Feb. 16, 1932. H. HUEBER 1,845,969

SUCTION AUGMENTING DEVICE

Filed April 2, 1928

Fig. 1

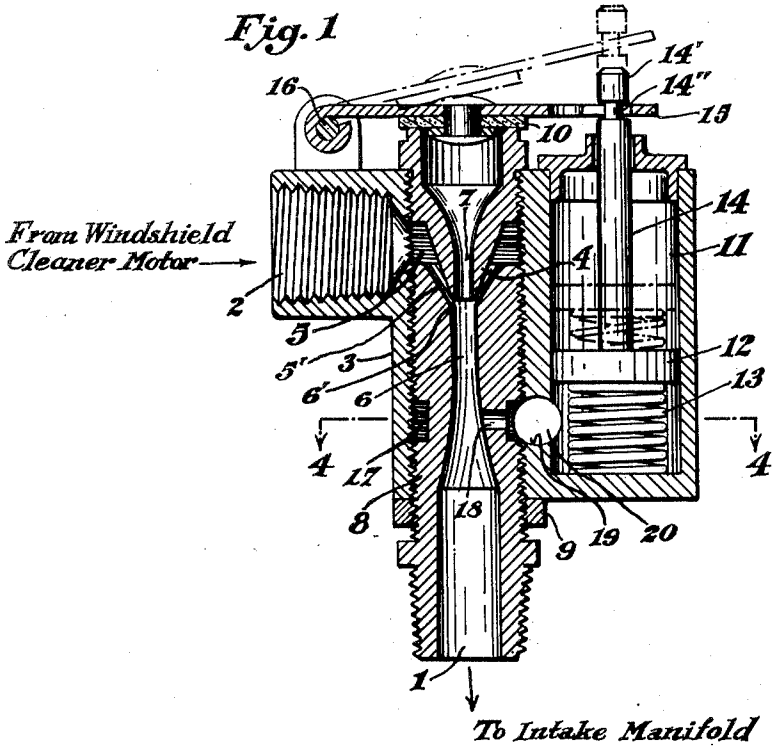


Fig. 2

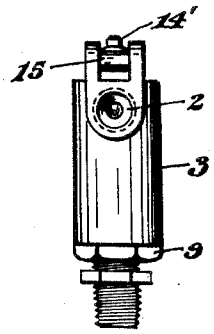


Fig. 3

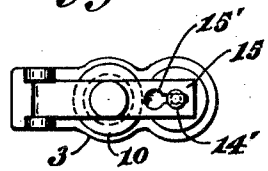
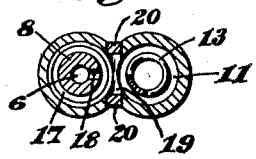


Fig. 4



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UNITED STATES PATENT OFFICE

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SUCTION AUGMENTING DEVICE

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This invention relates to means for controlling the supply of suction furnished by the intake manifold of the vehicle hydrocarbon engine for operating suction operated mechanisms with which the motor vehicles may be equipped, such as automatic windshield cleaners.

In the normal operation of a suction operated windshield cleaner the wiper element is operated at a variable speed, sometimes attaining a high speed, or "racing", as when the engine is throttled, and at other times having a reduced speed of operation which is quite insufficient to properly clean the windshield, and at times may come to a standstill, such as when the engine is laboring with the throttle more or less fully opened. Under the latter circumstances it is necessary to disengage the engine clutch and permit the engine to accelerate in order to furnish more suction to operate the cleaner, or else to manually assist the cleaner which requires the removal of a hand from the vehicle control thereby providing an additional element of danger in the driving of the vehicle.

The present invention has for an object to provide means for intensifying or augmenting the supply of suction to the windshield cleaner motor when the degree of suction maintaining in the intake manifold is negligible or insufficient, whereby the cleaner will continue to operate efficiently over a greater range or variation in pressure differentiation.

The invention has for a further object to increase the suction by means of an induced or Venturi action, such as by an aspirator device. Further the invention resides in a suction augmenter which may be automatically rendered inoperative when the supply of suction furnished by the intake manifold is adequate for the efficient operation of the windshield cleaner motor.

The invention resides in a suction inducing device more in the nature of an aspirator through which the atmosphere is drawn into the intake manifold through a Venturi tube in which is induced an increased suction leading off to the windshield cleaner motor, and also an automatic control subject to the pressure conditions maintaining in the suction line for rendering the Venturi tube inoperative whereby the manifold will be in a direct and uninterrupted communication with the windshield cleaner motor.

The invention further resides in the features of construction and the arrangements and combinations of parts hereinafter set forth, reference being had to the accompanying drawings wherein,

Fig. 1 is a sectional view through the improved device, constructed in accordance with the present invention.

Fig. 2 is an elevation thereof.

Fig. 3 is a plan view of the device.

Fig. 4 is a detailed cross sectional view about on line 4—4 of Fig. 1.

In accordance with the present invention it is designed to insert the improved device in the suction lines leading from the intake manifold to the windshield cleaner. Thus, the outlet passage 1 is connected direct to the intake manifold while the inlet passage 2 is connected direct to the windshield cleaner motor, and between these two passages 1 and 2 is arranged the Venturi tube which comprises a body 3 having an injector part or nozzle 4 extending into the aspirator or induction chamber 5 and discharging thereacross into an axial delivery passage 6. Passage 6 is depicted as being slightly larger in diameter than the funnel-shaped passage 7 of the injector part or nozzle.

The exterior surface of the nozzle 4 is conical and tapers off into the flare 5′ at the inner end of the passage 6, whereby there is provided an annular gap or restricted orifice 6′ at the throat of the Venturi tube, or at the point where the injector nozzle discharges into the passage 6, for creating an aspirating effect on the fluid in chamber 5. This restricted orifice may be adjusted as to size for obtaining the most efficient results from the Venturi device. To effect this adjustment the nozzle 4 is threaded in the upper end of the chamber 5, with respect to Fig. 1, while thread in the lower end of the chamber 5 is a plug member 8 in which are formed the passages 1 and 6 and and the flaring wall 5′, so that by threading or turning the plug mem-

ber in or out of the body 3 the flaring wall 5' of the aspirator chamber will be advanced toward or retracted from the nozzle 4 and thereby vary the size of the orifice leading from the chamber 5. After the desired size of the orifice is obtained the adjustment may be secured by such means as a jam nut 9 jammed against the lower end of the body 3.

In the operation of a suction-operated windshield cleaner the degree of suction as applied by the intake manifold varies according to the extent to which the throttle valve is opened; when the throttle valve is closed the degree of suction is at its maximum while when the throttle valve is fully opened the degree of suction is at its minimum, for a given speed of the engine. Therefore, the windshield cleaner operates under ordinary driving conditions between an accelerated, "racing" speed and a very slow and impractical speed, sometimes coming to a standstill, because in the latter instance the degree of suction is insufficient to operate the windshield cleaner motor against the resistance offered by the wiper blade and other parts of the windshield cleaner.

Practical experience has demonstrated that by the insertion of the Venturi tube in the suction line between the intake manifold and the windshield cleaner, a small or low degree of suction on the intake manifold side of the Venutri tube will be substantially augmented or increased on the windshield cleaner side thereof whereby the windshield cleaner will operate at a practical speed even on a very subnormal supply of suction. With the atmospheric air issuing from the injector nozzle 4 into the passage 6 the degree of suction reached in the chamber 5 will be greater than that obtaining at the intake manifold side of the venturi by reason of the aspiration or induction set up at the restricted orifice 6' leading from the chamber 5 into the passage 6.

When the suction in the intake manifold approaches a supernormal degree and the windshield cleaner accelerates beyond the normal speed of operation, it is found that too large a quantity of air will enter the manifold through the nozzle 4 and result in thinning the combustible mixture to an impractical degree. Therefore, it is advisable to restrict and even stop the admission of air through the injector nozzle 4 during intervals when the supply of suction is sufficient for the normal operation of the windshield cleaner, or is in excess relative thereto. This is automatically effected in the present disclosure by providing a fluid pressure controlled cut-off to the nozzle 4. The cut-off comprises a valve 10 seating on the upper or outer end of the injector part 4, which constitutes the seat, and this valve is moved to and from its seat by means of a fluid pressure responsive device depicted as comprising a cylinder 11 having communication with the suction passage 1, a piston 12 supported in the cylinder by a coil spring 13, and a stem 14 extended through the upper end of the cylinder and connected to the valve lever 15, the latter being fulcrumed at 16 and supporting the valve 10 intermediate its ends.

The connection between the stem 14 and the lever 15 is preferably a detachable one comprising a head 14' insertible through a key-shaped slot 15' whereby the reduced neck 14'' of the stem may be slid into the reduced portion of the slot 15'. The communication between the suction passage 1 and the cylinder 11 is preferably effected by providing an annular groove 17 on the plug body 8, a radial duct 18 leading from the base of the peripheral groove 17 into the passage 6, and the opening 19 through the intermediate wall dividing the cylinder 11 and the chamber 5, which latter opening is practically formed by providing a transverse bore the ends of which may be suitably closed by plugs 20, as shown in Fig. 4.

In operation when a normal or excessive degree of suction maintains within the intake manifold, the same will act through the communicating channel 17, 18, 19 and likewise reduce the pressure beneath the piston 12 whereby atmospheric pressure entering along the unpacked stem 14 will drive the piston 12 downwardly against the action of the spring 13 and thereby draw the valve 10 to its seat. Under these conditions the intake manifold will have a direct and uninterrupted communication with the windshield cleaner motor, but when the suction in the intake manifold lessens, as when the throttle valve is more or less fully opened, the spring 13 will counteract the atmospheric pressure and expand to force the piston 12 upwardly thereby unseating the valve 10 and permitting atmospheric pressure to enter the suction line through the injector nozzle 4 thereby producing an aspirating effect at the restricted orifice 6' leading to the chamber 5 to decrease the pressure or increase the suction at the windshield cleaner side of the Venturi device.

The aspirator effect of the atmosphere discharging from the nozzle 4 will also be varied in accordance with the change of pressure conditions in the intake manifold. As the suction conditions recede from an impractical subnormal and approach an operating normal the valve 10 will gradually close and thereby decrease the volume of fluid passing through the injector nozzle and, consequently, gradually break the aspirator action of the venturi.

By the inclusion of this device in the suction line the degree of suction supplied to the windshield cleaner motor or to the accessory device will be augmented at the proper time and for the proper interval so

that the accessory motor will function more nearly at a normal speed, and will not be subjected to a wide range of operating speeds in proportion to the variation in the degrees of suction maintaining in the normal operation of the intake manifold of a motor vehicle.

What is claimed is:

1. An aspirator attachment for the suction lines of motor vehicles, comprising a delivery passage, an aspirator chamber, an injector passage discharging across the chamber into the delivery passage for creating an aspiratory action in the chamber, means responsive to sub-atmospheric pressure conditions in the delivery passage for restricting the flow of fluid through the injector passage, and means for varying the spacing between said passages.

2. A suction increasing device comprising a body having an intercommunicating chamber and cylinder, said chamber having an inlet and an outlet, a delivery passage leading to the outlet, an injector passage discharging across the chamber and defining an aspiratory chamber between said passages, said delivery passage communicating with the cylinder, a lever pivoted on the body, a valve movable by the lever to and from a position closing the injector passage, a piston in the cylinder operatively connected to the lever for operating the same, and means normally urging the valve to an inoperative position.

3. A suction increasing device comprising a body having an intercommunicating chamber and cylinder, said chamber having an inlet and an outlet, a delivery passage leading to the outlet, an injector passage discharging across the chamber and defining an aspiratory chamber between said passages, said delivery passage communicating with the cylinder, a lever pivoted on the body, a valve movable by the lever to and from a position closing the injector passage, said lever overhanging the cylinder, a piston in the cylinder detachably connected to the lever, and resilient means normally urging the valve to its inoperative position.

4. A suction intensifier for windshield cleaners, comprising a unitary body having a chamber and a cylinder, a piston operable in the cylinder, a delivery passage in the chamber with which the cylinder communicates, an injector nozzle arranged in the chamber and defining with said passage an aspirating chamber, a valve for opening and closing said injector nozzle, and a member directly connected to the piston and supporting the valve for bodily movement.

5. A suction intensifier comprising a body having a chamber opening through one side thereof and a cylinder also opening through said side, a piston operating in the cylinder and having a rod part extending axially thereof, a member carried by the rod part for movement with the piston and overlying the chamber, a valve carried by said member and movable by the piston to and from a position seating over the chamber opening to close and open the same to the atmosphere, a delivery nozzle in said chamber, an injector nozzle arranged in the chamber between the valve and delivery nozzle and discharging into the latter to create an aspirating action, and means of communication between the cylinder and the delivery nozzle.

6. A suction intensifier for windshield cleaners comprising a body having a chamber with an inlet and an outlet, a cylinder communicating with the outlet and carried by the body, an injector nozzle discharging within the chamber toward the outlet thereof to create an aspiratory action at the inlet side thereof, said injector nozzle opening to the atmosphere through one side of the body whereby atmospheric air may enter through the injector nozzle into the chamber, a lever pivoted on the body, a valve directly carried by the lever and seating to close the injector nozzle to the atmosphere, and a piston operable in the cylinder and connected to the lever for actuating the same.

7. An attachment for suction-operated windshield cleaner systems, comprising a block having a chamber provided with an inlet and an outlet, a cylinder formed in the block having a communication between its inner end and said chamber adjacent its outlet, a spring-supported pressure-influenced piston in the cylinder, a venturi, within the chamber for creating an aspiratory action at the inlet, and a valve movable by the piston to open and close the venturi, said valve and piston being wholly supported and contained by the block.

8. In a suction operated accessory having a source of variable suction, in combination an aspirator chamber, a Venturi tube having an inlet end discharging across the aspirator chamber to a discharge end and connected at its discharge end to the source of variable suction, a valve normally opening the inlet end of the tube, a line connecting the accessory to the aspirator chamber of the Venturi tube, and means for operating the valve to its closed position when the suction supply is sufficient for the operation of the accessory, said means being in communication with, and operable by the pressure maintaining at, the source of suction, said means acting to open the valve to admit air through the inlet end when the suction at the source of variable suction reaches a predetermined minimum.

9. A device for augmenting the suction supplied by the intake manifold to an automotive accessory, when insufficient to actuate the accessory, comprising a delivery passage for connection to an intake manifold, an aspirator chamber for connection to a suction operated accessory, an injector passage discharging across the aspirator chamber

into the delivery passage, valve means for controlling the passage of fluid through the injector passage, means responsive to the manifold suction of a predetermined degree for moving the valve means to its closed position, and means acting to move the valve means to its opened position when the manifold suction is insufficient to actuate the accessory, whereby fluid is admitted to the injector passage for discharge across into the delivery passage to thereby induce a flow from the aspirator chamber into said delivery passage for the augmentation of the supply of manifold suction.

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