

UNITED STATES PATENT OFFICE

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MOTOR

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My invention relates to power actuating means.

It has for its object to provide improved power actuating means and more particularly an improved motor of the air actuated type. A further object of my invention is to provide an improved air motor of the intermeshing rotor type. A still further object is to provide an improved air motor having spiral toothed intermeshing rotors which permit exhausting the actuating fluid at each end of the motor. A still further object is to provide an improved arrangement of fluid conducting passages. A further object is to provide an improved arrangement of passages adapted to allow the discharge of exhaust fluid from either side of the motor casing. It is to be understood that this motor is adapted for general use but is especially constructed and so arranged as to be particularly useful in a mining machine of a type adapted to be disposable in inverted positions. The usual operation of such a machine requires that one side or the other of the motor be brought adjacent a coal face of the mine in which it is working. Thus my improved passage arrangement permits proper exhaust of the fluid regardless of which side of the motor is disposed adjacent the face. A further object is to provide an improved motor having an improved arrangement of operating elements in order to obtain the highest maximum efficiency thereof. Other objects include improved lubricating mechanism, rotor construction, and fluid controlling means. These and other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice.

In these drawings,—

Fig. 1 is a transverse horizontal section through the improved motor.

Fig. 2 is a vertical longitudinal section on line 2—2 of Fig. 1, showing one of the rotors in elevation.

Fig. 3 is a vertical transverse section on line 3—3 of Fig. 1.

Fig. 4 is an enlarged fragmentary detail of the oiling mechanism.

In the particular embodiment of my invention illustrated in the present application which is a division of my copending application, now matured into Patent No. 1,670,155, patented May 15, 1928, I have shown a motor housing 8 having suitably journaled therein a pair of longitudinally extending double helical rotors 9, 10 preferably meshing as herein on the longitudinal center line of the machine and housed in suitable intersecting bores 11, 12 formed in the section 8; the rotors 9, 10 each preferably having between their oppositely disposed sets of helical teeth, a spur gear 13 meshing with its fellow. More particularly it will be observed that each of these rotors comprises a plurality of oppositely disposed helical portions 14 on opposite sides of a spur gear and that these elements are clamped together by a plurality of bolts 15 carrying on their ends clamping rings 16 engaging opposite shoulders 17 on a shaft 18 to which one of the helical tooth sections is keyed as at 19. In this connection attention is directed to the fact that as viewed in Fig. 1 the right hand helical section of one rotor is keyed to one shaft while the left hand section of the other rotor is keyed to the other shaft, in such manner as to enable identical rotors to be utilized on the two shafts, the rotors being simply oppositely mounted on the different shafts. It will further be noted that the shafts 18 have reduced portions adjacent their shoulders 17 which in turn are supported in motor head members 20, 21 seated in the opposite ends of the casing and herein having flanges 22 adapted to position the same relative to the casing, suitable ball bearings 23 preferably being provided between further reduced portions 24 on the shaft and the heads. It will also be noted that the heads are disposed within the ends of the motor casing, thus providing an extremely compact motor and further permitting the assemblage of frame elements of a mining machine frame directly against the motor housing edges.

Operatively associated with the rotors

above described is improved means for supplying pressure fluid thereto and exhausting the same therefrom. Actuating fluid is admitted by a longitudinally extending passage 25 passing through suitable means to the head 21 through suitable packed joints and extending longitudinally of the center line of the section 8 beneath the mesh line of the rotors 9 and 10, to a point below the spur gear sections 13 where it communicates with a plain upwardly extending motor inlet 26, thus supplying motive fluid to the rotors in such manner as to cause the same and their shafts to rotate in a well known manner in the opposite directions indicated by the arrows in Fig. 3. As shown herein, the exhaust from the rotors passes out of the opposite ends thereof into end exhaust chambers 27 communicating through baffle chambers 28 with outlets 29 disposed two in a set vertically at the opposite ends of each side of the motor section 8, the baffles serving to prevent the entry of foreign matter such as coal into the rotor casing when the rotors draw a vacuum in the casing as the motor is shut down. Here attention is also directed to the fact that a longitudinal passageway 30 is provided above the mesh line of the rotors connecting the two end exhaust chambers. It is to be noted that the exhaust passages are formed in the sides of the motor casing as distinguished from the top and bottom and the ends thereof for the purpose of keeping the overall height to a minimum.

Here attention is also directed to the controlling mechanism for the fluid pressure supply which is preferably provided in addition to another usual valved supply connection. More particularly, it will be observed that a hollow tubular throttle valve 31 having a longitudinally extending slot or aperture 32 therein is journaled in the passage 25 immediately beneath the motor inlet 26, this throttle valve 31 being rotatable on a horizontal axis in such manner that rotation of the same acts to throttle more or less as desired the supply of pressure fluid from the passage 25 to the motor inlet 26. More particularly, it will be noted that this valve 31 which is preferably so constructed as to be expanded by the fluid pressure in such manner as to resist a turning movement, is provided with a rod 33 extending in the opposite direction from the passage 25 and through the head 20, and that this rod is journaled in the bottom of the motor casing 8 and the head 20 and carries on a protruding end a pinion 34 which is adapted to mesh with suitable means such as a transversely disposed rack member.

Cooperating with the motor mechanism is also improved lubricating mechanism therefor. This mechanism herein comprises a plurality of lubricant chambers 36, 37, formed in the frame of the motor casing 8 above the horizontal median plane thereof and a plu-

rality of similar lubricant chambers 38, 39 below that plane. Herein one of these chambers 36 communicates with the bore for the rotor 9 through a small air passage 40 and also through a restricted oil discharge 41 located adjacent the bottom of the chamber and controlled by a valve 42 operatively connected, as through a pin 43, with an adjusting screw 44, in turn operable by an adjusting knob 45 disposed in a recess 46 in the side of the casing 8 substantially midway between the top and bottom thereof. Thus it will be noted that the construction is such that when the knob 45 is adjusted, the air pressure passing from the rotor chamber into the chamber 36 and acting on the top of the oil therein forces the oil out through the aperture 41 and into the rotor chamber into the pressure fluid in such manner as to lubricate the rotor. Referring to the chamber 37, it will be noted that the same is not provided with a valve but that instead the opening in which the member 44 would be seated is plugged by the plug 47 and that similar plugs close the chambers 38, 39, this arising from the fact that the chamber 37 is only used when that side of the machine is away from the coal face and therefore accessible, the plug 47 then closing the chamber 36, while the chambers 38, 39 are only used under like circumstances when the motor is turned bottom side up and operating with the top surface shown in Fig. 3 forming its shoe, all as more fully described in my copending application. Here it will also be noted that these chambers may be filled through removable two part screened plug connections 48, 49, 50 and 51 in both the top and bottom surfaces of the machine.

Suitable driving gearing is associated with my improved motor and comprises a spur gear 52 keyed to one of the rotor shafts 18 and disposed adjacent the head 21 while a second spur gear 53 is keyed to the other rotor shaft 18 but disposed a slight distance from the face of the head 21. A shaft 54 is rotatably mounted between or intermediate the free ends of the rotor shafts 18 as by a roller bearing 55 disposed at one end while any suitable bearing could be used for the other reduced end. Non-rotatably but longitudinally slidably mounted upon the shaft 54 is a spur gear 56 adapted to be alternatively engaged with the gears 52 and 53 as by any suitable shipper mechanism adapted to engage a usual collar 57. Disposed on the opposite end of the motor is additional gearing comprising a pinion 58 meshing with a gear 59 keyed to a shaft 60 rotatably supported at its opposite ends in bearings 61 and 62 carried respectively by spaced supports 63 and 64 forming a part of head 20. The gear 59 is disposed between said supporting portions. A pinion 65 is formed on the outer end of the shaft 60 and adapted to be suitably driven upon rotation of the rotors.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a pressure fluid motor, a plurality of intermeshing rotors rotatable on parallel axes, each of said rotors comprising a shaft having a central portion of larger diameter than the end portions to form shoulders therebetween, a plurality of spiral toothed sections rigidly secured together and mounted on said central portion, and locking plates removably secured directly to said sections and engaging said shoulders for holding said rotor sections on said shafts.

2. A pressure fluid motor comprising a frame having plane top and bottom walls, vertical side walls and end walls, a pair of intermeshing rotors mounted in said frame with their axes disposed in a horizontal plane and their peripheries extending to points closely adjacent the top and bottom of said frame and said vertical side walls being disposed parallel to the rotor axes, the height of said frame being only that requisite for the power producing elements, exhaust passages formed in the sides of said frame adjacent each end of the rotors and opening directly to atmosphere through the vertical side walls of said frame wholly within the vertical limits of the latter, and rotor lubricating means including a lubricating reservoir formed in the sides of said frame between said exhaust passages.

3. In a pressure fluid motor, a casing having parallel plane top and bottom surfaces upon either of which the motor may be supported during operation, a pair of intermeshing rotors mounted in said casing with their axes disposed in the same horizontal plane, the overall height of said motor being only that requisite for the power producing elements and vertical side walls arranged parallel to the rotor axes, and reversely curved exhaust passages constituting a trap for solid particles, said passages being formed in the side walls of said casing.

4. In a pressure fluid motor, a plurality of intermeshing rotors with their axes disposed in a common horizontal plane, a motor casing enclosing said rotors whose height is substantially equal to the diameter of one of said rotors plus twice the required thickness of the motor casing, the height of said motor casing being substantially only that requisite to the power producing function of the motor, a plurality of lubricant reservoirs one of which is disposed in one of the side walls and another of which is formed in the

opposite side wall, each of said reservoirs communicating with the rotor chambers by a plurality of ports, and a transposable valve to cooperate with one of said openings in the lubricant chamber formed in the side of said motor casing which is accessible, said valve being adapted to cooperate with one of the openings of another lubricant chamber when the other side of the motor casing is accessible.

5. In a pressure fluid motor having an invertible casing presenting parallel plane top and bottom surfaces upon either of which the motor may be supported during operation, the height of the motor being only that necessary for its power producing function, a pair of intermeshing rotors housed in said chamber whose peripheries extend to points closely adjacent said plane surfaces and means for supplying lubricant to said rotor chambers in either position of the motor comprising a plurality of lubricant reservoirs each having a plurality of openings communicating with the rotor chambers one of said reservoirs being formed in one of the side walls so as to supply lubricant thereto when the motor is resting on one of said plane surfaces, and another lubricant reservoir formed in one of said side walls which may be employed for supplying lubricant to the motor when the same is supported on the other of said plane surfaces.

6. A pressure fluid motor comprising an invertible casing having parallel plane top and bottom surfaces upon either of which the motor may be supported during operation and means for lubricating said motor comprising a plurality of lubricant reservoirs disposed in each of the opposite side walls of the casing and within the vertical limits of said plane surfaces, one of said reservoirs on each side having means for supplying lubricant to the motor when the latter is supported on one of said plane surfaces, and a second reservoir on that side having means for supplying lubricant to the motor when it is supported on the other of said plane surfaces.

7. In a machine, a pressure fluid motor comprising a casing and intermeshing rotors disposed therein in the same horizontal plane, the height of said machine being only that requisite for said rotors and the walls of said casing, said casing having an inlet connection at one end of the motor and an inlet passage extending longitudinally of the casing and disposed in the space between said rotors on one side of the mesh line, said inlet passage also having an angled portion through which fluid is supplied directly to the rotors, a throttle valve in said inlet passage adjacent said angled portion, and a valve operating member mounted in the casing in the space between the rotors at the same side of said mesh line and arranged wholly within the vertical limits of the motor cas-

ing and extending to the other end of the motor.

8. In a machine, a pressure fluid motor constructed according to claim 7 wherein said valve operating element is in axial alinement with said longitudinally extending passage and operable from the end of said casing.

9. In a machine, a pressure fluid motor comprising a casing having substantially
10 plane unbroken top and bottom walls, intermeshing rotors disposed in said casing in the same horizontal plane, the height of said machine being substantially equal to the outer diameter of one of said rotors plus
15 twice the required thickness of the motor casing, said casing having an inlet connection at one end of the motor, a passage extending longitudinally of the casing from said connection and disposed in the space
20 between said rotors at one side of the mesh line, a port leading from said passage to the mesh line of said rotors located centrally of the rotors, and means arranged entirely within the vertical limits of said motor casing
25 for controlling fluid flow to said motor including a valve in said passage adjacent said port, and a valve operating rod extending through said casing to one end thereof and mounted in the space between said rotors.

30 10. In a machine, a pressure fluid motor constructed according to claim 9, wherein said longitudinally extending passage and said valve operating rod are located between parallel planes determined respectively by
35 the axes of said rotors and by common tangents to said rotors at one side of said axes.

11. In a machine, a pressure fluid motor comprising a casing having a pair of intermeshing rotors disposed therein and vertical
40 side walls arranged parallel to the rotor axes, the height of said machine being only that requisite for the rotors and top and bottom walls of the casing, and exhaust passages formed in the side walls of said casing and
45 opening directly to atmosphere through said side walls, said exhaust passages being formed to constitute return bends to form a trap in each exhaust passage.

12. In a motor, an invertible low compact
50 motor frame presenting parallel plane top and bottom surfaces upon which the frame is adapted to be selectively supported during its operation, the height of said motor frame being only that requisite for the power producing elements of the motor, said frame having
55 parallel overlapping bores intersecting at the longitudinal vertical center of the motor, and motor exhaust chambers at the ends of said bores, parallel intermeshing toothed
60 rotors arranged in said bores, means for supplying fluid to said motor to act on the teeth of said rotors comprising an inlet connection at the end of said frame and a passage extending longitudinally through said frame to
65 the central portion of the rotors, and exhaust

passages leading from said exhaust chambers to the atmosphere including passages extending laterally from said rotor chambers on both sides of the frame and opening through the sides of said frame, said supply and exhaust passages being so arranged within the vertical limits of said frame that the latter may be supported in either of its inverted positions while permitting supply of fluid to said motor and free exhaust from the sides of said motor.

13. In a motor, the construction specified in claim 12 wherein there is further provided lubricating means for the rotors including lubricant reservoir means, and means for conducting lubricant therefrom to said rotors operative irrespective of the position in which said motor is supported.

14. In a pressure fluid motor, a plurality of intermeshing rotors rotatable on parallel
85 axes, each of said rotors comprising a shaft having a central portion of larger diameter than the end portions to form shoulders therebetween, a plurality of rotor sections mounted on said central portion, and locking
90 elements removably secured directly to said rotor sections and engaging said shoulders for holding said rotor sections on said shafts.

In testimony whereof I affix my signature. 95
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