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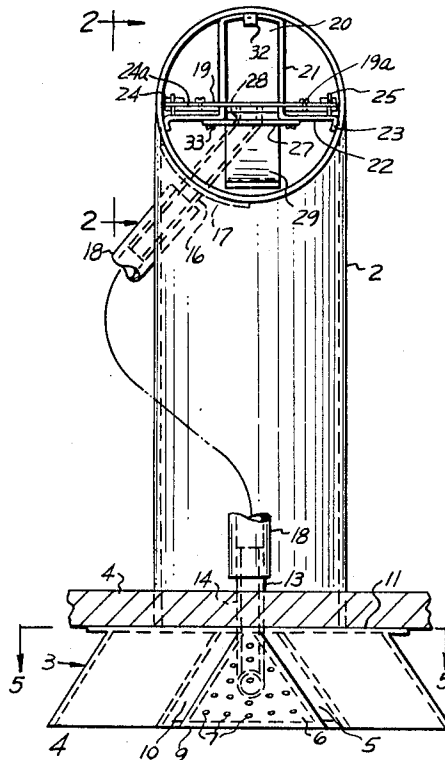
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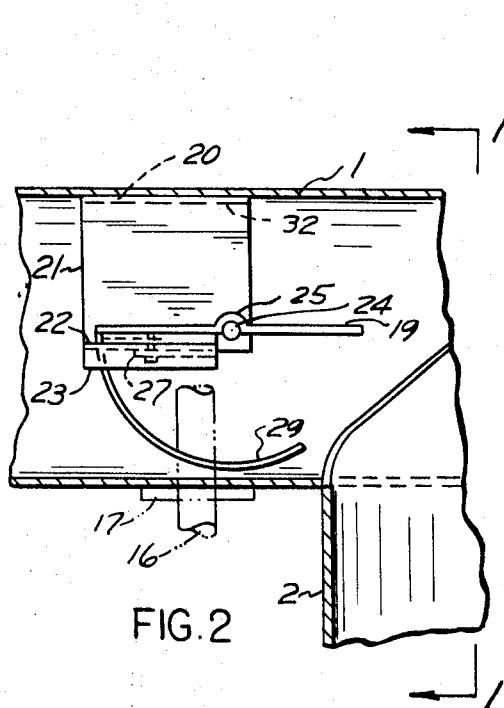
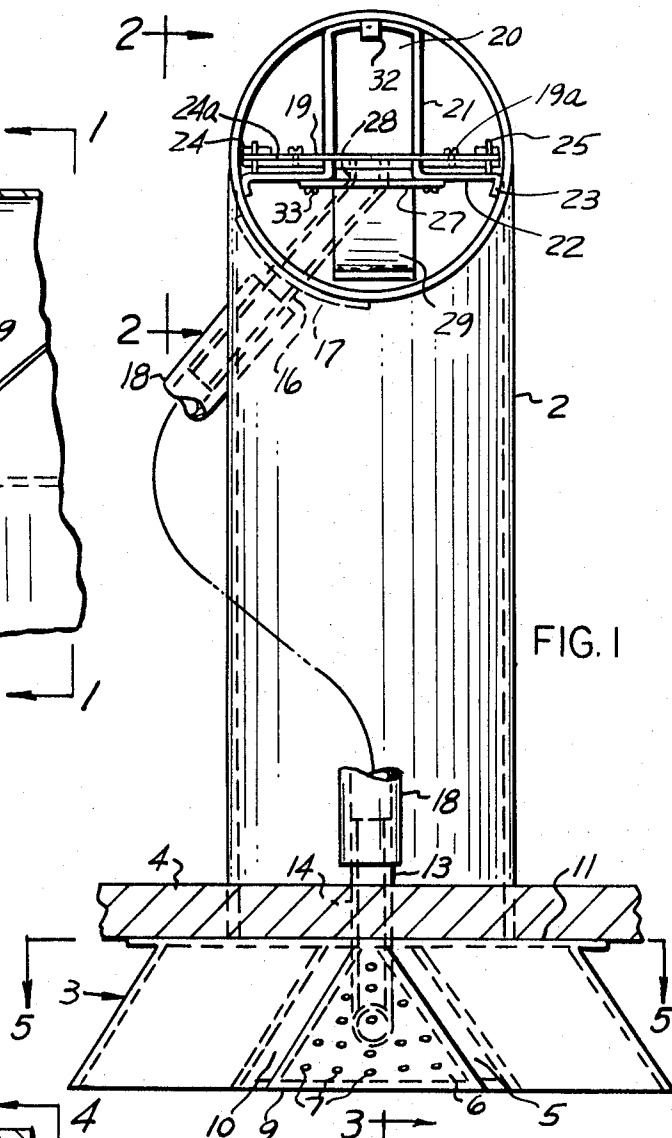
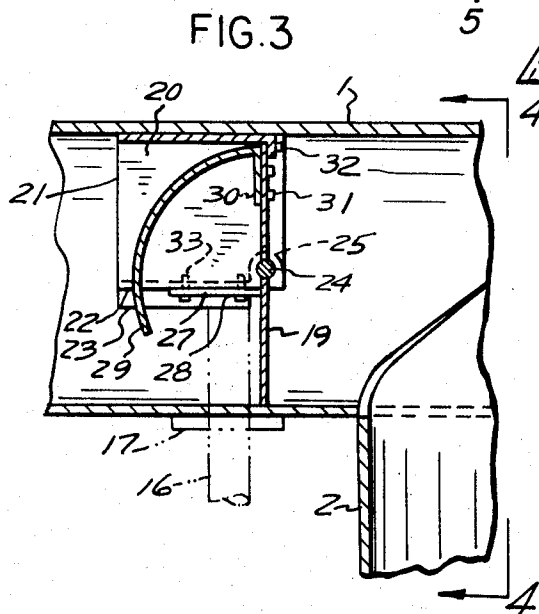
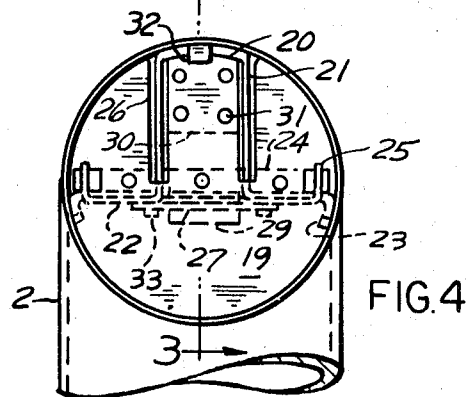
[54] **DIRECTIONAL FLOW EXHAUST REGULATOR
 WITH FLUID CONTROL**
 13 Claims, 7 Drawing Figs.

[52] U.S. Cl. 115/0.5,
 181/39
 [51] Int. Cl. F01n 7/12
 [50] Field of Search 115/0.5;
 181/39

[56] **References Cited**
UNITED STATES PATENTS
 2,713,841 7/1955 Forbes 115/0.5
 3,371,645 3/1968 Ward 115/0.5

ABSTRACT: An exhaust system for an internal combustion engine in a boat having a first conduit through which gases are exhausted into the atmosphere, said first conduit communicating with a second conduit through which gases are exhausted under the water, a valve mounted on a bracket installed in said first conduit and having a closed position to exhaust gases through the second conduit and an open position to exhaust gases through the first conduit, a third conduit to direct a flow of water against said valve to establish and maintain said closed position when said boat is moving, and a cavitator disposed beneath the boat's hull, and forwardly formed with a pressure chamber to receive water through a plurality of holes comprising an area greater than an escape hole so that water is forced through said escape hole into said third conduit under substantial pressure. The sidewalls of said cavitator are downwardly, outwardly angled to afford a downward pressure of water passing over said sidewalls to counteract any tendency of the cavitator to lift the boat from an even keel.





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DIRECTIONAL FLOW EXHAUST REGULATOR WITH FLUID CONTROL

CROSS-REFERENCES

U.S. Pat. No. 3,371,645 issued on Mar. 5, 1968, to applicant for an analogous device to accomplish this purpose, of which device the following is an improvement.

FIELD OF INVENTION

The field of invention lies in the area of devices to automatically direct the flow of exhaust gases into the atmosphere when a boat is standing still, thereby relieving back pressure on the engine. When the boat is moving, gases are exhausted under water in a manner in which minimum back pressure is imposed upon the engine.

SUMMARY AND OBJECT OF INVENTION

Invention resides in the disposition of a valve mounted in a bracket in the first conduit, with the provision of an arcuate lever secured to the valve, and a plate secured across the open mouth of said bracket, to form a chamber flooded with water when said valve is in a closed position, and in provision of conduit means extending through and secured by said plate to direct water as desired to establish and maintain said valve in a closed position. Further, novelty is thought to lie in the combination with the foregoing elements of a cavitator having sidewalls diverging rearwardly of the boat, and inclined downwardly and outwardly to receive a downward pressure of water passing over said wall as the boat moves, to counteract any tendency of the cavitator to lift the boat from an even keel, and it is the object of the invention to afford through said elements a means of automatically directing the flow of exhaust gases, according as the boat is moving or still in the water, to relieve back pressure and strain upon the moving parts of an engine.

The object of the invention is attained by the construction as described hereinafter and illustrated in the accompanying drawing, wherein:

FIG. 1 is a front, elevational view of the construction in partial section, portraying a portion of the hull of a boat.

FIG. 2 is a partial, vertical, sectional view on line 2-2 of FIG. 1, showing the valve in its open position, and taken on line 2-2 of FIG. 2, but omitting one-half of conduit wall 1 to show the elements interiorly of said conduit in relief.

FIG. 3 is a vertical, sectional view similar to FIG. 2, showing the valve in its closed position, and taken on line 3-3 of FIG. 4.

FIG. 4 is a partial, vertical view taken on line 4-4 of FIG. 3.

FIG. 5 is a plan view of the top wall of the cavitator taken on line 5-5 of FIG. 1.

FIG. 6 is a side elevational view in partial sectional taken on line 6-6 of FIG. 5.

FIG. 7 is a partial view taken on line 7-7 of FIG. 6 showing the perforate front wall of said pressure chamber.

In these views the reference character 1 designates the first conduit, through which exhaust gases are emitted into the atmosphere. Through a second conduit 2, exhaust gases may be alternatively emitted into the water. Said second conduit communicates with a cavitator 3 secured to and beneath the hull 4 of a boat by screws or other conventional means (not shown). Gases are swept from within the cavitator rearwardly of the boat by the movement of the boat in the water.

The cavitator forwardly terminates in a pressure chamber 3 having a front wall 6 formed with a plurality of holes 7 to admit water as the boat is moving forwardly through the water. A rear wall 8 separates the pressure chamber from the rest of the cavitator, and the chamber also includes a bottom wall 9 and sidewalls 10. The sidewalls have rearward extensions which conjoin integrally with a top wall 12 to complete the construction of the cavitator.

The rear wall 8 is formed with a hole 13, which receives an end portion of an elbow pipe 14. The other end portion of said elbow pipe passes through the top wall 12 and the hull 4 of the

boat to project upwardly as clearly shown in FIGS. 1 and 6. A pipe 16 passes through the wall of the conduit 1, for purposes hereinafter explained, and may be provided with a flange 17 to afford attachment as by screws (not shown) or other means to said conduit. The pipe 16 and the elbow pipe 14 are communicably interconnected by a length of rubber hose or the like 18.

Disposed within the conduit 1 is a butterfly valve 19, rotatably mounted in a U-shaped bracket 20, having approximately parallel sidewalls 21. Oppositely and outwardly extending from the bottom edge of said sidewalls, are integral wings 22, which themselves terminate in downwardly turned flanges 23 whereby the bracket is secured to the wall of the conduit 1. Again, screws (not shown) or any other suitable means may be used to maintain the position of the bracket within the conduit.

A rock shaft 24 has its end portions journaled in ears 25 upturned from the respective flanges 23. Between said end portions the rock shaft is formed with a flat 24a. Screws 19a secure the butterfly valve to said flat. It is believed clear that the diametrically opposed areas of the butterfly valve must be apertured appropriately to accommodate the end portions of the rock shaft, and the ears 25.

Approximately parallel slots 26 are formed in the butterfly valve to accommodate the sidewalls 21 of the bracket 20, as is best seen in FIG. 4, in which the valve is in its closed position. As is most clearly seen in FIG. 1, the sidewalls 21 of the bracket 20 form an inverted U, and across the opening of said U is disposed a plate 27 formed with a hole 28 to admit and support the upper end portion of the aforesaid pipe 16. In FIGS. 2 and 3, is clearly seen an arcuately formed lever 29 having a flange 30 secured by screws 31 to the butterfly valve 19.

A tab 32 integrally depending from the bracket limits rotation of the butterfly valve about the rotative axis of the shaft 24 in one direction, to establish the closed position of the valve. Screws 33 secure the aforesaid plate 27 across the mouth of said bracket as above described. Said screws are made to serve a dual function by having the threaded end portions project upwardly through the flanges 23 a predetermined distance. Thus, the screws 33 serve as stops to limit the rotative travel of said valve about said axis of said shaft in the opposite direction, to establish the open position of the valve which is illustrated in FIGS. 1 and 2.

As mentioned above, the conduit 1 communicates with an open bottomed, open end exhaust chamber 36 defined by the top wall 12, and the rearward sidewall extensions 11 of the cavitator. Such communication occurs through a circular area 34 formed with a plurality of holes 35. Said perforate area 34 thus affords some strength and rigidity to the top wall 12, as distinguished from a completely cut out area, and the perforations aid in bearing the exhaust stream into a plurality of minor streams which are more readily dispersed by the movement of the boat.

The construction of the pressure chamber is such that the combined area of the hole 7 is substantially greater than that of the hole 13, so that the forward motion of the boat admits water into said pressure chamber at a rate faster than it may be emitted through the elbow pipe 14. Consequently water is forced under substantial pressure into said elbow pipe, and upwardly through the hose 18 and the pipe 16.

The pipe 16 is so disposed as to direct a flow of water upon the butterfly valve, as seen in FIG. 2, to force said valve to rotate about the axis of the rock shaft 24 into the closed position shown in FIGS. 3 and 4. Once said position is established, the flow of water is directed against the arcuate lever 29 to maintain the closed position of the valve until said flow of water ceases. It is to be noted that the butterfly valve 19, in association with the sidewalls 21 of the bracket 20, and the arcuate lever 29, define a chamber which, when the boat is moving is flooded with water under pressure. Some of said water may escape between the edges of said lever and said sidewalls, but such escape is sufficiently slight as to maintain a

substantial pressure in the chamber thus formed, to maintain the valve in its closed position against any substantial pressures of exhaust which might tend to open it.

In previous practice it has been found that cavitators have a tendency, particularly at higher speeds, to lift the boat and contribute to instability of the boat in the water. To counteract this tendency, the sidewalls 10 and their extensions 11 are downwardly, outwardly inclined so that the flow of water passing beneath the boat and upon the outer surfaces of said sidewalls will tend to effect a downward pressure. To minimize resistance of the cavitator as it passes through the water, it is desired to rearwardly diverge the aforesaid sidewalls as best seen in FIG. 5.

I claim:

1. The combination with a boat having an internal combustion engine with an exhaust system, of an exhaust directional flow assembly incorporated in said system, said assembly including:

a first conduit disposed to afford escape of exhaust gases into the atmosphere,

a second conduit disposed to afford escape of exhaust gases into the water,

a valve having an open position to exhaust gases from said first conduit and a closed position to exhaust gases from said second conduit,

fluid flow means effective upon said valve to move said valve to its closed position when the boat moves, and an arcuately formed lever secured to said valve and upon which said fluid flow is directed to maintain said valve in its closed position.

2. The combination as set forth in claim 1: means to provide water under pressure, said valve being disposed in said first conduit, and said fluid flow comprising a third conduit extending into said first conduit to direct said fluid flow.

3. The combination as set forth in claim 2: a bracket secured in said first conduit, said valve being mounted for rotation about an axis therein between said positions,

said bracket having approximately parallel sidewalls, said valve being formed to accommodate said sidewalls, and said arcuate lever being disposed between said sidewalls when said valve is in said closed position to form a chamber therewith,

whereby said chamber remains filled with water while the boat is in motion to resist return of said valve to its open position.

4. The combination as set forth in claim 3, means on said bracket to limit travel of said valve around said axis in one direction and to establish the closed position of said valve.

5. The combination as set forth in claim 4, means on said bracket to limit travel of said valve around said axis in the other direction and to establish the open position thereof.

6. The combination as set forth in claim 5:

a plate secured across said parallel walls to form a wall of said chamber,

said third conduit having a fluid flow delivery end portion received and retained in said plate whereby said fluid flow is directed as desired.

7. The combination as set forth in claim 6:

said parallel sidewalls terminating in outwardly, oppositely extending flanges, and said plate overlapping said flanges, screws securing said plate to said flanges, and having their threaded end portions projecting through said flanges to engage said valve and establish the open position thereof.

8. The combination as set forth in claim 1:

a cavitator disposed beneath said boat and communicating with said fluid flow means,

said cavitator being adapted to deliver a flow of water under pressure to said fluid flow means,

said cavitator being formed with an exhaust-receiving chamber communicating with said second conduit, a perforate plate being disposed in said second conduit; whereby an exhaust stream emitting into said exhaust chamber is dispersed in a plurality of lesser streams.

9. The combination as set forth in claim 8:

said exhaust chamber forwardly terminating in a pressure box,

said box having a front wall,

a plurality of water-receiving holes formed in said front wall,

said pressure box having a rear wall,

an aperture formed in said rear wall to afford a flow of water to said fluid flow means.

10. The combination as set forth in claim 8, said cavitator being formed with downwardly, outwardly divergent sidewalls, which receive a downward pressure from the passage of water thereon.

11. The combination as set forth in claim 10, said sidewalls diverging rearwardly of the boat hull to minimize water resistance.

12. The combination as set forth in claim 1:

means to provide water under pressure,

said fluid flow means being a third conduit communicating with said means and directing said water to said valve and to said lever,

a cavitator disposed at the bottom of the boat hull, and communicating with the second conduit, and forming an exhaust outlet chamber.

13. The combination as set forth in claim 12:

said cavitator forwardly terminating in a water pressure box, having

a front wall formed with a plurality of perforations,

a rear wall apertured to receive said third conduit to supply water to said third conduit.