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FLUID-OPERABLE REVERSIBLE MOTOR COMPRISING A ROTARY PISTON

Filed June 8, 1966

2 Sheets-Sheet 1

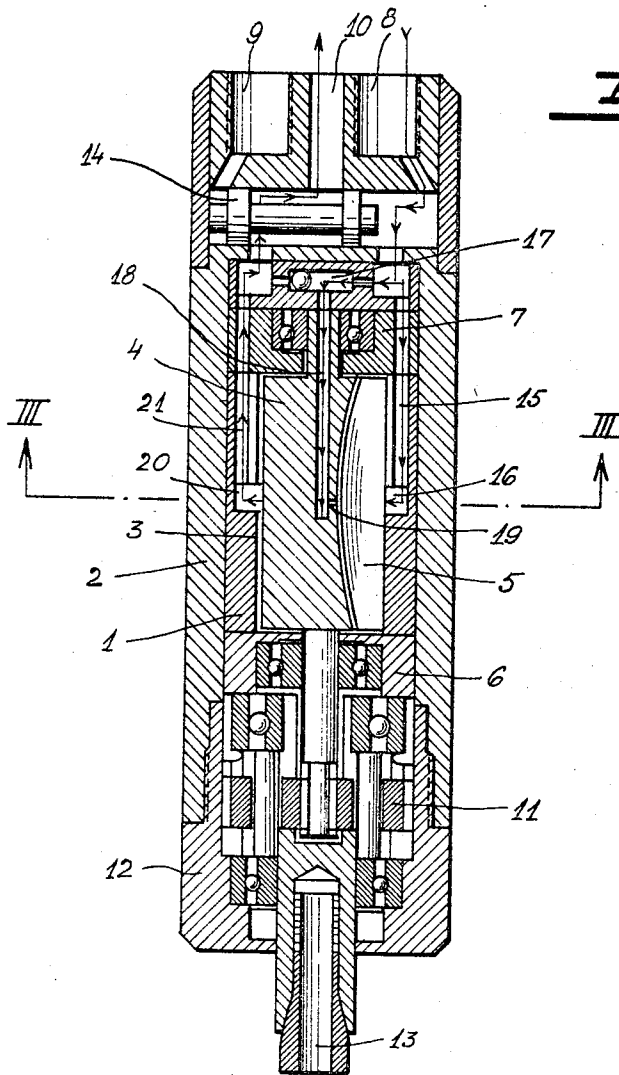


Fig. 1.

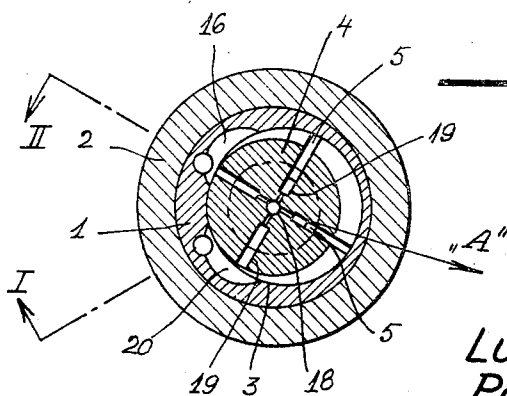


Fig. 3.

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Fig. 2.

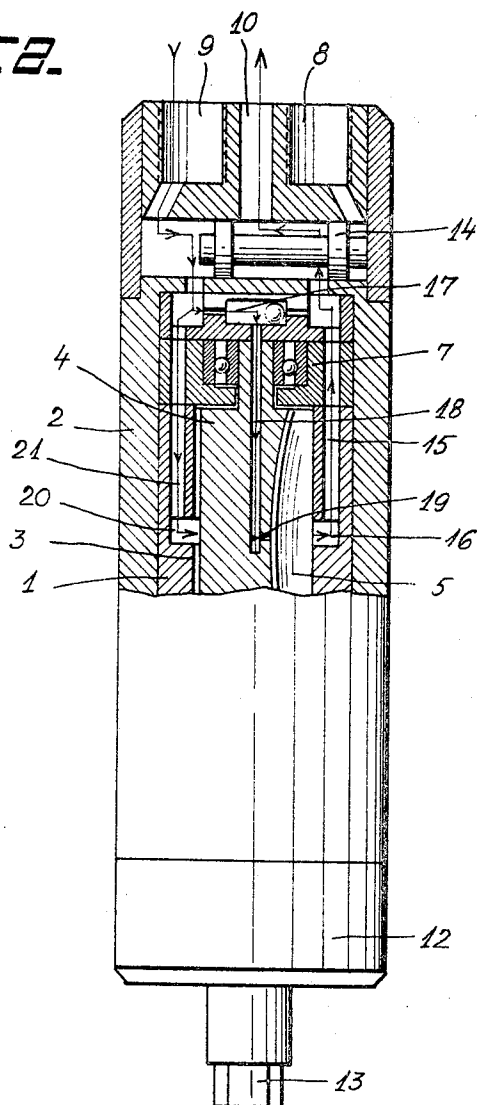
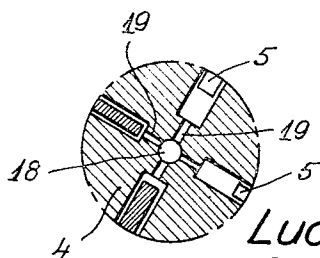


Fig. 4.



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1 Claim. (Cl. 91—138)

ABSTRACT OF THE DISCLOSURE

A fluid-operable reversible motor having a cylinder with a longitudinal axis, as a stator, with a bore eccentric to the cylinder axis in which is a rotor or a piston body concentric to said cylinder mounted for rotation in the bore, the piston body having radial slots in which operate vanes guided in the slots for movement radially outwardly in contacting the cylinder in the operation of the fluid motor with valve means for bleeding a portion of the pressure and duct means for directing this bled pressure to the piston body and radially outwardly towards the radial slots for movement of the vanes radially outwardly at a predetermined time before the main pressure drives the motor in either of two opposite senses.

This invention relates to a compressed air motor which comprises a reversible rotary piston having a rotor formed with vane guide slots. Such motors are used as drive means for tools, such as grinding wheels and drills.

In the known compressed-air motors of this type, the vanes in the rotor are urged against the cylinder wall by the centrifugal force which is due to the rotation of the piston. Particularly with relatively large motors, this arrangement involves the disadvantage that the motor starts slowly and with inadequate torque because the vanes tend to remain retracted when the motor slows down to a stop and starting of the motor is difficult in this condition.

These disadvantages are eliminated by the present invention. The compressed-air motor according to the invention comprises a reversible rotary piston having a rotor formed with vane guide slots and is characterized in that the vanes are urged against the cylinder wall by compressed air, which is bled off before the inlet to the driving cylinder. As a result, the vanes are urged against the cylinder wall before the compressed air enters the cylinder. This arrangement ensures a satisfactory start.

More specifically, the compressed air which is bled from the air supply system may be centrally supplied to the vanes through a longitudinal bore in the rotor and succeeding radial bores. The longitudinal bore in the rotor is fed by a transverse bore formed in the end ring provided with a ball valve, which enables an admission of air on both sides. The ball valve is connected to the air supply and discharge conduits, which are reversible, and tends to seat on the opening which is under lower pressure.

According to another feature of the invention, the cylinder is formed with an eccentric bore which accommodates the centrally disposed rotor and with two air inlet and air outlet pockets, which are symmetrical with respect to the longitudinal center plane. Compressed air is supplied to the cylinder from a reversible spool valve, which is parallel to the ball valve. The shunt-connected spool valve is preceded by two air inlets, which cause the valve spool to be reversed by an admission and interruption of the supply of air whereas the air outlet is disposed intermediate the inlets.

An embodiment of a compressed-air motor according

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to the invention, comprising a reversible rotary piston, is shown by way of example in the drawing, in which:

FIGS. 1 and 2 are longitudinal sectional views taken taken on lines I and II, respectively, in FIGS. 3 and 4 showing a compressed-air motor in condition for two different directions of movement.

FIG. 3 is a transverse sectional view taken on line III—III in FIG. 1 and

FIG. 4 shows the detail A of FIG. 3 on a larger scale.

As is apparent from the drawing, a stator cylinder 1 is mounted in a housing 2 and formed with an eccentric bore 3, which accommodates a rotor or rotary piston 4. Vanes 5 are guided in slots of the rotor 4 and subjected to the compressed air used to drive the rotary piston. The rotor 4 is rotatably mounted at both ends in ball bearings held in bearing blocks 6, 7. Air inlets and outlets 8, 9, 10 are provided at one end and a transmission 11 provided with a transmission sleeve 12 and a tool chuck 13 is provided at the other end.

According to FIG. 1, air enters at 8 and moves a valve spool 14 upwardly. Before compressed air enters through in air supply conduit 15 and an inlet pocket 16 into the cylinder bore 3, compressed air is bled through a ball valve 17 and flows through a longitudinal bore 18 and radial bores 19 and is centrally admitted to vanes 5, which are thus moved outwardly so that a rapid start is ensured. When the compressed air has performed work in the cylinder bore 3, the air flows through the outlet pocket 20 and the air discharge conduit 21 and past the valve spool 14 to the exhaust outlet 10.

FIG. 2 shows the air supply in a reversed state. The valve spool 14 and the ball valve 17 have been automatically reversed because air is admitted through 9. This air flows in the opposite direction through 21, 20 to 16, 15 and past the valve spool 14 to the same exhaust outlet 10. The ball valve 17 is always seated on the opening which is under a lower pressure. A simple change of the supply of air from 8 to 9 enables thus a reversal of the direction of rotation. In either case, the vanes are moved against the wall of the cylinder bore 3 by compressed air which is bled off before its admission to the cylinder bore. As is apparent from the drawing, the valve spool 14 is parallel to the ball valve 17.

What is claimed is:

1. A fluid-operable motor comprising a cylinder having a longitudinal axis and formed with a bore eccentric to said axis, a piston body concentric to said cylinder mounted for rotation in said bore and formed with radially outwardly open radial slots, which are closed at both ends of their axial extent, a plurality of vanes radially guided in said slots and adapted to project radially from said piston body into engagement with said cylinder, a main pressure fluid system for selectively supplying main pressure fluid to said bore in either of two opposite senses to cause said piston to rotate in either of two opposite senses, bleeding means arranged to withdraw pressure fluid from said system at a predetermined time and at a point disposed before said bore and to supply the pressure fluid thus withdrawn to portions of said slots disposed radially inwardly of said vanes so that said vanes are urged into engagement with said cylinder before rotation of said piston by the main pressure fluid in either of the two opposite senses, said system comprising two conduits having inner ends at peripherally spaced points of the inside surface of said cylinder and which comprises an exhaust outlet and valve means for selectively connecting the outer end of either of said conduits to said exhaust outlet, in which said bleeding means comprises a ball valve having two inlets, each of which communicates with the outer end of one of said conduits, and a pressure fluid outlet disposed intermediate said inlets, a longitudinal duct formed in said piston body

and communicating with said pressure fluid outlet and with the radially inner ends of said slots, said valve means comprising a reversible spool valve which precedes said ball valve and is connected in parallel thereto, said spool valve having two pressure fluid inlets and an exhaust port constituting said exhaust outlet and disposed intermediate said pressure fluid inlets of said spool valve, and said spool valve, being arranged to be reversed between two positions upon a supply of pressure fluid to one end then to the other of said pressure fluid inlets, in one of which positions said spool valve connects one of its pressure fluid inlets to one of said conduits and the other of said conduits to said exhaust port, whereas in the other position said spool valve connects the other of its pressure fluid inlets to said other conduit and said one conduit to said exhaust port.

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