March 28, 1944. A. RAPPL 2,344,949

MOTOR

Filed May 31, 1940 2 Sheets-Sheet 1

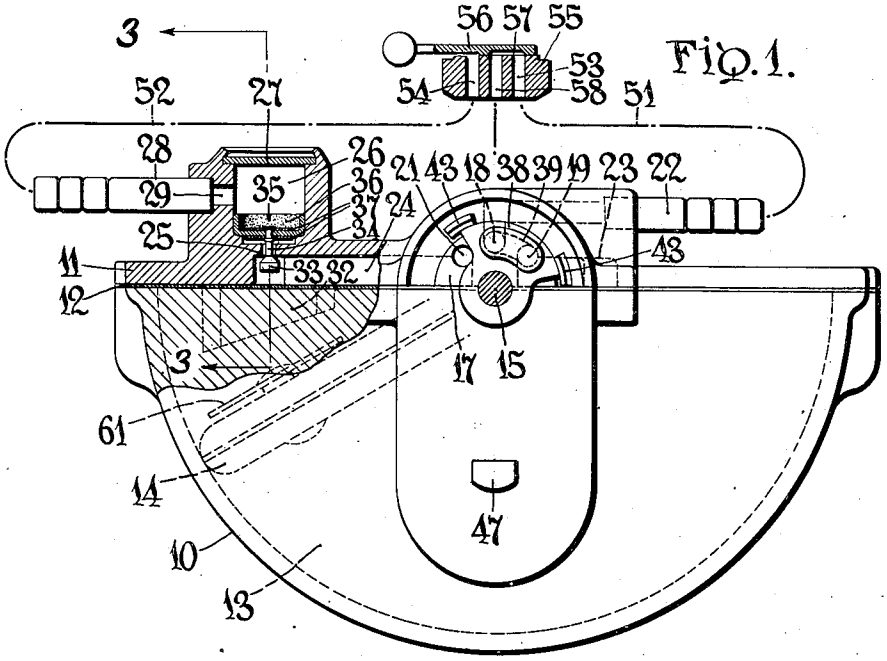


Fig. 1.

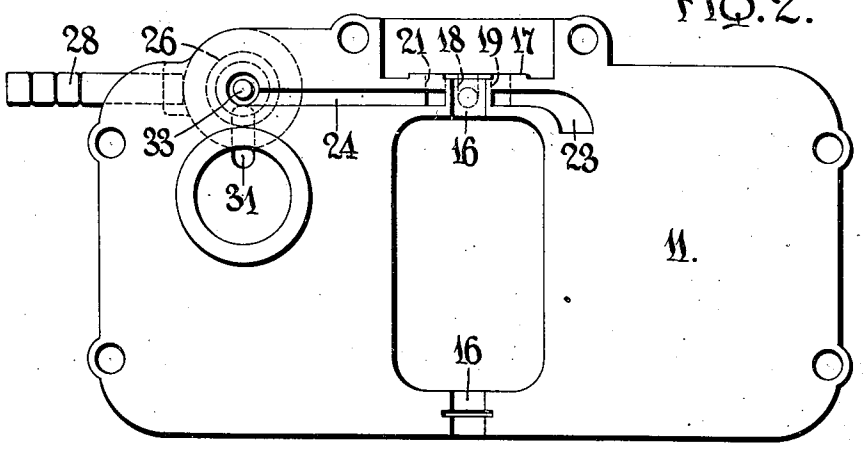


Fig. 2.

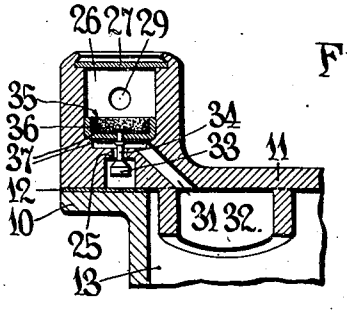


Fig. 3.

INVENTOR
Anton Rappl,
BY
Beau, Brooks Buckley & Beau.
ATTORNEYS

March 28, 1944. A. RAPPL 2,344,949

MOTOR

Filed May 31, 1940 2 Sheets-Sheet 2

Fig. 4.

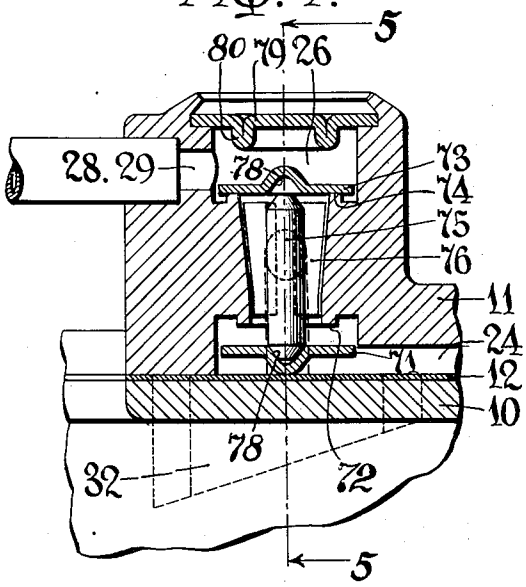


Fig. 7.

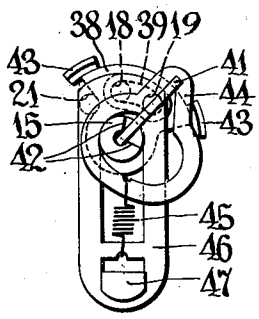


Fig. 6.

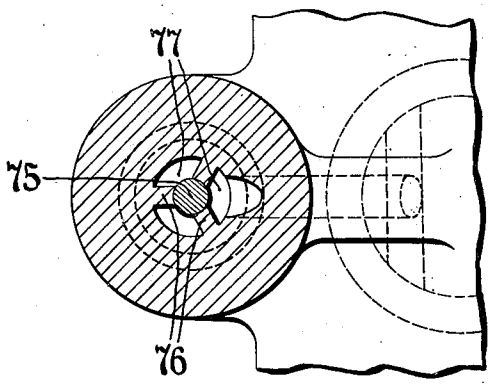
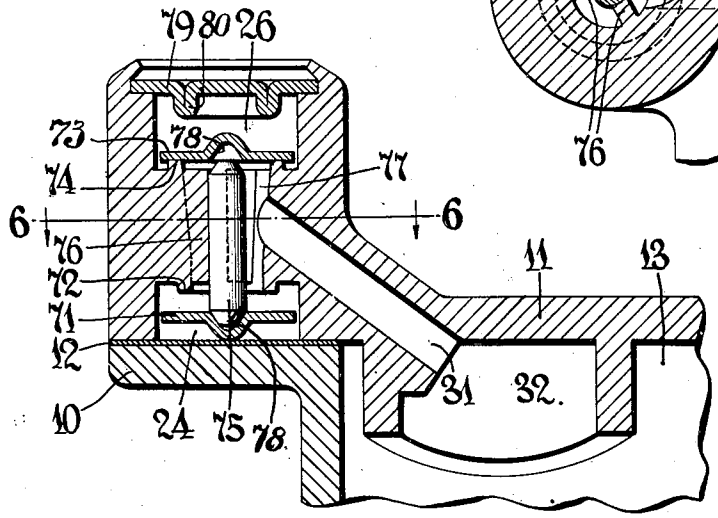


Fig. 5.



INVENTOR
Anton Rappl,
BY
Beau, Brooks, Buckley & Beau.
ATTORNEYS

Patented Mar. 28, 1944 2,344,949

UNITED STATES PATENT OFFICE

2,344,949

MOTOR

Anton Rappl, Buffalo, N. Y., assignor to Trico Products Corporation, Buffalo, N. Y.

Application May 31, 1940, Serial No. 337,966

14 Claims. (Cl. 121—97)

The present invention relates to fluid operated motors and has particular relation to motors of this type, such, for example, as those employed for operating windshield cleaners on vehicles, having means for parking the drive shafts thereof in one position.

According to the present invention means are provided, in addition to the valve means, which reverse the application of differential fluid pressures to opposite faces of the piston during normal operation, for blocking the normal channel of fluid flow to and from the motor chamber on one side of the piston and for placing the latter in direct communication with a source of pressure, for parking the piston in a predetermined position. By this arrangement a manually operated control valve may be located remotely from the motor and may be connected thereto by two conduits, one for conducting fluid for normal motor operation and the other for the fluid required for parking the motor.

The means for blocking the normal channel of flow of fluid from the motor on one side of the piston and for providing direct communication with a source of pressure for parking, comprise a pair of valve elements so connected that the first element is closed when the second is open, the first element serving to block the normal channel of fluid flow and the second opening a direct path to the source of pressure for parking.

These and other objects and advantages will become apparent from the following description of the typical embodiments of the invention that are shown in the accompanying drawings, wherein:

Fig. 1 is a front elevational view of a motor with the valve cover removed, with certain parts broken away and appearing in vertical section, and a remote manual control valve appearing in section;

Fig. 2 is a bottom plan view of the cover section of the motor casing;

Fig. 3 is a fragmentary vertical sectional view taken on line 3—3 of Fig. 1 at right angles to the structure appearing in section therein;

Fig. 4 is a fragmentary vertical sectional view, similar to the portion of Fig. 1 shown in vertical section, but of a modified construction;

Fig. 5 is a vertical section taken transversely of Fig. 4 on line 5—5 therein;

Fig. 6 is a view taken along line 6—6 of Fig. 5; and,

Fig. 7 is a front elevational view showing a snap action valve operating means for the motor.

The motor casing may comprise a body section 10 and a cover section 11, separated by a gasket 12, and providing a motor chamber 13 in which a vane type piston, 14, may reciprocate about the axis of a shaft 15 to which it is secured, the shaft being journaled in bearings 16 of the casing.

On casing section 11 is a valve seat 17 into which open ports 18, 19 and 21, port 18 communicating with a nipple 22, port 19 opening through passage 23 into the motor chamber on the right side of the piston (as the parts appear in Figs. 1 and 2), and port 21 communicating with a channel 24 in the cover section.

The channel 24 opens through a valve seat 25 into a cylindrical chamber 26 whose outer end is closed by a disc 27. A nipple 28 communicates, through a passage 29, with the chamber 26, and the latter is open, by way of a passage 31, with a well 32 in the upper wall of the motor chamber on the left side of the piston.

A valve 33 disposed in channel 24 and adapted to close against seat 25, to block communication between the channel and chamber 26, has a stem 34 connected to piston-valve 35. The latter comprises a cup leather 36 having disc members 37 rigidifying the central or web portion thereof and having its flexible flange portions normally engaging the cylindrical wall of chamber 26.

Mounted for movement upon shaft 15 and against valve seat 17 is a valve member 38 having a recess 39 which is adapted to connect ports 18 and 19 in one position of the valve (as shown in Fig. 1) and to connect ports 18 and 21 in the reverse position of the valve. The valve opens to the atmosphere the one of ports 19 and 21 which is not in communication with port 18.

For operating the valve 38 there may be employed the snap action mechanism shown in Fig. 7, which is the subject matter of Patent No. 1,978,634 granted to Henry Hueber on October 30, 1934. This mechanism may consist of a kicker 41 which is pivoted to the shaft 15 at the axis of the latter and is engageable by one or the other of faces 42 of a recess in the end of the shaft. The kicker is engageable with ears 43 on valve 38 to shift the latter between its two operative positions, and its outer end is engaged by a frame 44 which is anchored by a spring 45 to a pressure plate 46. The latter is mounted over the shaft 15 upon a post 47 extended from the adjacent face of the casing section 10, and bears against the outer face of valve member 38.

When the shaft 15 moves angularly, counterclockwise as viewed in Fig. 7, right shoulder 42 will finally engage and move kicker 41 until the outer end thereof passes beyond a line extended

through the center of post 47 and the center of shaft 15, whereupon spring 45 will snap the kicker counterclockwise against the left shoulder 43 of valve 38 and move the latter to its left limit position, connecting ports 18 and 21. Movement of the shaft in the opposite direction, or clockwise, will cause the parts to operate in the reverse manner, snapping the valve to the position shown in Figs. 1 and 7, wherein ports 18 and 19 are connected.

The nipples 22 and 28 may be connected by conduits 51 and 52, indicated diagrammatically in Fig. 1, to ports 53 and 54, respectively, in the casing 55 of a valve unit which may be, if desired, located remotely from the motor. A manually operated slide valve 56 has a recess 57 which in the position of the valve shown in Fig. 1 opens communication between port 53 and a port 58 that may be connected to a suitable source of less-than-atmospheric pressure, such as the intake of an internal combustion engine, the other port 54, being blocked from the suction source port 58, although preferably being vented to the atmosphere. In the other position of the valve 56, the recess 57 may connect ports 54 and 58, port 53 being opened to the atmosphere.

With the parts in the position shown, air under atmospheric pressure may enter the left side of the motor chamber, via port 21, channel 24, past valve 33 into chamber 26 beneath piston-valve 35, passage 31 and well 32, while air will be withdrawn from the right side of the motor chamber via channel 23, port 19, recess 39 in valve 38, port 18 and nipple 22 to the source of low pressure. Accordingly, piston 14 will move to the right until the snap action mechanism reverses the valve 38, causing the low pressure to be applied to the left side of the motor chamber and atmospheric pressure to the right side. Thus the valve means will alternate application of sub-atmospheric and atmospheric pressures to opposite sides of the motor chamber, causing the piston to reciprocate.

When the control valve 56 is moved to connect ports 54 and 58, air will be withdrawn from chamber 26 via passage 29, nipple 28 and conduit 52. Since the channel 24 will be open to the atmosphere, either through port 53 or directly through port 21, depending upon the position of valve 38, the piston-valve 35 will be caused to rise, closing valve 33 upon seat 25, and thereby closing communication between port 21 and the left side of the motor chamber. Continued withdrawal will result in air being drawn from the left side of the motor chamber through passage 31 and past the flexible flange portions of cup leather 36, causing the piston 14 to move to parked position wherein a closure 61 carried by its seats over the well 32. During such parking movement of the piston, atmospheric air may enter the right side of the motor chamber from port 53 if the valve 38 is in the position shown in Fig. 1. If the valve 38 is in the opposite or reverse position, atmospheric air will enter directly through port 19. When the valve is moved to connect the ports 53 and 58, as shown in Fig. 1, the operation of the motor will be resumed since the parking port 54 will be open to the atmosphere and therefore the atmospheric pressure acting on the upper side of the piston-valve 35 will move the latter to unseat the valve 33.

In the modified structure shown in Figs. 4, 5 and 6, a disc valve 71 closing against a flat valve seat 72 replaces the valve 33 and seat 25 of the device shown in Figs. 1, 2 and 3 while a disc valve 73 closing against a seat 74 replaces the piston-valve 35. Valves 71 and 73 are separated by a valve stem 75 of such length that one valve must be open when the other is closed, and the stem is guided by radial webs 76 in the passage 77 between chamber 26 and channel 24.

The ends of the stem are preferably tapered and complementary tapered recesses 78 are formed in the valve discs for receiving the ends of the stem. Valve 71, when in the fully opened position thereof shown in Figs. 4 and 5, may rest upon the gasket 12, the mass of stem 75 maintaining the valve substantially centered. A ridge 80 is preferably formed in the closure disc 79 for preventing valve 73 from becoming excessively tipped or uncentered when in open position.

Operation is substantially the same as of the device shown in Figs. 1, 2 and 3, the valve 71 being open and valve 73 closed during normal operation of the motor, so that valve port 21 is in communication via channel 24, passages 77 and 31, and well 32 with the left side of the motor chamber; whereas when air is withdrawn through nipple 28, the resulting pressure differential between the fluid in channel 24 and chamber 26 results in opening of valve 73 and closing of valve 71, whereby port 21 is blocked from the left side of the motor chamber and the latter is placed in open communication with the source of parking pressure through nipple 28. The piston will then move to its parked position wherein well 32 is closed.

If desired the valve stem 75 may be attached to the valve 71 and 73. However, in the illustrated construction this is not done because the valves are suitably confined by adjacent walls of passage 24 and chamber 26, and fluid pressures acting upon them suffice to operate them.

It will be understood that the structures herein shown and described are merely illustrative of the inventive principles involved and that these may be otherwise embodied without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. In a fluid pressure motor having a motor chamber and piston means movable therein, a passage for applying operating pressure to the chamber and a second passage for applying a parking pressure to the chamber, the two passages adapted to be associated with means for selectively rendering either passage operative, automatic valve means for alternately directing the operating pressure from the first passage to the chamber on the opposite sides of the piston means, a pressure operated valve responsive to pressure in said second passage to place one side of the chamber in communication with said second passage, and a second pressure operated valve closing upon opening of the said first named pressure operated valve for blocking communication between said one side of the chamber and the automatic valve means.

2. In a fluid pressure motor having a motor chamber and piston means movable therein, a passage for applying operating pressure to the chamber and a second passage for applying a parking pressure to the chamber, the two passages adapted to be associated with means for selectively rendering either passage operative, automatic valve means for alternately directing the operating pressure from the first passage to the chamber on opposite sides of the piston means, a pressure operated valve responsive to pressure in said second passage to place one side of the

chamber in communication with said second passage, and a second valve closing upon opening of the pressure operated valve for blocking communication between said one side of the chamber and the automatic valve means, said second valve being connected to the pressure operated valve for operation thereby in one direction but movable independently thereof in the opposite direction.

3. In a fluid pressure motor having a motor chamber and piston means movable therein, a passage for applying operating pressure to the chamber and a second passage for applying a parking pressure to the chamber, the two passages adapted to be associated with means for selectively rendering either passage operative, automatic valve means for alternately directing the operating pressure from the first passage to the chamber on opposite sides of the piston means, and means independent of the automatic valve means and responsive to the pressure in said second passage for blocking the application of pressure to one side of the chamber by the automatic valve means and for connecting said side of the chamber to said second passage.

4. In a fluid pressure motor having a motor chamber and piston means movable therein, means for applying, alternately, differential operating pressures to the opposite sides of the chamber for reciprocating the piston means therein, a passage selectively operable with the applying means for applying pressure to one side of the chamber for moving the piston means to a parked position, and fluid pressure operated means responsive to pressure in said passage for substantially simultaneously opening said passage and blocking communication between said one side of the chamber and said means for applying the differential operating pressures.

5. In a fluid pressure motor having a motor chamber and piston means movable therein, means for applying, alternately, differential pressures to the opposite sides of the chamber for reciprocating the piston means therein, a passage selectively operable with the applying means for applying pressure to one side of the chamber for moving the piston means to a parked position, said passage having a valve chamber and said applying means having a valve chamber, each valve chamber opening through a valve seat into a common duct leading to said one side of the motor chamber, a valve in each valve chamber connected to the companion valve for substantially simultaneously opening said passage and blocking communication between said one side of the chamber and said means for applying the differential operating pressures, one of said valves being operated in response to the pressure in said passage.

6. In a fluid pressure motor having a motor chamber and piston means movable therein, means for alternately applying differential pressures to opposite sides of the chamber and including a passage on one side of the piston means, a normally open valve for closing said passage, a second chamber communicating with said passage between the valve and motor chamber, a second passage selectively operable with the applying means and connecting said second chamber to a source of pressure for parking the motor, and a fluid operable member in said second chamber between said passages, said fluid operable member being connected to the valve for operating the latter and including a means adapted to by-pass fluid to effect the application of the pressure of said source to said side of the motor chamber.

7. In a fluid pressure motor having a motor chamber and piston means movable therein, means for alternately applying differential pressures to opposite sides of the chamber and including a passage on one side of the piston means, a normally open fluid actuated valve for closing said passage, a second passage selectively operable with the applying means and communicating with the first mentioned passage between said normally open valve and the motor chamber for applying a parking pressure to the motor chamber, a normally closed fluid actuated valve for said second passage, the two valves closing on seats arranged therebetween, and means associating said valves and passing through the seats to unseat one valve when the other valve is closed.

8. In a fluid pressure motor having a motor chamber and piston means movable therein, means for alternately applying differential pressures to opposite sides of the chamber and including a passage on one side of the piston means, a normally open valve for closing said passage, a second passage selectively operable with the applying means and communicating with the first mentioned passage between said normally open valve and the motor chamber for applying a parking pressure to the motor chamber, a normally closed valve for said second passage, and means associating said valves whereby the normally closed valve must be open when the other valve is closed, said last mentioned means comprising a slidable stem disposed between the valves.

9. In a fluid pressure motor having a motor chamber and piston means movable therein, means for alternately applying differential pressures to opposite sides of the chamber and including a passage on one side of the piston means, a normally open valve for closing said passage, a second passage selectively operable with the applying means and communicating with the first mentioned passage between said normally open valve and the motor chamber for applying a parking pressure to the motor chamber, a normally closed valve for said second passage, means associating said valves whereby the normally closed valve must be open when the other valve is closed, said last mentioned means comprising a stem disposed between the valves, and the valves having recesses for freely receiving the ends of said stem.

10. In a fluid pressure motor having a motor chamber and piston means movable therein, means for alternately applying differential pressures to opposite sides of the chamber and including a passage on one side of the piston means, a normally open valve for closing said passage, a second passage selectively operable with the applying means and communicating with the first mentioned passage between said normally open valve and the motor chamber for applying a parking pressure to the motor chamber, a normally closed valve for said second passage, said valves having tapered recesses formed therein and a stem disposed between said valves and adapted to seat in said recesses to compel one valve to be open when the other is closed; and means for supporting one of said valves against tipping when in open position.

11. In a suction operated motor having a motor chamber and piston means movable therein, an operating passage and a parking passage adapted to be selectively connected to a source

of suction, automatic valve means for alternately connecting the opposite sides of the motor chamber to said operating passage and to the atmosphere, and means responsive to suction in said parking passage for closing the automatic valve means from one side of the chamber and for opening the latter to the parking passage.

12. In a fluid operated motor having a motor chamber and piston means movable therein, an operating passage and a parking passage adapted to be selectively connected to a source of operating pressure, automatic valve means for alternately connecting the opposite sides of the motor chamber to the atmosphere and to the operating passage to effect oscillation of the piston in the chamber when said operating conduit is connected to a source of operating pressure, and fluid operated valve means responsive to pressure in the parking passage and actuated when the latter is connected to a source of pressure to shut off communication between one side of the chamber and the automatic valve means and to open communication between said one side of the chamber and the parking passage.

13. In a fluid operated windscreen wiper motor having a reciprocable piston and automatic valve mechanism for applying fluid power alternately to the opposite sides of said piston for operating the motor, and having a control valve which is operable selectively to connect a source of fluid power either by one passage to said valve mechanism for operating the motor or by a second passage to one side only of the piston for moving the piston to a parking position and there stopping the motor, the provision of a conduit leading from said valve mechanism directly to said one side of the piston without passing through said control valve, said conduit affording communication between said one side of the piston and either fluid power or atmospheric air according to the operation of said valve mechanism when the motor is working, and valve means operable by the difference between the pressures in the conduit and the second passage for blocking said conduit when the control valve is operated to park the piston.

14. A fluid operated windscreen wiper motor having a reciprocable piston and automatic valve mechanism for connecting a source of fluid power alternately to opposite sides of the piston for operating the motor and at the same time venting the side of the piston not for the time being under the influence of said source, and a control valve which when in one position connects said source through one passage to the automatic valve mechanism for operating the motor and when in another position disconnects said source from the automatic valve mechanism and connects it through a second passage to one side only of the piston to move the latter to a parking position where the piston stops, characterised in that a conduit leads from the automatic valve mechanism directly to the said one side of the piston without passing through the control valve, a valve operable by the differential in the pressures in the second passage and the conduit and provided in the latter to prevent the venting of that side of the piston to which said source is connected when the control valve is moved to park the piston, thereby avoiding loss of power whilst the piston is being moved to the parking position.

ANTON RAPPL.