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ELECTRIC CIRCUITS FOR POSITIVE PICTURE COPIERS

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FIG. 1

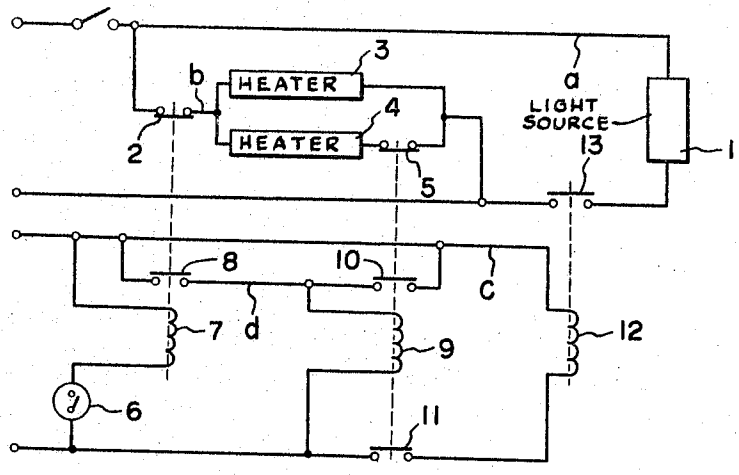
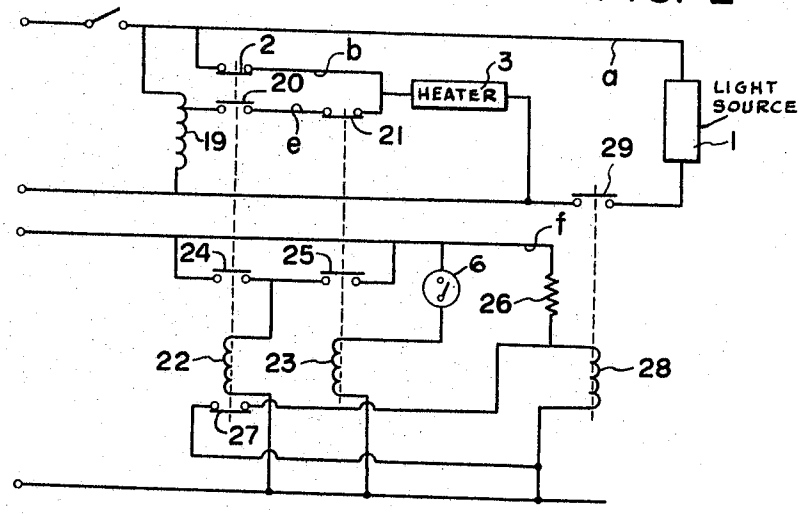


FIG. 2



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FIG. 3

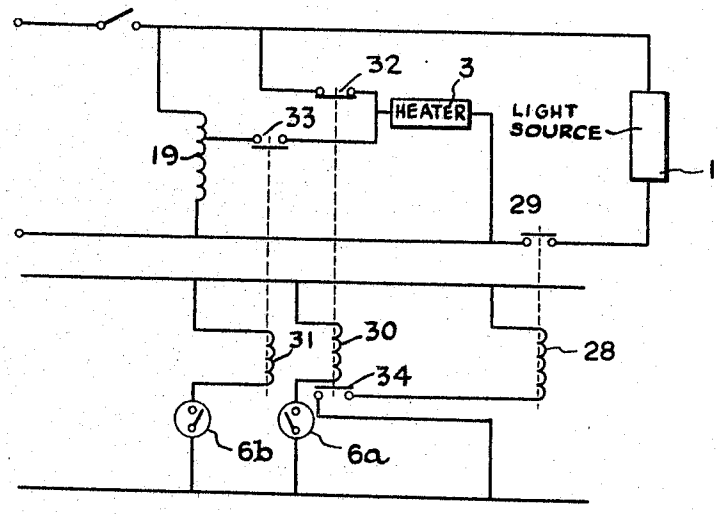
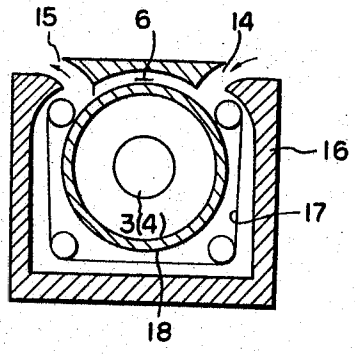


FIG. 4



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3,331,945

ELECTRIC CIRCUITS FOR POSITIVE PICTURE COPIERS

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2 Claims. (Cl. 219—471)

The present invention relates to electric circuits for positive picture copiers equipped with heating means powered by low current wiring.

Generally, when electric current is used for drying operation in liquid bath developing copiers, as a heating source in heat-developing copiers, or as a source for gas-developing copiers, a high capacity electric current for heating sources and a low capacity electric current for driving purpose are necessary. In this case, particularly at the beginning of operation, as the temperature of machine rises rapidly, the heaters alone may require a current of nearly 10 amperes which is the current capacity for the electrical wiring in some office rooms. For this reason, electric current for light sources and that for heating are often taken from two different sources, or special wiring is used for the power source to increase the available capacity.

An object of the present invention is to provide an electrical circuit for positive picture copiers wherein both the heating source and the light source may be powered over the same current leads.

The invention contemplates an electric circuit in a positive picture copier, which passes a major part of the electric current from the input leads across the heater of the copier until the copier reaches an appropriate fixed temperature suitable for positive picture copying. After the fixed temperature is reached the electric current is switched to light a light source and also to automatically control the flow of current through the heater in order to keep up a constant temperature.

In each of the embodiments of the present invention, the light source is not lit until the rollers for drying the liquid bath sensitized papers or for heat-development of the sensitized papers reach a certain definite temperature at the beginning of the copier operation. The heater circuit is disconnected automatically under action of thermostats and relays, the light source is lit, and thereafter a part of electric current is passed intermittently across the heater circuit so that the temperature of heating rollers may be retained at a predetermined range. Therefore, the electric power may be effectively divided in heat and light energy and used without surpassing the ordinary electric capacity of indoor wirings.

In the present invention, separate electric sources are not needed for the heater circuit and light source circuit, and consequently, simultaneous drying for both heat-development and liquid bath development are obtainable in an ordinary office room.

The present invention will now be described in further detail in connection with preferred embodiments of this invention as shown in the accompanying drawings, although the present invention is not so limited. Also it should be noted that similar parts are represented by similar symbols throughout the drawings, in which

FIG. 1 is a circuit diagram representing one embodiment of the invention;

FIG. 2 is a circuit diagram showing another embodiment of this invention;

FIG. 3 is another circuit diagram representing a further embodiment of this invention; and

FIG. 4 is a sectional view of the heating roller portion for a positive picture copying machine.

FIG. 1 shows a wiring diagram wherein a driving circuit is omitted. A heater circuit *b* diverges from a light source circuit *a* of light source **1** which has a main switch (not shown in FIG. 1) connected through relay switch **2**, to heaters **3** and **4** respectively, connected in parallel. Heater **4** is connected through relay **5** to the input power leads. Relay circuit *c* coming from the identical electric source is coupled to a thermostat **6** and **7** circuit. Relay contacts **2** and **8** are operated by relay **7**, so that when contact **2** is closed, contact **8** is arranged to be opened. A current path *d* has a relay **9** with switch contact **10**, a switch contact **11** of relay circuit *c* and the switch contact **5** of the heater circuit associated therewith. When relay coil **9** is energized contact **5** is opened and contacts **10** and **11** are closed. Further, a relay **12** operates a switch contact **13** of light source circuit *a*.

Heaters **3** and **4** are accommodated in a heat insulating casing **16** which in turn possesses an inlet **14** and an outlet **15** for sensitized paper as shown in FIG. 4. The heaters are arranged in heating roller **18** which revolves in contact with a conveyor belt **17**. A thermostat **6** is arranged as shown.

Thus, in an electric circuit having the construction referred to above, if the main switch (not illustrated) is turned on, electric current will pass through heaters **3** and **4** so that the heater roller will generate heat. The light source **1** is not lit since switch **13** is open. A thermostat **6** is closed and the switch **8** is closed by the action of relay **7**, when the temperature of heating roller **18** shown in FIG. 4 rises up to approximately 160° C., the relay switch **2** of heater circuit *b* is simultaneously opened to disconnect electric current from heaters **3** and **4** and stop generation of heat. When switch **8** is closed, the switch **5** is opened by means of relay **9** and the switches **10** and **11** are closed. Thus, the circuit for relay **12** is closed, the switch **13** for light source circuit *a* is closed by relay **12**, and the light source **1** is lit.

When the temperature of heating roller **18** is lowered to a predetermined temperature by interruption of circuits for heaters **3** and **4**, the thermostat **6** is opened and then switch **8** is opened by return of relay **7**. Simultaneously the relay switch **2** is closed to only heat the heater **3** by current in order to restore the temperature of heating roller **18**. Thereafter the conditions for off and on are alternately repeated, thus enabling the heating roller **18** to retain a definite range of temperatures, and the switches **5**, **10**, **11** and **13** to retain the circuit conditions until the main switch (not illustrated) is opened.

FIG. 2 shows a modification of the embodiment of FIG. 1, constituting a wiring diagram for a copier having a case with a single heater. The diverging heater circuit *b* of light source circuit *a* has the relay switch circuit *e* leading from the tapped impedance **19** through switches **20** and **21** respectively. Relays **22** and **23** operate switches **24** and **25** for relay circuit *f* and the circuit for relay **23** is arranged with thermostat **6**. The circuit *f* for resistance **26** is provided with switch **27** incorporated with switches **20** and **24** and operated by relay **22**. Switch **29** for closing light source circuit *a* is operated by relay **28** connected in parallel with switch contact **27**.

In the embodiment of FIG. 2, when switch **2** is closed, switches **20** and **24** are opened and switch **27** is closed. Switch contact **29** is closed by the operation of relay **28** and remains closed until the main switch (not shown in FIG. 2) is turned off. Switches **21** and **25** open and close in response to the action of thermostat **6**. When said main switch is turned on, heater **3** is heated with full current through the closed circuit provided by contact **2**, and as heating roller **18** in FIG. 4 raises its temperature, the thermostat **6** becomes closed, enabling the energization of relay coil **23**. Switches **20** and **24** are closed by relay **22** which operates when switch **25** is closed. Simultaneously

as switches **2** and **27** are opened, current to heater **3** is stopped, electric current passes through resistance **26** and relay **28**, and the light source circuit *a* is closed to light the light source **1**. When thereafter the temperature of heating roller **18** is lowered, relay **23** is operated by thermostat **6** to open switch **25** which closes switch **21**, and heater **3** maintains the temperature of heating roller **18** with electric current under lowered voltage passing through resistance **19** and closed switch **20**.

In the embodiment shown in FIG. 3, heater **3** is first heated to a predetermined temperature by using the thermostat **6***a* and relay **30** and thereafter the light source **1** is lit by passing heater current across the light source **1**, and thereafter the heating roller **18** in FIG. 4 is maintained at a constant temperature by a low capacitance electric current, and its action is generally similar as in the other two embodiments.

Relay **30** when energized opens switch **32** and closes contact **34**. Relay **28** upon energization closes contact **29**. Thermostat **6***b* controls the operation of contact **33** by opening and closing the circuit through relay **31**.

Furthermore, in addition to the foregoing embodiments, various combinations of relays and thermostat are considered for use in the light source, which are at first used at the starting operation of the positive picture copying machine, followed by using the same current source for both the light source and for controlling the heater current.

What we claim is:

1. In a positive picture copier, the combination comprising

a heated roller,

a current source,

a source of light energized by the current source,

a light source circuit having the source of light normally disconnected from said current source,

a heater circuit having at least one heating element housed in said roller and electrically coupled to said current source,

a heater control circuit including relay means and at least one thermostatic control switch connected to said current source, said thermostatic switch and relay means operable to disconnect the heater element for the current source at a predetermined temperature level and to reconnect said element to the current source when the temperature of said roller falls below said level a predetermined amount, and

switching means coupled to said relay means, connecting said source of light to said current source in response to the initial actuation of said relay means and thereafter maintaining the connection throughout the copier operation.

2. The apparatus of claim **1** wherein said switching means comprises a first relay switch, a second relay switch, the first relay switch being connected to said current source in response to the initial actuation of said relay means, and the second relay switch being connected to the current source in response to the actuation of said first relay switch, said second relay switch when actuated operating to connect the light source circuit to the current source.

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