Oct. 15, 1946. T. R. KELLEY 2,409,496

EXHAUST GAS DEFLECTOR FOR INTERNAL-COMBUSTION ENGINES

Filed Jan. 8, 1943 2 Sheets-Sheet 1

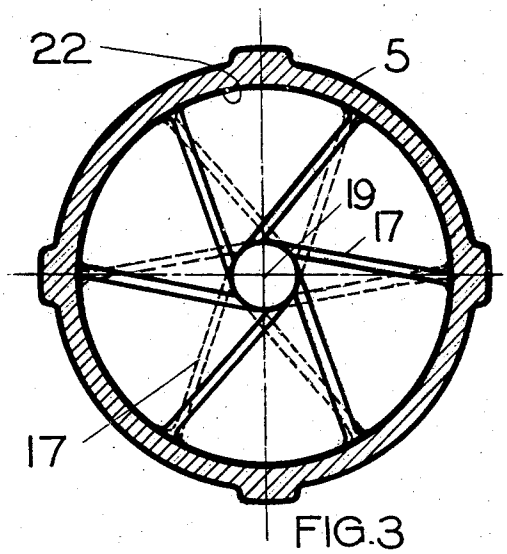


FIG.3

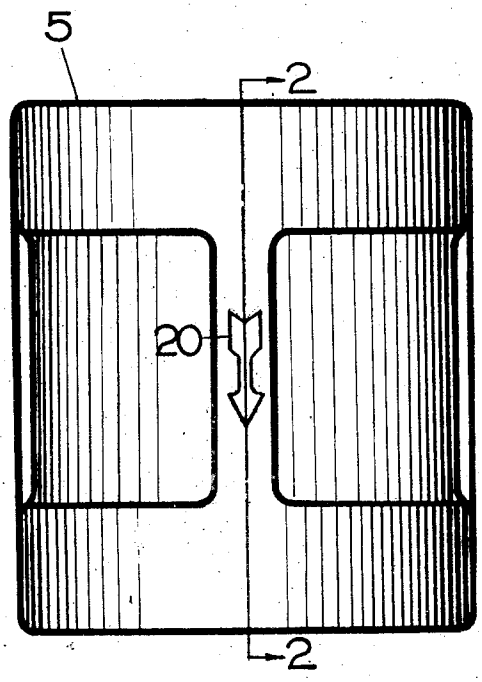


FIG.-1

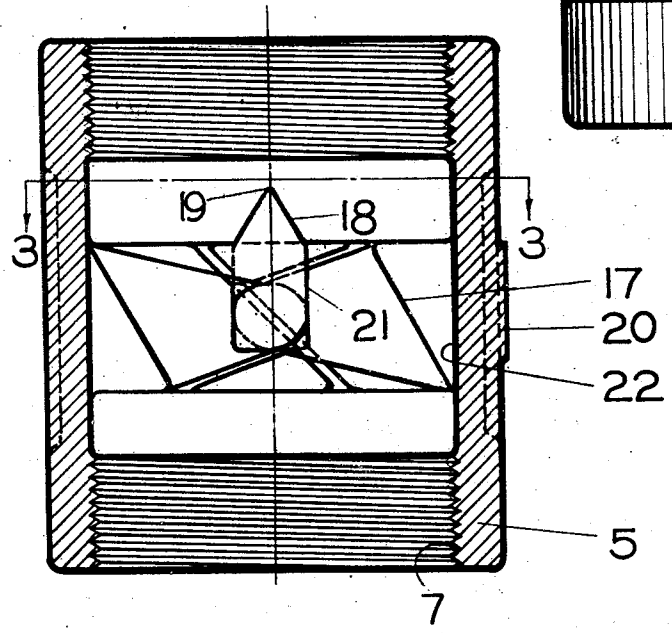


FIG.-2

Theron R. Kelley
INVENTOR

BY C. Verne Martin
ATTORNEY

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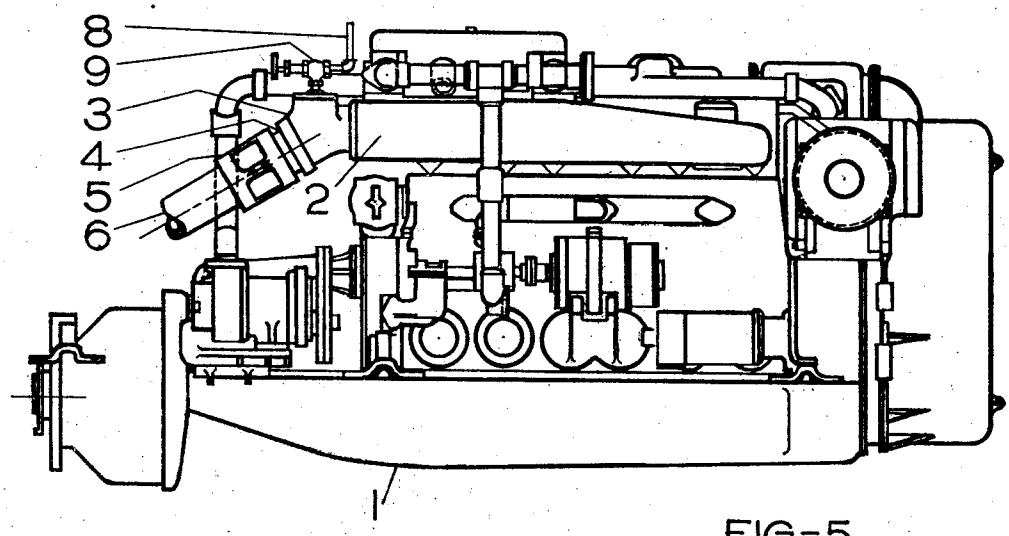


FIG.-5

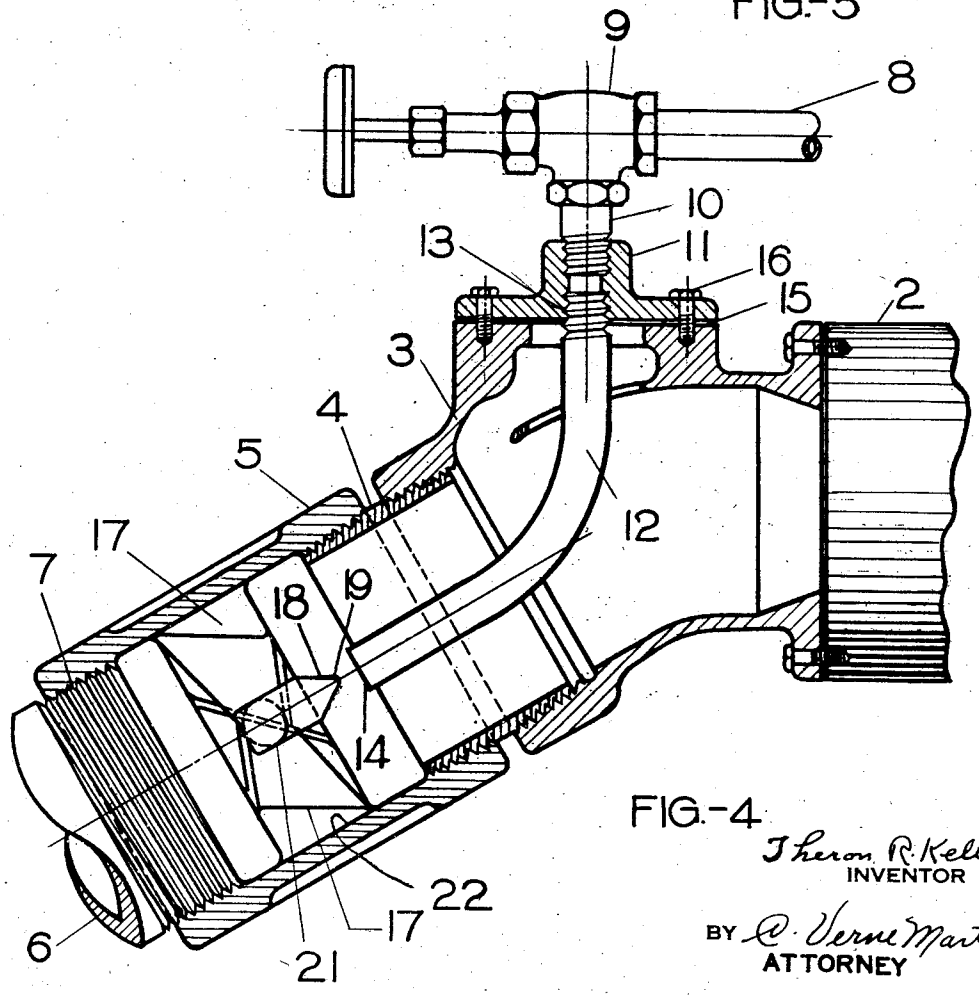


FIG.-4

Theron R. Kelley
INVENTOR

BY C. Verne Martin
ATTORNEY

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EXHAUST GAS DEFLECTOR FOR INTERNAL-COMBUSTION ENGINES

Theron R. Kelley, Springfield, Ohio, assignor to The National Supply Company, Pittsburgh, Pa., a corporation of Pennsylvania

Application January 8, 1943, Serial No. 471,774

5 Claims. (Cl. 181—43)

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My invention relates to the construction of an improved exhaust gas deflector for use with internal combustion engines, particularly of the type used in marine service.

In using an internal combustion engine for marine propulsion it is common practice to admit a small stream of water from a circulating pump and system through the exhaust pipe in order to chill and contract the hot gases and absorb the heat therefrom while the gases are passing through said exhaust pipe. This procedure decreases the loud noise from the engine exhaust and quiets the running of the engine as well as reduces the exhaust gas temperature and back pressure to an efficient and safe degree for economical operation.

A muffler may be used in place of the stream of water and while tests show that an internal combustion engine used for marine propulsion so equipped is much quieter in its operation than one using a stream of water passing through the exhaust pipe, it is also proven that the use of a muffler sets up an appreciable back pressure and, therefore, its use is not entirely satisfactory.

The principal object of this invention is to provide as complete sudden intermingling of a coolant liquid with the hot exhaust gases from an internal combustion engine as possible to accentuate the rapid heat transfer from the hot gases to the cooling liquid in order to be able to use as short an exhaust pipe as practcial and thereby reduce noise and back pressure to a minimum.

Another object of the present invention is to provide an efficient exhaust gas deflector to be used in conjunction with a stream of cooling liquid flowing through an exhaust pipe, wherein the stream of cooling liquid is finely broken up and given a swirling motion through the exhaust pipe in order that it may more completely intermingle with the exhaust gases and thus accentuate the chilling effect on the exhaust gases and thus rapidly complete the transfer of heat from said gas to the deflected spray of cooling liquid. This procedure also reduces the noise of the exhaust and the back pressure on the engine.

Another object of this invention is to provide an exhaust gas deflector with a water, or other cooling liquid, discharge orifice positioned to discharge a stream of water or other cooling liquid, axially through the deflector body towards a plurality of symmetrically spaced helical fins integrally formed within said body and in the direction of flow of the exhaust gases.

Another object of this invention is to provide an exhaust gas deflector with a conical fluid

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spreader positioned in the axial path of the stream of the cooling liquid such that the cooling liquid will be positively and forcibly directed towards a plurality of symmetrically spaced helical fins integrally formed with the inner wall of the deflector body to more completely break up the cooling liquid stream and thus create a deflected spray which more effectively intermingles with the hot exhaust gases in order that they may be rapidly cooled and thus reduce the noise and back pressure on the engine.

Another object of this invention is to provide an exhaust gas deflector for an internal combustion engine wherein means are provided to impart a swirling motion to a liquid cooling medium and the exhaust gases passing therethrough, which action suddenly chills the hot exhaust gases, causing a very rapid heat transfer, which in turn quickly reduces their volume and sets up a suction or pull through the exhaust pipe, which causes the mixture of exhaust gases and deflected spray to rush through the exhaust pipe and on out to the atmosphere, materially decreasing the noise and back pressure on the engine.

Other objects and intended advantages of this invention will clearly appear from the following particular description and appended claims taken in connection with the accompanying drawings illustrating the preferred embodiment of my invention in which like parts are designated by like numerals.

Fig. 1 is an external elevational view of the deflector body or hollow coupling.

Fig. 2 is a vertical section through the hollow coupling embodying my invention and taken on the line 2—2 of Fig. 1.

Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 2 showing the helical fins and conical fluid spreader construction relating to my invention.

Fig. 4 is an assembly view, partially in section, of the exhaust gas deflector coupling and coolant liquid supply valve and orifice.

Fig. 5 is an elevational view of an internal combustion engine showing the exhaust gas deflector embodied in my invention in assembled relation to said engine.

In the drawings the numeral 1 represents, generally, an internal combustion engine provided with the conventional exhaust manifold 2. An exhaust pipe fitting 3 is attached to the outlet end of the manifold and a short section of exhaust pipe 4 is screw threadably positioned between said fitting and a hollow coupling or exhaust gas deflector body 5. A second and longer

section of exhaust pipe 6 is screw threadably attached to the lower or outlet end of the coupling 5 as shown at 7.

A cooling liquid line 8 conducts cooling liquid from a suitable source, not shown, to a control valve 9. From the outlet end of this valve a coolant liquid supply pipe 10 is screw threadably attached to the upper end of the bonnet 11 of the exhaust pipe fitting 3. A second section 12 of the coolant liquid supply pipe is screw threadably attached to the lower or inner surface of the bonnet, as at 13 and extends in a downward course through the fitting 3, short section of exhaust pipe 4 and terminates in an orifice or nozzle 14 just beyond the end of said pipe 4. The bonnet 11 is conventionally secured to the exhaust pipe fitting 3 and is sealed against liquid or gas leakage through suitable packing 15 and cap screws or studs and nuts as indicated at 16.

A plurality of symmetrically spaced helical fins 17 and a conical fluid spreader 18 are integrally formed within the bore of the hollow coupling or deflector body 5. The conical fluid spreader 18 is positioned axially within the coupling bore and extends upwardly above the helical fins 17 but below the orifice 14. The apex 19 of the conical fluid spreader is directed counter to the flow of the coolant liquid and exhaust gas discharge through the coupling 5, which is indicated by the arrow 20 cast on the external surface of the coupling or deflector body and shown in Fig. 1.

The helical fins extend radially in a helical course from the outer surface 21 of the conical fluid spreader to the inner wall 22 of the coupling.

In operation:

As soon as the internal combustion engine 1 is started hot exhaust gases resulting from combustion pass through the exhaust manifold 2. Automatically, at a predetermined temperature the control valve 9 in the liquid coolant supply line 8 opens and admits the coolant liquid through the supply lines 10 and 12 to the orifice or nozzle 14 and hence into the exhaust gas deflector or coupling 5. As the coolant flows through the coupling 5 it strikes the apex 19 of the conical fluid spreader 18 and is diverted from its normal straight course through the exhaust pipe. It is directed forcibly against the helical fins 17. The hot exhaust gases passing through the exhaust manifold fitting and pipe likewise strike the conical fluid spreader and are also forcibly thrown against the helical fins 17.

The principal effect produced by the helical fins is to break up the deflected coolant spray and create a swirling motion to both the coolant liquid and the hot exhaust gases being forcibly drawn into intimate contact with each other while passing therethrough. This breaking up of the coolant liquid makes it possible for more cooling liquid surface to be brought into contact with the hot exhaust gases than would otherwise be possible. The sudden contact of the hot exhaust gases with the spray of the cool coolant liquid accentuates the rapid heat transfer from the hot exhaust gases to the coolant liquid. The mixture of hot gases and coolant liquid spray are further intermingled as they are forcibly thrown radially through the helical path, defined by the fins 17, against the comparatively cold inner wall surface of the coupling and consequently out into the discharge run of the exhaust pipe 6, the inner wall surface of which at this point is also relatively cool. The heat transfer from the hot

exhaust gases to the relatively cool liquid is very rapid. This sudden chilling effect rapidly contracts the hot exhaust gases and reduces their temperature and volume materially. This creates a partial vacuum in the exhaust pipe which in turn sets up a suction or pull on the condensed exhaust mixture causing it to rush through the exhaust pipe in a continuous discharge seeking a rapid exit to the atmosphere. Naturally this result considerably decreases the noise from the exhaust and the back pressure on the engine as well as permitting the use of as short an exhaust pipe as is practical.

While only a typical preferred form and application of my invention has been herein disclosed I do not wish to be limited or restricted to the specific details set forth and wish to reserve to myself any further embodiments, modifications and variations that may appear to those skilled in the art or fall within the scope of the appended claims.

Having thus fully described my invention, what I claim as new, and desire to secure by United States Letters Patent is:

1. An exhaust gas deflector adapted to be axially inserted in the run of an exhaust pipe for accentuating the discharge of hot exhaust gases from an internal combustion engine, comprising a hollow coupling with an axial bore therethrough, a plurality of symmetrically spaced helical shaped fins formed integral with the inner wall within said bore, a conical fluid spreader with its apex slightly in advance of said fins and formed integral therewith, a water discharge orifice positioned axially within said exhaust pipe to discharge a stream of cooling water in the direction of flow of the escaping hot gases to impinge against the apex of said spreader and rapidly swirl towards said helical fins, whereby said hot exhaust gases and water are intimately intermingled, producing a sudden chilling effect upon said hot gases and creating a partial vacuum in said exhaust pipe that reduces back pressure and noise of the engine exhaust.

2. An unitary exhaust gas deflector for axial insertion in the run of an exhaust pipe of an internal combustion engine through which hot exhaust gases are discharged, comprising a hollow coupling within the inner walls of which are integrally formed a plurality of helical shaped fins and a conical fluid spreader, with its apex slightly in advance of said fins in a direction counter to the flow of said discharge through said coupling, a water discharge orifice positioned to discharge a stream of cooling water axially through said exhaust pipe in the direction of flow of said hot exhaust gases to impinge against the apex of said conical spreader, whereby said cooling water is forcibly dispersed radially in all directions, intimately intermingled with the hot exhaust gases, forming a minutely fine gaseous spray, producing a sudden chilling effect upon said hot gases and creating a partial vacuum in said exhaust pipe which reduces back pressure and the noise of the engine exhaust.

3. An exhaust gas deflector for internal combustion engines for accelerating the discharge of hot exhaust gases through an exhaust pipe, comprising a hollow coupling axially positioned in the run of said exhaust pipe, a conical fluid spreader and a plurality of helical shaped fins formed integral with the inner wall of said coupling, the apex of said conical spreader positioned slightly in advance of said fins in a direction counter to the flow of said discharge through said

coupling, a water discharge nozzle positioned axially within said exhaust pipe to discharge a stream of cooling water directly against the apex of said spreader and in the direction of flow of said hot exhaust gases, whereby said water is forcibly directed against said helical fins to produce a fine vapor spray causing a sudden chilling effect upon said hot exhaust gases, reducing their volume and creating a partial vacuum in said exhaust pipe which tends to rapidly pull the hot exhaust gases through said exhaust pipe, thus reducing the back pressure and noise of the engine exhaust.

4. An exhaust gas deflector for use with a substantially uniform diameter exhaust pipe, for accelerating the discharge of hot exhaust gases therethrough from the operation of an internal combustion engine, comprising a hollow coupling axially positioned in the run of said exhaust pipe, a plurality of helical shaped fins formed integral with the inner wall of said coupling, a water discharge nozzle positioned axially within said exhaust pipe to discharge a stream of cooling water axially through the coupling toward the fins and in the direction of flow of the exhaust gases, a conical fluid spreader formed integral with said fins and located between said nozzle and fins and having its apex directed counter to the flow of

discharge through said coupling, whereby through the intimate intermixing of the cooling water and the hot exhaust gases a condenser effect is established which breaks up the exhaust pulsations and reduces the back pressure and noise of the engine exhaust.

5. An unitary exhaust gas deflector for internal combustion engines comprising a hollow coupling axially positioned in the run of an exhaust pipe from said engine and through which hot engine exhaust gases are discharged, a water discharge nozzle positioned to discharge a stream of water axially through said exhaust pipe in the direction of flow of said hot exhaust gases, said coupling including a plurality of helical shaped fins formed integral with the inner wall of said hollow coupling and a conical spreader formed integral with said fins and having its apex positioned between said nozzle and fins and in a direction counter to the flow of discharge through said coupling, whereby said cooling water impinges against said apex with sufficient force to disperse said cooling water radially in all directions forming a fine spray which completely intermingles with said escaping exhaust gases, breaking up the exhaust pulsations in said engine and reduces back pressure and noise.

THERON R. KELLEY.