March 14, 1933. J. E. REHOR 1,900,950

FLUID PRESSURE MOTOR

Filed Sept. 12, 1929 3 Sheets-Sheet 1

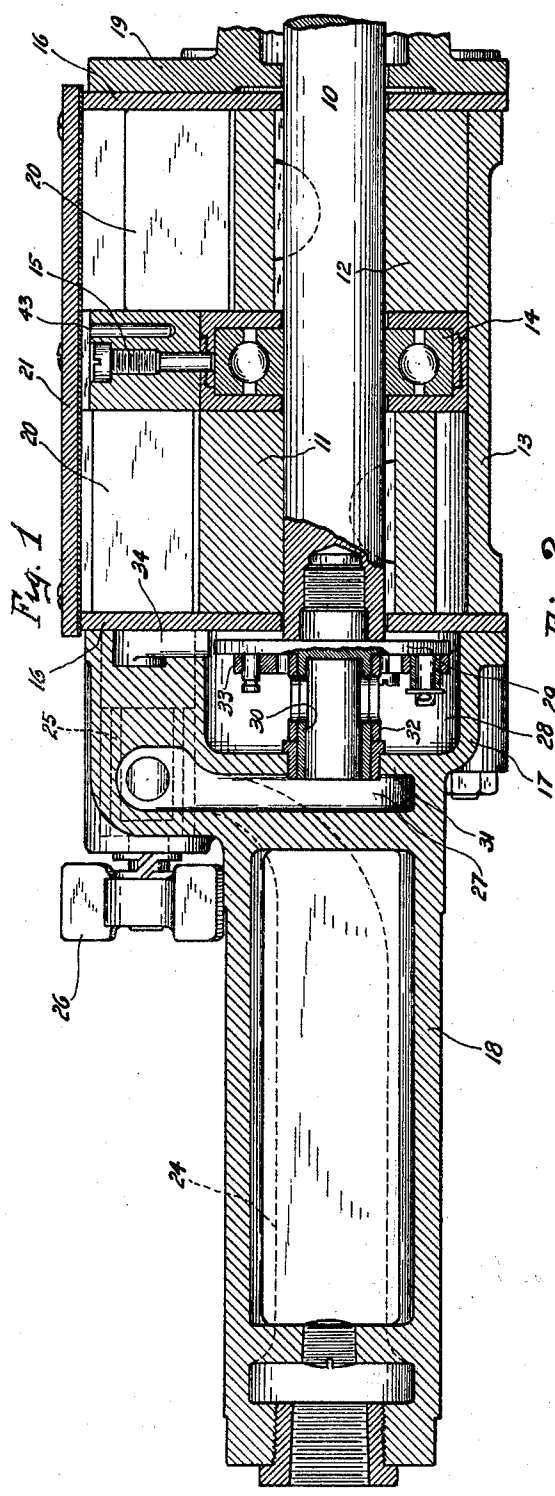


Fig. 1

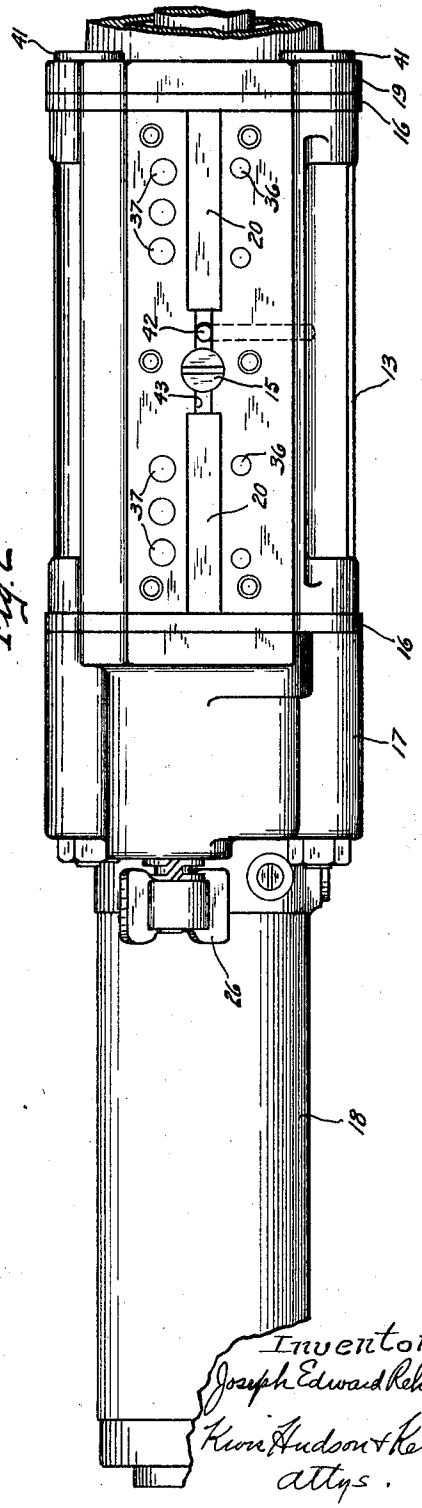


Fig. 2

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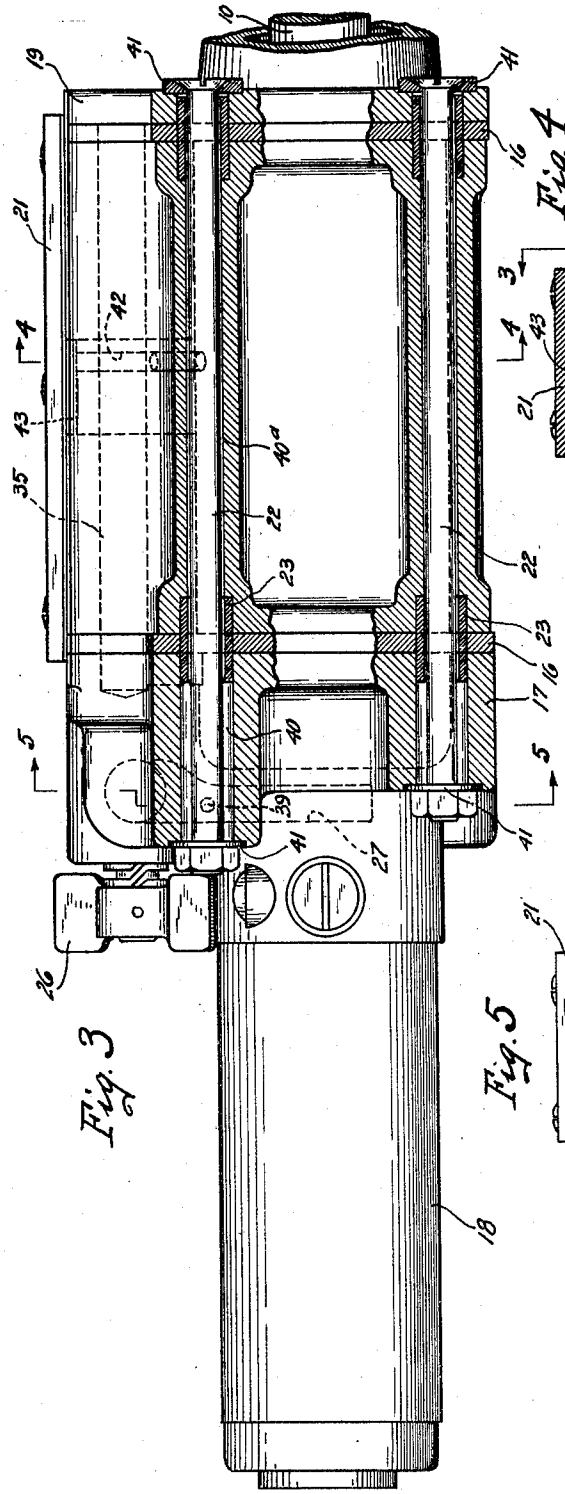


Fig. 3

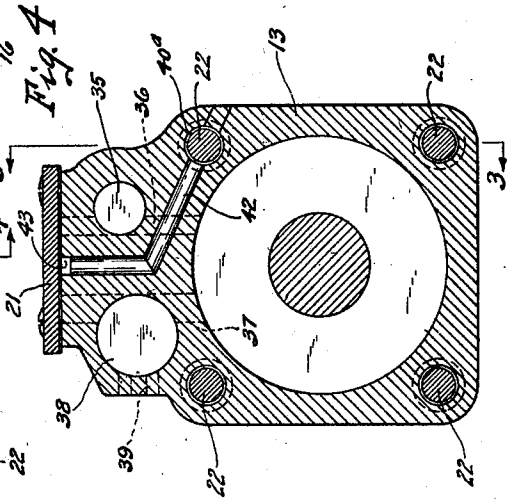


Fig. 4

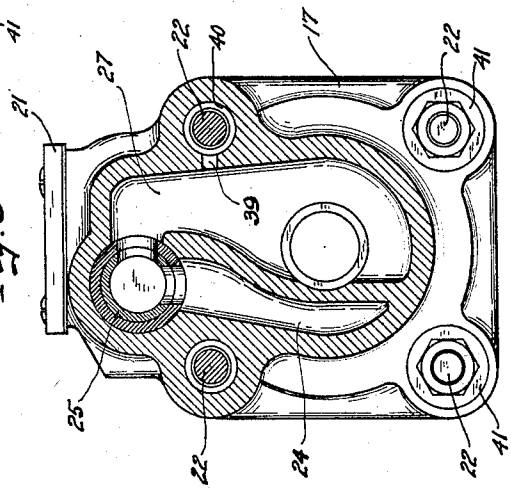


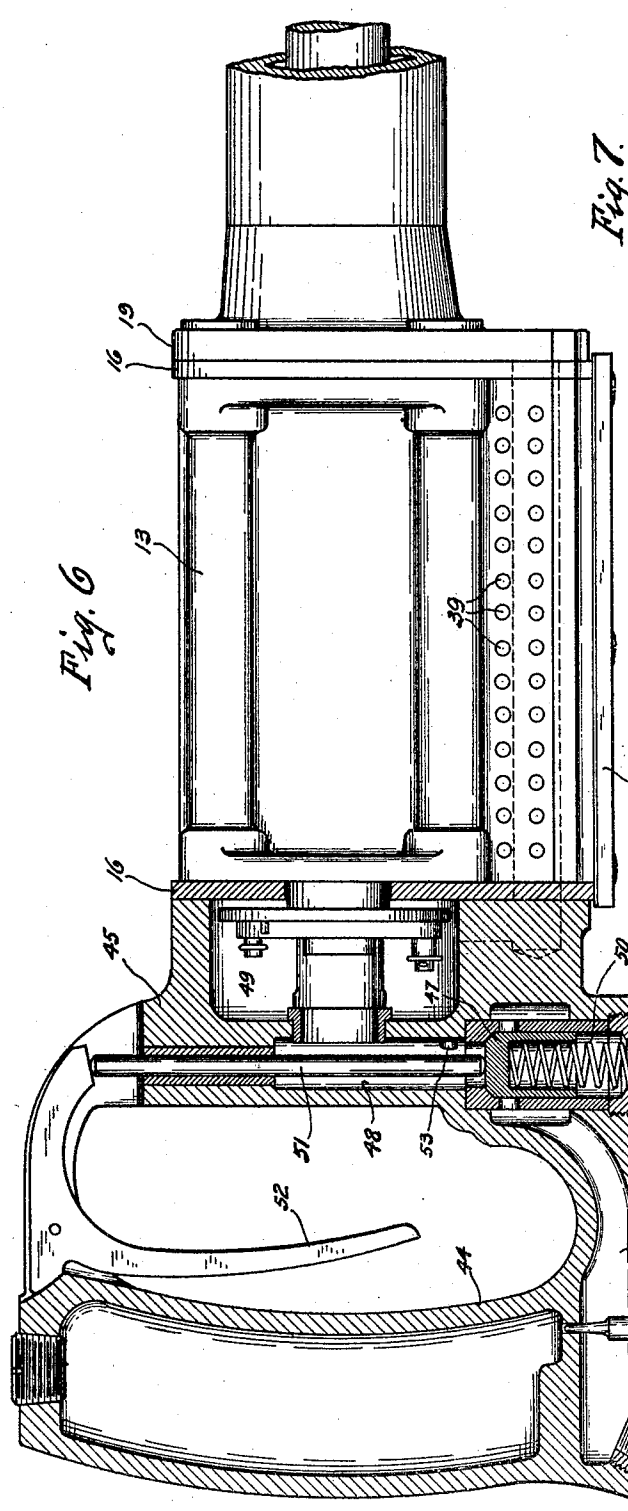
Fig. 5

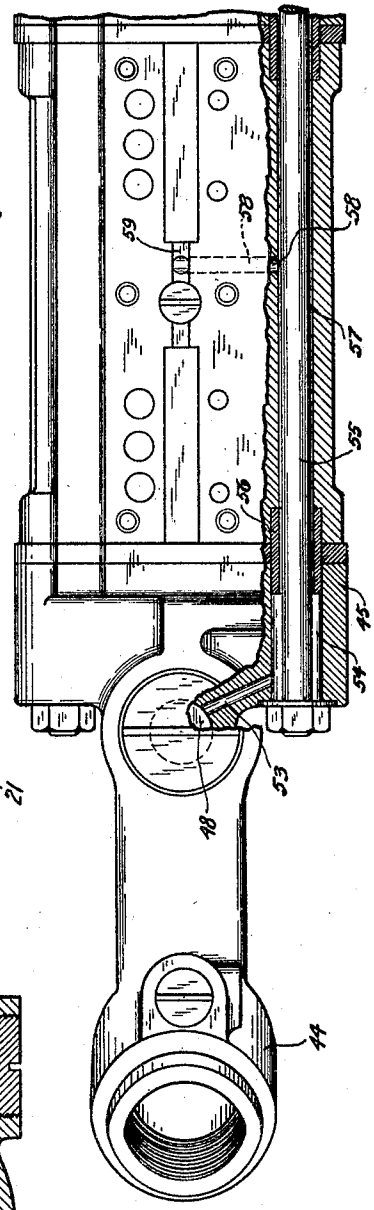
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FLUID PRESSURE MOTOR

Filed Sept. 12, 1929 3 Sheets-Sheet 3





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UNITED STATES PATENT OFFICE

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FLUID PRESSURE MOTOR

Application filed September 12, 1929. Serial No. 392,029.

This invention relates to fluid pressure motors such, for example, as are commonly employed for operating grinders and other tools.

More particularly, the invention relates to that type of rotary motor tool wherein there is a rotor carried by the spindle and a slidable abutment blade which is either carried by the stationary part of the motor and at its inner edge engages the rotor, or carried by the rotor and at its outer edge engages the rotor bore. The invention relates especially to the former arrangement wherein the abutment blade or blades are slidably mounted in the stationary part of the motor.

Motors of the above type have been used quite extensively and it is common, particularly when the abutment blade or blades are slidably mounted in the stationary part of the motor, that they be actuated by fluid pressure to hold the same in engagement with the rotor when the blade is carried by the stationary part of the motor or with the cylinder bore when carried by the rotor. This expedient has proven to be useful but heretofore not entirely satisfactory in view of the fact that the fluid under pressure which acts on the blade has been taken from a point such that the actual pressure exerted on the blade varies very materially with the speed of the motor. The fluid pressure on the blade decreases as the motor speed increases and therefore the efficiency of the motor is reduced due to the fact that the blade is not held at all times in engagement with the rotor or cylinder bore and leakage of fluid and, consequently, loss of power occurs.

The object of the present invention is to provide a construction wherein live motive fluid whose pressure is constant or unaffected by the speed of the motor is led to the blade so that it may act thereon and cause it to be held against the part which it is intended to engage at all times under the maximum pressure.

The above and other objects are attained by the present invention which may be here briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings wherein I have shown two slightly different embodiments of the invention,

Figure 1 is a central, longitudinal, sectional view of a motor of well-known form and constructed in accordance with my invention.

Fig. 2 is a plan view looking at the top of Fig. 1, with the cap plate removed.

Fig. 3 is a longitudinal, sectional view substantially on the line 3—3 of Fig. 4.

Fig. 4 is a transverse, sectional view substantially along the line 4—4 of Fig. 3.

Fig. 5 is a transverse, sectional view substantially on the line 5—5 of Fig. 3.

Fig. 6 is a view of a slightly modified form of motor, the motor proper being in side elevation and the handle in section; and

Fig. 7 is a bottom view, or inverted plan, of Fig. 6, with the cap plate removed, this view corresponding to Fig. 2.

The structure of the motor in so far as the main parts and the arrangement of the parts are concerned is substantially the same as that disclosed in the Van Hamersveld and Cook Patent 1,653,748 and, therefore, the construction of the motor proper will be given briefly. The motor spindle 10 has secured to it in this instance two eccentric rotors 11 and 12 adapted to rotate in a cylindrical bore formed in the stationary part or body 13 of the motor. These rotors are separated by a center bearing 14 with the bearing parts enclosed in a housing, held in place by screw 15, fitted into the central portion of the motor body 13. At the ends of the cylinder body 13 are end plates 16 and to these end plates are secured an end bracket 17 with a handle 18 and an end bracket 19 with a handle

portion through which the spindle 10 projects.

The cylinder body is provided with radial slots milled inwardly from opposite ends toward the central portion of the body and in these slots are the radially slidable abutment blades 20 whose inner edges are maintained in engagement with the rotors 11 and 12 by fluid pressure supplied to the outer portions of the slots, the latter being closed by removable cover plate 21, a suitable gasket being provided between the cover plate and the cylinder body to present any leakage of fluid. By reference to Fig. 4 it will be seen that the cylinder body has a lateral extension in which are provided the slots for the blades, as well as passageways to be subsequently referred to. The cylinder body 13, end plates 16, and brackets 17 and 19 are clamped rigidly together by a series of axially extending bolts 22 and to perfectly align the parts bushings 23 which surround the bolts are fitted into accurately formed openings in the end portions of the cylinder body, in the end plates, and in the brackets. For a purpose to be subsequently explained, a suitable clearance is provided between the bolts and the bores of the bushings.

The handle 18 in the construction illustrated in Figs. 1 to 5 is known as a straight handle, this handle having a fluid passageway 24 extending therethrough from its outer end, this passageway being shown by dotted lines in Fig. 1 and by full lines in Fig. 5. The handle is generally provided also with a lubricant chamber alongside the major portion of the fluid passageway 24 but the same is not here illustrated, but is illustrated in the Van Hamersveld and Cook patent referred to above. By a suitable connection the fluid is supplied to the outer end of passageway 24, the fluid usually employed being compressed air. From the inner end of the passageway 24 the fluid is adapted to pass through a valve here shown as a sleeve-valve 25, manually controlled by a handle 26, to a chamber 27 (see Figs. 1 and 5) which lies alongside and just outwardly of a governor chamber 28, the chambers 27 and 28, as well as the passageway 24 being in the bracket 17.

The inner end of the spindle 10 projects very slightly through or beyond the end plate which is next to the bracket 17 and secured to the end of the spindle, and located in the governor chamber 28 is a governor 29 which is preferably provided to control the speed of the motor so as to prevent racing and possible injury to the motor. Any suitable governor may be employed but I have here illustrated a governor of the type disclosed and claimed in a prior application filed in the name of Hal L. Cook, June 2, 1928, Serial No. 282,311. This governor has a governor body with a sleeve-like extension 30 which projects through a bushing filled in an opening in the wall 31 which separates the chamber 27 from the chamber 28, this opening being in line with the axis of the spindle 10. Additionally the governor has a sleeve 32 which is rotatable on the sleeve-like extension 30 and is moved by the weights 33, both the sleeve-like extension 30 of the governor and the sleeve 32 having ports adapted to be brought into and out of registration by the rotation of sleeve 32.

It will be seen, therefore, that the motive fluid passes from the chamber 27 into the governor and through the ports of the governor into the governor chamber 28. From there the motive fluid passes by way of a short passageway 34 formed in the inner face of the bracket 17 to a main inlet passageway 35 shown by dotted lines in Fig. 3 and by full lines in Fig. 4, this passageway 35 being bored through the lateral extension of the cylinder body for the full length of the latter, as well as through the end plates 16, the forward bracket 19 closing the forward end of this passageway.

From the passageway 35 the fluid passes inwardly by way of auxiliary inlet passageways 36 to the cylinders, these passageways 36 being drilled from the outer face of the lateral extension of the cylinder body to the inner bore, and intersecting the main inlet passageway 35. The fluid is exhausted from the cylinders by way of auxiliary exhaust passageways 37 which are drilled from the outer face of the lateral extension of the cylinder body to the cylinder bore intersecting the main exhaust passageway 38 bored axially through the cylinder body from end to end in parallel relation with the inlet passageway 35. A series of exhaust ports 39 extend from the passageway 38 through the outer surface of the cylinder body.

As explained in the Van Hamersveld and Cook patent the motive fluid is supplied to the outer portions of the guideways for the abutment blades so as to press the blades against the rotors by short ducts which connect the outer portions of the guideways with the auxiliary passageways 36, but this method of conducting the motive fluid to the abutment blade guideways and, in fact, any arrangement of fluid supply ducts which receive fluid from the main inlet passageway or from any point in the fluid line on the motor side of the governor are open to the objection that the pressure of the motive fluid supplied to the guideways varies with the motor speed, being decreased as the motor speed increases, resulting in loss of power as previously explained.

In accordance with the present invention the motive fluid is supplied in an entirely new way which overcomes the objection noted above and this will now be explained. By reference to Figs. 3 and 5 it will be seen that a short passageway 39 is provided from a

point in advance of the governor, in this instance from the chamber 27, to one of the openings here designated 40 formed in the bracket 17 to receive one of the clamping bolts 22, there being a considerable clearance between the bore of this opening 40 and the surface of the bolt. The motive fluid is adapted to pass along this passageway and between the bolt and the adjacent bushing 23 and into the passageway 40*a* formed in the cylinder body for this same bolt, which passageway has a clearance between its bore and the bolt. It might be here stated that the ends of the passageway for the bolt referred to, and in fact the ends of the passageways for all the bolts, are closed and sealed by washers 41 and by the bolt heads and nuts so that leakage of fluid where the bolts emerge from the brackets 17 and 19 is absolutely prevented. From the passageway 40*a* the motive fluid is conducted by a passageway 42 to a groove 43 formed in the central portion of the cylinder body beneath the cover plate 21, and communicating at its ends with the guideways of the two abutment blades 20. In this way live motive fluid is conducted under the maximum pressure of the fluid from a point in advance of the governor to the abutment blade guideways and this pressure remains constant irrespective of the speed of the motor, with the result that the blades will be held against the external surfaces of the rotors under a constant and maximum pressure of the motive fluid. In view of the fact that the only movement of motive fluid through the passageways leading to the outer portions of the abutment blade guideways is due to the inward and outward movement of the abutment blades, the actual flow of motive fluid is very slight and no greater clearances than illustrated in the drawings are required between the bolt 22 and the parts which surround it to give the maximum fluid pressure on the outer ends of the blades.

In the construction shown in Figs. 6 and 7, the same motor construction precisely is provided aside from the shape of the handle 44 forming a part of the end bracket 45, this bracket corresponding in function to the bracket 17 of the first described construction. The motive fluid passes through a passageway 46 formed in one portion of the handle 44, and by way of a valve 47 into a passageway 48 to the governor which may be the same as that first described or any suitable governor, and into the governor chamber 49 formed in the bracket 45, as in the bracket 17 of the first construction.

The valve here illustrated is of the sliding or poppet valve type which is normally seated by a spring 50 and is unseated by a pin 51 adapted to be depressed by a trigger 52, this pin extending through the passageway 48. In this instance motive fluid is supplied under maximum pressure to the outer portions of the abutment blade guideways in substantially the manner first described, a passageway 53 being provided to connect the passageway 48 with the clearance space 54 between one of the clamping bolts 55 and the bore formed in the bracket 45 for the bolt. The motive fluid passes along the bolt between the bushing 56 of the bolt to the clearance space 57 provided between the bolt and the passageway for the bolt formed in the cylinder body, and from this clearance space the motive fluid passes as before by way of a passageway 58 leading to a groove 59 formed beneath the cover plate in the central part of the lateral extension of the cylinder body and communicating at its ends with both guideways for the abutment blades. The results and advantages of this slightly modified motor are precisely the same as with that first described.

I have herein illustrated a convenient way of conducting the motive fluid from a point in the fluid line where constant maximum pressure is obtainable to the outer ends of the abutment blades, but it will be obvious that the motive fluid may be conducted to the blades by passageways formed in other ways than herein illustrated. Likewise it will be understood that while I have illustrated motors each having two rotors, the invention is equally applicable to a motor having one rotor, or more than two rotors. Likewise it will be understood that while I have illustrated that type of motor wherein the blades have reciprocating motion in the stationary part of the motor, it may be applied with equal advantage to a motor wherein the abutment blades slide in the rotor itself and engage the cylinder bore. In the latter event the motive fluid will be supplied through the spindle to the inner ends of the blades so that their outer ends will be held under the constant maximum fluid pressure against the cylinder bore.

I therefore aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of the invention as set forth in the appended claims.

Having thus described my invention, what I claim is:

1. A motor comprising a cylinder body with a member attached to an end thereof, a clamping bolt, and an opening extending through said body and member for the clamping bolt, a rotor in the cylinder bore, a slidable abutment blade in the cylinder body and at its inner end adapted to engage the surface of the rotor, and means including said bolt opening for supplying fluid pressure to the outer end of the blade.

2. A motor comprising a cylinder body with members attached to the ends thereof, a clamping bolt and an opening extending through said body and members for the

clamping bolt, a rotor in the cylinder bore, a slidable abutment blade in the cylinder body and at its inner end adapted to engage the surface of the rotor, and means for supplying substantially constant fluid pressure to the outer end of the blade comprising a fluid passageway connected to said bolt opening and a fluid passageway leading from the bolt opening to the cylinder body at the outer end of the blade.

In testimony whereof, I hereunto affix my signature.

JOSEPH EDWARD REHOR.