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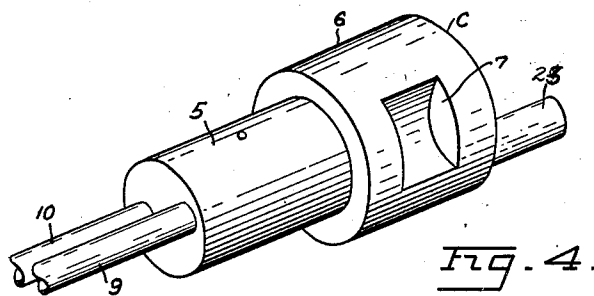
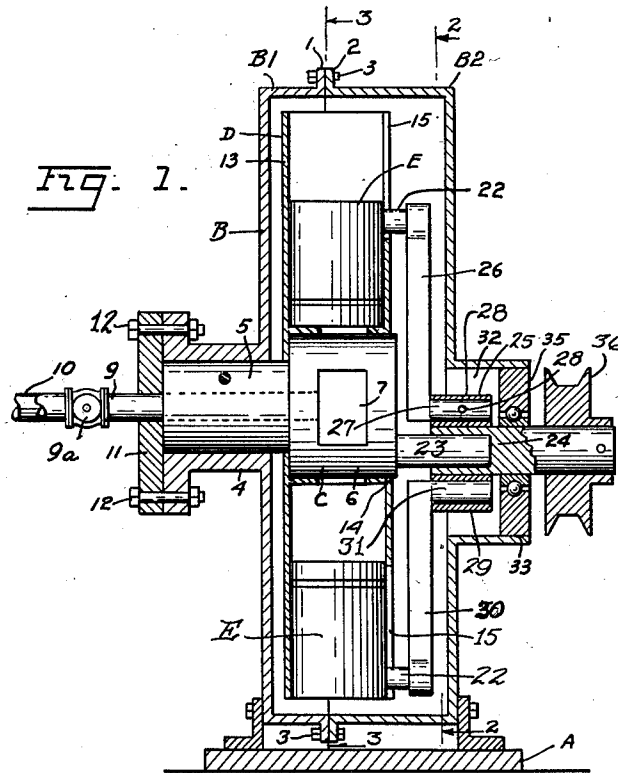
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2,364,306

AIR MOTOR

Filed April 5, 1943

2 Sheets-Sheet 1



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Fig. 2.

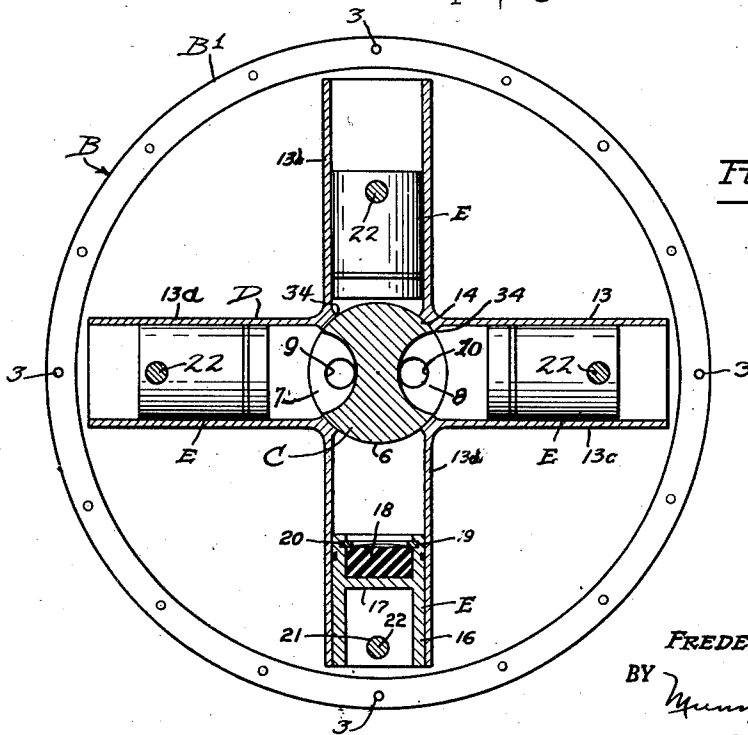
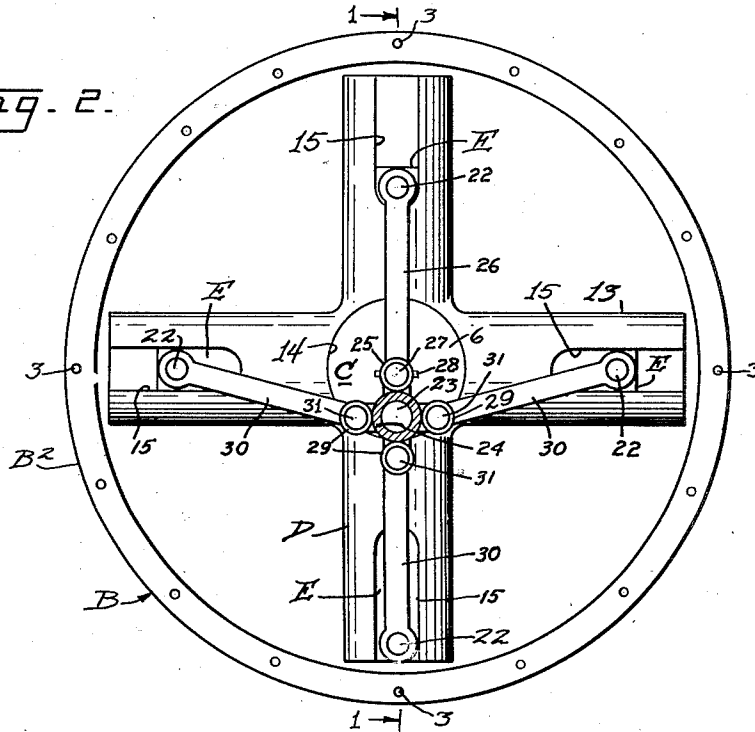


Fig. 3.

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AIR MOTOR

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Application April 5, 1943, Serial No. 481,932

7 Claims. (Cl. 121-59)

The present invention relates to improvements in an air motor and it consists of the combinations, constructions and arrangements herein-after described and claimed.

An object of my invention is to provide an air motor in which the cylinder block is composed of radially extending cylinders that rotate on a stationary valve whereby the valve performs two functions in that it supports the rotating cylinder block and also feeds air or other gases under pressure to the cylinders.

A further object of my invention is to provide a device of the type described in which the cylinder ports cooperate with the valve ports for opening and closing the latter in proper sequence, thus doing away with the necessity of providing poppet valves and any mechanism for operating the valves.

Novel means is employed for converting the reciprocating motion of the pistons into a rotary motion of the cylinders and driven shaft. The motor is simple in construction and is durable and efficient for the purpose intended.

Other objects and advantages will appear in the following specification and the novel features of the device will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings forming a part of this application, in which:

Figure 1 is a vertical section through the device taken along the line 1-1 of Figure 2;

Figure 2 is a transverse section taken along the line 2-2 of Figure 1;

Figure 3 is a central transverse section taken along the line 3-3 of Figure 1; and

Figure 4 is a perspective view of the valve.

While I have shown only the preferred form of my invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

In carrying out my invention I provide a base indicated generally at A in Figure 1. This base supports a motor housing B that is in two parts. The part B1 has a circular flange 1 and the part B2 has a similar flange 2, these flanges being secured together by bolts 3. The part B1 carries a hub portion 4 that receives the reduced portion 5 of a stationary valve C. The valve body 6 has two recesses 7 and 8 in its periphery, see Figures 3 and 4. An air inlet pipe 9 communicates with the inlet recess 7 and an air exhaust pipe 10 communicates with the exhaust recess 8. The valve C does not rotate in the motor housing B.

If desired, a cover plate 11 may be secured to the hub 4 by bolts 12 and forms a part of the stationary motor housing B.

The cylinder block is indicated generally at D. The block has four radially extending cylinders 13 with a central recess 14 that receives and permits the cylinder block to rotate on the valve body periphery, see Figure 3. Each cylinder 13 is identical to all of the others and the cylinders are disposed 90° apart. Figure 1 shows the cylinders 13 provided with inwardly extending slots 15 for a purpose presently to be described.

Pistons E are slidably mounted in the cylinders and since all of the pistons are identical, a description of one will suffice for all. One of the pistons is shown in cross-section in Figure 3 and it comprises a cylindrical body 16 with an integral partition 17. A rubber shock absorbing cushion 18 is placed in the end of the piston disposed nearest the valve body 6. The rubber cushion bears against the partition 17. A split ring 19 is received in an annular groove 20 and holds the rubber cushion in place. The piston has a wrist pin opening 21 and a wrist pin 22 is mounted therein.

Figures 1 and 2 show a stub shaft 23 eccentrically mounted on the body 6 and carrying a rotatable shaft 24. The rotatable shaft 24 has an offset sleeve 25 rigidly secured thereto. A main connecting rod 26 leads from a wrist pin 22 and has a stub shaft 27 received in the sleeve 25 and keyed thereto by a pin 28. The connecting rod 26 will cause the sleeve 25 and shaft 24 to rotate with the cylinder block D.

The shaft 24 carries three other sleeves 29 that are mounted around the shaft and spaced 90° from each other. Other connecting rods 30 extend from the other wrist pins 22 and carry stub shafts 31 that are rotatably received in the offset sleeves 29. The motor housing part B2 has a recess 32 for receiving the offset sleeves 25 and 29 and has an opening 33 through which the shaft 24 extends. A ball bearing 35 rotatably supports the shaft in the opening.

The shaft 24 may be used for driving any machine desired. For example, a pulley 36, see Figure 1, may be mounted on the shaft and this pulley connected to a pulley of a device to be operated by means of a belt, not shown.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood.

Reference to Figure 3 shows the left hand cylinder 13a with its piston E midway through its power stroke. Air or liquid entering the recess

7 through the pipe 9 will move the piston E outwardly in the cylinder 13a and this through the connecting rod 30 will cause the cylinder to swing downwardly and rotate the cylinder block in a counterclockwise direction when looking at Figures 2 and 3. When the cylinder reaches the position 13d, which is 90° from the position 13a, the opening 34 in the cylinder bottom will be out of communication with the inlet recess 7 and the piston will be ready for its inward or exhaust stroke. As soon as the piston starts to move inwardly for any appreciable distance, the opening 34 in the cylinder will communicate with the exhaust recess 8 and permit the spent air in the cylinder to exhaust into the recess and out through the exhaust pipe 10. The exhaust stroke continues as the cylinder passes position 13c and is completed just before the cylinder reaches the position 13b. The cylinder port or opening 34 is cut off from the exhaust opening 8 in the valve C when the cylinder is in the position 13b. A further slight counterclockwise movement of the cylinder will bring its opening 34 again into registration with the inlet recess 7 and the compressed air will move the piston outwardly. The cylinder now reaches its starting position at 13a.

The four cycles will repeat themselves continuously so long as the motor operates. Since there are four cylinders, there will be four power impulses for each rotation of the cylinder block. The driven shaft 24 will therefor receive four power impulses for each revolution. The rubber cushion 18 absorbs any shock from the compressed air suddenly entering the cylinder and striking the piston. The eccentric position of the fixed shaft 23 on the valve body 6 determines the length of the stroke of the pistons. The slots 15 permit the wrist pins 22 to move therein.

As already stated, the motor shaft 24 can be mechanically connected to any device that is desired to be operated. The positive connection between the rod 26 and the sleeve 25 assures the rotation of the shaft 24 with the cylinder block. All types of moving valves are dispensed with and there is no valve mechanism necessary. The cylinder ports 34 open and close the valve ports 7 and 8 in proper sequence to cause the motor to operate. This makes the device very simple to construct and operate. The speed of rotation is controlled by the pressures of the air entering the inlet pipe 9. A valve 9a controls the flow of air in the pipe 9 and thus controls the motor speed. The front of the motor is considered to be where the air inlet and outlet pipes 9 and 10 enter the reduced portion 5 of the valve. The motor rotates in a clockwise direction when looking at the front of the motor, and in a counterclockwise direction when looking at the rear of the motor or when looking at Figures 2 and 3.

I claim:

1. An air motor comprising a stationary valve having a cylindrical portion with diametrically opposed recesses in its periphery, an air inlet communicating with one recess, an air outlet communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of

sleeves as there are cylinders, and connecting rods having trunnions journaled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft.

2. An air motor comprising a stationary valve having a cylindrical portion with diametrically opposed recesses in its periphery, an air inlet communicating with one recess, an air outlet communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of sleeves as there are cylinders, and connecting rods having trunnions journaled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft, said cylinders having radially extending slots therein extending inwardly from the outer ends of the cylinders, the operative connecting between the pistons and the connecting rods including wrist pins carried by the pistons and slidable in the slots, said wrist pins being connected to the connecting rods.

3. An air motor comprising a base, a cylindrical housing rigidly secured thereto, a stationary valve centrally mounted in the housing and having a cylindrical portion with diametrically opposed recesses in its periphery, a longitudinally extending air inlet in the valve communicating with one recess, an air outlet in the valve paralleling the inlet and communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of sleeves as there are cylinders, and connecting rods having trunnions journaled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft.

4. An air motor comprising a base, a cylindrical housing rigidly secured thereto, a stationary valve centrally mounted in the housing and having a cylindrical portion with diametrically opposed recesses in its periphery, a longitudinally extending air inlet in the valve communicating with one recess, an air outlet in the valve paralleling the inlet and communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of

of sleeves as there are cylinders, and connecting rods having trunnions journalled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft, said cylinders having radially extending slots therein extending inwardly from the outer ends of the cylinders, the operative connecting between the pistons and the connecting rods including wrist pins carried by the pistons and slidable in the slots, said wrist pins being connected to the connecting rods.

5. In an air motor, a stationary valve having a cylindrical portion with diametrically opposed recesses in its periphery, an air inlet communicating with one recess, an air outlet communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, each piston having a cylindrical body, a transverse partition, and a shock absorbing member mounted in the piston between the partition and the inner end of the piston, said member being designed to absorb the shocks resulting from the inrush of compressed air into the cylinders and against the pistons, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of sleeves as there are cylinders, and connecting rods having trunnions journalled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft.

6. In an air motor, a stationary valve having a cylindrical portion with diametrically opposed recesses in its periphery, an air inlet communicating with one recess, an air outlet communicating with the other recess, a cylinder block

having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve portion, pistons slidably mounted in the cylinders, each piston having a cylindrical body, a transverse partition, and a shock absorbing member mounted in the piston between the partition and the inner end of the piston, said member being designed to absorb the shocks resulting from the inrush of compressed air into the cylinders and against the pistons, a stub shaft eccentrically mounted on the valve, a driven shaft concentrically and rotatably mounted on the stub shaft, sleeves disposed around the driven shaft and having their axes parallel therewith, there being a like number of sleeves as there are cylinders, and connecting rods having trunnions journalled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve, whereby a rotation of the cylinder block on the valve will cause the connecting rods to rotate the driven shaft, said cylinders having radially extending slots therein extending inwardly from the outer ends of the cylinders, the operative connecting between the pistons and the connecting rods including wrist pins carried by the pistons and slidable in the slots, said wrist pins being connected to the connecting rods.

7. An air motor comprising a stationary cylindrical valve having a pair of recesses in its periphery, a fluid inlet communicating with one recess and a fluid outlet communicating with the other recess, a cylinder block having radially extending cylinders communicating with a central opening in the block that rotatably receives the cylindrical valve, pistons slidably mounted in the cylinders, a stub shaft eccentrically mounted on the valve, a driven shaft rotatably mounted on the stub shaft, sleeves integral with and spaced around the rotatable shaft, connecting rods having trunnions journalled in the sleeves and being operatively connected to the pistons, one of said trunnions being rigidly secured to its sleeve.

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