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2,594,636

HUMIDIFIER

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Fig. 1

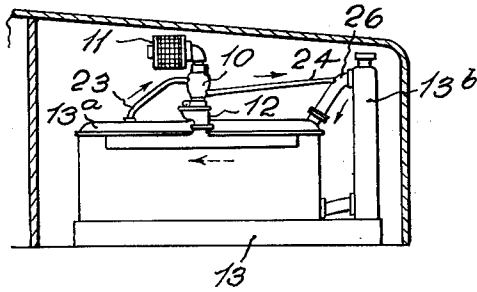


Fig. 2

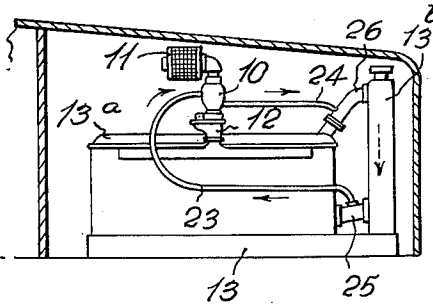


Fig. 3

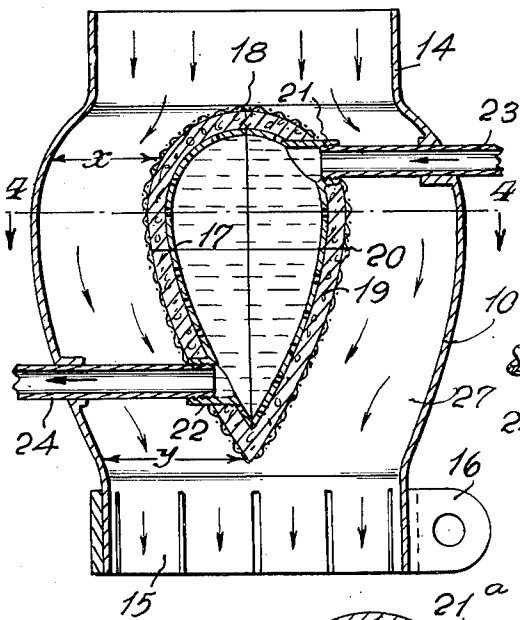


Fig. 4

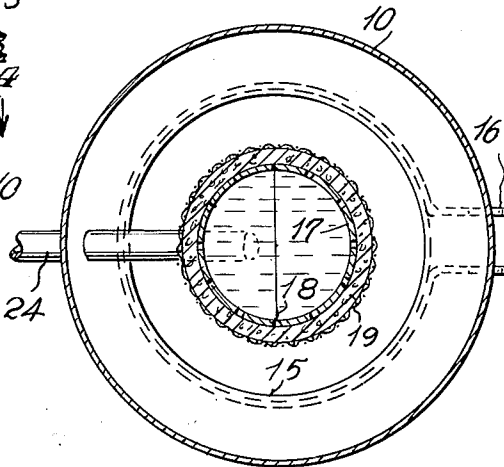
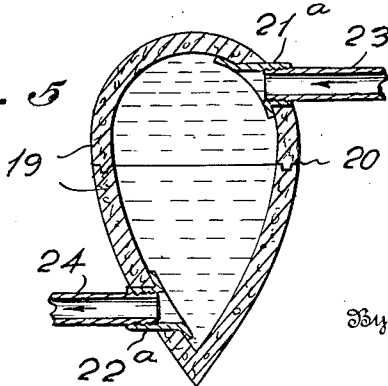


Fig. 5



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UNITED STATES PATENT OFFICE

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HUMIDIFIER

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5 Claims. (Cl. 261—36)

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The present invention relates to the cleaning and humidifying of the suction air of an internal combustion engine, and also to the intimate admixing and atomization of the air and entrained or added moisture.

Desiderata in apparatus for effecting the aforesaid operations are (a) that the air be thoroughly cleaned prior to delivery to the carburetor of the internal combustion engine, (b) that the admixture of air and moisture resulting from the humidification be as intimate and uniform as possible and in a high degree of atomization, (c) that the admixture be effected by the suction action of the engine whereby air is sucked into the latter during the suction stroke thereof, and (d) that the apparatus be of as simple a construction as possible consistent with absolutely reliable and efficient operation.

A primary object of the present invention is the provision of a cleaning and humidifying construction for assuring an effective realization of the above-enumerated desiderata.

To this end, briefly stated, the present invention provides a novel relationship of parts wherein there is interposed, between the essentially conventional air filter and carburetor of an internal combustion engine, a humidifier construction consisting essentially of a hollow porous container arranged within a casing conduit extending between and interconnecting the air filter and the carburetor. The air is sucked through the said conduit in encompassing relationship to said hollow porous container, which is kept full of water and which is configured so as to provide a very large external surface relative to the volume of water therein, whereby the requisite amount of moisture is sucked from the container in finely-divided form through the pores thereof. Enhanced suction action and humidification of the air and also enhanced admixture of the air and moisture are realized by making the inlet to the conduit smaller than the outlet therefrom so that a nozzle-like action is produced.

Presently-preferred embodiments of the invention are shown, in somewhat diagrammatic manner and by way of example, on the accompanying sheet of drawings, wherein:

Fig. 1 illustrates one method of interposing the humidifier construction of the invention into the circulating water (cooling) system of an internal combustion engine;

Fig. 2 illustrates an alternative mode of interposing the aforesaid humidifier construction into the said system;

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Fig. 3 is a cross-section through one embodiment of humidifier construction according to the invention;

Fig. 4 is a sectional view taken along line 4—4 of Fig. 3; and

Fig. 5 is a sectional view through a further form of porous container according to the invention.

Referring first to Fig. 3 of the drawings, the humidifier assembly may conveniently comprise a substantially tear drop-shaped hollow porous container, maintained filled with water as hereinafter described, and substantially centrally disposed within the casing conduit 10, as shown. The wall of the conduit 10 is centrally bulged outwardly after the general manner of the adjacent wall of the porous container. However, the configuration of the outwardly bulged wall of conduit 10 is so contrived that the width of the circumferential passageway therebetween and the porous container is smaller at the top (inlet end) than at the bottom (outlet end); i. e. dimension x is smaller than dimension y (Fig. 3).

The casing conduit 10 is interposed, as shown, between the essentially conventional air filter 11 and conventional carburetor 12 of an internal combustion engine 13 (see Figs. 1 and 2), the filter 11 being mounted on the reduced neck 14 of the conduit 10 and the slotted sleeve extension 15 of the latter being fitted to the carburetor and clamped thereto with the aid of essentially conventional strap-and-bolt clamping means 16.

The hollow porous container, as shown in Fig. 3, may conveniently be constituted by a perforated metallic inner shell 17, the two halves of which may be welded or otherwise joined together or integrated at 18, and by a porous outer shell 19 preferably of a porous or water-permeable material, such as ceramic or the like which permits seepage and evaporation of the liquid contents of the porous container or reservoir. The shell 19 may conveniently be made in two parts, if desired, joined together by waterproof cement or other essentially conventional integrating means, as at 20. Shell 17 is preferably provided with a large number of perforations so that water may pass unobstructedly therethrough.

The shell 17 may conveniently be provided with upper and lower sleeve-like projections 21 and 22 which may be interiorly threaded for engagement with the threaded ends of pipes 23 and 24, respectively. These pipes pass through the cor-

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responding openings in the casing 10 which thus provides the requisite support for the pipes 23 and 24 and, in turn, for the porous container.

Pipe 23 may be connected at its other end to the cylinder head 13a of the internal combustion engine 13, as shown in Fig. 1, or to the lower pipe connection 25 from the radiator 13b, as shown in Fig. 2. Pipe 24 may preferably be connected at its other end to upper pipe connection 26 from the radiator 13b.

In operation, air sucked in during the suction stroke of the internal combustion engine with which the device according to the invention is associated, passes through the filter element 11 and is cleaned of its foreign ingredients. The air then passes along passageway 27 defined between casing 10 and the porous container whereby humidification takes place with the aid of the moisture seeping through to the exterior surface of the said container. The greater the suction action on the air passing through passageway 27, the greater the velocity thereof and the greater the amount of water entrained from the surface of the said porous container.

By constructing the parts as indicated, i. e. by effectually constituting the inlet end of the passageway 27 a restricted throat, a nozzle action is realized such that, during the suction stroke of the engine, not only is an increased quantity of moisture entrained by the air per unit of area of porous material, as compared with an unrestricted passageway, but the increased velocity due to the jet effect also results in a better mixing of the sucked-in air and entrained water particles and also a better atomization of the resultant mixture. In addition, the pear-shaped or tear-drop shaped configuration of the porous container provides a relatively very high ratio of surface to volume of water, which is manifestly advantageous.

In the embodiment according to Fig. 5, the inner shell is omitted, the porous container being constituted entirely of porous ceramic material. Flanged sleeves 21a and 22a are provided for connection to pipes 23 and 24 and for supporting the container. In other respects, the arrangement coincides exactly with that above described.

It is evident from the foregoing that the relationship of parts according to the present invention realizes the objects of the invention as hereinbefore set forth.

It is to be understood that the specific embodiments above described in detail are purely exemplary in character and that the invention is not to be limited except as required by the terms of the claims hereunto appended.

Having thus disclosed the invention, what is claimed is:

1. A humidifier comprising an air conduit having an enlargement in the wall thereof, a hollow

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porous container for a liquid located within said enlargement and spaced from said wall so that air passing through said conduit encircles said container, a source of liquid and conduits fixed to said wall supporting said container at the upper and lower portions thereof within said enlargement, said conduits being connected in a closed circuit with said source.

2. A humidifier comprising an air conduit having an enlargement in the wall thereof, a hollow porous container for a liquid located within said enlargement and spaced from said wall, so that air passing through said conduit encircles said container, a source of liquid, a conduit for feeding a liquid from said source to said container fixed to the wall of said air conduit and to said container near one end thereof, another conduit for withdrawing liquid from said container fixed to the wall of said air conduit and near the other end of said container, said last named conduits supporting said container within said enlargement and being connected in a closed circuit with said source.

3. A humidifier comprising an air conduit, a hollow porous container for a liquid located within said conduit and spaced from the wall thereof so that air passing through said conduit encircles said container, a source of liquid and conduits fixed to said wall supporting said container within said air conduit, said conduits being connected in a closed circuit with said source.

4. A humidifier as set forth in claim 1, wherein the inlet cross-sectional area for the air passing said container is less than the outlet cross-sectional area for passing said container.

5. A humidifier as set forth in claim 1 wherein said container is of teardrop design with the enlarged portion located in the direction of the inlet end of said air conduit.

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