March 7, 1950 N. NORDENSTAM 2,499,671

SUCTION OPERATED WINDSHIELD WIPER MOTOR

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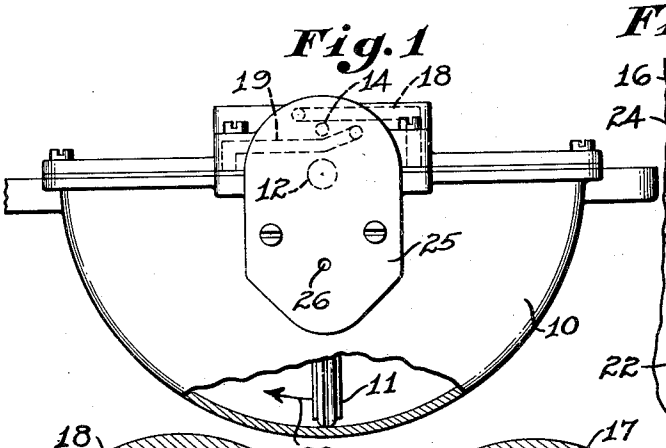


Fig. 1

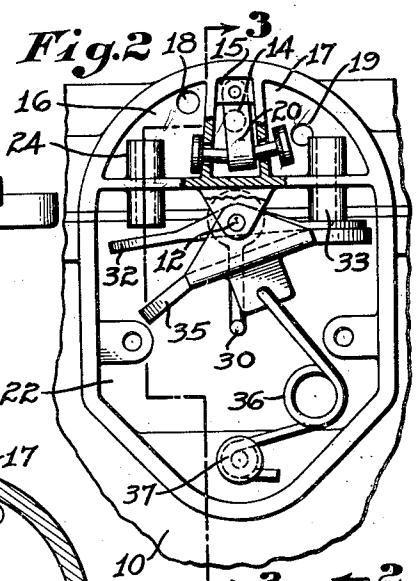
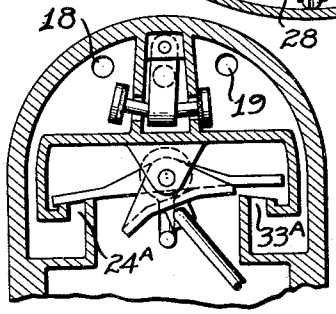


Fig. 2



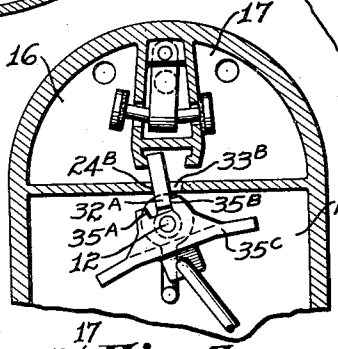


Fig. 5

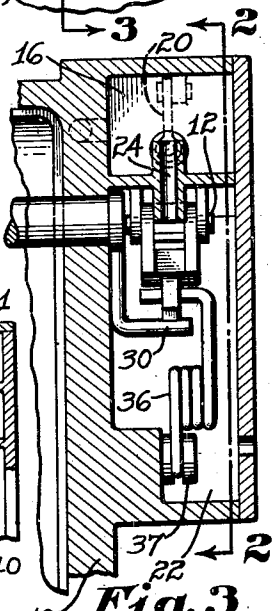


Fig. 3

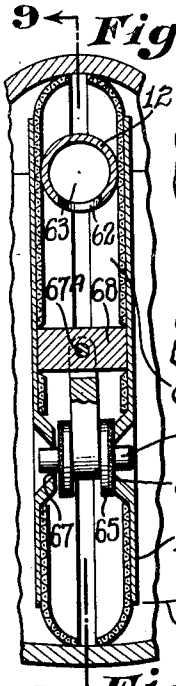


Fig. 8

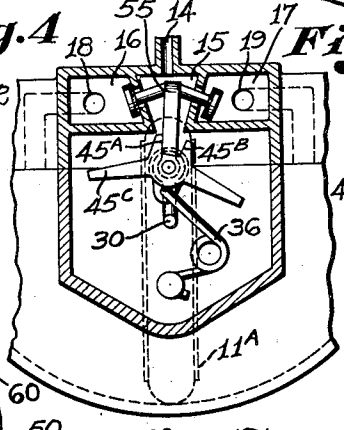


Fig. 7

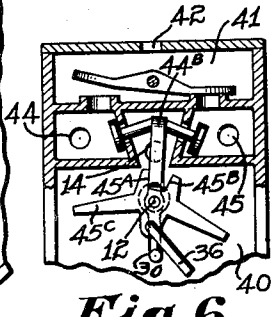


Fig. 6

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SUCTION OPERATED WINDSHIELD WIPER MOTOR

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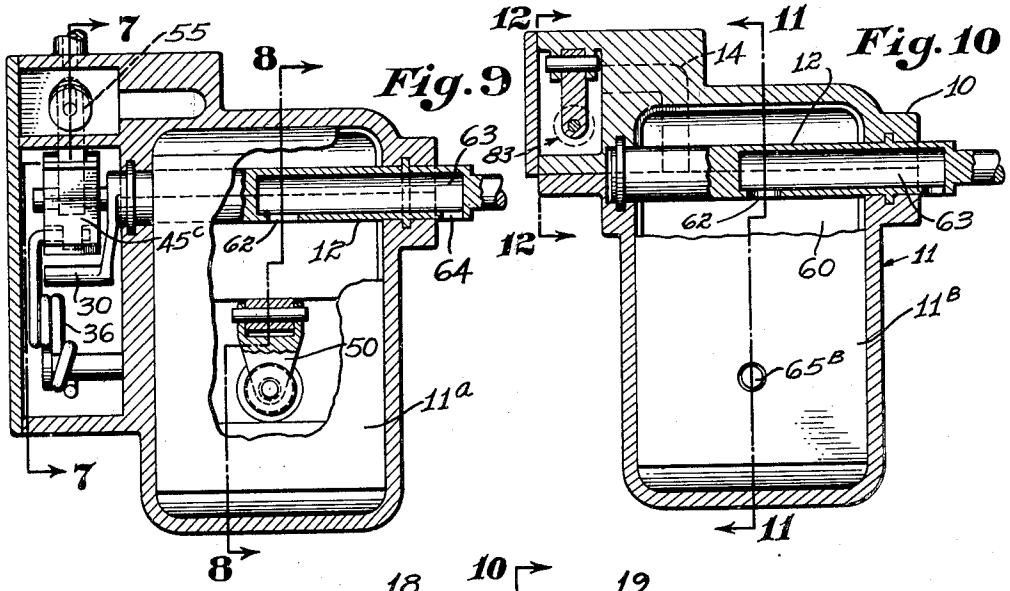


Fig. 9

Fig. 10

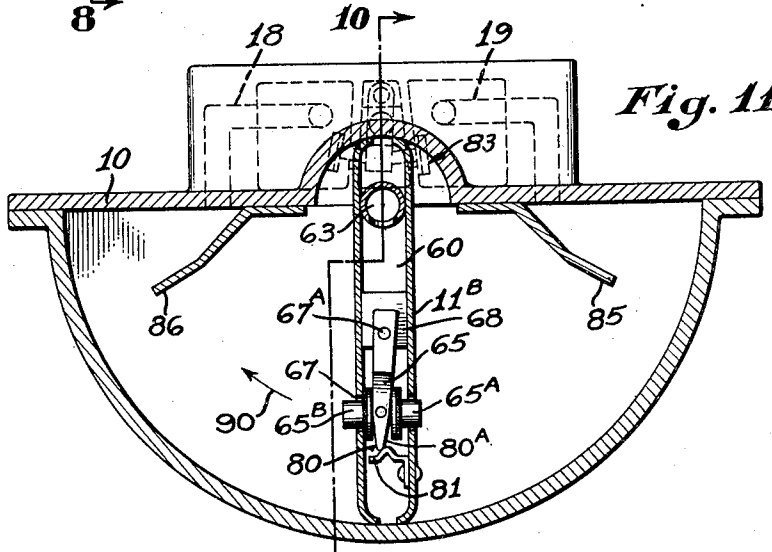


Fig. 11

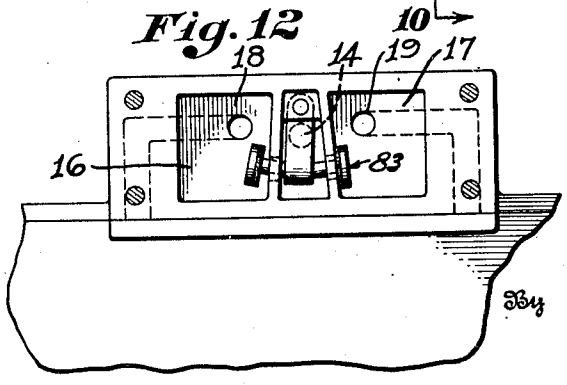


Fig. 12

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SUCTION OPERATED WINDSHIELD WIPER MOTOR

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6 Claims. (Cl. 121—97)

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The present invention relates to improved suction operated motors of the type useful as windshield wiper motors which are operated in accordance with suction pressures in manifolds of internal combustion engines.

An object of the present invention is to provide an improved simplified valve structure in fluid motors of the type indicated above which are positive in action and easy to manufacture and assemble in accordance with present day mass production methods.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. This invention itself, both as to its organization and manner of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a view in elevation of a suction operated motor embodying the present invention with a portion of the vane casing broken away.

Figures 2 and 3 show details of the motor shown in Figure 1 and are views taken respectively on the lines 2—2 of Figure 3 and on the lines 3—3 of Figure 2.

Figures 4, 5 and 6 are views similar to the view shown in Figure 2 of three different modified structures embodying the present invention.

Figures 7, 8 and 9 show the structure of another modified motor embodying the present invention, Figures 7 and 8 being sectional views taken respectively on the lines 7—7 and 8—8 of Figure 9 and Figure 9 is a view taken substantially on the line 9—9 of Figure 8.

Figures 10, 11 and 12 show a further modified suction operated motor embodying the present invention, Figures 11 and 12 being taken substantially on the lines 11 and 12 of Figure 10 and Figure 10 being a view taken substantially on the line 10—10 of Figure 11.

Referring to the structure shown in Figures 1, 2 and 3, there is provided a hollow semicircular casing 10 in which a vane member 11 is pivoted for reciprocal movement on its shaft 12, the shaft 12 being journaled for rotation within the casing 10. The vane 11 is operated by subjecting one side thereof alternately to pressure below atmospheric, such as that existing in the manifold of an internal combustion engine. Such vacuum or subatmospheric pressure is created in the manifold of the internal combustion engine as is well known and such manifold is connected to the vacuum port 14 to thereby always maintain the chamber 15 at subatmospheric pressure. This chamber 15 may be placed in communication with either one, but not both, of the chambers 16 and 17 which are respectively in communication with opposite sides of the vane member 11. For this purpose, port

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or channel 18 places the right hand side of the vane 11 in Figure 1 in communication with the chamber 16 and the port or channel 19 places the left hand side of vane 11 in communication with the chamber 17. The pivoted check valve member 20 serves alternately to place the chamber 15 in communication with the chamber 16 or 17 as the case may be and, as shown in Figure 2, this valve member 20 closes the passage between chambers 15 and 16. The valve member 20 is held in position shown therein by atmospheric pressure which exists in such chamber 16 since it is in communication with the bottom chamber 22 through the tubular valve member 24, the chamber 22 being normally closed by the releasable cover member 25 which has a vent hole 26 therein to place the chamber 22 at all times at atmospheric pressure.

Thus, as shown in Figures 1, 2 and 3, air at atmospheric pressure enters the vent hole 26, into the chamber 22, flows through the valve member 24 into the chamber 16 to close the valve 20, and to cause a force to be exerted on the right hand side of the vane 11 in Figure 1 to move the vane in the direction indicated by the arrow 28; at the same time, the air on the left hand side of the vane is being removed through the channel 19 which is in communication with the chamber 17 and the chamber 15 which is in communication with the port 14.

Such motion of the vane 11 in Figure 1 continues until, at the extremity of its stroke, the lever member 30 mounted on the shaft 12 causes the valve port to close in a manner described now.

The tubular valve member 24 may be sealed by the valve member 32 which pivots freely on the shaft 12, it being noted that this valve member 32 is pivoted at a point intermediate its ends so as to cooperate with the two identical tubular valve members 24 and 33 so that when the tubular valve member 24 is opened, the other tubular valve member 33 is closed and vice versa.

This valve member 32 in Figure 2 is held firmly in either one of its two positions by a snap action over center mechanism comprising a pressure plate member 35 which is pivotally mounted on the shaft 12 and which is maintained in spring biased position against the valve member 32 by the overcenter torque spring 36 having one of its ends anchored on the post 37 on the valve casing 10 and the other one of its ends connected to an intermediate portion of said pressure plate 35.

It is noted that this pressure plate member 35 is in the path of movement of the lever member 30 and is engaged thereby near the end of the stroke of the vane member 11 to cause such pressure plate member 35 to move to a position wherein the torque spring 36 attached thereto moves to overcenter position in which case the pressure plate member 35 continues to move under the influence of spring 36 to move the valve member 32

in Figure 2 to its other position with a snap action.

When, as indicated above, such valve member 32 is moved to its opposite position than that shown in Figure 2, the chamber 17 is placed in communication with the chamber 22 through the valve member 33 to cause the check valve member 20 to move to its opposite position and to cause a force to be exerted on the left hand side of the vane member 11 to drive it to the right in Figure 1 at which time simultaneously air on the right hand side of the vane member 11 is being removed through channel 18 with chamber 15, which is in communication with the suction port 15.

In the modified structure shown in Figures 4, 5 and 6, corresponding parts have identical reference numerals. In Figure 4, the valve arrangement is similar to that shown in Figure 2 but for the fact that instead of the valve members 24, 33 comprising tubular sleeve members, they, in Figure 4, have as their counterpart, sleeves 24A, 33A disposed on the underside of the valve member 32. In Figure 5, the valve members 24, 33 and cooperating valve member 32 find as their counterpart a pivoted vane member 32A adapted to engage its seat 24B, 33B. This vane member 32A is pivotally mounted on the central vane shaft 12 and is engageable by the oppositely disposed abutment members 35A, 35B on the pressure plate 35C to press such vane member 32A against the corresponding valve seat 24B, 33B. In Figure 5, the chamber 16 is sealed off from the atmospheric pressure chamber 22 by the valve member 32A engaging its seat 24B and a subatmospheric pressure existing in such chamber 16, while at the same time, atmospheric pressure exists in the chamber 17.

In the modified structure shown in Figure 6, the vacuum port is represented at 14 in which case the bottom chamber 40 within which the overcenter spring 36 is disposed is always at subatmospheric pressure while the upper chamber 41 vented at 42 is always maintained at atmospheric pressure and in this case, the check valve member 44B is moved with a snap action by the spring 36 to alternately place the ports 44, 45 extending to opposite sides of the vane member 11 in communication either with atmospheric pressure or with the subatmospheric pressure existing in chamber 40. This check valve member 44B is pivotally mounted on the vane shaft 12 and is engageable by the oppositely disposed abutments 45A, 45B on the spring biased pressure plate member 45C to which is attached the spring 36 and which is engageable by the lever member 30, Figure 6, on the shaft 12 to move the spring 36 to overcenter positions.

In the arrangements shown in Figures 7, 8 and 9, the vane member 11A is of hollow wall construction and incorporates therein the valve structure 50 whose function is the same as the valve in Figure 2 comprising the elements 24, 32 and 33. The vacuum port 14 is in communication with the chamber 15 which is always at subatmospheric pressure, such chamber 15 being selectively disposed in communication with the chambers 16 and 17 by the snap actuated valve member 55 which is operated in the precise manner as is the valve member 44B in Figure 6 and for that reason corresponding parts in Figures 6 and 7 have identical reference numerals. Referring to the construction of the vane 11A shown in Figures 8 and 9, it is noted that the chamber 60 defined by the hollow walls is in communication with the hollow portion 63 of shaft 12, such

hollow portion 63 being vented to the atmosphere at 64 so that the internal chamber 60 of the vane 11A is always maintained at atmospheric pressure. When subatmospheric pressure or suction is exerted on either side of the vane member 11A, Figure 8, the relative high atmospheric pressure within chamber 16 causes the pivotally mounted valve member 50 to move either to the right or to the left as the case may be in Figure 8 to close the valve ports 66 or 67. This valve member 65 is pivotally mounted at 67A, Figure 8, on the cross member 68 within the vane 11A. In the operation of the motor shown in Figures 7, 8 and 9, vacuum or subatmospheric pressure exists in the chamber 17 in the channel 19 and on the right hand side of the valve member 11A. Existence of such subatmospheric pressure in chamber 17, in channel 19 and on the right hand side of the vane member 11A in Figure 8 causes the valve member 65 to close the port 66 in which case the atmospheric pressure exerted on the left hand side of the vane member 11A introduced through the port 62, Figure 8, causes the valve member 11A to move in the direction indicated by the arrow 70 in Figure 8 until near the end of its stroke at which time the valve member 55 is moved to its other position under the influence of spring 36 to place the chamber 16 in communication with the vacuum port 14. At this time there is a subatmospheric pressure on the left hand side of the vane 11A, atmospheric pressure on the right hand side of the vane and the vane moves in the direction opposite to the direction indicated by the arrow 70 to the end of its stroke at which time again the valve member 55 is actuated to again cause movement of the vane stroke 11A. Thus, oscillator movement is imparted to shaft 12 upon which may be mounted a windshield wiper blade of conventional construction.

In the arrangement shown in Figures 10, 11 and 12, the corresponding check valve 50 of Figure 8 is maintained in one of its two positions by spring detent means 80 and for that reason it is unnecessary that the corresponding valve member 55 of Figure 7 be spring actuated. In other words, comparing the arrangements shown in Figures 7, 8 and 9 with the arrangement shown in Figures 10, 11 and 12, there is a reversal of parts in the sense that the valve member 65 in Figure 11 is maintained by a spring 81 in one of its two positions and the valve member 83, Figures 10, 11 and 12, freely floats. Referring specifically to Figures 10, 11 and 12, the pivoted valve member 83 is identical to the valve member 20 in Figure 2 and serves to place the vacuum port 14 in alternate communication with the chambers 16 and 17, the chambers 16 and 17 being in communication with opposite sides of the vane member 11B through corresponding channels 18 and 19. The valve member 65 is provided with oppositely extending projections 65A, Figure 11, 65B arranged at the end of its stroke to engage the corresponding extensions 85, 86 on the casing 10 to thereby transfer the position of the valve member 65, the valve member 65 being maintained in position by the spring detent means 80 comprising the extension 80A and cooperating deflectable spring 81. Thus, as shown in Figures 10, 11 and 12, vacuum introduced at port 14 causes the valve member 83 to move to the right as shown since atmospheric pressure from the hollow wall 60 is transferred through the open valve 65 up through channel 19 to such valve member 83 to thereby maintain it in the position shown in Figure 12. At the same time,

such atmospheric pressure presses against the right hand side of the vane 11B in Figure 11 to move it to the left in the direction indicated by the arrow 90 and simultaneously the air on the left hand side of the vane 11B is removed through channel 13 which is in communication with the vacuum port 14. Such movement continues in the direction indicated by the arrow 90 until the extension 65B engages the extension 86 in which case the valve member 65 is moved to open the port 67 and the spring detent means 80 is effected to maintain such valve member 65 in relative position with respect to vane member 11B. Thereafter, the direction of motion of the vane member 11B is reversed since atmospheric pressure is exerted on the left hand side of it to cause the valve member 83 to move to its other position wherein the vacuum port 14 is pressed in communication with the right hand side of the vane member 11B in Figure 11 until the extension 65A engages the extension 85 in which case the valve member 65 is moved to its other position and the direction of movement of the vane is again reversed.

While the particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. In a fluid motor of the type described, a housing with a first chamber therein, a vacuum port leading to said chamber, said housing having a pair of chambers each on an opposite side of the first mentioned chamber, an oscillating vane pivotally mounted in said housing, a fluid channel extending from the corresponding one of said pair of chambers to opposite sides of said vane, a pivoted check valve member in the first chamber arranged to selectively place said first chamber in communication with either one of said pair of chambers, and means responsive to movement of said vane arranged to vent either one of said pair of chambers to the atmosphere.

2. In a fluid motor of the type described, a housing having a first chamber, said housing having a pair of chambers on opposite sides of said first chamber, valve means interposed between said first chamber and said pair of chambers arranged to place said first chamber in communication with only one of said pair of chambers at any particular time, valve means arranged to vent either one of said pair of chambers to the atmosphere at any one particular time, said first mentioned valve means being a pivotally mounted check valve member movable in response to the presence of atmospheric pressure in either one of said pair of chambers.

3. In a fluid motor of the type described, a housing having a first chamber, said housing having a pair of chambers on opposite sides of said first chamber, valve means interposed between said first chamber and said pair of chambers arranged to place said first chamber in communication with only one of said pair of chambers at any particular time, valve means arranged to vent either one of said pair of chambers to the atmosphere at any one particular time, a vane in said housing with opposite sides thereof in communication with corresponding ones of said pair of chambers, said first mentioned valve means being engaged and moved by a snap action mechanism actuated in accordance with movement of said vane.

4. In a fluid motor of the type described, a housing having a first chamber, said housing having a pair of chambers on opposite sides of said first chamber, valve means interposed between said first chamber and said pair of chambers arranged to place said first chamber in communication with only one of said pair of chambers at any particular time, valve means arranged to vent either one of said pair of chambers to the atmosphere at any one particular time, a movable vane within said housing having opposite sides thereof in communication with a corresponding one of said pair of chambers, the second mentioned valve means being engaged and moved by a snap action mechanism actuated in response to movement of said vane.

5. In a fluid motor of the type described, a housing having a first chamber, said housing having a pair of chambers on opposite sides of said first chamber, valve means interposed between said first chamber and said pair of chambers arranged to place said first chamber in communication with only one of said pair of chambers at any one particular time, valve means arranged to vent either one of said pair of chambers to the atmosphere at any one particular time, a movable vane within said housing having opposite sides thereof in communication with a corresponding one of said pair of chambers, said vane being of hollow wall construction vented to the atmosphere, and the second mentioned valve means being disposed within the hollow wall structure of the vane and arranged to selectively vent opposite sides of said vane to the atmosphere.

6. In a fluid motor of the type described, a housing having a pair of chambers on opposite sides of said first chamber, valve means interposed between said first chamber and said pair of chambers arranged to place said first chamber in communication with only one of said pair of chambers at any particular time, valve means arranged to vent either one of said pair of chambers to the atmosphere at any one particular time, a movable vane within said housing having opposite sides thereof in communication respectively with a corresponding one of said pair of chambers, said vane being of hollow wall construction vented to the atmosphere, the second mentioned valve means being disposed within the hollow walls of said vane to place opposite sides of said vane in communication with the atmosphere, extension means serving as motion limiting means interposed in the path of movement of said second valve means to change the position of said valve, and indexing means mounted on said vane arranged to index said second valve means to the position at which it is actuated by its engagement with said motion limiting means.

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