

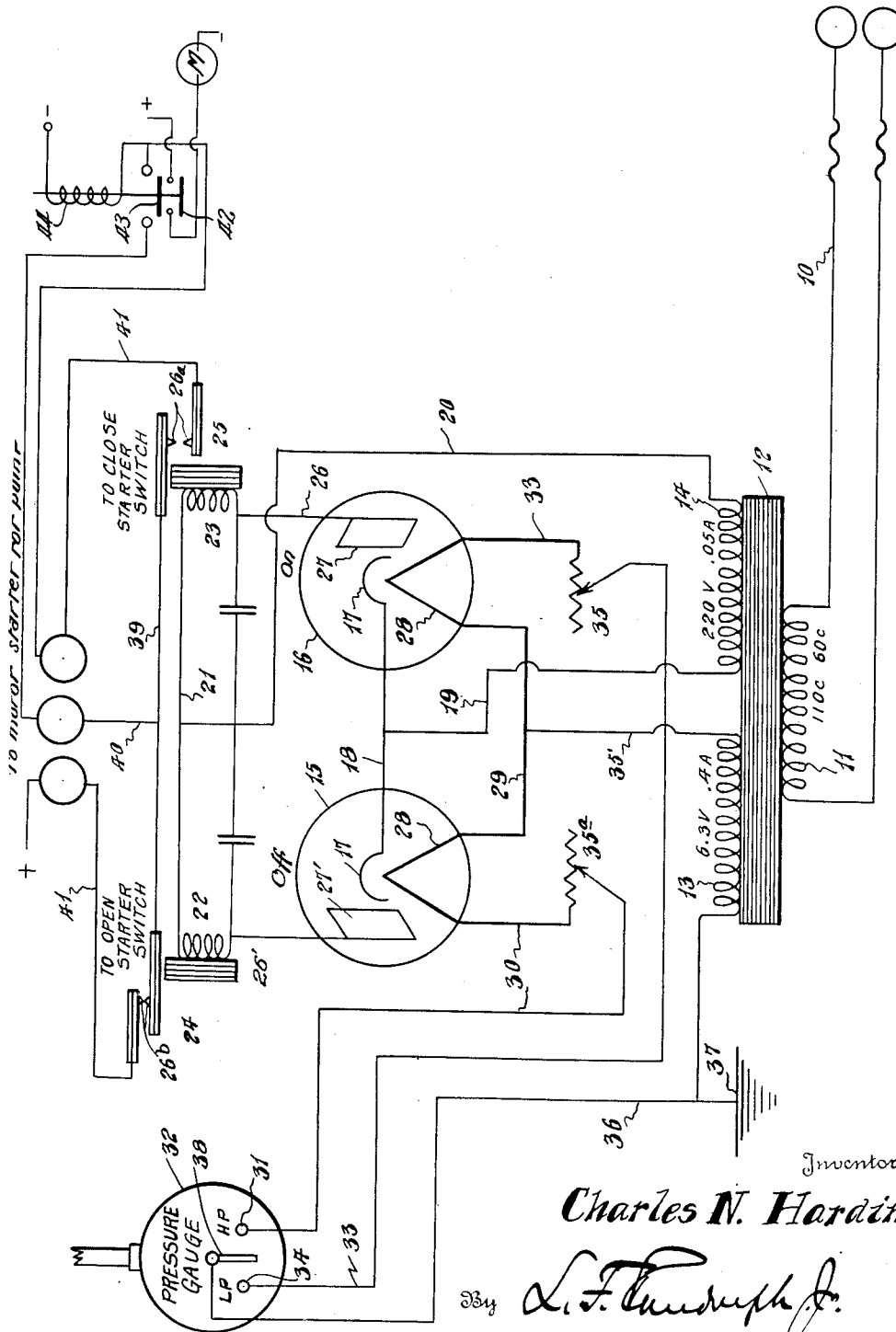
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SURGEPROOF PILOT SWITCH

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SURGEPROOF PILOT SWITCH

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3 Claims. (Cl. 175—320)

This invention relates to a surge-proof pilot switch, one field of use for which is in connection with city water-pumping equipment with a view to maintaining the water in the stand pipe within a few feet of that recommended by the manufacturer of the equipment. At the same time, it is to be understood that the invention is capable of general use and application and is therefore not to be limited to the specific purpose mentioned.

A more specific object is to provide a pilot switch for controlling the motor of the pumping equipment and which switch is operable according to the pressure of the water pumped by that equipment.

An important object is to provide such a pilot switch as is controlled by vacuum tube apparatus.

Another important object is to provide a construction wherein the time required for the necessary heating and cooling of the cathode is variable and may be regulated, thus giving any desired time lag, and rendering the switch unaffected by pressure surges.

The more specific objects and advantages will become apparent from a consideration of the description following taken in connection with accompanying drawing illustrating an operative embodiment.

In said drawing:—

The view shows the apparatus in electrical diagram.

Referring specifically thereto, alternating current from any suitable source is conducted by wires 10 to the primary 11 of a transformer 12 having secondary wiring or coils at 13 and 14. For example, primary 11 may receive electric current of 110 volts, 60 cycles, while the secondary 13 receives electric current of 6.3 volts, .4 ampere and the secondary 14 receives 220 volts, .05 ampere.

Vacuum tubes 15 and 16, for instance of type 237 as used in radio telephony, are shown employed, the cathodes 17 thereof being connected by a conductor 18 from which a conductor 19 leads to the secondary 14. From the same secondary 14, a conductor 20 leads to a conductor 21 having coils 22 and 23 therein respectively adapted to actuate and being associated with relays 24 and 25. From the conductor 21, conductors 26 and 26' lead to the plates 27 and 27' within the tubes 15 and 16.

The filaments or heaters 28 of the tubes 15 and 16 are connected by a conductor 29 and from the filament 28 of the tube 15 a conductor 30

leads to a contact 31 of a pressure gauge 32. A conductor 33 leads from the filament 28 of the tube 16 to a contact 34 of said pressure gauge 32. In the conductors 30 and 33, heavy duty rheostats 35 and 35a are incorporated as shown. A conductor 35' connects conductor 29 to the secondary 13 and from the same secondary a conductor 36, grounded at 37, leads to a movable contact 38 of the said pressure gauge 32. While a pressure gauge has been specifically referred to, yet it is to be understood that the element 32 may represent contacts or a relay in a light sensitive cell circuit or be any other means or lead to any other means of making and breaking an electric circuit at high and low pressure or vacuum.

The relays 24 and 25 may be a type as manufactured by Struthers Dunn Inc., Philadelphia, Pennsylvania, according to Patent No. 1,646,888. Any other type of relay, however may be used.

It will be realized that when the coils 22 and 23 are deenergized, the contacts 26b of the relay 24 are closed while the contacts 26a of the relay 25 remain in normally open position. A conductor 39 connects one side of both relays and has a conductor 40 leading therefrom while conductors 41 and 41' lead from the other side of each relay. The conductors 40, 41 and 41' are adapted to be operatively connected to the operating motor M of the centrifugal pumping mechanism previously referred to or to the line starter for that motor in the diagrammatic or conventional manner shown, 42 being a line switch having an interlock 43. An actuating coil is provided for said switch 42 at 44.

When the water pressure reaches the low point, the pressure gauge operated by that water, moves contact 38 into engagement with contact 34, causing current to flow through the filament 28 of tube 16. As a result, the cathode of vacuum tube 16 is heated and the coil 23 is energized closing the switch 26 which has the effect of closing the line starter for the motor of the pump, such action being equivalent to pushing an "on" button of a line starter.

When such motor starts and the pump begins discharging, the pressure is immediately increased by the amount of the friction head which is sufficient in any case to open the contacts 38 and 34, allowing the vacuum tube 16 to immediately cool off and remain idle until the next start is performed.

When the pressure builds up to the high point, the contact 38 engages contact 31 of the pressure gauge, causing a similar action to take place in

the relay 24 and vacuum tube 15, which has the effect of moving the starter switch for the motor of the pump to an "off" position. When such motor stops, the pressure then decreases by the amount of the friction head which opens the high pressure contacts and the vacuum tube 15 cools off, and remains cool until the next stop is performed.

In both of said operations the rheostats 35 determine the time required for the cathode to heat and may be varied, for example, from approximately seventeen seconds to one and one-half minutes, however, the time necessary for the cathode to cool will remain approximately the same at any setting of relays 24 and 25 and is approximately nine seconds. Such difference of time necessary for heating and cooling of the cathode renders the present device successful and not affected by pressure surges.

Attention is called to the fact that the present invention is also adaptable among other uses, to acting as an automatic starter for electric motor driven centrifugal pumps installed in deep wells such as are used in irrigated areas and in the oil fields. For such use, the time delay periods may be increased over that previously suggested to say to one and one-half to two or more minutes. This can be accomplished by connecting two or more of the vacuum tubes in circuit in series.

Various changes may be resorted to provided they fall within the spirit and scope of the invention.

I claim as my invention:—

1. In combination with a control device having a gauge for pressure developed therein, a pressure moveable arm on said gauge, vacuum tubes of the two element type having a common conductor connected to their cathodes, each tube having another conductor connected to the gauge and to their filaments and engageable one at a time by said arm, a conductor connecting the filaments, a conductor having relay coils therein connected to the plates of said tubes, first and second windings, said first conductor branch-

ing to the last mentioned conductor through the first winding, a conductor connecting the filaments branching through the second winding to said arm, the closing of one relay operating the device to "on" position and the closing of the other relay moving the device to "off" position, and means to energize said windings.

2. In combination with a control device having a gauge for pressure developed therein, a pressure moveable arm on said gauge, vacuum tubes of the two element type having a common conductor connected to their cathodes, each tube having another conductor connected to the gauge and to their filaments and engageable one at a time by said arm, a conductor connecting the filaments, a conductor having relay coils therein connected to the plates of said tubes, first and second windings, said first conductor branching to the last mentioned conductor through the first winding, a conductor connecting the filaments branching through the second winding to said arm, the closing of one relay operating the device to "on" position and the closing of the other relay moving the device to "off" position, and means to energize said windings, each conductor connected to the filaments having a rheostat therein.

3. In combination with a control device having a gauge for pressure developed therein, a pressure moveable arm on said gauge, vacuum tubes of the two element type having a common conductor connected to their cathodes, each tube having another conductor connected to the gauge and to their filaments and engageable one at a time by said arm, a conductor connecting the filaments, a conductor having relay coils therein connected to the plates of said tubes, said first conductor branching to the last mentioned conductor, and the conductor connecting the filaments branching to said arm, and means to supply current, the closing of one relay operating the device to "on" position and the closing of the other relay moving the device to "off" position.

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