadedly engage the body 14 of Venturi mixer nozzle means 13 within the threaded opening formed in the wall of tank 11. A spacer collar area is disposed between the two

threaded portions in order to assist in the mounting of the nozzle **13** within the tank.

Attention is now directed to FIG. **3** of the drawings for a more complete description of the interior of Venturi mixer nozzle means **13.** In this connection, the body **14** consists of a pair of individual axially aligned and coupled segments **20** and **21,** with orifice **22** being disposed adjacent the juncture point of the segments **20** and **21.** Venturi throat **23** is disposed forwardly of orifice **22,** with expansion zone **24** extending between throat **23** and each pair of arcuately and axially spaced outlet ports **17—17.** Plug **25** is threadedly engaged within the forward tip end portion of segment **21,** as is illustrated in FIG. **3.**

It is appreciated, therefore, that body **14** provides an elongated hollow cylindrical body with bore **15** extending therethrough. Orifice **22** has a certain first predetermined area which is small relative to the area of Venturi throat **23.** The Venturi throat is of larger area in order to accommodate the greater flow which will pass through throat area **23,** this flow including the main pressure flow entering inlet **16,** as well as the aspiration flow entering inlet openings **18—18.**

In a typical operational embodiment for agricultural spray systems, the orifice **22** will have an area suitable for accommodating flow of 7 gallons per minute, with the throat **23** having an area suitable for accommodating flows of from 17 to 20 gallons per minute. The additional 10 to 13 gallons per minute is obtained for the system through inlet openings **18—18,** with the outlet openings **17—17** having an area suitably larger than the area of throat **23** for readily accommodating the total outlet flow of 17 to 20 gallons per minute. With continued attention being directed to FIG. **3** of the drawings, it will be seen that segments **20** and **21** are threadedly engaged with each other in and along mating threads **26.** Orifice **22** is appropriately received within counterbore **27** formed within segment **21.**

In this manner, orifice **22** may be readily removable from the system, and retained in place by the shoulders of counterbore **27** and the forward tip end of segment **20.** If it is desired to change orifices so as to accommodate other flow volumes, this can be accomplished without significant difficulty.

Attention is now directed to FIG. **4** of the drawings wherein a modified Venturi mixer nozzle means is illustrated. Accordingly, the nozzle means generally designated **30** has a pair of body segments **30A** and **30B,** coupled together as indicated, and having a fluid transmitting bore extending therethrough. Orifice **31** is interposed in the bore adjacent the junction between segments **30A** and **30B,** with a Venturi being formed in the bore forwardly of orifice **31.** The Venturi means includes a contraction or compression zone **32,** a throat zone **33,** and an expansion zone **34.** As is indicated, inlet ports **18—18** communicate with the main bore through the walls of segment **30B,** the inlet openings being disposed between the orifice **31** and the Venturi throat **33.** Outlet ports, radilly disposed, are provided as at **35,** with the through-bore being closed by means of threaded plug member **36.** It will be observed that plug member **36** has a plurality of generally helically arranged slots or grooves **37** formed therewithin, these slots or grooves extending radially in a direction which is counter to that of the threads for plug **36** in order that the force which the fluid exerts on plug **36** will tend to tighten the plug member within the confines of the segment **30B.** This groove has been found to enhance the swirling effect of the fluid as it leaves the nozzle through outlet openings **35—35,** the swirling effect enhancing agitation and reducing the tendency toward stratification.

In a typical operational environment, for agricultural spray purposes, a pump is provided which delivers approximately 12.5 gallons per minute at 50 psi. Total capacity for all of the nozzles on the spray boom is recommended at 9 gallons per minute, with the extra output from the pump being available for agitation. With 40 psi spraying pressure, a 5/32 inch orifice will be employed, while if 30 psi spraying pressure is utilized, a 3/16 inch orifice will be utilized. In the system illustrated, the area of the inlet openings **18—18** is preferably approximately 0.38 square inch, with the area of the outlet openings **17—17** totalling approximately 0.56 square inch. The diameter of the Venturi throat, such as throat **23,** is preferably approximately 11/32 inch in the example given.

In the example given, sufficient agitation is available to accommodate storage tanks or vessels having capacities up to about 100 gallons, it being recommended that additional Venturi mixer nozzle means be employed for large volume tanks.

I claim:

1. Venturi mixer means comprising:

a. an elongated hollow cylindrical body with an axial bore formed therewithin and having rearwardly disposed inlet port means and forwardly disposed outlet port means with said axial bore terminating in a generally closed forward end;

b. orifice means of predetermined area, and seating means within said body for positioning said orifice means rearwardly within said bore and adjacent said inlet port;

c. throat means of area greater than said predetermined area mounted within said hollow cylindrical body and disposed within said bore and providing a restriction for flow, and including a forward expansion chamber between said throat means and said outlet port;

d. a plurality of radially disposed inlet openings formed through said hollow cylindrical body and being positioned between said orifice means and said throat means and communicating with said bore;

e. said forward outlet port means being a plurality of radially disposed openings through the wall of said hollow cylindrical body, with the combined area of said radially disposed openings forming said forward outlet port being greater than that of said throat means.

2. The Venturi mixer nozzle means as defined in claim **1** being particularly characterized in that said orifice means is a disc removably secured within said hollow cylindrical body.

3. The Venturi mixer nozzle means as defined in claim **1** being particularly characterized in that said hollow cylindrical body comprises mating forward and rearward segments.

4. Venturi mixer means comprising:

a. an elongated hollow cylindrical body with an axial bore formed therewithin and having rearwardly disposed inlet port means and forwardly disposed outlet port means;

b. orifice means of predetermined area, and seating means within said body for positioning said orifice means rearwardly within said bore and adjacent said inlet port;

c. throat means of area greater than said predetermined area mounted within said hollow cylindrical body and disposed within said bore and providing a restriction for flow, and including a forward expansion chamber between said throat means and said outlet port;

d. a plurality of radially disposed inlet openings formed through said hollow cylindrical body and being positioned between said orifice means and said throat means and communicating with said bore;

e. said forward outlet port means being a plurality of radially disposed openings through the wall of said hollow cylindrical body, and including arcuately and axially spaced openings.

5. Venturi mixer means comprising:

a. an elongated hollow cylindrical body with an axial bore formed therewithin and having rearwardly disposed inlet port means and forwardly disposed outlet port means, said bore terminating in a forwardly disposed plug, said plug having a rearwardly directed conical projection extending into said bore to an axial position adjacent said forward outlet port means, said conical projection having a helical groove formed within the surface thereof;

b. orifice means of predetermined area, and seating means within said body for positioning said orifice means rearwardly within said bore and adjacent said inlet port;

c. throat means of area greater than said predetermined area mounted within said hollow cylindrical body and disposed within said bore and providing a restriction for flow, and including a forward expansion chamber between said throat means and said outlet port;

d. a plurality of radially disposed inlet openings formed through said hollow cylindrical body and being positioned between said orifice means and said throat means and communicating with said bore;

e. said forward outlet port means being a plurality of radially disposed openings through the wall of said hollow cylindrical body.

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