Feb. 26, 1924. 1,484,960

C. H. PECK

ROTARY CYLINDER MOTOR

Filed July 28, 1921 4 Sheets-Sheet 1

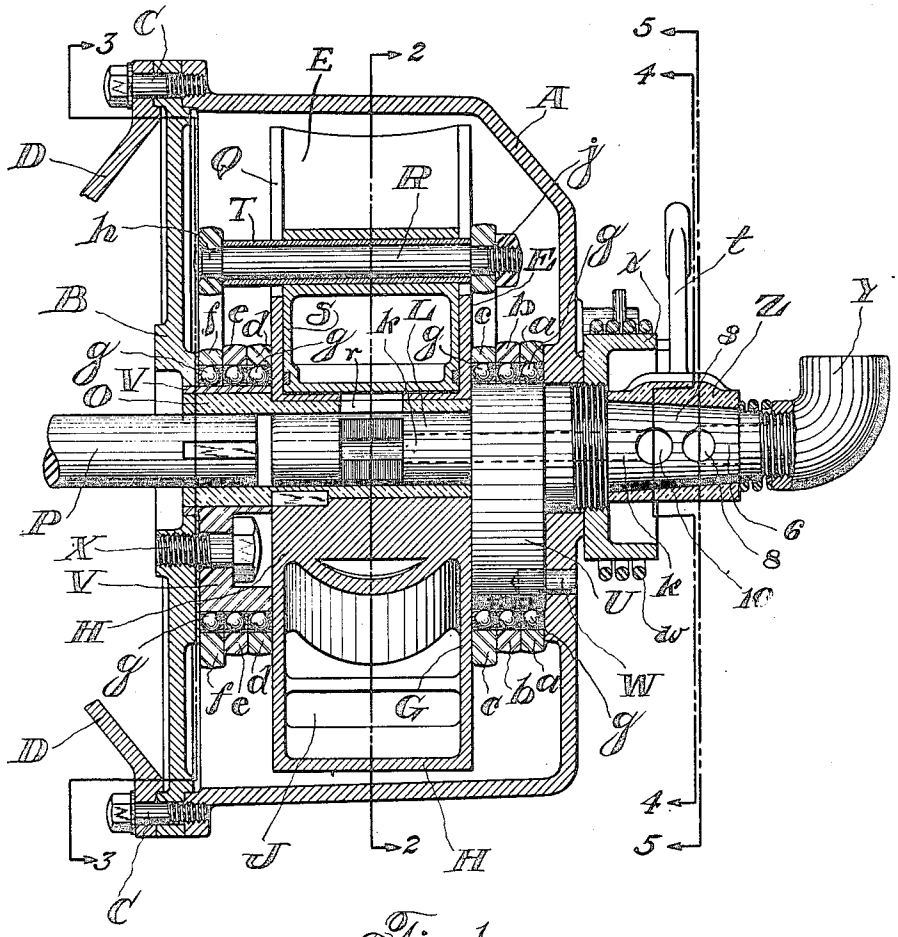


Fig. 1.

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Filed July 28, 1921 4 Sheets-Sheet 2

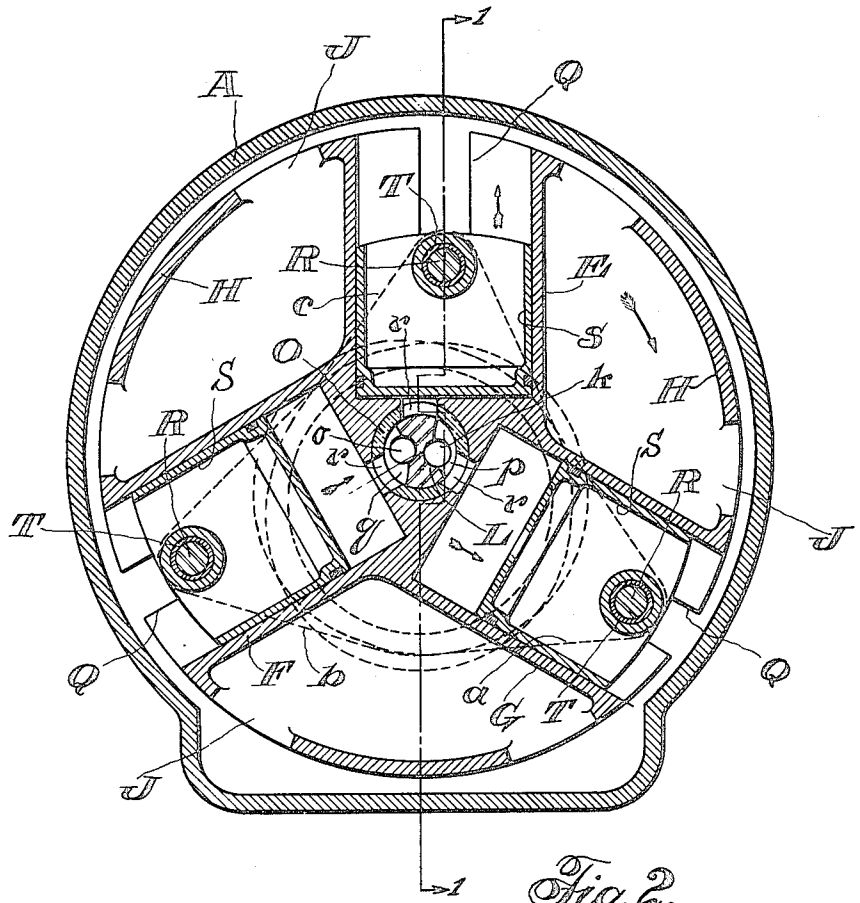


Fig. 2.

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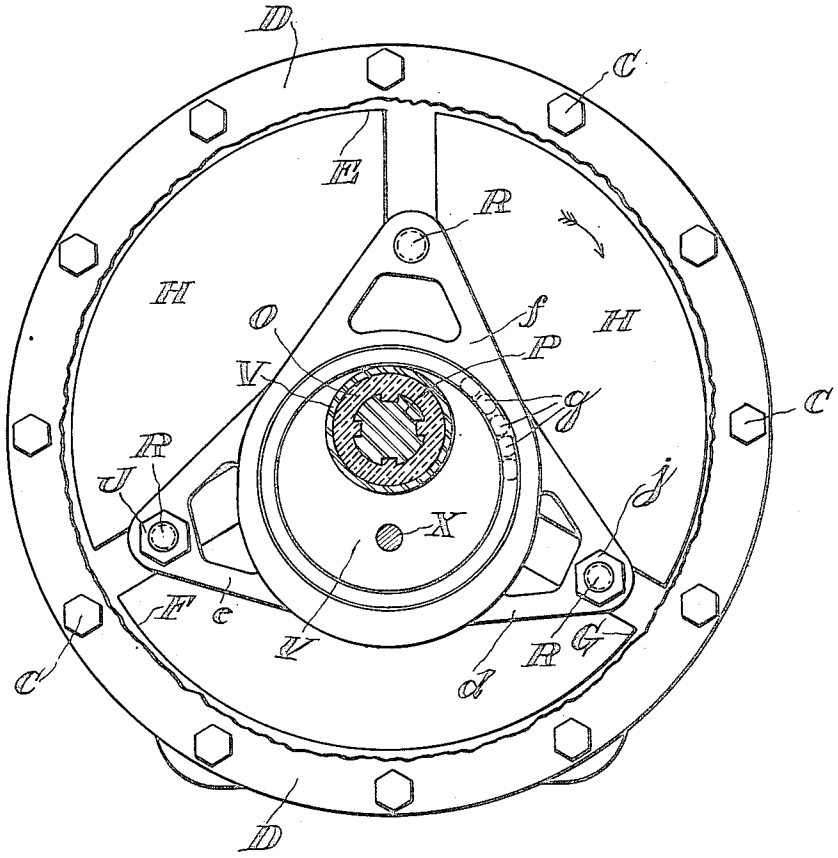


Fig. 3.

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Filed July 28, 1921 4 Sheets-Sheet 4

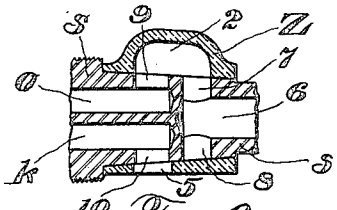


Fig. 6.

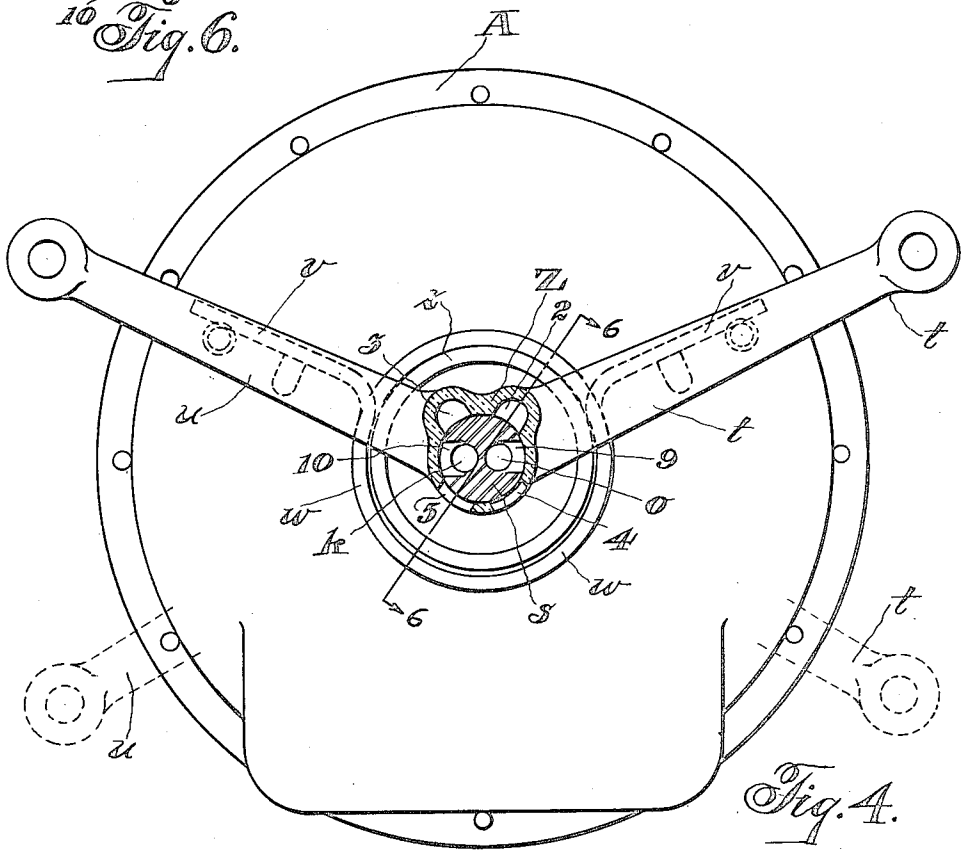


Fig. 4.

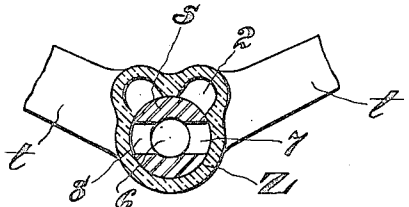


Fig. 5.

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Patented Feb. 26, 1924. 1,484,960

UNITED STATES PATENT OFFICE.

CAID H. PECK, OF WAVERLY, NEW YORK, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

ROTARY CYLINDER MOTOR.

Application filed July 26, 1921. Serial No. 488,062.

To all whom it may concern:

Be it known that I, CAID H. PECK, a citizen of the United States, a resident of Waverly, county of Tioga, State of New York, have invented a certain Rotary Cylinder Motor, of which the following is a specification.

This invention relates to rotary fluid actuated cylinder motors of the type in which the rotary driving member is in the form of a plurality of rigidly connected angularly disposed cylinders bodily rotatable as a unit about a center and operatively connected to rotate a driven member, which may be in the form of a shaft. Such rotary motors may be operated by steam, compressed air or other motive fluid, and are useful for numerous industrial purposes including hoisting and hauling as well understood.

A hoisting motor connected to a hoisting drum may remain in use for an indefinite period suspended high above the working floor, out of reach of the workmen where it may receive little or no cleaning, oiling or other attention, unless reached by a ladder or lowered to the floor.

The objects of the present invention are to produce a simple, cheap, light, yet strong and rugged, and powerful motor which will withstand constant use without getting out of order under the unfavorable conditions to which such motors are ordinarily subjected.

The motor is shown in its preferred form in the accompanying drawings in which—

Figure 1 is a longitudinal sectional elevation through the motor on the line 1—1 of Figure 2 looking in the direction of the arrows, with the driven shaft broken away. This particular motor was intended for a hoist and a portion of the hoist casing is also shown broken away.

Figure 2 is a transverse vertical sectional view on the line 2—2 of Figure 1 looking in the direction of the arrows, with a set of yokes which would otherwise be hidden indicated in dotted lines in order to indicate the relation of the yokes and pistons,

Figure 3 is an end view of the driven end of the motor with the case or frame broken away to show the motor and the driven shaft in transverse section on the line 3—3 of Figure 1 looking in the direction of the arrows,

Figure 4 is an end view of the opposite end of the motor partly in transverse section on the line 4—4 of Figure 1,

Figure 5 is a detail transverse sectional view taken through the controlling valve on the line 5—5 of Figure 1, and

Figure 6 is a detail longitudinal sectional plan view through the controlling valve with the valve in a different position.

Referring to the drawings the enclosing case A having the cover plate B secured thereto as by means of the cap screws C forms the frame of the motor. A portion of a frame D held by the screws C is shown in Figure 1 which may form the frame of a hoisting drum or other suitable part to be operated by the motor.

The rotary driving member consists of a plurality of rigidly connected angularly disposed cylinders, in this instance three cylinders E, F and G being shown for purposes of illustration, it being understood that as many cylinders may be provided as desired. The cylinders are in this instance constructed as integral parts of a suitable circular cylinder casing H which connects and braces the cylinders and is preferably hollow with openings J in its periphery for lightness. Such a construction is light and strong and may conveniently be cast or otherwise constructed in one piece.

In this instance the longitudinal axes of the cylinders are shown lying on chords of the circle formed by the cylindrical casing, rather than on radii of the circle, so that these axes are preferably offset from the center of the driving member to produce the requisite leverage and reduce the side pressure on the cylinder walls as will appear, although the cylinders may be radial if desired.

The circular cylinder casing H is mounted to rotate about the hollow stationary shaft L suitably supported in the case A, at one side of the case, and extending into a rotary sleeve O keyed to the cylinder casing to rotate therewith, and suitably connected to rotate a driven member as the driven shaft P extending through the cover plate B.

The walls of the cylinders E, F and G are preferably slotted longitudinally at opposite sides at their outer portions for a portion of their length as indicated at Q through which extend the wrist pins R of the pistons S, and spacing sleeves T are preferably

provided over the wrist pins. Stationary eccentrics U and V are mounted at each side of the cylinder casing H in any suitable manner and in this instance the eccentric U is preferably formed as a part of the stationary shaft L, the shaft and eccentric being held from rotation as by means of the pin W. The eccentric V is conveniently secured to the cover plate B as by means of the screw X and the sleeve O and driven shaft P rotate within the eccentric which forms a bearing for the sleeve.

A plurality of yokes *a*, *b* and *c*, and *d*, *e*, and *f*, are revolubly mounted side by side on the eccentrics U and V respectively and ball bearings *g* consisting of cages and balls as shown are preferably interposed between the yokes and the eccentrics. The yokes are connected in pairs to the projecting ends of the piston wrist pins R in any suitable manner. As shown in this instance, the inner and outer yokes *c* and *f* forming one pair are connected to the wrist pin R of one piston, one end *h* of the wrist pin being reduced and entering an aperture in the end of the yoke *f*, and a nut *j* secures the yoke *c* to the other screw threaded end of the wrist pin. The inner and outer yokes *d* and *a* forming another pair are adapted to be connected to another wrist pin and the intermediate yokes *b* and *e* are adapted to be connected to the remaining wrist pin or pins depending upon the number of cylinders and pistons, it being understood that there are twice as many yokes as cylinders.

Suitable means are provided for automatically supplying and distributing motive fluid to the cylinders, and as shown fluid under pressure, as compressed air may be supplied and exhausted through the hollow stationary shaft L from the supply connection Y. The shaft L is provided with two longitudinal passageways *k* and *o* opening outwardly through the ports *p* and *q* at the center of the machine, which are controlled by the rotating valve sleeve O having the ports *r*, so that motive fluid is successively admitted to and exhausted from the cylinders as the cylinder casing and valve sleeve O rotate together. A suitable throttle valve Z is provided for controlling the supply of fluid from the supply connection Y and for reversing the motor. This throttle valve Z may be in the form of a sleeve rotatable upon the reduced and preferably tapered end *s* of the stationary shaft L forming a seat and operated by means of the arms *t* and *u* to which ropes or chains may be connected in the usual manner. The ends *v* of a retracting spring *w* coiled about the collar *x* engage the arms *u* and serve to center the throttle valve so that it may be rocked in either direction for distributing motive fluid to the motor for rotation in one direction or the other. The throttle valve sleeve Z is formed with the chambers 2 and 3 and the exhaust ports 4 and 5 and the valve seat *s* is provided with the inlet passage 6 communicating with the radial ports 7 and 8, and also with the radial ports 9 and 10 communicating with the longitudinal passages *o* and *k* in the shaft L. By rocking the throttle valve sleeve Z, motive fluid is admitted from the supply passage 6 through a chamber 2 or 3 to one of the passages *k* or *o*, the other of which passages forms an exhaust passage to the atmosphere through an atmospheric port 4 or 5. In Figure 6 the valve Z has been turned to admit fluid from passage 6, through chamber 2, to the passage *o*, and from thence to the motor at the central rotary valve sleeve O. Fluid is exhausted back through the passage *k* to the exhaust ports 10 and 5.

In the operation of the apparatus, let it be assumed that the motor is rotating in the direction indicated by the arrows, or clock-wise as Figures 2 and 3 are viewed. In Figure 2 the piston of the upper cylinder E is about to start on its outward power stroke and motive fluid is about to be admitted to the cylinder as indicated by the position of the valve sleeve O. The piston of the left hand cylinder F is on its inward stroke and the cylinder is exhausting through the passage *o*. The piston of the right hand cylinder G has not yet reached its outward position and air is still being supplied to the cylinder through the passage *k*. The reciprocations of the pistons in the cylinders as will be apparent cause the cylinder casing to revolve at high speed due to the eccentricity of the stationary eccentrics about which the yokes revolve. By turning the throttle Z to the reverse position as described, the motor will be reversed.

I claim:

1. A rotary fluid actuated cylinder motor comprising a case or frame, a stationary hollow shaft supported in said case, a rotary sleeve on said shaft, a rotary driving member in the form of a cylinder casing bodily revoluble with said sleeve on said shaft and provided with a plurality of angularly disposed cylinders, the outer ends of the walls of the cylinders being longitudinally slotted at opposite sides for a portion of their length, pistons adapted to reciprocate in said cylinders, wrist pins carried by said pistons and projecting laterally through the slots in the cylinder walls, stationary eccentrics located within the case or frame at each side of the cylinder casing, one eccentric being formed on the stationary hollow shaft, the rotary sleeve extending through the other eccentric, a plurality of yokes revolubly mounted side by side on each eccentric, there being double the number of yokes for a given number of cylinders, pairs of yokes being connected to the projecting

ends of the said wrist pins at each side of the cylinders, a driven shaft extending outwardly from the case or frame in alignment with the said stationary shaft and connected through the agency of said rotary sleeve to be rotated by the rotary cylinder casing, and means operated and controlled by the rotation of the cylinder casing and said rotary sleeve for automatically distributing motive fluid to said cylinders.

2. A rotary fluid actuated cylinder motor comprising a case or frame, a stationary hollow shaft supported in said case, a rotary sleeve on said shaft, a rotary driving member in the form of a cylinder casing bodily revoluble with said sleeve on said hollow shaft and provided with a plurality of angularly disposed cylinders, the outer ends of the walls of the cylinders being longitudinally slotted at opposite sides for a portion of their length, pistons adapted to reciprocate in said cylinders, wrist pins carried by said pistons and projecting laterally through the slots in the cylinder walls, stationary eccentrics located within the case or frame at each side of the cylinder casing, one eccentric being formed on the stationary hollow shaft, the said rotary sleeve extending through the other ecentric, a plurality of ball bearings side by side on each eccentric, a plurality of yokes revoluble on said ball bearings, there being double the number of yokes for a given number of cylinders, pairs of yokes being conected to the projecting ends of the said wrist pins at each side of the cylinders, a driven shaft extending outwardly from the case or frame in alignment with the said stationary shaft and connected through the agency of said rotary sleeve to be rotated by the rotary cylinder casing, and means operated and controlled by the rotation of the cylinder casing and said rotary sleeve for automatically distributing motive fluid to said cylinders.

3. A rotary fluid actuated cylinder motor comprising a case or frame, a stationary hollow shaft supported in said case and provided with ports and passages for the distribution of motive fluid to the motor, a rotary sleeve on said shaft, a rotary driving member in the form of a plurality of rigidly connected angularly disposed cylinders bodily revoluble with said sleeve on said hollow shaft, the walls of the cylinders being longitudinally slotted at opposite sides for a portion of their length, pistons adapted to reciprocate in said cylinders, piston wrist pins projecting laterally through said slots in the cylinder walls, stationary eccentrics mounted at each side of the driving member within the case, one eccentric being formed on the stationary hollow shaft, the said rotary sleeve extending through the other eccentric, a plurality of yokes revoluble on each eccentric, pairs of yokes being connected to the projecting ends of the wrist pins at each side of the cylinders, a driven member connected through the agency of said rotary sleeve to be rotated by the driving member, said rotary sleeve over the stationary shaft being rotated by the driving member and having ports cooperating with the distribution ports in said shaft for automatically supplying motive fluid to and exhausting fluid from said cylinders.

In testimony whereof I have signed this specification.

CAID H. PECK.