G. A. KNAAK.

CONTROLLING APPARATUS.

APPLICATION FILED DEC. 1, 1919.

1,416,092. Patented May 16, 1922.

Fig. 1.

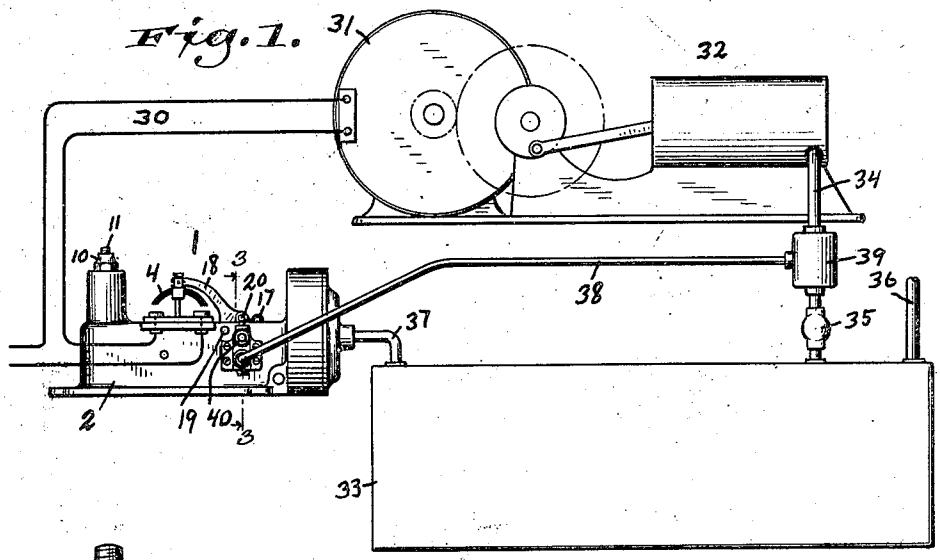


Fig. 2.

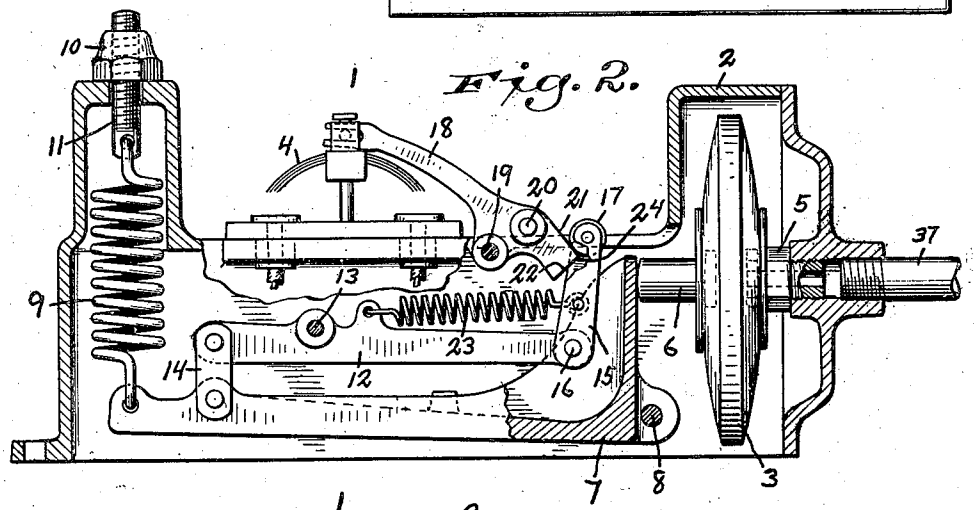
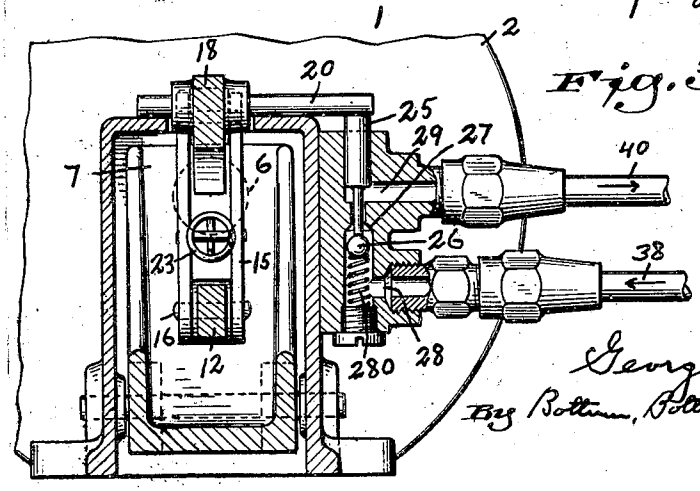


Fig. 3.



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CONTROLLING APPARATUS.

1,416,092. Specification of Letters Patent. Patented May 16, 1922.

Application filed December 1, 1919. Serial No. 341,702.

To all whom it may concern:

Be it known that I, GEORGE A. KNAAK, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Controlling Apparatus, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to controlling apparatus and the object of the invention is to improve the construction and operation of controlling apparatus in the manner to be hereinafter described and claimed.

Referring to the drawings which accompany this specification and form a part hereof, which drawings illustrate an embodiment of this invention, and on which drawings the same reference characters are used to designate the same parts wherever they may appear in each of the several views, Fig. 1 is an elevation of the apparatus showing it installed for use; Fig. 2 is a vertical, longitudinal section of the apparatus; and Fig. 3 is a transverse, vertical section taken on the line 3—3 on Fig. 1, looking in the direction indicated by the arrows.

There are constructions of electric motors which will not start under appreciable loads but which will readily carry the loads for which they are designed after they have acquired speed and this invention is more especially intended for use with such motors but the invention is not limited to use with such motors.

Referring to the drawings, the reference numeral 1 designates a controller which is illustrated as including a casing 2, a condition responsive element 3, and an electric switch 4. The condititon responsive element 3 is illustrated as a fluid-pressure motor or box which is secured to the casing 2 by an apertured nipple 5 through which fluid can reach the interior of the box and exert pressure therein to bulge the heads of the box in a manner which will be readily understood from an inspection of Fig. 2 of the drawings. The free end of the box is provided with a stud 6 which is adapted to bear against a bell-crank lever 7 which can rock upon the fixed pivot 8. A spring 9 is fastened to the bell-crank lever 7 and its tension can be adjusted by a nut 10 which bears against the top of the casing 2 and engages with a screwthreaded pin 11 to which the spring 9 is also connected. It will be readily understood that the pressure of the fluid in the box 3 can bulge its ends and rock the bell-crank lever 7 against the tension of the spring 9 and that, on a decrease of pressure in the box, the spring 9 will rock the bell-crank lever 7 in the opposite direction. A lever 12 is pivoted on a pivot 13 and is connected with the bell-crank lever 7 by a link 14. An arm 15 is pivoted to the lever 12 by a pivot 16 and is provided with an antifriction roller 17. The switch 4 is carried by a switch arm 18 and the switch arm 18 is provided with the pivot 19, the part 20, the upper inclined face 21 and the lower inclined face 22. The spring 23 tends to swing the arm 15 towards the pivot 19 of the switch arm 18 so that the antifriction roller will open the switch 4 if forced against the upper inclined face 21 and will close the switch if forced against the lower inclined face 22 of the switch arm. The antifriction roller 17 is raised above or depressed below the point 24 on the switch arm 18 by movements of the bell-crank lever 7 which are communicated to the lever 12.

The part 20 on the switch arm 18 is illustrated as overlying a plunger 25 which can push a valve 26 off from its seat 27 against the tension of a spring 280. When the valve 26 is opened communication is established between the chambers 28 and 29, and when the valve 26 is closed there is no communication between the chambers 28 and 29.

The switch 4 is adapted to close or break the electric circuit in a power circuit 30 which supplies electrical energy to an electric motor 31 to operate an air compressor 32. The air compressor 32 pumps air into a tank 33 through a connection 34 provided with an outwardly closing check valve 35. Compressed air is conducted from the tank 33 by a pipe 36 to any point of use. The condition responsive element 3 is connected by the pipe 37 with the tank 33 and the switch 4 will be opened or closed according to the pressure in the tank 33 in a manner which will be readily understood.

A pipe 38 connects chamber 28 with the connection 34 between the compressor 32 and the check valve 35. The connection 34 may be provided with an enlargement 39 to increase its capacity. The chamber 29 is the exhaust and a pipe 40 may conduct the

exhaust air to any suitable point of discharge to lead away any oil or dirt which may be carried by the air.

The operation of the apparatus will be readily understood from the foregoing description. The figures of the drawings show the parts in the positions which they occupy when there is enough air pressure in the tank 33 to have opened the switch 4 and the valve 26. The motor 31 and the compressor 32 are not operating. Assume, now, that the pressure in the tank 33 is depleted sufficiently to cause the spring 9 to rock the bell-crank lever 7, the switch 4 will be closed and the valve 26 will be closed as the result of the rocking of the bell-crank lever 7, and the motor 31 and compressor 32 will be started. The compressor will start under atmospheric discharge load and the motor 31 will get up to speed before the pressure in the connection 34 is raised high enough to open the check valve 35 against the air pressure in the tank 33. When the air pressure in the tank 33 is raised sufficiently high, the condition responsive element 3 will rock the bell-crank lever 7 in the opposite direction and will open switch 4 and valve 26. The motor and the compressor will stop and the air will exhaust from enlargement 39, pipe 38 and chamber 28 until the pressure is lowered to atmospheric pressure.

What is claimed is:

1. In controlling apparatus, the combination with a fluid-pressure condition responsive element for opening an electric switch, of an electric switch, means for closing the switch, means for positively retaining the switch opened or closed regardless of the fluid-pressure condition responsive element except at a predetermined pressure, and a pressure relief valve adapted to be actuated only in unison with the switch.

2. In controlling apparatus, the combination with a fluid-pressure condition responsive element for opening an electric switch, of an electric switch, means for closing the switch, means for positively retaining the switch opened or closed regardless of the fluid-pressure condition responsive element except at a predetermined pressure, a pressure relief valve, and means connected with the switch opening mechanism for opening said valve.

3. The combination with an electric motor, a compressor and a tank, of a connection between the compressor and the tank provided with a check valve opening in the direction from the compressor to the tank, a fluid-pressure condition responsive element in communication with the tank for opening an electric switch, an electric switch, means for closing the switch, means for positively retaining the switch opened or closed regardless of the fluid-pressure condition responsive element except at a predetermined pressure, a relief valve adapted, when open, to establish communication between the atmosphere and the said connection at a point between the compressor and the check valve, and means to open said relief valve only when the switch is opened.

In witness whereof I hereto affix my signature.

GEORGE A. KNAAK.