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HOMOGENIZER FOR FUEL-AIR MIXTURE FROM CARBURETOR

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FIG_1

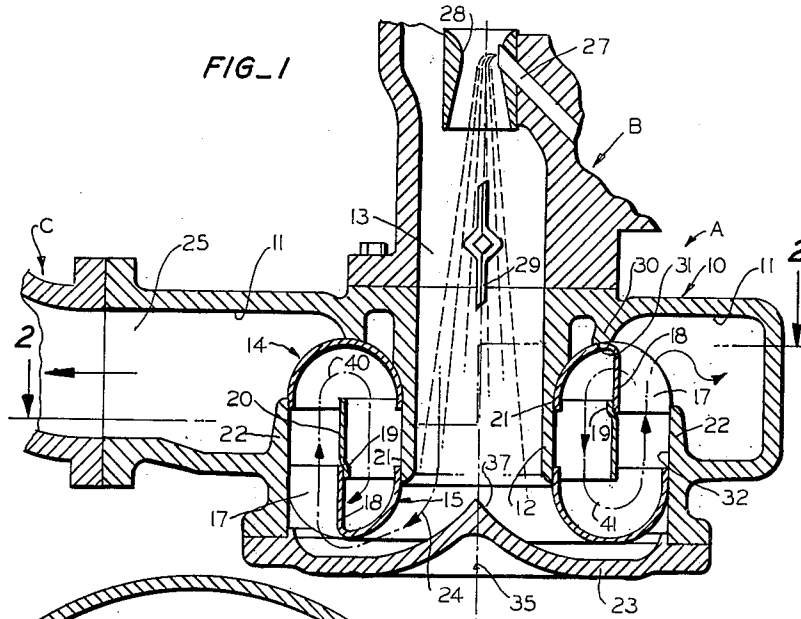


FIG_2

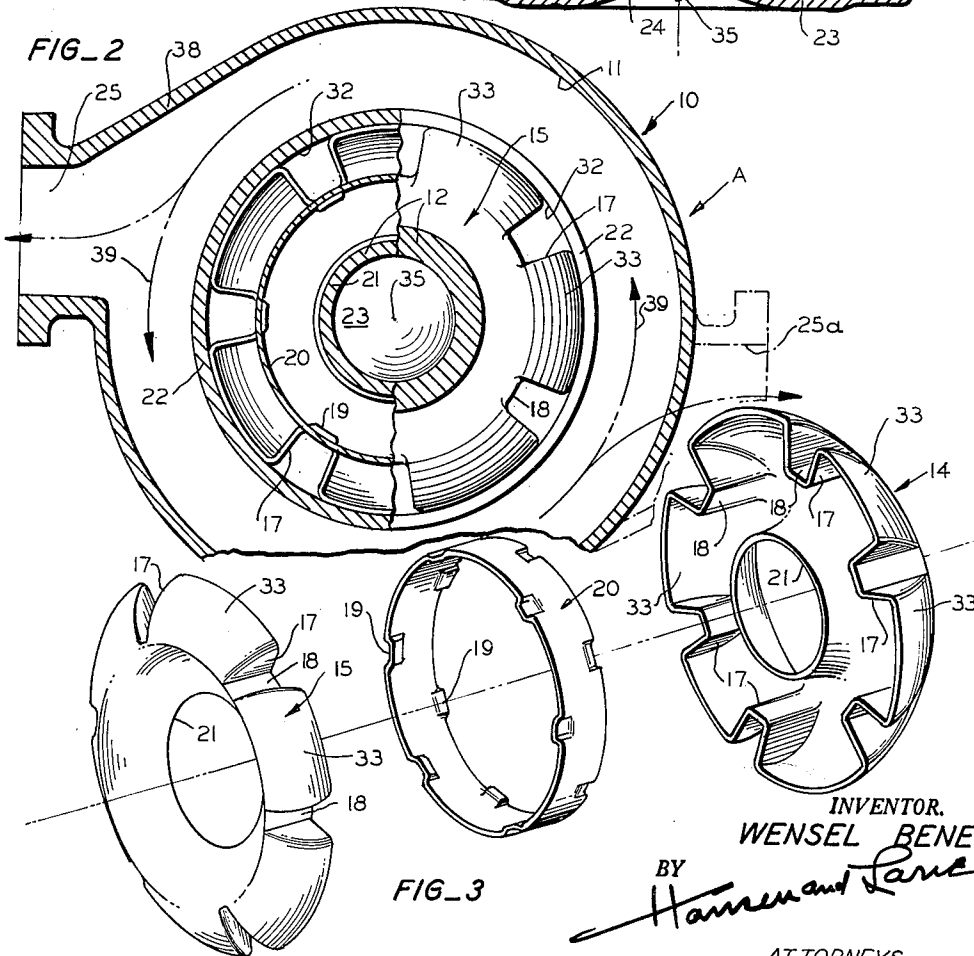


FIG_3

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HOMOGENIZER FOR FUEL-AIR MIXTURE FROM CARBURETOR

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The present invention relates to internal combustion engines and pertains more particularly to a mechanism for homogenizing the fuel-air mixture from a carburetor prior to the introduction of such mixture into the combustion chamber of such engine.

When air is drawn through a carburetor into an engine cylinder by the movement of a piston in the cylinder on the intake stroke of such engine, the speed of air flow past the carburetor fuel jet pulsates, since the suction or reduction in pressure caused by each intake stroke varies from a minimum at substantially the beginning of such intake stroke to a maximum at substantially the midpoint of such stroke, and then again to a minimum toward the end of such stroke.

These pulsations or changes in velocity of air movement past the fuel jet result in a change in the proportion of fuel to air picked up from the jet by the air stream, and also in the size of the fuel droplets. Furthermore, in the zone of the stream closely adjacent the jet the fuel concentration will be relatively high, while in the portions of the air stream laterally more remote from the jet the fuel concentration will be lower. Therefore, as the fuel-air mixture enters an engine cylinder directly from an ordinary carburetor, portions of the mixture will be too rich for perfect combustion, while other portions will be too lean.

During the compression stroke the fuel-air mixture is heated, thereby tending to vaporize the fuel droplets in the mixture, but when the mixture is fired near the top of each compression stroke, the richer portions of the mixture do not contain sufficient oxygen to properly unite with all of the hydrocarbons available, while in the leaner zones the mixture may also fail to combust completely. These factors tend to result in afterburning, and in the generation of less energy than would have been produced if all of the fuel contained in the mixture had completely burned. They also result in the discharge of annoying and dangerous pollutants into the atmosphere.

If we assume that an internal combustion engine is running at a speed of 3000 r.p.m., a relatively low cruising speed for most current automotive engines, this would be at the rate of fifty revolutions per second. Thus, the time for each stroke at such speed would be only one hundredth of a second. This, then is the amount of time in which any uniform mixing or homogenizing of the uneven fuel-air mixture as it leaves the carburetor, as explained in the preceding paragraphs must be accomplished.

Pre-heating of the air supplied to the carburetor, or post-heating of the fuel-air mixture from the carburetor assist in vaporizing the fuel droplets, but since such heating of the air or fuel-air mixture results in a loss in the weight of the incoming charge, thereby reducing the power output of the engine, the advantage of such pre-heating is doubtful.

The present invention contemplates the provision of a homogenizer coupled between the carburetor and the intake port or manifold of an internal combustion engine, and so constructed and arranged that the fuel-air mixture

from the carburetor will pass through the homogenizer and be substantially homogenized therein before passing into a combustion chamber of such engine.

A further object of the invention is to provide a recirculating, homogenizing chamber between the mixture outlet of a carburetor and the intake port of an internal combustion engine in which chamber the fuel-air mixture from the carburetor is violently recirculated in the manner of a gas fly-wheel to provide a substantially homogeneous mixture of fuel particles, vapors and air for introduction into a combustion chamber of such engine.

A further object of the invention is to provide a homogenizer for coupling between a carburetor and an intake port of an internal combustion engine, and comprising a housing surrounding the mixture outlet of a carburetor of such engine, a pair of bowl-like members having air admitting indentations in their peripheries being fitted into the housing in co-axial, relatively reversed relation, and interconnected in axially spaced relation by a co-axial, tubular collar, the peripheral indentations of one bowl-like member being out of alignment with those of the other, means being provided for directing the fuel-air mixture from such carburetor into and through the indentations in one of said bowl-like members for inward, circulating deflection around said collar by an unindented peripheral portion of the other bowl-like member, the indentations of the other bowl-like member communicating with a collecting ring channel formed in said housing and communicating with the intake port of such internal combustion engine.

A still further object of the invention is to provide a fuel-air mixture homogenizer for coupling between a carburetor and an intake port of an internal combustion engine, the homogenizer having means for guiding the fuel-air mixture from the carburetor into recurring, circulating paths, and thence into the intake port of such engine.

These, and other objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is an axial, diametrical, sectional view through a homogenizer embodying the present invention mounted thereon, portions of a carburetor and of an engine intake port or manifold being shown diagrammatically.

FIG. 2 is a transverse sectional view of the homogenizer taken along line 2-2 of FIG. 1, an optional additional outlet being shown in broken lines.

FIG. 3 is an exploded view showing the two peripherally indented, annular, bowl-shaped recirculating members and their interconnecting spacing collar.

Briefly, the illustrated form A of the invention comprises a housing 10 having an annular channel or collector ring passage 11 formed therein and surrounding a central, co-axial tubular portion 12. The housing 10 is adapted to be connected to a carburetor B with the tubular portion 12 co-extensive with the carburetor mixture passage 13. The housing 10 is formed to receive a pair of similar, annular, bowl-shaped members 14 and 15 in relatively reversed, fitted relation therein. To facilitate description the parts are described herein in their upright position of FIG. 1, although the invention is not limited to use in that position as will be apparent to those familiar with the art. Each of the bowl shaped members has a plurality of peripheral indentations 17 therein and the inner ends 18 of these indentations are fitted into shallow

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indentations 19 provided therefor in opposite ends of a spacer collar 20, with the indentations of one bowl shaped member out of line with those of the other. The central openings 21 of the annular bowl shaped members 14 and 15 are of a diameter to fit closely onto the tubular housing portion 12, while their peripheries fit closely into a tubular flange 22 provided co-axially of the lower end of the housing 10. A bottom closure and deflector plate 23 is secured across the lower end of the tubular flange 22, and deflects the downward flow of the fuel-air mixture from the carburetor B radially outwardly, as indicated by the arrow 24 in FIG. 1, and thence upwardly through the indentations 17 in the lower bowl shaped member 15.

The upward flow of the fuel-air mixture is again reversed by the upper bowl shaped member 14 and is directed inwardly and downwardly over the upper edge of the spacing collar 20. The flow of the mixture is again reversed by the lower bowl shaped member 15 and said mixture escapes into the collector ring 11 through the indentations 17 in the upper bowl shaped member 14. From the collector ring 11 the then thoroughly intermixed fuel-air mixture flows through an outlet 25, a usual intake port or manifold C and into an engine cylinder, not shown, in a conventional manner.

Referring to the drawings in greater detail, the carburetor B and manifold or intake port C are intended to represent any conventional carburetor and intake manifold. In the carburetor B a vaporisable fuel, such as gasoline, is picked up in droplets and as a vapor from a usual fuel jet 27 mounted in a carburetor throat 28, which, as illustrated, is of the conventional Venturi type. A usual throttle valve 29 is provided in the usual carburetor mixture passage 13. The homogenizer housing 10 is coupled, in sealed relation, onto the carburetor B with the tubular, central portion 12 of the housing 10 sealed in co-extensive relation onto the carburetor mixture passage 13. The tubular housing portion 12 is formed to fit closely into the central openings 21 of the two annular, bowl shaped members 14 and 15.

An annular top flange 30 is also provided within the housing 10 co-axially with the tubular central portion 12, and is spaced radially outwardly therefrom at a distance to lie just inwardly of the indentations 17 in the upper bowl shaped member 14 when the latter is inserted in the housing as shown in FIG. 1, in which position the lower edge 31 of the flange 30 is formed to have fitted relation with the convex exterior of the upper bowl shaped member 14.

The tubular bottom flange 22 is formed co-axially with the tubular central portion 12 in the bottom of the housing 10. The inner face 32 of the tubular flange 22 is formed to receive the two bowl shaped members 14 and 15 in interfitted relation therein, and is of a height to completely enclose the space between these bowl shaped members when the upper one 14 thereof is seated against the annular top flange 30. The two bowl shaped members 14 and 15 are identical with each other, each being of substantially semi-circular cross-sectional curvature throughout the unindented portions 33 thereof, as shown in the left hand section of the upper bowl shaped member 14 and in the right hand section of the lower bowl shaped member 15 in FIG. 1.

A plurality of, for example six, similar indentations 17 are provided in the peripheries of each of the bowl shaped members 14 and 15. These indentations are of sufficient width to allow an adequate flow of the fuel-air mixture therethrough, but preferably are narrower than the unindented portions 33 therebetween. The indentations 17 are preferably spaced symmetrically about the periphery of each bowl shaped member, and are of a depth, radially of the bowl shaped member in which they are provided, equal to approximately one half the radial width of the annulus section of the member in which they are pro-

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vided. The bottom 18 of each indentation is preferably flat, and is disposed in a plane substantially perpendicular to a radius centrally therethrough from the axis of the bowl shaped member in which the indentation is provided.

The spacing and interconnecting collar 20 is of an internal radius approximately equal to the radial distance from the common axis 35 to the bottom 18 of an indentation 17 in one of the bowl shaped members mounted in the housing as shown in FIG. 1. Both ends of the collar 20 are provided with shallow indentations 19 therein, each so located, and of a size to receive the inner ends of the indentations 17 of the bowl shaped members 14 and 15 therein when mounted as shown in FIG. 1. The indentations 19 in one end of the collar 20 are offset rotatively from those in the other end to lie midway therebetween as best shown in FIG. 3.

The bottom closure and deflector plate 23 closes and seals the lower end of the tubular bottom flange 22 and is spaced downwardly from the bottom of the lower bowl shaped member 15 a sufficient distance to provide a gas passage therebetween. A conical, upward projection 37 preferably is provided centrally of the bottom plate 23 to deflect mixture gases flowing downwardly through the tubular central portion 12 radially outwardly, as indicated by the arrow 24 in FIG. 1.

The collector ring passage 11 is concentric with the common axis 35, and the indentations 17 in the upper bowl shaped member 14 openly communicate with this annular passage. The outlet 25 from the collector ring 11 is offset from a radius from the common axis 35 and the housing wall 38 adjacent said outlet is substantially tangent to the circle defined by the remainder of this outer wall so as to provide a semi-scroll shape to the collector ring for inducing a circular flow of gases around it in the direction of the arrows 39 in FIG. 2. If desired, a second, similar outlet, indicated by the broken lines 25a in FIG. 2 may be provided on the housing 10 for feeding a second intake port or manifold (not shown) leading in a usual manner to another or to other engine cylinders, also not shown.

The operation of the illustrative homogenizer A is as follows:

With the homogenizer housing 10 coupled in sealed, co-extensive relation to the mixture passage 13 of a carburetor B, and with the outlet 25 of the collector ring 11 connected in sealed relation to an intake port or manifold C of an internal combustion engine (not shown), pressure within the intake manifold C and the annular collector ring passage 11 will be reduced upon each intake stroke of such engine. Such reduction of pressure will be communicated, through the indentations 17 in both bowl shaped members and the tubular central portion 12 with the throat of the carburetor B. This reduction in pressure produces a downward air flow through the carburetor B and causes a feeding of gasoline droplets and vapor from the fuel jet 27 in a conventional and well known manner.

When the fuel-air mixture from the carburetor passes downwardly through the tubular central portion 12 the mixture is deflected radially outwardly by the bottom plate 23 and flows upwardly through the passages formed by the indentations 17 in the lower bowl shaped member 15 and the tubular flange 22 as indicated by the arrow 24 in FIG. 1. Since each indentation in the lower bowl shaped member 15 is in linear register with an unindented intermediate portion 33 of the upper bowl shaped member 14, the upflowing stream of fuel-air mixture from each of the indentations 17 in the lower bowl will enter and be deflected inwardly by such unindented portion and will be reversed thereby over the upper edge of the collar 20 as indicated by the arrow 40 in FIG. 1.

Thence the mixture flows downwardly in the space between the collar 20 and the tubular central portion 12, and when it reaches the lower bowl shaped member

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15 the latter will again reverse the flow of these gases, as indicated by the arrow 41 at the right hand side of FIG. 1. On their next upward flow some of the gases will escape to the collector ring through the passages between the indentations 17 in the upper bowl and the tubular flange 22, but some of the gases will recirculate more than once along this circuitous path in the manner of a gas fly-wheel. When the gases are discharged into the collector ring passage 11 they are thoroughly intermixed and homogenized. The gases discharged into the collector ring passage 11 flow around this passage in the direction of the arrows 39 (FIG. 2) and are drawn through the outlet 25 into the intake port or manifold C, whence they are drawn in a usual manner into the combustion chamber or chambers of the engine upon which the homogenizer A is mounted.

The invention provides a simple and effective mechanism for supplying a uniform, homogeneous fuel-air mixture to an internal combustion engine, thereby tending to develop more power from the engine due to the fact that all parts of the mixture are thoroughly intermixed so as to provide adequate oxygen properly distributed for complete combustion of all available hydrocarbons present in the mixture. Such mixture uniformity will also tend to reduce afterburning and to lessen the discharge of dangerous and noxious atmospheric pollutants in the exhaust.

While I have illustrated and described a preferred embodiment of the present invention, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desired to protect by Letters Patent is defined in the following claims.

I claim:

1. A homogenizer for the fuel-air mixture for an internal combustion engine comprising an annular housing, a co-axial central tubular housing portion adapted to be coupled co-extensively to the fuel-air mixture passage of a carburetor, a pair of annular, bowl shaped members fitted co-axially onto said central portion with their concave sides facing each other, each bowl shaped member having a plurality of indentations in the periphery thereof, the indentations of one bowl shaped member being out of alignment with those of the other, a tubular flange enclosing both bowl shaped members to form, with said indentations, a plurality of nozzles opening tangentially into the space between said bowl shaped members, a deflector plate below the lower end of the tubular central member and spaced therefrom and from the lower bowl shaped member and sealed to said tubular flange to deflect fuel-air mixture from such carburetor passing downwardly through the tubular central member radially outwardly and into the nozzles defined by the indentations of the lower bowl shaped member, and a passage communicating with the nozzles defined by the indentations of the upper bowl shaped member and coupled to an intake manifold of such internal combustion engine.

2. A homogenizer for the fuel-air mixture for an internal combustion engine comprising an annular housing, a co-axial central tubular housing portion adapted to be coupled co-extensively to the fuel-air mixture passage of a carburetor, a pair of annular, bowl shaped members fitted co-axially onto said central portion with their concave sides facing each other, each bowl shaped member having a plurality of indentations in the periphery thereof, the indentations of one bowl shaped member being out of alignment with those of the other, a collar mounted co-axially of the bowl shaped members and extending therebetween substantially medially of the width thereof, a tubular flange enclosing both bowl shaped members to form, with said indentations, a plurality of nozzles opening tangentially into the space between said bowl shaped members, a deflector plate below the lower

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end of the tubular central member and spaced therefrom and from the lower bowl shaped member and sealed to said tubular flange to deflect fuel-air mixture from such carburetor passing downwardly through the tubular central member radially outwardly and into the nozzles defined by the indentations of the lower bowl shaped member for circulation endwise around said collar in the space between said bowl shaped member, and a passage communicating with the nozzles defined by the indentations of the upper bowl shaped member and coupled to an intake manifold of such internal combustion engine.

3. An arrangement according to claim 2 wherein the two bowl shaped members are identical and are positioned in relatively rotatively offset position so that the gases passing through the indentations in the lower bowl shaped member are reversed in direction by unindented portions of the upper bowl shaped member in line therewith.

4. An arrangement according to claim 2 wherein the indentations are of a depth equal to substantially one half the width of the annulus of a bowl shaped member.

5. An arrangement according to claim 4 wherein the inner end of each indentation is a flat wall substantially perpendicular to a radius from the axis of the bowl in which said each indentation is formed.

6. An arrangement according to claim 2 wherein the collar is provided with shallow indentations on each end thereof of a depth and so positioned as to receive the indentations of one of said bowl shaped members therein, the indentations in one end of said tube being rotatively offset from those in the other end thereof.

7. A homogenizer for the fuel-air mixture for an internal combustion engine comprising an annular housing, a co-axial central tubular housing portion adapted to be coupled co-extensively to the fuel-air mixture passage of a carburetor, a pair of annular, bowl shaped members fitted co-axially onto said central portion with their concave sides facing each other, each bowl shaped member having a plurality of indentations in the periphery thereof the total cross sectional area of the indentations at each bowl rim being not less than the cross sectional area of the central tubular portion, the indentations of one bowl shaped member being out of alignment with those of the other, a tubular flange enclosing both bowl shaped members to form, with said indentations, a plurality of nozzles opening substantially tangentially into the space between said bowl shaped members, deflector means below the lower end of the tubular central member and spaced therefrom and from the lower bowl shaped member and sealed to said tubular flange to deflect fuel-air mixture from such carburetor passing downwardly through the tubular central member radially outwardly and into the nozzles defined by the indentations of the lower bowl shaped member, and an annular passage co-axial with the bowl shaped members and openly communicating with the nozzles defined by the indentations of the upper bowl shaped member and having an outlet therefrom coupled to an intake manifold of such internal combustion engine.

8. An arrangement according to claim 7 where the outlet from the circular passage is offset from a radius from the axis of the annular passage and one side of said passage adjacent such outlet is straight and tangent to the outer wall of the passage to direct the mixture in a circular path around the circular passage.

9. A carburetor homogenizer for an internal combustion engine comprising a housing having an annular chamber therein, a tubular central housing portion co-axially of the chamber and adapted to be coupled at one end thereof to such carburetor to receive coarse fuel-air mixture therefrom, a pair of annular, bowl shaped members fitted into the annular chamber in relatively reversed, axially spaced relation, with their concave sides facing each other and with said central tubular portion fitted co-

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axially therethrough, a plurality of indentations in the periphery of each annular bowl shaped member out of alignment with the indentations of the other bowl shaped member, a tubular chamber element fitted around both bowl shaped members and enclosing the space therebetween, and forming, with said indentations, a plurality of nozzles communicating with the space between the bowl shaped members, means for deflecting the fuel-air mixture after passing through the tubular central portion radially of the latter and into and through the nozzles defined by the tubular chamber element and the peripheral indentations of one of the bowl shaped members, and

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enclosed channel means for conducting the mixture from the indentations of the other bowl shaped member to an intake element of such engine.

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