FORM 2

(39 OF 1970)

AND

The patent rules, 2003

COMPLETE SPECIFICATION

(See section 10: rule 13)

1. TITLE OF INVENTION

LIQUID LEVEL CONTROLLING APPARATUS

2 APPLICANTS

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3. PREAMBLE TO THE DESCRIPTION

COMPLETE

Following specification particularly describes the invention and the manner in which it is to be performed.

4. DESCRIPTION.

Technical field of invention:

This invention generally relates to an apparatus for liquid and more specifically for water to control for maintaining its levels within certain high and low limits in utility tank or utility tanks or alike storage provisions comprising float sensors and a novel electronic circuit thereby controlling electric motor pump or similar devices in ON and OFF modes, wherein the liquid may be electrically or thermally conducting or insulating and less viscous from a well or a reservoir tank.

Use:

In order to have a continuous or uninterrupted supply of water from utility tank or a container, hereinafter referred to utility tank, one has to ascertain that water levels are maintained within certain desired levels in the utility tank and for that one has to manually observe such levels by controlling the water feeding device such as electric water pump otherwise the said tank can go dry thereby causing inconvenience or if there is an overflow of water thereby wasting precious water, electricity and if water is drawn from a well or reservoir having limited storage capacity, the said pump can run dry if the water therein gets exhausted thereby causing wastage of electricity and to accomplish such operation one has to observe water availability in the well or storage tank and further ascertain the availability of water in the utility tank by continuously checking and manually operating the water pump which may cause wastage of time, wastage of water and electricity , shortening the life of the pump to the user hence to avoid such inconvenience an automatic system is desirable.

There are various methods by which liquid level can be sensed and different methods have been proposed such as by means sensors comprising ultra-sound technique, optical, mechanical floats, liquid thermal or electrical conductivity sensors, liquid dielectric property sensors, galvanic voltage on the sensing probes.

Most of the water used in non-critical areas generally contains dissolved salts rendering the water conducting so the simplest controller comprises resistance probes and electronic sensing and motor control circuits. If the probes are using direct current (DC) voltage then in the course of time salt gets deposited on the probes, due to electrolysis, rendering them ineffective so a periodic preventive maintenance is required for cleaning the sensing probes and if the sensors are using alternating current (AC) voltage, to avoid electrolysis and subsequent salt deposition, renders the electronic sensing circuit more noise susceptible, complicated, and less cost effective.

The sensors using other properties comprising radar or ultra-sound technique, optical, ball floats with electrical switches, liquid thermal or electrical conductivity, liquid dielectric property, galvanic voltage for sensing, rendering the sensing, and controlling electronic circuit more complex and hence less cost effective and less reliable.

One such electronic water level detector in U.S. pat. No. 6,820,483 B1 discloses a probe detecting the difference between galvanic voltage when in contact with water and otherwise. The main disadvantage of the application is the very sensitive and complex electronic circuit, further subjected to extrinsic electrical noise rendering it to be less reliable and less cost effective for general use.

Hence there was a long felt need in the art to have such an apparatus means for sensing and controlling the water levels wherein water level detected by float sensors comprising sealed means water-proof reed relay actuated by permanent magnetic float in conjunction with electromagnetic relay, hitherto referred to sensor, thereby dispensing electronic circuit rendering it simple, cost effective and reliable for applications generally to non-critical domestic water level control either for only utility tank or in conjunction with well or reservoir tank.

Object:

1. Primary object of the present invention is to device a novel water level controlling apparatus using float sensors to start the pump to feed water from the reservoir, having adequate storage capacity, to the utility tank when the water level therein is just below the low set level and to stop the pump when the water level is just above the upper set level thus making the system automatic thereby reducing the human efforts and avoiding inconvenience, wastage of electricity and water.
2. Another object of the present invention is that, when the reservoir does not have adequate storage capacity to feed the water to the utility tank and to allow the pump to operate only when the water level in the reservoir is between desired low and high limits thereby avoiding dry running of the pump and saving electricity and enhancing pump life by making the system automatic to reduce human efforts.
3. Another object of the present invention is to get rid of electronic circuit to make it more reliable, cost effective, simple, and easy to manufacture and maintain.
4. Still another object of the present invention is to provide a simple installation and ease of setting of a high and a low level sensors in utility tank and reservoir.
5. Still further object of the present invention is to provide an indicator to show desirable water level, a low water level and pump ON/OFF condition.
6. Still further object of the present invention is to provide an overriding manual ON/OFF control of the pump if so desired without affecting the basic automatic operation and control.

Other objects, features, and advantages will become apparent from detail description and appended claims to those skilled in art.

STATEMENT:

The novel apparatus of the present invention meant for controlling liquid or water levels in utility tank or overhead tank in conjunction with well or a reservoir tank, comprising water level detectors means sensors and such sensors comprising sealed reed, means water tight or water proof, relay (not part of invention) having a change over electrical contacts and actuated by external magnetic float and two sets of sensors mounted within the utility tank and reservoir tank respectively and each set of sensors comprising two separate sensors mounted at desired low level and desired high level within the reservoir tank and utility tank respectively and further comprising a suitable power supply, electromagnetic relay or contactor hereinafter comprising two sets of normally open contacts hereinafter referred to relay, manual ON switch comprising a set of normally closed contacts, manual OFF switch comprising a set of normally open contact and the said sensors and the said sensor having normally open contacts, hereinafter referred to N/O sensor and having normally closed contacts, hereinafter referred to N/C sensor and one N/C sensor mounted at high desired water level hereinafter referred to UHL and second N/C sensor mounted at desired low water level, hereinafter referred to ULL inside said utility tank, and one N/O sensor mounted at high desired water level hereinafter referred to RHL and second N/O sensor mounted at desired low water level, hereinafter referred to RLL inside said reservoir tank and respective sensor terminals brought out from respective tanks and one terminal of the said incoming power supply connected in series with the said manual OFF switch and said UHL N/C sensor and said ULL N/C sensor connected in series with RHL N/O sensor and one set of N/O contact of said relay, hereinafter referred to relay first N/O, connected in parallel with said ULL N/C sensor and RHL N/O sensor circuit and further connected in series with RLL N/O sensor and further connected to first terminal of the magnetic coil of the said relay and second terminal of the said magnetic coil connected to remaining terminal of the said power supply and a freewheeling diode with proper polarity connected across the first and second terminal of the said relay

and said manual ON switch N/O contact connected in parallel with said first N/O contact of the said relay and a relay ON indicator connected across the said relay coil first and second terminals respectively and relay OFF indicator connected between first terminal of power supply and first terminal of magnetic coil of the said relay and remaining set of N/O contact of the said relay connected further operation of the said system, and while the system operates only with utility tank then when water level goes below, the respective sensor's normally close contacts it closes while high level sensor contacts are also closed hence the current flows to the relay and concurrently normally open contact of the relay also closes providing a parallel path across the contacts of low level sensor contacts and now when the pump starts , the water level increases and goes above the low level sensor, upon which it actuates and it's contacts open, being normally closed however, being bypassed by said relay contacts the relay continues to be in ON state till the water level reaches the high level sensor, being normally closed, gets actuated and it's contact opens thereby switching OFF the relay and hence the pump, and pump remains OFF till the water reaches the low level sensor and thus operation continues automatically between the low and high level sensor and further a manual switching OFF of the pump accomplished while water level is in between high and low level sensors thereby discontinuing relay supply, removing the bypass across the low level contacts and further pump be started manually when water level is between high and low level sensors thereby providing a temporary bypass to the open contacts of the low sensor thus simulating a low level condition, and the relay OFF condition is indicated by indicator connected in series with the relay coil which indicates only when relay is OFF and other relay ON indicator is connected across the relay coil and a freewheeling diode limits the switching OFF electrical surges due to relay inductance, and in this manner an automatic water level control in the utility tank is accomplished and while when the utility tank is fed from a reservoir by a pump (not included) operated by the said relay meant for controlling liquid or water levels in utility tank comprising two additional sensors with normally open contacts, mounted at desired low level and

desired high level within the reservoir wherein the normally open contacts of the low level sensor of reservoir is connected in series with the high level sensor contacts of utility tank as described in the first embodiment and the normally open contacts of high level sensor of reservoir is connected in parallel with the low level sensor contacts of utility tank and other connections remaining same as described in the first embodiment respectively and other operation remaining same as described in the first embodiment while the pump switches OFF when the water level in the reservoir goes below the low level sensor, it switches from closed to normally open contacts thereby switching OFF the relay while the water level in the reservoir reaches the desired high level the high level sensor therein switches from normally open contacts to closed contact thereby switching ON the relay thereby automatic operation.

In order that the manner in which the above-cited and other advantages and objects of the said invention are obtained, a more particular description of the invention briefly described above will be referred to, which are illustrated in the appended drawing. Understanding that these drawing depict only typical embodiment of the invention and therefore not to be considered limiting on its scope, the invention will be described with additional specificity and details through the use of the accompanying drawing.

Brief description of drawing:

This invention is described by way of example with reference to the following drawing where:

Sheet 3/1 Figure 1 shows schematic diagram of the system comprising reservoir, utility tank, sensors in their respective tank with their mounting at their respective locations and their electrical connection to the control circuit block.

Sheet 3/2 Figure 2 shows water level controller system circuit diagram comprising utility tank and reservoir.

Sheet 3/3 Figure 3 shows water level controller system circuit diagram comprising utility tank.

Detailed description:

This invention is described by way of example with reference to the following drawing where:

Sheet 3/1 Figure 1 shows schematic diagram of liquid or water level controller working in conjunction with a reservoir tank 202, an electric water pump set 104, a utility tank 201 wherein the electrical pump 104 pumps water from reservoir tank 202 through suction pipe 203 to fill utility tank 201 through delivery pipe 204. The electric motor pump set may be working on a three-phase or single-phase supply or other suitable power source 101 and 102 and the motor supply is controlled by the liquid level controller 199 through ON/OFF contact between 102 and 103. The water level controller unit 199 may be supplied through 101 and 102 or a suitable independent power source. On the utility tank 201 said sensors 110 and 111, with normally closed contacts, are mounted at high level 205 and low level 206 respectively whereas their electric terminals 113, 114 and 115 connected to the said water level controller and further the reservoir tank 202 said sensors 150 and 151, with normally open contacts are connected in series and mounted at high level 215 and low level 216 respectively whereas their electric terminals 153, 154 and 155 connected to the terminals 114,115 and 116 of the said water level controller respectively.

Sheet 3/2 Figure 2 shows electrical diagram of the said invention wherein the water level control of utility tank and reservoir tank be accomplished automatically, comprising electric motor pump set 104 (not included), electric power supply 101, 102, circuit power supply 132 having positive (+) terminal 131, negative (-) terminal 130, relay or contactor 116 having normally open contacts 117 connected to control circuit of motor 104 and wherein to relay's normally open contacts 118, reservoir upper level sensor's normally open contacts 150, utility tank lower level sensor's

normally closed contact 111 are connected in series and manual ON push button normally open switch 121 are connected in parallel. Further to the common junction 115, 153 reservoir low level sensor's one of the normally open contacts 151 connected in series and the remaining contact 155 is connected to the magnetic coil 116 of the relay and remaining coil terminal 116 is connected to the negative terminal 130 of the circuit power supply 132 and further to the common junction 114 utility tank upper level sensor's normally closed contact 110 connected and to the remaining terminal 115 is connected to STOP push button normally closed, 120 and remaining terminal further connected to positive supply terminal 131 of circuit power supply 132. A freewheeling diode 115 with proper polarity be connected across the magnetic coil terminals of relay 116. Relay ON indicator 122 is connected across the relay 116 terminals and indicates when relay 116 is energized to switch ON the motor 104 for pumping water in utility tank 201, whereas relay OFF indicator 123 is connected between positive terminal 131 of supply 132 and relay terminal 155 indicates when relay 116 is OFF means in tern the motor 104 is in off condition. When the water level of reservoir is below low level, the sensor 151 is open or when utility tank level is above high sensor 110 contacts are open or OFF button 120 is pressed the normally closed contacts become open and in either of these conditions relay 116 remains open, and when the water level of reservoir is above high level, the sensor 151 is closed, low level sensor 150 is closed and when utility tank water is below low level thence low level sensor 111 is closed and high level sensor is closed thereby completing the electrical circuit to switch ON the relay 116 and relay normally open contacts 118 get closed and connected across the series combination of sensors 111 and 151 and the relay remains ON even if the water level in the utility tank goes above low level sensor 111 thereby opening it or reservoir level goes below high level sensor 150 thereby opening it and relay 116 switches OFF only when utility tank high level sensor 110 or reservoir low level sensor 151 high level sensor or manual OFF switch is actuated thereby contacts 118 open thereby removing the bypass across thence open contact 115 and 154 respectively and relay remains open

till utility tank low level sensor 111 and reservoir high level sensor are in closed condition thus rendering the said system fully automatic. Whereas if due to any condition such as input power supply goes off due to some power supply failure and if both tanks are water levels between their respective high and low levels the relay can be switched ON by actuating manual ON switch 121 and the system is restored to its automatic version.

Sheet 3/3 Figure 3 shows electrical circuit diagram of other embodiment of the said invention wherein water level control of utility tank only be executed automatically, comprising electric motor pump set 104 (not included), electric power supply 101, 102, circuit power supply 132 having positive (+) terminal 131, negative (-) terminal 130, relay or contactor 116 having normally open contacts 117 connected to control circuit of motor 104 and wherein to relay's normally open contacts 118, utility tank lower level sensor's normally closed contact 111 is connected and manual ON push button normally open switch 121 are connected in parallel. Further to the common junction 115 is connected to the magnetic coil 116 of the relay and remaining coil terminal 116 is connected to the negative terminal 130 of the circuit power supply 132 and further to the common junction 114 utility tank upper level sensor's normally closed contact 110 connected and to the remaining terminal 115 is connected to STOP push button normally closed, 120 and remaining terminal further connected to positive supply terminal 131 of circuit power supply 132. A freewheeling diode 115 with proper polarity be connected across the magnetic coil terminals of relay 116. Relay ON indicator 122 is connected across the relay 116 terminals and indicates when relay 116 is energized to switch ON the motor 104 for pumping water in utility tank 201, whereas relay OFF indicator 123 is connected between positive terminal 131 of supply 132 and relay terminal 155 indicates when relay 116 is OFF means in tern the motor 104 is in off condition. When utility tank level is above high sensor 110 contacts are open or OFF button 120 is pressed the normally closed contacts become open and in either of these conditions relay 116 remains open, and when the water level of reservoir is above high level, the sensor

151 is closed thence low level sensor 150 is closed and when utility tank water is below low level thence low level sensor 111 is closed and high level sensor is closed thereby completing the electrical circuit to switch ON the relay 116 and relay normally open contacts 118 get closed and connected across sensor 111 and the relay remains ON even if the water level in the utility tank goes above low level sensor 111, thereby opening it or reservoir level goes below high level sensor 150 thereby opening it and relay 116 switches OFF only when utility tank high level sensor 110 or manual OFF switch is actuated thereby contacts 118 open thereby removing the bypass across thence open contact 115 and relay remains open till utility tank low level sensor 111 is in closed condition thus rendering the said system fully automatic. Whereas if due to any condition such as input power supply goes off due to some power supply failure and if both tanks are water levels between their respective high and low levels the relay can be switched ON by actuating manual ON switch 121 and the system is restored to its automatic version.

Additional advantages and modification will readily occur to those skilled in art. Therefore, the invention in its broader aspect is not limited to specific details and representative embodiments shown and described herein. Accordingly various modifications may be made without departing from the spirit or scope of the general invention concept as defined by the appended claims and their equivalents.

CLAIMS

We claim:-

1. An apparatus meant for controlling liquid or water levels in utility storage tank or utility tank in conjunction with a reservoir water tank comprising suitable power supply, electromagnetic relay or contactor hereinafter comprising two sets of normally open contacts referred to relay, manual ON switch comprising a set of normally closed contacts, manual OFF switch comprising a set of normally open contact and water level sensors and sealed means water tight or water proof float switches means sensors and each sensor comprising a change over electrical contacts or either normally open, hereinafter referred to N/O sensor or normally closed contacts, hereinafter referred to N/C sensor and usually operated by external magnetic float (not part of the present invention) and one N/C sensor mounted at high desired water level hereinafter referred to UHL and second N/C sensor mounted at desired low water level, hereinafter referred to ULL inside said utility tank, and one N/O sensor mounted at high desired water level hereinafter referred to RHL and second N/O sensor mounted at desired low water level, hereinafter referred to RLL inside said reservoir tank and respective sensor terminals brought out from respective tanks, as shown in Figure-1 and one terminal of the said incoming power supply connected in series with the said manual OFF switch and said UHL N/C sensor and said ULL N/C sensor connected in series with RHL N/O sensor and one set of N/O contact of said relay, hereinafter referred to relay first N/O, connected in parallel with said ULL N/C sensor and RHL N/O sensor circuit and further connected in series with RLL N/O sensor and further connected to first terminal of the magnetic coil of the said relay and second terminal of the said magnetic coil connected to remaining terminal of the said power supply and a freewheeling diode with

proper polarity connected across the first and second terminal of the said relay and said manual ON switch N/O contact connected in parallel with said first N/O contact of the said relay and a relay ON indicator connected across the said relay coil first and second terminals respectively and relay OFF indicator connected between first terminal of power supply and first terminal of magnetic coil of the said relay and remaining set of N/O contact of the said relay connected further operation of the said system as in Figure-2,

2. Another embodiment of the said invention claimed in 1 wherein the apparatus meant for controlling liquid or water levels in utility storage tank or utility tank alone wherein said sensors associated with reservoir tank dispensed with else the system remaining the same as in Figure-3 as claim 1,
3. As claimed in claim 1,2 said manual ON switch, manual OFF switch, relay ON indicator, relay OFF indicator, freewheeling diode and each being optional wholly or individually.
4. In the device as claimed in claims 1,2,3 entire automatic operation of water level controller of the utility tank and the reservoir tank is accomplished by a novel circuit topology comprising a single relay in association with sensors.

ABSTRACT

The present invention provides a novel water level controller to maintain the level in an utility tank or utility tank, fed by electric motor pump where water is supplied either from ground or reservoir tank or well comprising simple magnetic float switches operating a relay and dispensing with electronic circuit thereby rendering the controller simple, reliable, and cost effective. Following invention is described in detail with the help of figure 1 of sheet 1 showing detailed block diagram of the system comprising reservoir tank, utility tank, float level switches in their respective tank and their mounting at their respective locations and their electrical connection to the control circuit block.

Ingole Vijay Tulshiram

Ingole Indira Vijay Sheet 3/1

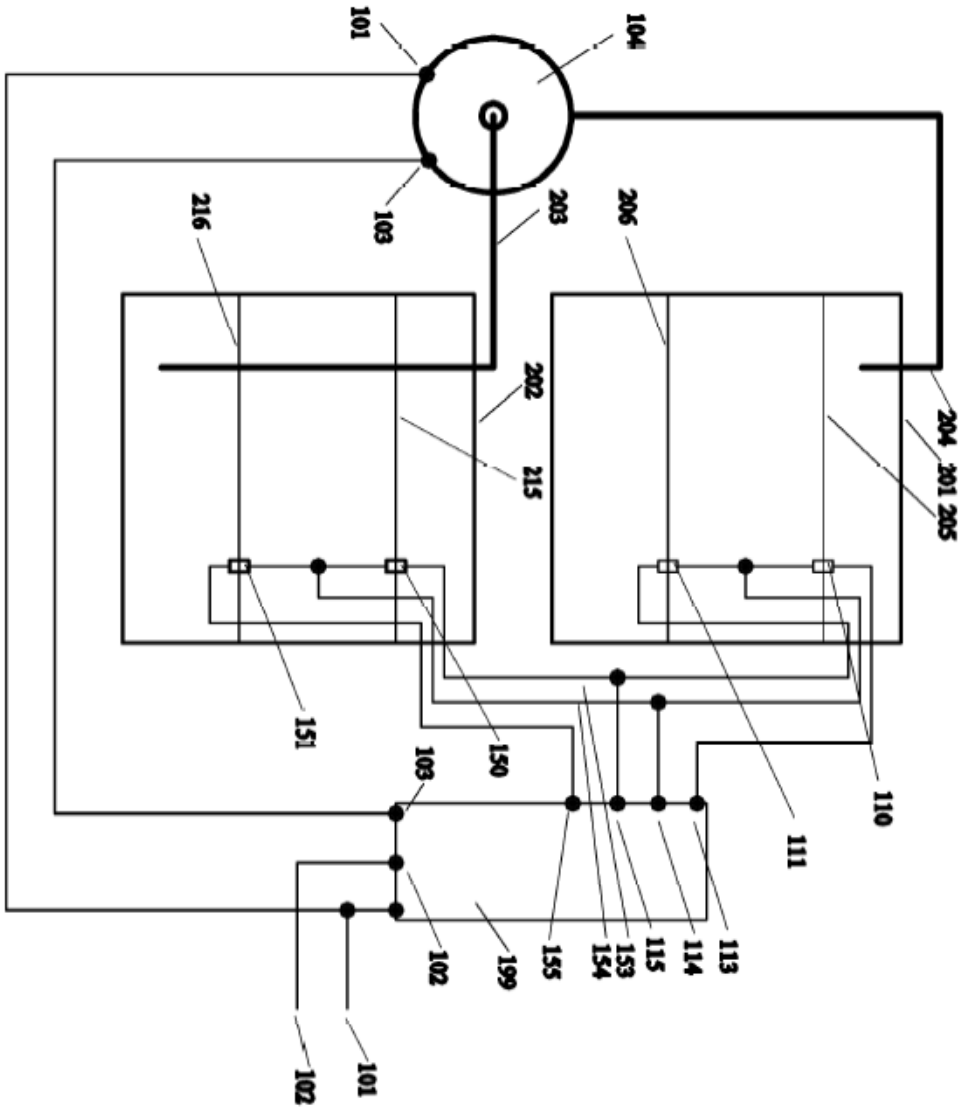

Figure-1

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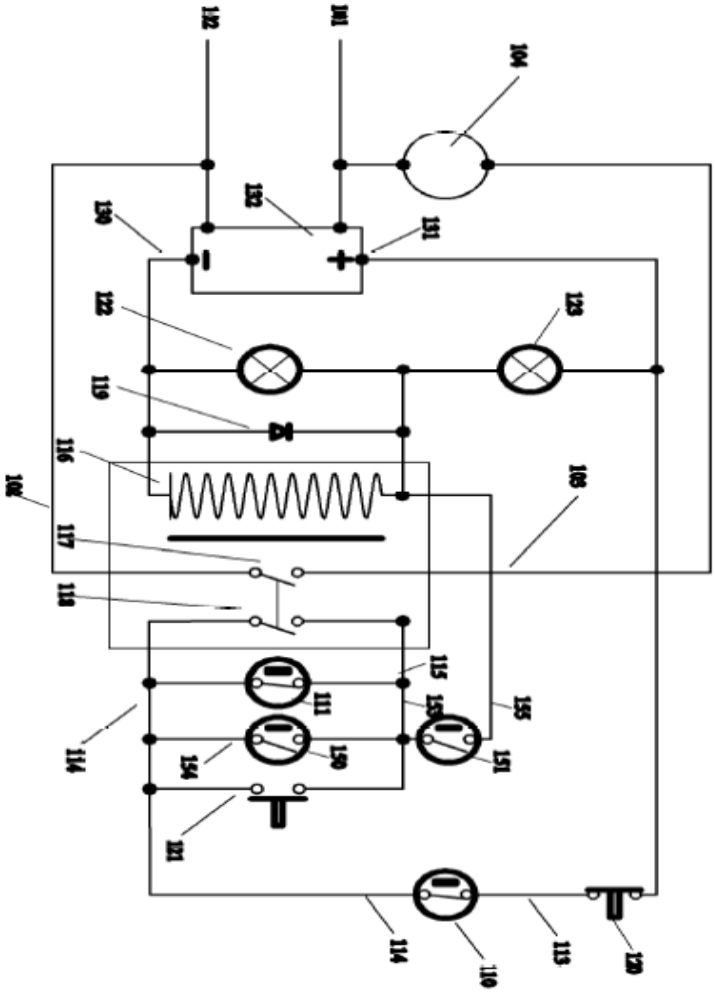

Figure-3

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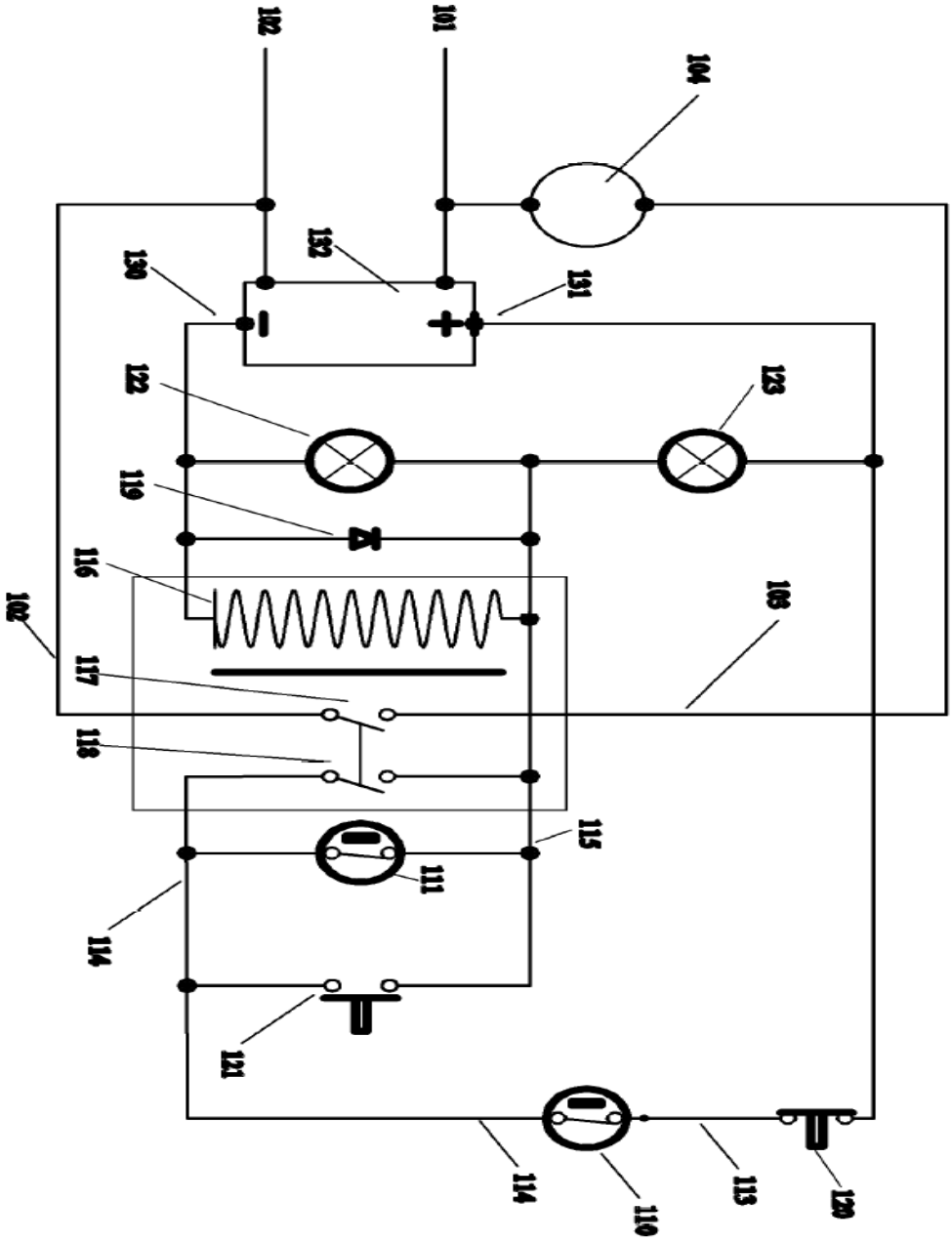
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