Oct. 31, 1939. W. BRAUER 2,177,977

MOTOR

Filed May 13, 1937 2 Sheets-Sheet 1

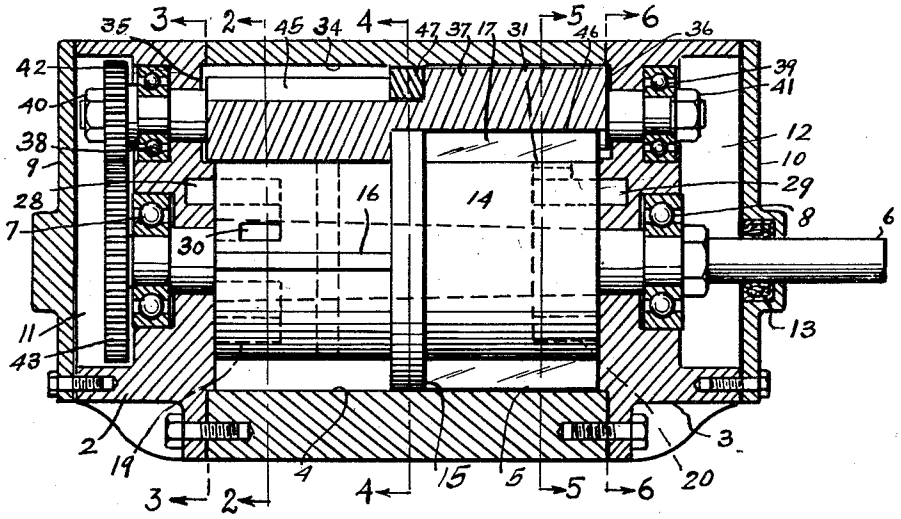


Fig. 1.

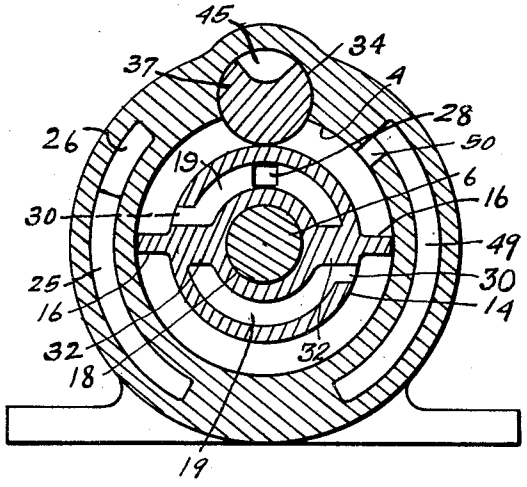


Fig. 2.

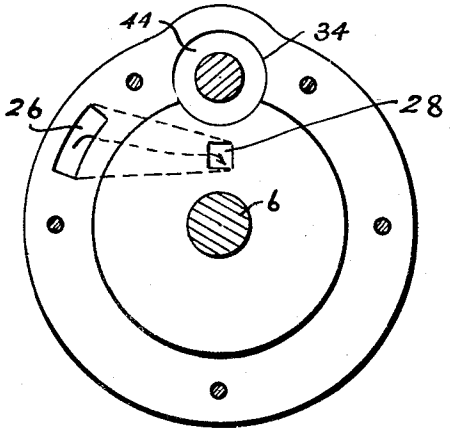


Fig. 3.

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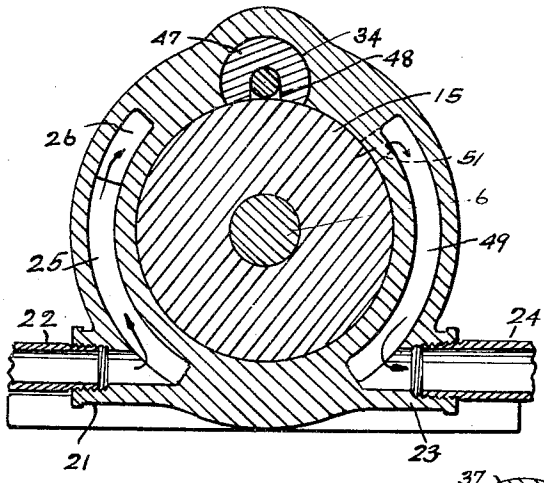


Fig. 4.

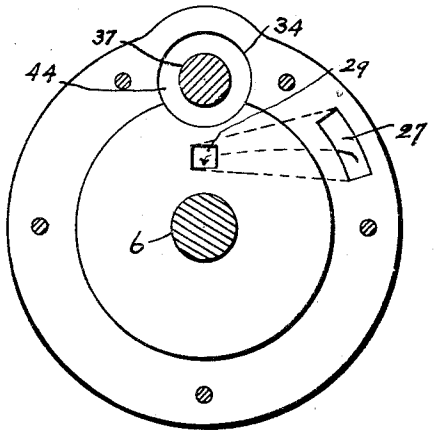


Fig. 6.

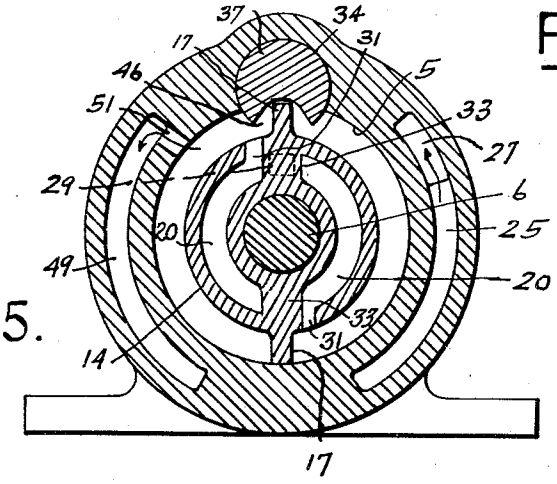


Fig. 5.

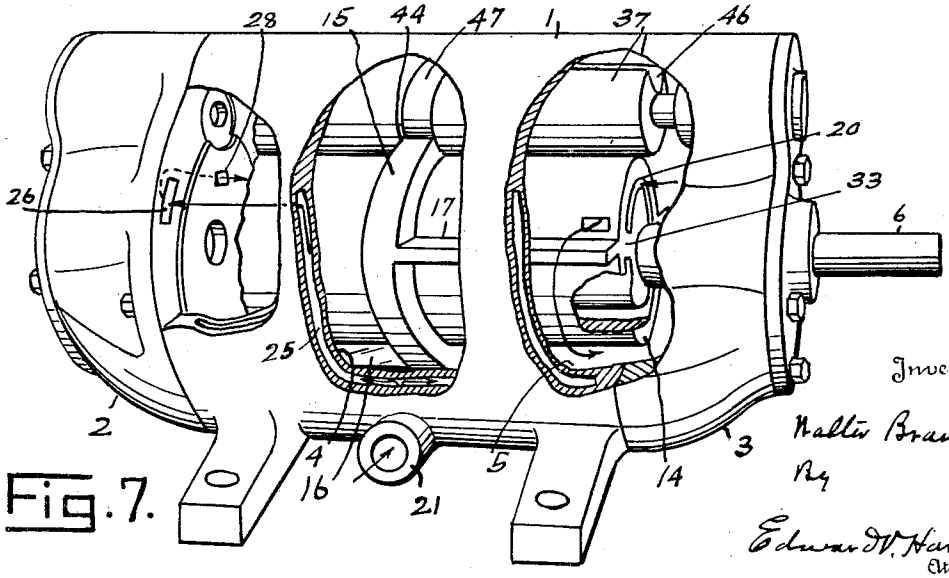


Fig. 7.

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2,177,977

MOTOR

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Application May 13, 1937, Serial No. 142,392

7 Claims. (Cl. 121—71)

This invention relates to a motor and embodies certain improvements over that type of motor disclosed in my co-pending application filed in the United States Patent Office on August 19, 1935, under Serial No. 36,813.

An object of the invention is to provide a rotary engine having a novel type of rotor therein and adapted to be driven by an expansible fluid such as compressed air or compressed steam and of such construction as to provide the desirable torque characteristics and to be capable of compactness of construction and to operate with a minimum of vibration. It is another object of the invention to provide a rotary motor, or engine, embodying a casing having cylinders and a rotor in the cylinders equipped with a plurality or series of blades, the blades of one series being arranged in staggered relation with respect to the blades of the other series, with partitioning means completely separating the series of blades, the arrangement being such that the engine cannot stop on dead center and will have a high starting torque.

It is another object of the invention to provide a rotary engine or motor of this character wherein the cylinders are provided with a rotatable abutment forming a partition separating the pressure chambers from the exhaust chambers, said abutment having pockets adapted to register with the corresponding blades to permit the blades to pass the abutment as they revolve about the cylinders, said motor having a novel arrangement of motive fluid passageways whereby the operating fluid may be applied, to effect the rotation of the rotor, and exhausted.

With the above and other objects in view the invention has particular relation to certain novel features of construction, operation and arrangement of parts, an example of which is given in this specification and illustrated in the accompanying drawings, wherein:

Figure 1 shows a longitudinal, sectional view of the motor.

Figure 2 shows a cross-sectional view taken on the line 2—2 of Figure 1.

Figure 3 shows a cross-sectional view taken on the line 3—3 of Figure 1.

Figure 4 shows a cross-sectional view taken on the line 4—4 of Figure 1.

Figure 5 shows a cross-sectional view taken on the line 5—5 of Figure 1.

Figure 6 shows a cross-sectional view taken on the line 6—6 of Figure 1, and

Figure 7 shows a perspective view of the complete motor partly broken away.

Referring now more particularly to the drawings wherein like numerals of reference designate the same parts in each of the figures, the numeral 1 designates a casing which is preferably cylindrical in form and which has the end heads 2, 3, secured thereto preferably by means of suitable bolts, as shown. There is enclosed within the casing, in the manner hereinafter described two cylinders 4, 5. An axial shaft 6 is mounted in suitable antifriction bearing assemblies 7, 8, in the heads 2, 3, and extends axially through the cylinders. Secured on the outer ends of the heads are the cover plates 9, 10, which enclose the end chambers 11, 12 and mounted in the cover plate 10 there is a stuffing box 13 through which the power shaft 6 extends.

Secured on the shaft 6 within the cylinders 4, 5 there is a cylindrical rotor 14 whose outer ends abut closely against the inner walls of the respective heads 2, 3. The rotor is provided with an external, annular rib 15 approximately midway between the ends of the rotor and which forms a partition between the cylinders 4, 5. The rotor has two series of radial blades 16, 17, extending from the outer ends thereof to the rib, or partition 15 and whose outer margins are flush with the outer surface of said rib. The blades of one series are staggered with relation to the blades of the other series as is more clearly indicated in Figure 7. Preferably there are two blades of each series, the blades 16, 17, being set approximately ninety degrees apart, each cylinder thus being divided into a pressure chamber and an exhaust chamber. The rib 15 and the blades 16, 17 extend out approximately to the cylinder walls, there being, however, preferably, sufficient clearance to prevent friction.

The rotor has an axial bearing 18 extending therethrough from end to end to receive the shaft 6 and at opposite ends of the rotor are the arcuate receiving chambers 19, 20 which extend out to the corresponding ends of the rotor as shown more accurately in Figure 7 and whose outer ends are closed by the corresponding heads 2, 3. The casing has an inlet connection 21, for the connection thereto of an inlet pipe 22 and has an outlet connection 23 for the connection thereto of an outlet pipe 24 whereby the operating fluid is admitted into and discharged from the motor.

Within the wall of the casing and extending from end to end thereof there is the inlet passageway 25 into which the motive fluid is delivered from the inlet pipe 22. The heads 2 and 3 have the respective inlet ducts 26, 27 which ter-

minate in the respective discharge ports 28 and 29, respectively, and through which the motive fluid is delivered into the respective receiving chambers 19, 20. These receiving chambers have the ports 30, 31, respectively, through the walls thereof into the pressure chambers of the motor. The ports 28, 29 are longitudinally aligned and, as will be noted, the ends of the rotor have the radial webs 32, 33. These webs are staggered relative to each other being spaced approximately ninety degrees apart around the rotor so that if the rotor should stop with one web closing one of said ports 28, or 29, as is shown in Figure 5, the other of said ports will be open, as is illustrated in Figure 2, so that upon the subsequent application of the motive fluid the rotor will start. It will thus be impossible for the rotor to stop on dead center.

The wall of the casing is provided with a semi-cylindrical recess 34 whose ends terminate in circular recesses 35, 36 in the respective heads 2, 3. Rotatably mounted in the recess 34 and with its ends extended into the recesses 35, 36 there is an abutment 37. The ends of this abutment are reduced and journaled in said heads 2, 3 and are mounted on anti-friction bearing assemblies 38, 39. The outer ends of the reduced positions of said abutment 37 are threaded to receive the retaining nuts 40, 41, the former of which also serves to clamp the small spur-gear 42 on the corresponding end of the abutment. This gear 42 is in mesh with and driven by a larger spur-gear 43 which is fixed on the corresponding end of the shaft 6 whereby the abutment will be rotated.

The abutment 37 has a centrally located circular groove 44 therearound which receives the rib 15 snugly as indicated in Figures 1 and 7. The abutment 37 is cylindrical in general contour but has approximately semi-cylindrical side pockets 45, 46 on opposite sides of the rib 15 and extending from said rib to the corresponding ends of the abutment. These side pockets, as will be noted from an inspection of Figure 1 are located on opposite sides of the abutment and are so positioned that the respective blades 16, 17 will register with and pass closely through the corresponding pockets as the rotor revolves, the gear ratio between the gears 42, 43 being such as to cause the blades to register with and pass through said pockets as above stated. There is only sufficient clearance between the abutment 37 and the rotor and its blades to prevent friction.

Within the recess 34 and seated in the groove 44 there is a filler block 47 which is of an external contour to closely fit the recess 34. Its inner margin is shaped to fit closely against the rib 15 and it has a slot 48 therein forming a bearing to receive the reduced portion of the abutment 37, said reduced portion being formed by the groove 44. The operating fluid is thereby confined within the two cylinders 4, 5 and prevented from passing from one to the other.

It will be noted that the ports 30, 31 are arranged approximately ninety degrees apart around the rotor so as to discharge the motive fluid into the respective pressure chambers immediately behind the corresponding blades 16, 17. The casing also has an outlet passageway 49, extending approximately from end to end thereof and in communication with the outlet pipe 24. Leading from the exhaust chambers of the cylinders into said outlet passageway are the outlet ports 50, 51 through which the exhausted operating fluid may pass.

The motive fluid entering through the pipe 22 will pass into the passageway 25 and thence through the ducts 26, 27 and discharge ports 28, 29 into the receiving chambers 19, 20 and will pass thence through the ports 30, 31 into the pressure chambers between the abutment 37 and the corresponding blades 16, 17, causing a rotation of the rotor, the spent motive fluid exhausting out through the ports 50, 51, the passageway 49, outlet connection 23 and through the exhaust pipe 24.

The provision of two pairs of blades on the rotor arranged in staggered relation will give a high starting torque with a minimum of vibration and conduces to compactness of construction.

The drawings and description disclose what is now considered to be a preferred form of the invention by way of illustration only, while the broad principle of the invention will be defined by the appended claims.

What I claim is:

1. A motor comprising a casing having a cylindrical chamber therein, a rotor arranged axially in the chamber and spaced from the walls thereof and having receiving chambers and having an annular, external rib shaped to divide the casing chamber into separate cylinders, radial blades on the rotor in the respective cylinders and extending from end to end of the cylinders, a rotary abutment mounted to rotate in the casing and spanning the cylinders and having an annular, inside groove to receive the rib and having pockets to receive the respective blades as they revolve, said abutment forming partitions to separate the spaces between the rotor and the cylinder walls into pressure chambers and exhaust chambers, the motor having inlet conduits which register with the receiving chambers in the rotor, said receiving chambers having ports leading into the respective pressure chambers and the motor also having discharge conduits which lead out from the exhaust chambers.

2. A motor comprising a casing having a cylindrical chamber therein, a rotor arranged axially in the chamber, having receiving chambers and having an annular rib and shaped to separate the casing chamber into a plurality of cylinders, series of radial blades on the rotor extending from end to end of the respective cylinders, the blades of one series being staggered with respect to the blades of the other series, a rotary abutment mounted to rotate in the casing and spanning the cylinders and having an annular groove to receive the rib and having pockets to receive the blades of the respective series as they revolve, a removal arcuate filler block in the groove complementing said rib to prevent passage of motive fluid from cylinder to cylinder, said abutment forming partitions which separate the spaces between the rotor and the walls of the respective cylinders into pressure chambers and exhaust chambers, the motor having conduits whose inner ends consecutively register with the outer ends of the respective receiving chambers, and said receiving chambers having ports leading into the respective pressure chambers and the motor also having conduits through which the spent fluid may be relieved from the exhaust chambers.

3. A motor comprising a casing having a cylindrical chamber therein, a rotor in the chamber and spaced from the walls thereof and having receiving chambers, a partition in the casing

chamber around the rotor arranged to divide the casing chamber into separate cylinders, radial blades on the rotor in the respective cylinders and extending from end to end of the cylinders, a rotary abutment mounted to rotate in the casing and spanning the cylinders and having pockets to receive the respective blades as they revolve, said abutment forming partitions which separate the spaces between the rotor and the cylinder walls into pressure chambers and exhaust chambers, said receiving chambers having ports leading into the pressure chambers, said motor having inlet conduits which terminate in ports arranged to register at intervals with the outer ends of the receiving chambers and the motor having discharge conduits which lead out from the exhaust chambers.

4. A motor comprising a casing having a cylindrical chamber therein, a rotor arranged axially in the chamber and spaced from the walls thereof and abutting the ends thereof and having end receiving chambers therein, a partition in the casing chamber around the rotor separating the casing chamber into separate cylinders, radial impellers on the rotor in the respective cylinders, a rotary abutment mounted to rotate in the casing and spanning said cylinders and having pockets to receive the respective impellers as they revolve, said abutment forming a partition to separate the cylinders into pressure chambers and exhaust chambers, said motor having inlet conduits whose inner ends consecutively register with the outer ends of the respective receiving chambers, said receiving chambers having ports leading into the respective pressure chambers, said motor having conduits in the casing wall which lead out from the respective exhaust chambers.

5. A motor comprising a casing having a cylindrical chamber therein, a rotor arranged axially in the chamber and spaced from the walls thereof and abutting the ends thereof and containing receiving chambers, said motor having an annular partition on the rotor which separates the casing chamber into separate cylinders, series of radial impellers on the rotor in the respective cylinders, the impellers of one series being offset with respect to the impellers of the other series, a rotary abutment mounted to rotate in the casing and spanning the cylinders and having pockets to receive the respective impellers as they revolve, said abutment forming partitions to separate the spaces between the rotor and the cylinder walls into pressure chambers and exhaust chambers, said casing having inlet conduits which register with the receiving chambers consecutively as the rotor turns and said receiving chambers having ports leading into the respective pressure chambers and the casing also having conduits through which the spent fluid may be relieved from the exhaust chambers.

6. A motor comprising a casing having a cylindrical chamber therein, heads on the casing enclosing said chamber, a rotor arranged axially in the chamber and spaced from the walls thereof and abutting the heads thereof, an annular partition on the rotor which separates the chamber into separate cylinders, the ends of the rotor having receiving chambers whose outer ends are closed by said heads, radial impellers on the rotor in the respective cylinders and extending from end to end of the cylinders, a rotary abutment mounted to rotate in the casing and spanning the cylinders and having pockets to receive the respective impellers as they revolve and being formed with an annular groove to receive said partition, said abutment forming partitions to separate the spaces between the rotor and the cylinder walls into pressure chambers and exhaust chambers, a separate, arcuate, removable filler block in said groove shaped to co-act with the rotor-partition to close said groove, said casing having inlet conduits in the walls thereof which extend through the respective heads and terminate at points to register with the respective receiving chambers, said receiving chambers having ports into the respective pressure chambers and the casing having conduits leading through the wall thereof through which the spent fluid may be relieved from the exhaust chambers.

7. A motor comprising a casing having a cylindrical chamber therein, heads on the casing enclosing the chamber and having conduits which terminate in ports on the inside of the heads, a rotor arranged axially in the chamber and spaced from the walls thereof and abutting the heads thereof, and an annular partition on the rotor which separates the chamber into separate cylinders, the ends of the rotor having receiving chambers whose outer ends are closed by said heads, radial impellers on the rotor in the respective cylinders, a shaft mounted to rotate in the casing, a rotary abutment on the shaft and spanning the cylinders and having pockets to receive the respective impellers as they revolve and being formed with an annular groove to receive said annular partition, said abutment forming partitions to separate the spaces between the rotor and the cylinder walls into pressure and exhaust chambers, a removable filler block in said groove shaped to form a seal between the respective cylinders, said casing having inlet conduits through the walls thereof which terminate in the conduits in the head, said ports in the heads consecutively registering with the respective receiving chambers as the rotor turns, and the casing having conduits leading through the wall thereof through which the spent fluid may be relieved from the exhaust chambers.

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