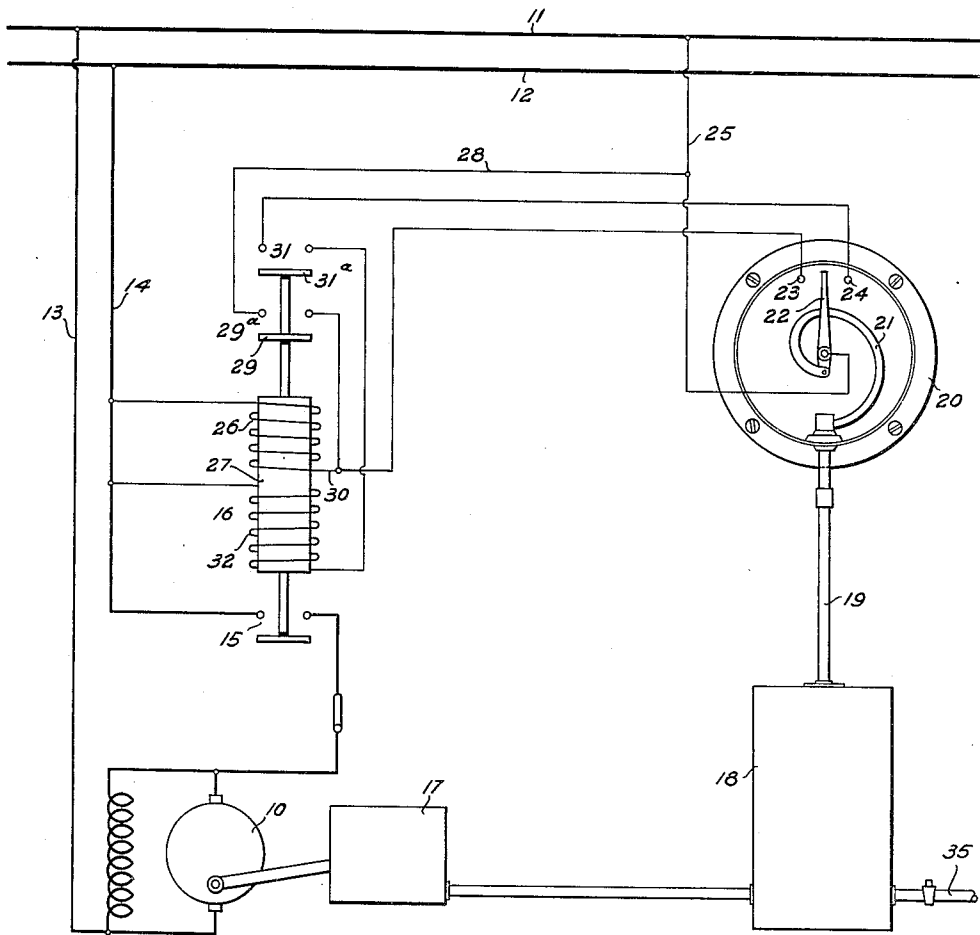


H. A. STEEN.
SYSTEM OF CONTROL.
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1,031,096.

Patented July 2, 1912.



Witnesses

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SYSTEM OF CONTROL.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HALFDAN A. STEEN, subject of the King of Norway, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Systems of Control, of which the following is a full, clear, and exact specification.

This invention relates to automatic circuit controllers.

In the operation of switches in electric circuits there is always more or less arcing at the contacts where the circuits are finally broken. Arcing to a small degree at contacts which are comparatively large, cause little trouble, especially when such contacts are readily accessible to render the trimming of such contacts a simple matter. But when contacts are made of a single strip of thin metal as is the case with indicator pointers which form movable contact members of switches in electrical circuits, a single occurrence of arcing may render such contacts useless. Bourdon gages, used in fluid pressure systems, have such indicators which act as movable contacts of switches for making and breaking electric circuits.

It is the object of this invention to prevent arcing at the contacts of gages and other similar switches which have limited current carrying capacity. This object is accomplished by providing automatically actuated auxiliary switches controlled by opposed windings for establishing a shunt around the frail contacts before the circuit is broken at such frail contacts under certain conditions, the arcing occurring at the auxiliary switches under all conditions.

The invention is illustrated diagrammatically on the accompanying sheet of drawings.

The various novel features of my invention will be apparent from the description and drawing and will be particularly pointed out in the appended claims.

Among some instances where my invention is of commercial value, useful application is found in fluid pressure systems wherein a gage is used which indicates the rise and fall of fluid pressure and which

acts as a double throw switch, the movable member of which makes and breaks certain circuits for controlling a main circuit controller, which in turn controls the supply of current to a motor for operating a fluid supplying pump.

A motor 10, here shown as being shunt wound, receives its supply of energy from mains 11 and 12 through intermediate conductors 13 and 14 and the main switch 15 of a circuit controller 16. The motor is adapted to operate a pump 17 for supplying compressed air to a reservoir 18, from which compressed air is transmitted through a pipe 19 to a pressure gage 20. The compressed air entering the gage passes into a resilient curved tube 21, which moves in opposite directions depending upon the rise or fall of fluid pressure. The pressure indicator or movable contact member 22 is secured to and moves with said tube 21. As the pressure in the reservoir 18 rises and falls, the movable contact member 22 of the gage is shifted from one position to another alternately engaging stationary contacts 23 and 24 of said gage. When the movable contact member 22 engages the stationary contact 23, a circuit is completed from main 11, through conductor 25, movable contact member 22, contact 23, solenoid 26, conductor 14, to the other main 12. Upon the completion of said circuit, the core 27 of the circuit controller 16 is raised due to the action of the current in coil 26, and a shunt circuit around the gage or double throw switch is formed from conductor 25, through conductor 28, bridging contact 29 of an auxiliary switch 29^a to conductor 30. At the same time another auxiliary switch 31 having a bridging contact 31^a is closed, and which, upon a movement of the contact member 22 to the stationary contact 24, will establish a circuit through a coil or winding 32 which acts in opposition to the winding 26. When the circuit is formed through the winding 32, the flux set up thus acts in opposition and overcomes the flux set up by the current in the winding 26, whereupon the main switch 15 of the circuit controller is opened. In other words the coil 32 is a

deenergizing winding, which, at definite times, opposes the winding 26 which is adapted to actuate the circuit controller in one direction. The gage or double-throw switch in its two positions is in series with said two windings respectively, and one of the auxiliary switches is in shunt to the double-throw switch in one position, and the other auxiliary switch is in series with said double-throw switch in the other position.

The complete operation of the system is as follows: Let it be assumed that the motor is at rest and the fluid pressure is decreasing in value. As the pressure gradually decreases, with the fluid escaping through the exhaust 35 of the reservoir 18, the movable contact member 22 moves to the left due to the decrease in pressure within the resilient tube 21. When the pressure has reached a minimum value of the operating range, the movable contact member 22 engages the stationary contact 23 of the gage, completing the circuit from main 11 through conductor 25, movable contact member 22, contact 23, winding 26, conductor 14, to the other main 12. The coil 26 thus being energized, the core 27 is drawn up, closing the main switch 15 of the circuit controller 16, whereupon the motor 10 is connected to the mains 11 and 12. The motor immediately operates the pump and the fluid pressure is gradually raised, causing a gradual movement of the movable contact member 22 of the gage from the stationary contact 23 toward stationary contact 24. When the movable contact member 22 leaves the stationary contact 23 no sparking is produced at said contact for the reason that at the instant the circuit controller is operated, closing switch 15, the two auxiliary switches 29^a and 31 are also closed by the circuit controller, a shunt around the gage switch being thus completed from conductor 25 through conductor 28, auxiliary switch 29^a to conductor 30. As the motor continues operating the pump, raising the fluid pressure, the movable contact member 22 is gradually shifted farther to the right due to the action of the fluid pressure in the resilient tube 21. The pressure of the fluid increases until the movable contact member 22 comes into engagement with the stationary contact 24 of the gage switch, when a circuit is formed from main 11, through conductor 25, movable contact 22, contact 24, auxiliary switch 31, winding 32, conductor 14 to the other main 12. Due to the fact that the windings 26 and 32 are opposed to each other, the fluxes, set up by the current in said windings, are neutralized, causing the main switch 15 of the circuit controller to be opened, thus cutting off the motor from its source of supply and causing the motor and

pump to stop immediately. At the same time the main switch 15 of the circuit controller is opened, both of the auxiliary switches 29^a and 31 are opened and what arcing there is to take place, occurs at the switches 15, 29^a, and 31. It is, therefore, seen that when the fluid pressure again decreases in value and the movable contact member 22 leaves the contact 24, no live circuit is broken and, therefore, no arcing takes place at said contacts. Due to the arrangement of the opposing coils and the circuits including the shunt circuit around the pressure gage, all arcing at the pressure gage contacts is obviated.

There may be other arrangements and modifications of the system which I have here shown and described, and I intend to cover all such arrangements and modifications which do not involve a departure from the spirit and scope of my invention as set forth in the appended claims.

What I claim as new is:

1. In combination, a circuit controller, two opposed windings controlling said controller, a double-throw switch which in its two positions is in series with said two windings respectively, and two auxiliary switches operated by said controller, one of said auxiliary switches being in shunt to the double-throw switch in one position, and the other being in series with said double-throw switch in the other position.

2. In combination, a circuit controller, opposed windings controlling said controller, a double-throw switch which in its two positions is in series with different ones of said windings, and two auxiliary switches operated by said controller, one of said auxiliary switches being in shunt to the double-throw switch in one position, and the other being in series with said double-throw switch in the other position.

3. In combination, a circuit controller, a winding adapted to control the movement of said controller in one direction, another winding adapted to influence the movement of said controller in a different direction, a double-throw switch which in its two positions is in series with said different windings respectively, and a plurality of auxiliary switches operated by said controller, one of said auxiliary switches being in shunt to the double-throw switch in one position, and another in series with said double-throw switch in the other position.

4. In combination, a circuit controller, two opposed windings controlling said controller, a switch which in different positions is in series with said two windings respectively, and two other switches operated by said controller, one of said switches being in shunt to said first switch in one position,

and the other being in series with said first switch in another position.

5 In a pressure control system, the combination of a circuit controller, opposed windings controlling said controller, a switch which in different positions is in series with said windings respectively, and a plurality of auxiliary switches, one of which is in shunt to said first-mentioned
10 switch in one position, and another of which

is in series with said first-mentioned switch in another position.

Milwaukee, Wis., July 7, 1911.

In testimony whereof I affix my signature, in the presence of two witnesses.

HALFDAN A. STEEN.

Witnesses:

CHAS. L. BYRON,
G. B. SCHLEY.