United States Patent

Johnson

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[54] IN-LINE FUEL FLOW RESTRICTING AND FILTER ASSEMBLY

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[52] **U.S. Cl.** **210/446,** 138/26, 138/30, 138/45

[51] **Int. Cl.** **B01d 35/00**

[58] **Field of Search** 138/26, 30, 40, 45; 210/435, 210/436, 446

[56] **References Cited**

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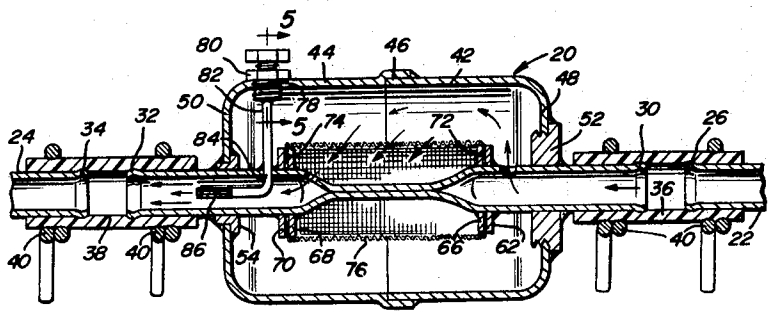
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[57] **ABSTRACT**

A tubular body adapted to be interposed in a fuel flow line and having a passage formed longitudinally therethrough. A mid-portion of the passage within the body has a flow restrictive zone for reducing fluid pressure pulses and the tubular body includes a zone of increased cross-sectional area intermediate the inlet end of the passage and the flow restrictive zone of the passage for further reducing fluid pressure pulses. Also, one form of the invention provides a pair of spaced flow restrictive zones intermediate the inlet and outlet ends of the passage with the zone of increased cross-sectional area disposed between the pair of flow restrictive zones. Finally, each of the tubular bodies has a filter body through which fuel flowing through the tubular body must pass and a check valved air inlet for ambient air is provided and has its outlet end disposed in position subject to reduced fluid pressures in response to fuel flow through the tubular body.

13 Claims, 12 Drawing Figures



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SHEET 1 OF 2

Fig. 1

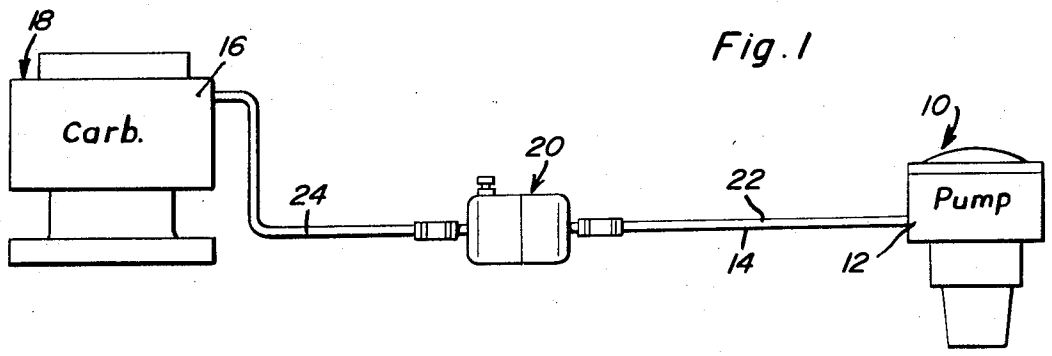


Fig. 2

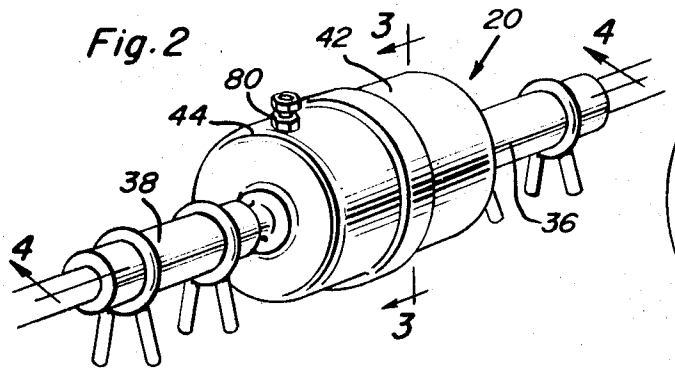


Fig. 3

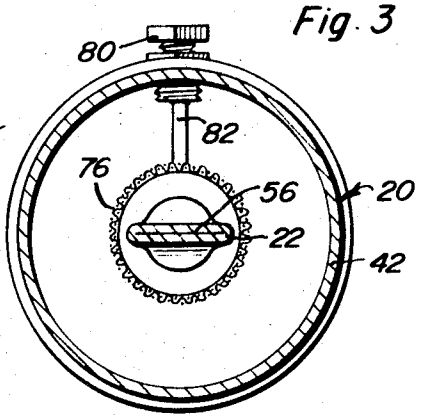


Fig. 4

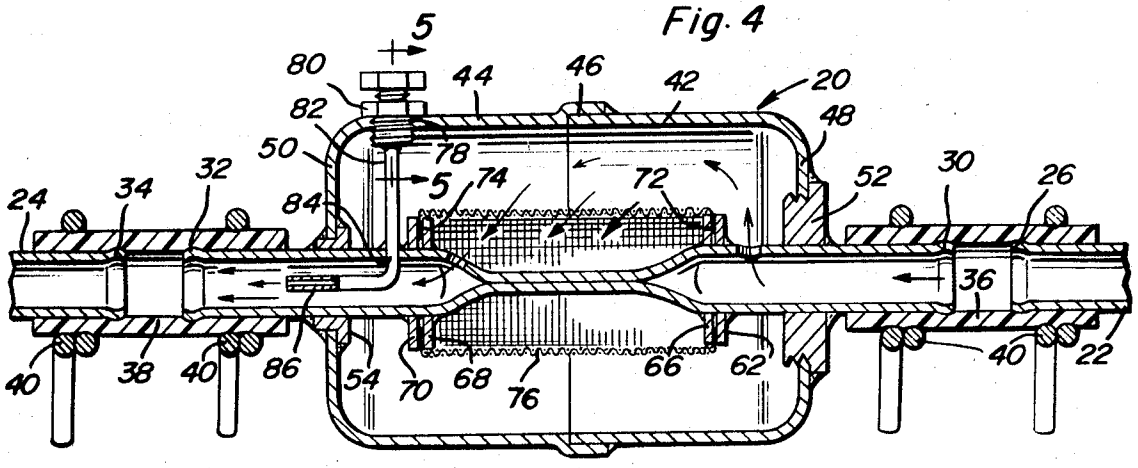


Fig. 5

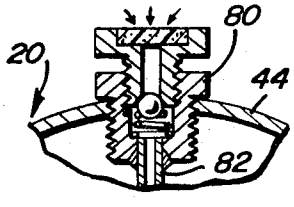
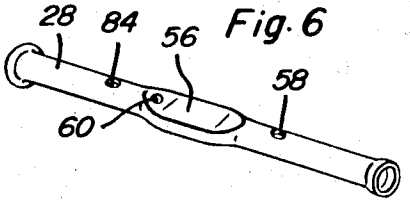


Fig. 6



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Fig. 7

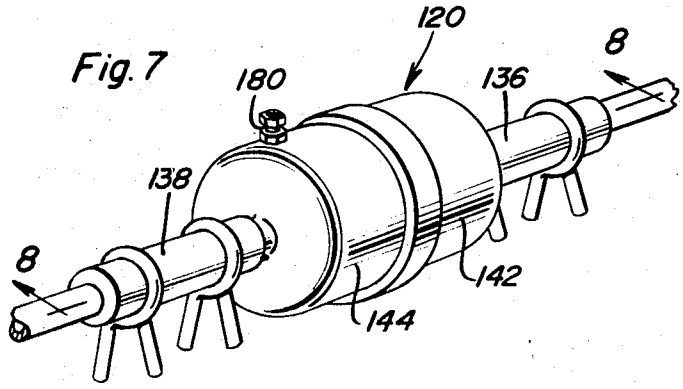


Fig. 9

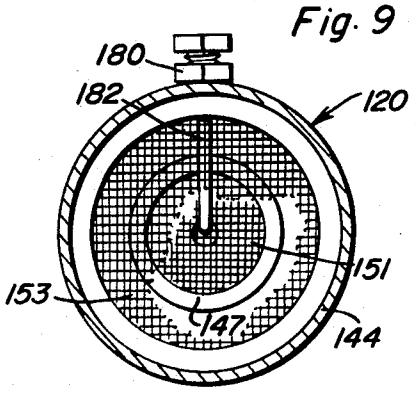


Fig. 8

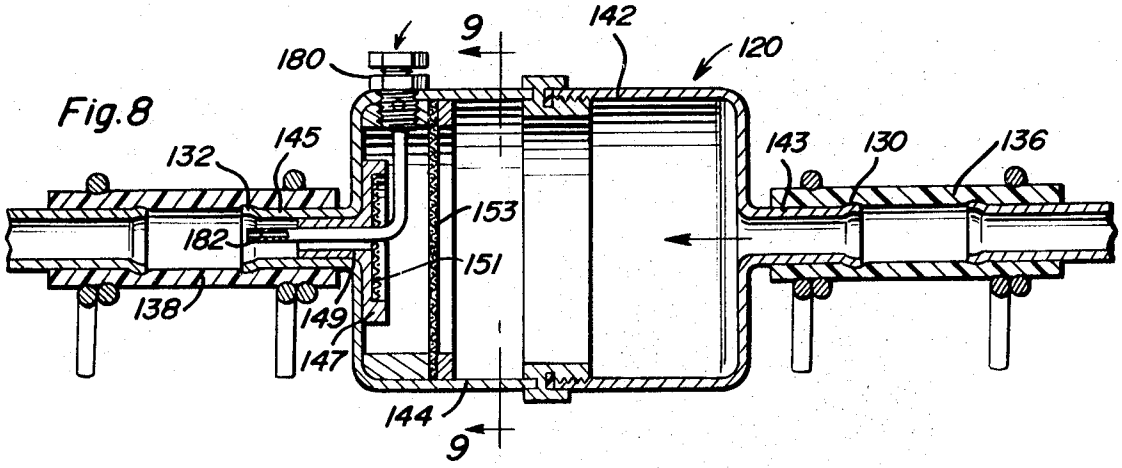


Fig. 10

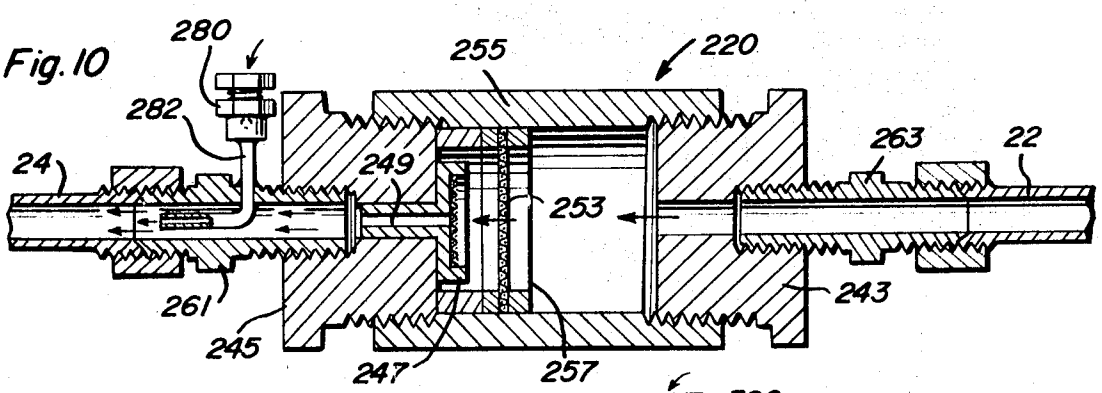


Fig. 11

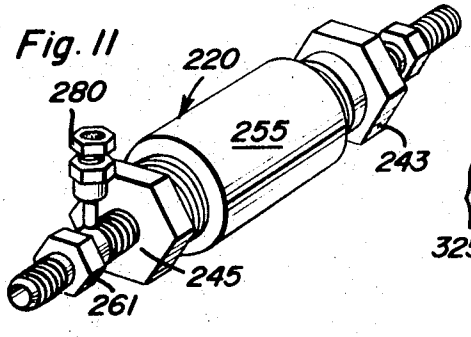
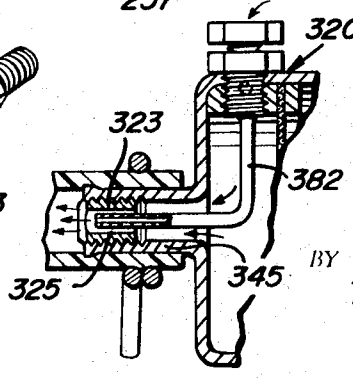


Fig. 12



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IN-LINE FUEL FLOW RESTRICTING AND FILTER ASSEMBLY

The flow restricting and filter assembly of the instant invention has been specifically designed to reduce pressure pulses of liquid fuel intermediate a supply pump and a carburetor or other air and fuel mixing device. Also, the assembly has further been designed to limit and thereby reduce maximum fuel pressures received at the inlet of an automotive carburetor from the fuel pump of the associated vehicle when the vehicle is operating at high speeds, but not under full throttle conditions.

Conventional mechanical fuel pumps provided on present day automobiles and other motor vehicles are engineered so as to be capable of delivering at least the maximum volume of fuel required by an automotive engine while operating at high speeds and under full throttle conditions. Further, most fuel pumps are capable of delivering fuel amounts in excess of the maximum fuel which might be required at an associated carburetor with the result that when the vehicle is operating at highway speeds and under normal partial throttle conditions required to obtain such highway speeds on level ground and excess volume of fuel is pumped to the carburetor under excess pressures. This excess volume of fuel at higher pressure than that required by the carburetor results in the pumped fuel forcing its way past the float valve or valves of the carburetor which attempt to throttle the flow of fuel into the float bowl as the level of fuel in the float bowl reaches the desired level. This condition of fuel being forced past the float valves results in the level of fuel within the float chamber or chambers being excessive and this is turn results in a richer air and fuel mixtures than is required and a resultant reduction in gas mileage and exhaust emission of smog producing materials.

It is accordingly the main object of this invention to provide an apparatus which will be capable of restricting the flow of fuel to the carburetor at a point upstream from the carburetor so as to reduce or eliminate excess fuel levels within the associated carburetor float chamber or chambers.

Another object of this invention, in accordance with the immediately preceding object, is to provide means for restricting the flow of fuel to an associated carburetor in a manner such that pressure pulses of fuel discharged from the associated fuel pump to the carburetor will be reduced en route to the carburetor. Still further, another object of this invention is to provide a means by which pressure pulse absorbing and liquid flow reducing bubbles of air may be admitted into the fuel line to the associated carburetor in response to rapid flow of fuel through the fuel line.

Still another object of this invention is to provide an apparatus in accordance with the preceding objects and which will also function to filter the flow of fuel therethrough.

A final object of this invention to be specifically enumerated herein is to provide a fuel flow restricting and filter assembly in accordance with the preceding objects which will conform to conventional forms of manufacture, be of simple construction and easy to install so as to provide a device that will be economically feasible, long lasting and relatively trouble free in operation.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIG. 1 is a schematic view of the instant invention interposed in a fuel line extending between a fuel pump and an associated carburetor;

FIG. 2 is a perspective view of that portion of the fuel line in which the flow restricting and filter assembly of the instant invention is disposed;

FIG. 3 is an enlarged transverse sectional view taken substantially upon the plane indicated by the section line 3—3 of FIG. 2;

FIG. 4 is a longitudinal sectional view on somewhat of an enlarged scale taken substantially upon the plane indicated by the section line 4—4 of FIG. 2;

FIG. 5 is an enlarged fragmentary transverse sectional view taken substantially upon the plane indicated by the section line 5—5 of FIG. 4;

FIG. 6 is a perspective view of the central tube portion of the flow restricting and filter assembly illustrated in FIGS. 1 through 5;

FIG. 7 is a perspective view similar to FIG. 2 but illustrating a modified form of flow restricting and filter assembly;

FIG. 8 is an enlarged fragmentary longitudinal sectional view taken substantially upon the plane indicated by the section line 8—8 of FIG. 7;

FIG. 9 is a transverse sectional view taken substantially upon the plane indicated by the section line 9—9 of FIG. 8;

FIG. 10 is a longitudinal sectional view similar to FIG. 8 but of a third form of the instant invention;

FIG. 11 is a perspective view of the assembly illustrated in FIG. 10 and on somewhat of a reduced scale; and

FIG. 12 is a fragmentary longitudinal sectional view similar to the left hand portion of FIG. 8 and illustrating a fourth form of the instant invention.

Referring now more specifically to the drawings the numeral 10 generally designates a mechanical fuel pump including an outlet 12 with which the inlet end of a discharge line 14 is communicated. The outlet end of the discharge line opens into the interior of the flow chamber 16 of a carburetor referred to in general by the reference numeral 18 and a first form of the fuel flow restricting and filter assembly of the instant invention is generally referred to by the reference numeral 20 and interposed in the line 14 which includes a first section 22 upstream from the assembly 20 and a second section 24 downstream from the assembly 20.

With attention now invited more specifically to FIG. 4 of the drawings it may be seen that the outlet end of the section 22 includes a formed bell end 26 and that the assembly 20 includes a through tube 28 including a bell end 30 on its inlet end and a bell end 32 on its outlet end. Further, the inlet end of the section 24 includes a bell end 34 and a pair of flexible tubing sections 36 and 38 have their opposite ends clamped over the bell ends 26 and 30 and the bell ends 32 and 34 by means of suitable clamps 40. In this manner, the assembly 20 is interposed in the discharge line 14.

The assembly 20 includes opposite end inlet and outlet sections 42 and 44 which are telescopingly and sealing joined together at their adjacent ends as at 46 and the remote ends of the sections 42 and 44 include integral annular end walls 48 and 50 through which suitable fittings 52 and 54 are secured. The opposite ends of the tube 28 are secured through the fittings 52 and 54 and the central portion of the tube 28 is flattened as at 56 so as to prevent the flow of liquid fuel through the central portion thereof. However, a small diameter aperture 58 is formed in the tube 28 upstream from the flattened portion 56 and a second small diameter aperture 60 is formed in the tube 28 downstream from the closed portion of the flattened area 56.

A first pair of washers 62 and 66 are secured in slightly axially spaced relation to the tube 28 between the aperture 58 and the flattened portion 56 and a second pair of washers 68 and 70 are secured to the tube 28 between the aperture 60 and the fitting 54. Annular end walls 72 and 74 of a cylindrical filter element 76 are anchored between the washers 62 and 66 and between the washers 68 and 70 and therefore all fuel passing out through the aperture 58 and into the sections 42 and 44 before passing in through the aperture 60 must pass through the filter element 76.

The section 44 includes a threaded radial bore 78 in which an adjustable and check valved air inlet fitting 80 is threadedly engaged and a small diameter tube 82 extends from the outlet end of the fitting 80 into the interior of the tube 28 through an aperture 84 formed therein and terminates in a downstream directed end portion 86 which opens outwardly into the tube

28 downstream from the aperture 84 and upstream from the bell end 32.

In operation, as fuel is pumped from the pump 10 to the carburetor 16, the fuel passes first through the aperture 58 which has the effect of reducing or restricting the fuel flow and as the fuel passing through the aperture 58 opens into the section 42 of the assembly 20, pulsations of pressure in the fuel flowing through the assembly 20 are reduced. The fuel then passes through the filer element 76 and through the aperture 60 thereby further reducing any pulsations in fuel pressure. However, should the flow of fuel through the assembly 20 approach the maximum, a reduced pressure will be formed in the outlet end of the tube 82 by the flow of fuel in the tube 28 there past and air will be drawn in through the air inlet fitting 80 and discharged into the flow of fuel being discharged from the bell end 32 of the tube 28. This discharge of air into the fuel flow will of course have the effect of reducing the volume of the flow and further absorb pressure pulses.

With attention now invited more specifically to FIGS. 6 through 8 of the drawings, there will be seen a second form of assembly referred to in general by the reference numeral 120 and including many components similar to components of the assembly 20 and which are designated by similar numerals in the 100 series. The section 142 is threadedly coupled to the section 144 and the assembly 120 includes an inlet neck 143 including a bell inlet end 130 and an outlet neck 145 including a bell end 132 in lieu of the through tube 28. Accordingly, reductions in fuel pressure pulses are accomplished by discharging the fuel from the inlet neck 43 into the interior of the section 142 and the inlet end of the outlet neck 145 includes a fitting 147 having a reduced bore 149 formed therethrough. The fitting 147 includes its own filter element 151 and a further filter element 153 is provided and constitutes a partition extending transversely of the section 144. An air inlet fitting 180 corresponding to the fitting 80 is provided and includes a tube 182 corresponding to the tube 82 which extends through the bore 149 and opens outwardly in the bell end 132.

Accordingly, it may be seen that the assembly 120 is capable of operating in a similar manner to the assembly 20 with the exception that a restricted zone of reduced volumetric fuel flow corresponding to the aperture 58 is not present in the assembly 120 although the bore 149 comprises a zone of restricted fuel flow corresponding to the aperture 60.

With attention now invited more specifically to FIGS. 10 and 11 of the drawings there will be seen a modified form of assembly referred to in general by the reference numeral 220 and which is quite similar to the assembly 120 except that the inlet neck 243 and outlet neck 245 thereof corresponding to the components 143 and 145 comprise threaded fittings threadedly engaged in the opposite ends of a cylindrical body portion 255 of the assembly 220. A tubular mount 257 is disposed within the body portion 255 and supports a partition filter 253 corresponding to the filter 153 and a fitting 247 corresponding to the fitting 147 and having a bore 249 formed therethrough corresponding to the bore 149 is supported from the outlet fitting 245 corresponding to the outlet neck 145. In addition, the assembly 220 includes an air inlet fitting 280 corresponding to the fitting 180 but which is supported by the inlet end of a tube 282 corresponding to the tube 182 and which opens inwardly through a tubular fitting 261 connecting the fitting 245 to the fuel line section 24. In addition, a similar inlet fitting 263 is provided and connects the section 22 of the fuel or discharge line 14 to the inlet fitting 243.

With reference now more specifically to FIG. 12 of the drawings there will be seen a final form of fuel flow restricting and filter assembly referred to in general by the reference numeral 320 and which is substantially identical to the assembly 120 except that it does not include a fitting corresponding to fitting 147 but instead includes a tubular fitting 323 threadedly engaged in the outlet neck 345 corresponding to the outlet neck 145. In addition, the outlet end of the tube 382 opens into the bore 325 formed through the fitting 323 in a downstream direction. Accordingly, it may be seen that the assembly 320 is capable of functioning in substantially the same manner as the assembly 120 except that a filter such as filter 151 is not provided.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, filling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. A tubular body defining a flow passage extending therethrough including small diameter inlet and outlet ends and an intermediate portion of considerably greater cross-sectional area than both of said inlet and outlet ends, said body further including means defining a flow restrictive zone intermediate said inlet and outlet ends of appreciably smaller cross-sectional area than either of said inlet and outlet ends, and small diameter check valved bleed air inlet means opening into said outlet end in a downstream direction for drawing ambient air into said outlet end in response to rapid fluid flow through said passage.

2. The combination of claim 1 wherein said body includes filter means for filtering liquids flowing through said passage.

3. The combination of claim 1 wherein said zone of flow restriction is disposed between said passage and said outlet end.

4. The combination of claim 1 wherein said tubular body includes means defining a second flow restrictive zone, the first-mentioned zone communicating said inlet end with said passage and the second-mentioned zone communicating said passage said outlet end.

5. The combination of claim 4 wherein said body comprises an elongated tube about whose mid-portion a generally cylindrical hollow member provided with apertured end walls is sealingly secured with the opposite ends of said tube extending through the apertures in said end walls and defining said inlet and outlet ends.

6. The combination of claim 5 wherein the central portion of the section of said tube disposed within said hollow member is closed to the passage of fluids therethrough, a pair of small diameter openings formed in said tube within said hollow member and on opposite sides of said closed central portion of said tube and comprising said flow restrictive zones.

7. The combination of claim 6 wherein said body includes filter means for filtering liquids flowing through said passage.

8. The combination of claim 7 wherein said filter means comprises a tubular filter body encircling said tube within said hollow member and whose opposite ends are closed relative to said tube at locations axially spaced in the same direction along said tube relative to said pair of small diameter openings.

9. The combination of claim 1 including a partition type filter body in said intermediate portion disposed transverse to the direction of fluid flow through said intermediate portion.

10. The combination of claim 1 wherein said body includes a pair of axially spaced opposite end generally cylindrical body sections opening toward each other and removably joined at their adjacent ends.

11. A tubular body defining a flow passage extending therethrough including small diameter inlet and outlet means and an intermediate portion of considerably greater cross-sectional area than both of said inlet and outlet ends, said body further including means defining a flow restrictive zone intermediate said inlet and outlet ends of appreciably small cross-sectional area than other of said inlet and outlet ends, said tubular body comprising a pipe section provided with threaded opposite ends with which end wall forming members are threadedly engaged, said end wall forming members having flow openings formed therethrough defining said inlet and outlet ends, the interior of said pipe section between said end wall forming members defining said intermediate portion.

12. A tubular body defining a flow passage extending therethrough including small diameter inlet and outlet ends and an intermediate portion of considerably greater cross-sectional area than both of said inlet and outlet ends, said body further including means defining a flow restrictive zone intermediate said inlet and outlet ends of appreciably small cross-sectional area than either of said inlet and outlet ends, ambient bleed air inlet means defining an air inlet passage including inlet and outlet end portions, said inlet end portion including check valve means and opening outwardly of said body and said outlet end portions opening into said outlet end in a downstream direction, said outlet end portion being disposed in said flow restrictive zone.

13. A tubular body defining a flow passage extending therethrough including small diameter inlet and outlet ends and an intermediate portion of considerably greater cross-sectional area than both of said inlet and outlet ends, said body further including means defining a flow restrictive zone intermediate said inlet and outlet ends of appreciably smaller cross-sectional area than either of said inlet and outlet ends, ambient bleed air inlet means defining an air inlet passage including inlet and outlet end portions, said inlet end portion including check valve means and opening outwardly of said body and said outlet end portions opening into said outlet end in a downstream direction, said outlet end portion opening into said outlet portion downstream from said flow restrictive zone.

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