Nov. 3, 1925. 1,559,654

J. SWENDIG ET AL

FLUID MOTOR

Filed July 25, 1922 2 Sheets-Sheet 1

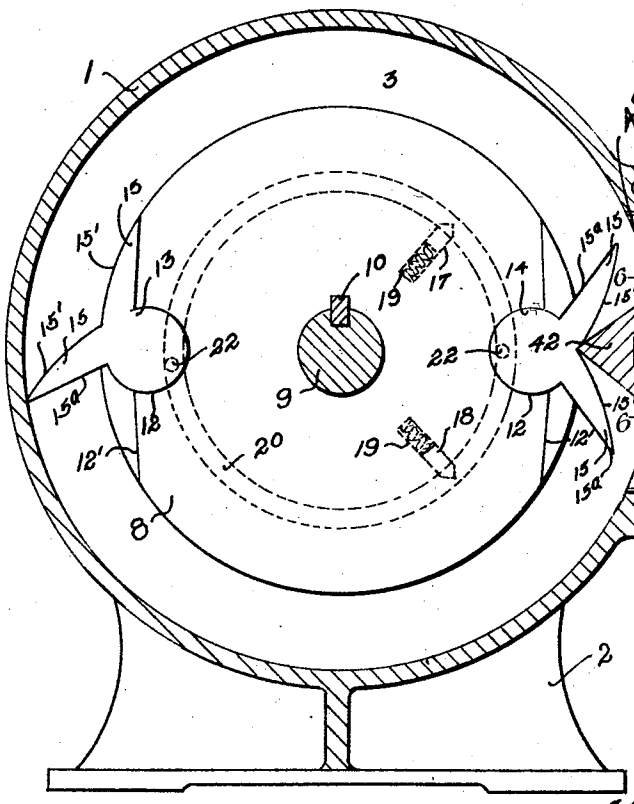


Fig. 1

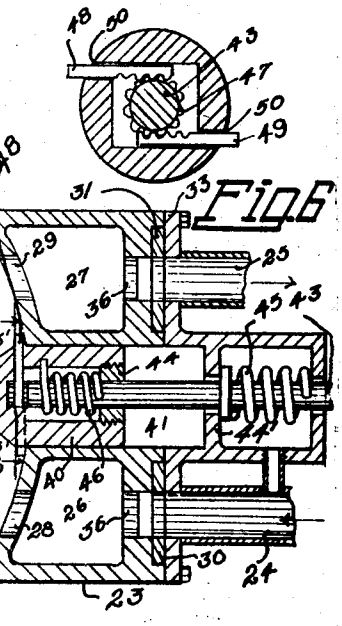


Fig. 6

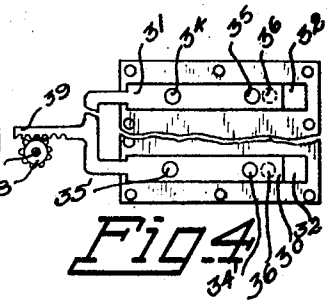


Fig. 4



Fig. 5

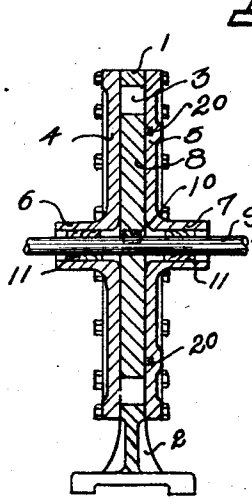


Fig. 2

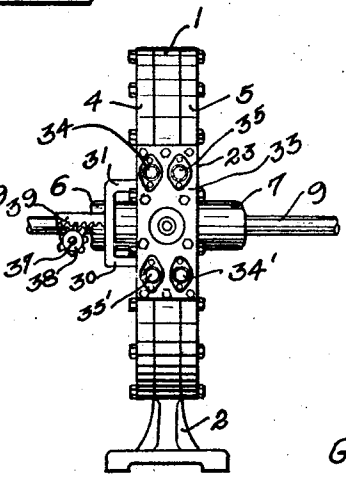


Fig. 3

Inventor

John Swendig

George H. Lawrence

Herbert E. Smith

Attorney

Nov. 3, 1925. 1,559,654

J. SWENDIG ET AL

FLUID MOTOR

Filed July 25, 1922. 2 Sheets-Sheet 2

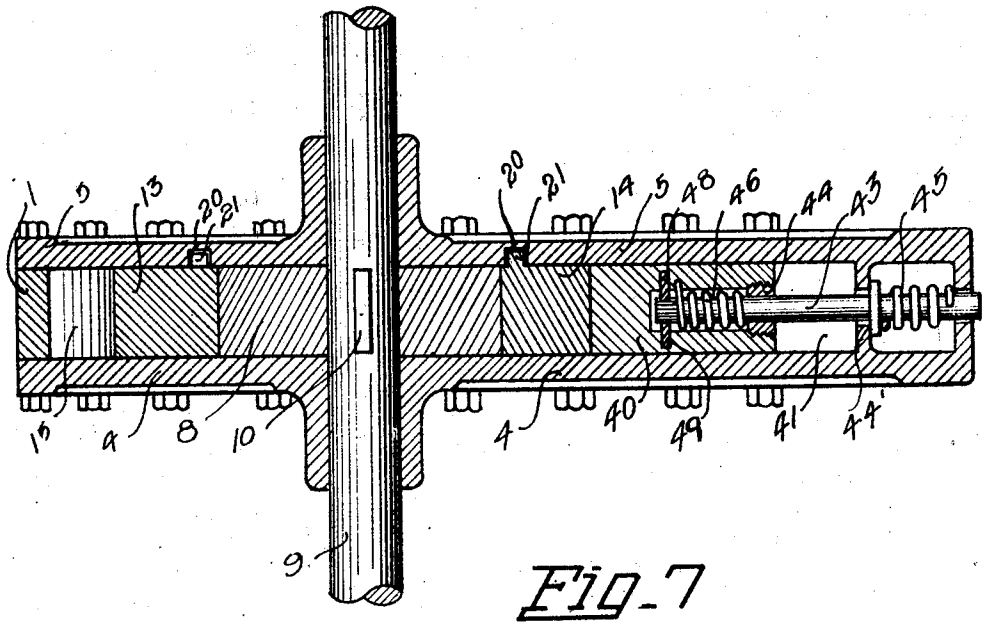


Fig. 7

Inventor
John Swendig
George H. Lawrence

By Herbert E. Smith
Attorney

Patented Nov. 3, 1925. 1,559,654

UNITED STATES PATENT OFFICE.

JOHN SWENDIG OF HARRISON, AND GEORGE H. LAWRENCE, OF COEUR D'ALENE, IDAHO.

FLUID MOTOR.

Application filed July 25, 1922. Serial No. 577,313.

To all whom it may concern:

Be it known that we, JOHN SWENDIG and GEORGE H. LAWRENCE, citizens of the United States, residing at Harrison, in Kootenai County and State of Idaho, and at Coeur d'Alene, in Kootenai County and State of Idaho, respectively, have invented certain new and useful Improvements in Fluid Motors, set forth in the annexed specification.

Our present invention relates to improvements in fluid motors of the type utilizing a rotor in a casing and having angular, swinging or oscillating vanes or pistons traveling through an annular expansion chamber in the casing. The angular vanes or pistons, as they revolve with the rotor are rocked or tripped on pivotal points to retracted position as they encounter an abutment provided therefor. The primary object of the invention is the provision of a compactly arranged motor of this type which is adapted especially for use on automotive vehicles, as illustrated in our co-pending application for Patent Ser. No. 577,314 filed July 25, 1922.

The motive fluid, as oil, is or may be compressed in usual manner and is pumped or forced into the casing of the rotor for the operation of the motor by circulation of the fluid in the expansion chamber of the casing.

Certain features of the motor are improved, as will be hereinafter pointed out, and the invention consists essentially in novel combinations and arrangements of parts, as hereinafter claimed.

In the accompanying drawings we have illustrated one complete example of the physical embodiment of our invention in which the parts are combined and arranged according to one mode we have devised for the practical application of the principles of our invention.

Figure 1 is a longitudinal vertical sectional view through the casing and motive fluid chest of the motor.

Figure 2 is a transverse vertical sectional view through the motor, shown on a reduced scale.

Figure 3 is an edge view of the motor as seen in Figure 2 looking at the motive fluid chest.

Figure 4 is a view showing the face plate of the motive fluid chest removed and disclosing the control valves for the motive fluid.

Figure 5 is an enlarged detail view of a spring pressed pawl or trip for the swinging or oscillating pistons.

Figure 6 is an enlarged transverse sectional view through the abutment on line 6—6 of Figure 1 showing the relation of the locking rack-bars for the abutment.

Figure 7 is a sectional view through the central horizontal axis of the motor in Fig. 1.

In the preferred form of our invention as illustrated the cylinder or casing includes an intermediate ring 1 having an integral or rigid base or support 2, and at the sides of the expansion chamber 3 of the cylinder are side plates or heads 4 and 5, bolted or otherwise affixed to the opposite faces of the intermediate ring 1.

Each of the side plates is provided with an exterior hub, as 6 and 7, located at the center of the circular plates, alined, and projecting laterally from the plates.

The rotor 8 within the casing of the motor is a circular disk of less diameter than the interior of the intermediate ring 1, and is encased by the two side plates, to form the annular expansion chamber 3 of the cylinder. The rotor drives the power shaft 9, the parts being keyed together as at 10, and the shaft which passes transversely through the casing is provided with suitable bearings at 11 in the hubs of the two side plates. The driven power shaft 9 may be equipped with suitable means thereon for transmitting its power to drive or operate devices, as the traction wheels of an automotive vehicle.

At the periphery of the rotor, and arranged at diametrical points thereon are semi-circular recesses or sockets 12, and adjacent these recesses the periphery of the rotor is cut away to form flat plane faces 12′. These recesses are designed to receive and retain the round piston heads 13 and 14 that are carried by the rotor, between the side plates of the casing, and these heads

are free to oscillate or swing in their respective recesses as the rotor revolves or rotates with its shaft in bearings 11. Each piston head is fashioned with oppositely disposed, outwardly projected wings or vanes 15, arranged in pairs, and each vane is provided with an outer curved face 15′ conforming to the inner periphery of the intermediate ring 1 of the casing, and an inner, flat face 15ª, conforming to the flat faces 12′ of the rotor. These pistons are thus permitted to swing or oscillate on their heads as centers with a movement limited by contact of the vanes with the inner face of the wall of the intermediate ring and the flat faces of the rotor.

In Figure 1 piston 13 is in working position and is being forced through the annular chamber 3 by pressure of motive fluid at the rear of the rear vane 15. At approximately the end of the working stroke the pistons are provided spaced reversing pawls 17 and 18, shown in dotted lines in Figure 1. These pawls are arranged in radial position with respect to the center of the rotor and are retained in sockets 19 in order that their pointed heads may project into the circumferential or annular groove 20 fashioned in the inner face of one of the side plates, as 5. By means of a spring 21 behind the pawl, the latter is forced outwardly with its head in position in the groove, and in the path of movement of a pin 22 projected laterally from each of the piston heads 13 and 14. Thus as the rotor is reversed and moves anticlockwise in Figure 1 the pin 22 of the piston 13 will encounter the pawl 18 which will result in a swinging or oscillating movement of the piston on its head as a center in order that the piston may be in position to pass the abutment 42 to be described.

Motive fluid is supplied to and exhausted from the motor through the motive fluid chest 23 located at one side or edge of the casing of the motor, and provided with an intake pipe 24 and exhaust pipe 25. These pipes may be duplex branch pipes, the pipe 24 receiving the oil from the pump under pressure, and the pipe 25 returning the oil to the sump or intake side of the pump which circulates the oil as a motive fluid. Within the motive fluid chest are provided the intake chamber 26 and exhaust or outlet chamber 27, these respective chambers communicating with the expansion chamber 3 through ports 28 and 29, when the engine is driving forward as shown in Figure 1.

The admission and exhaust of motive fluid to and from the respective chambers is controlled by a pair of slide valves 30 and 31, that are reversible to reverse the motion of the motor. These valves are located in a plane transverse to the rotor and parallel with the longitudinal axis of the shaft 9, and located in complementary grooves 32 in the outer face of the outer wall of the motive fluid chest, the head or plate 33 of the chest forming one wall of the space or groove 32 for guiding the valves. These slide valves it will be seen are flat metal plates with perforations or ports 34, 34′, 35, 35′. The port 34 in valve 31 is the intake port for reverse drive, and the port 34′ in valve 30 is the intake port for forward drive, while the port 35 in valve 31 is the exhaust port for forward drive, and the port 35′ in valve 30 is the exhaust port when the motor is operating for reverse drive.

These ports in the valves co-operate with complementary ports 36 in the motive fluid chest and govern the movement of the motive fluid or oil to and from the chambers 26 and 27. Under conditions represented as existing in Figure 1, the valves are set as in Figure 4, with the intake through port 34′ and exhaust through port 35. The valves may be operated from a valve gear shaft 37 manipulated in suitable manner, and by means of the gear wheel 38 on said shaft, and a rack bar 39 co-acting therewith, the valves may be moved as desired. The two valves or plates are rigidly connected together, as shown in Figure 4, and their movement is of course synchronous.

To close the expansion chamber against back pressure an abutment 40 is utilized, and located in its chamber 41 in the motive fluid chest between the chambers 26 and 27 of the chest. The abutment is preferably a hollow block, rectangular in cross section and fashioned with a wedge shaped or V-shaped head 42 that is adapted to project transversely across the annular chamber 3 and close communication between the portions of the chamber at the sides of the abutment or its V-shaped head. The abutment is reciprocable on its longitudinal axis in the socket 41, and is provided with a stem 43, which moves bodily with the abutment as it reciprocates, but in addition is adapted to rotate with relation to the abutment. The stem is supported in a screwplug 44 threaded into the body of the abutment and also has a bearing in the perforated flanges 44′ at the rear of the socket 41 for the abutment. By means of the spring 45 coiled about the stem and secured thereto and bearing against the perforated flange 44′ the abutment, through its stem, is urged to projected position with its head in the expansion chamber 3. And for holding the head in position to close the chamber a coiled spring 46 is wrapped around the stem with one end secured to the stem and its other end secured in the non-rotatable abutment body. On the end of the stem and within the hollow abutment body is

secured a rack wheel 47, with which a pair of rack bars 48 and 49 co-act. These bars are slidable in grooves 50 in the body of the abutment, the grooves being located on lines tangential to the rack wheel on the stem, and the bars are adapted to be slid up or down, as the case may be, by contact from the wings or vanes of the pistons, depending on the action of the motor.

The piston 14 in Figure 1, when the motor is in operation is carried in its circular path by the rotor, with the forward vane turned into the rotor against the flat face 12'. The rear vane, which is in projected position as it approaches the abutment, rides down upon the wedge shaped head of the abutment and is automatically oscillated as it passes the abutment. If the motor should be reversed while in operation upon the approach of the piston (in position at the left in Fig. 1) toward the abutment 42 the tip edge of the piston wing will contact with the outer end of one of the locking rack bars, as 49, and push said bar before it. The bar slides in its slot 50 and by its action on the rack wheel 47 turns the stem 43 against the tension of spring 46, as the projecting end of the lock bar is withdrawn within the hollow body of the abutment. As the lock bar is thus disengaged from the wall of the expansion chamber, the abutment is free to move to the right in Figure 1, under pressure from the passing vane of the piston as the former rides down upon the wedge shaped head of the abutment. After passage of the piston, the spring 45, which has been compressed by the movement of the abutment, expands and forces the stem and abutment again to projected position, and at the same time the coiled spring 46 revolves or rotates the stem. The rotation of the stem causes the projection of the two locking rack bars which engage the inner wall of the expansion chamber as in Figure 1, holding the abutment in locked position against the periphery of the rotor, for closing the expansion chamber against back pressure of the motive fluid or oil. Pins 17 and 18 do not function while the motor in being driven in forward or clockwise direction, and the pin 22 merely rides over these pins without altering the position of the pistons. If the movement of the motive fluid is reversed and the movement of the rotor thereby reversed these pins 17 or 18 in co-action with the pin 22 reverse the position of the piston, or pistons. Should the reversal of the circulation of the fluid occur with the pistons at intermediate positions with relation to the position shown in Fig. 1, the pressure of the fluid is sufficient to properly position the pistons for the reversed movement of the motor.

Assuming that the motor is attached to the rear axle of an automotive vehicle and that it is driving the vehicle up a grade. If the power is suddenly shut off, or the engine stalls, unless the brakes are quickly applied a back-up motion will result. The pistons would be so positioned that in order to pass the abutment they must be turned by the contact of pins as described, or contact with the rack bar for retracting the abutment. If the rotor continues to revolve in reverse direction the piston members will thus be moved to operative position by the pins. Under ordinary circumstances, when the fluid valves are set to drive the motor the fluid pressure will properly position the pistons. Whenever the movement of motive fluid is changed at the time a piston is passing a port, the safety elements 17 and 18 perform their functions to prevent destruction of parts.

Having thus fully described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. The combination in a fluid motor with its casing and rotor and admission and exhaust ports for said casing, of an oscillatable piston carried by said rotor having opposed spreading-vanes, a normally fixed abutment in the path of movement of said vanes and adapted to oscillate said piston, and locking means on said abutment adapted to be released by contact from a piston vane whereby when the motor is reversed said abutment is withdrawn from normal position.

2. The combination in a fluid motor with its rotor and an oscillatable piston carried thereby having opposed spreading vanes, of a normally fixed, movable abutment having a head in the path of movement of said vanes and adapted to oscillate said vanes, a stem in the abutment and a rack wheel thereon, a spring for rotating the stem, and a projected locking rack-bar in the abutment in the path of movement of said vanes whereby when the motor is reversed said abutment is withdrawn from normal position.

3. The combination with a rotor and its oscillatable piston, of a reciprocable, spring pressed normally fixed abutment having a head in the path of movement of said piston, a spring operated, rotatable stem in the abutment, a rack wheel on said stem and a locking rack bar in the abutment engaging said wheel, said locking bar being in the path of movement of said piston whereby when the motor is reversed said abutment is withdrawn from normal position.

4. The combination in a fluid motor with a rotor and its oscillatable piston, of a spring pressed reciprocable abutment, means carried by said abutment for holding it in locked projected position, and said means in the path of movement of said piston for con-

tact from the latter for releasing the abutment when the movement of the rotor is reversed.

5. The combination with a rotor and its oscillatable piston and an enclosing casing, of a pin fixed to said piston and a groove in the casing for said pin, and a spring pressed pawl located in said groove for coaction with said pin for tripping the piston when the movement of the rotor is reversed.

In testimony whereof we affix our signatures.

JOHN SWENDIG.
GEORGE HARRISON LAWRENCE.