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Nakamura et al.

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[54] **COPYING MACHINE**

[75] Inventors: **Kitamaro Nakamura**, Toyohashi; **Yasuhiko Doi**, Toyokawa both of Japan

[73] Assignee: **Minolta Camera Kabushiki Kaisha**, Osaka, Japan

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[63] Continuation of Ser. No. 865,837, Oct. 13, 1969, abandoned.

[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**.....**H01h 47/18**

[58] **Field of Search**.....317/141 S, 142 R; 307/154

[56] **References Cited**

UNITED STATES PATENTS

3,512,048 5/1970 Wallentowitz et al.....317/141 S

Primary Examiner—L. T. Hix

Attorney—Stanley Wolder

[57] **ABSTRACT**

A copying machine having a power switch, an operating switch, a relay with a contact acting as a holding switch in parallel with the power switch, and a timer. The relay is actuated in response to the closing of the operating switch following the actuation of the power switch, so as to hold the power switch. The timer is actuated upon opening of the power switch, so as to de-energize the relay only after a certain predetermined time delay. Whereby, copying operation of an original being copied is completed even if the power switch is opened by mistake in the midst of the copying operation.

6 Claims, 2 Drawing Figures

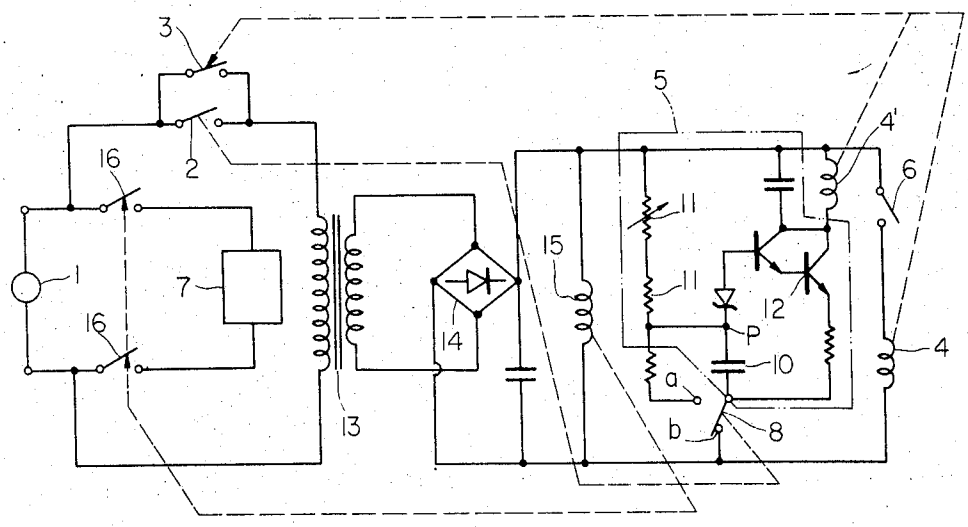


FIG. 1

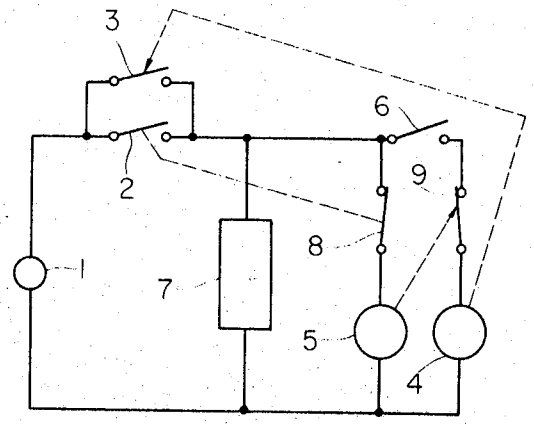
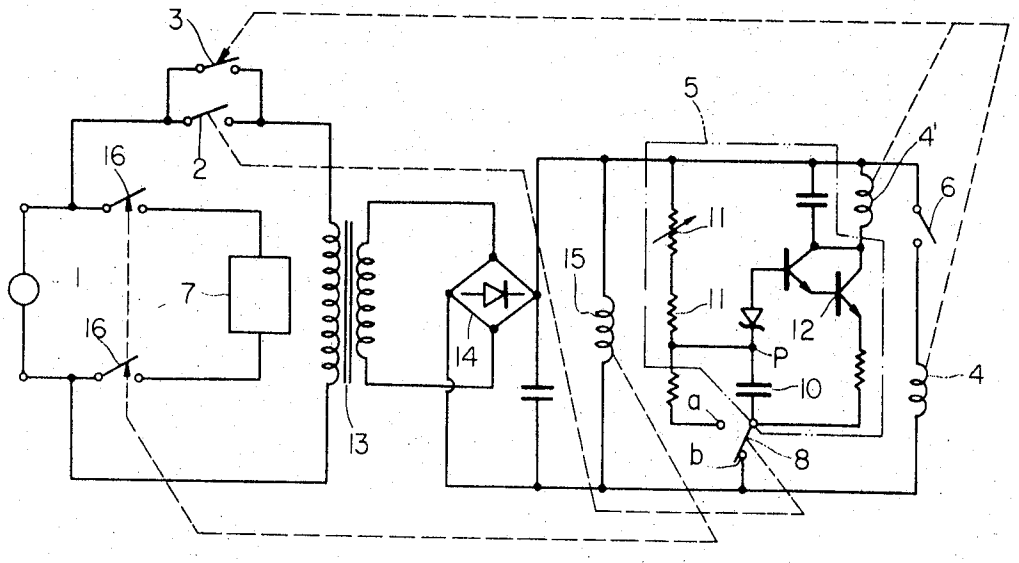


FIG. 2



INVENTOR.
KITAMARO NAKAMURA
YASUHIKO DOI
BY
Stanley Weiser

COPYING MACHINE

This application is a continuation of Ser. No. 865,837, filed Oct. 13,1969, and now abandoned.

This invention relates to a copying machine, and more particularly to a copying machine which includes a power switch, an operating switch, a holding switch in parallel with said power switch, a timer, and a circuitry, said circuitry is so constructed that said holding switch in parallel with the power switch is closed only upon actuation of said operating switch following the closing of said power switch, while said timer is actuated upon opening of said power switch so as to open said holding switch in parallel with the power switch after a certain predetermined delay time.

An object of the present invention is to provide a copying machine which ensure the completion of each copying operation even if the power switch is opened by mistake in the midst of the copying operation of an original, whereby the danger of troublesome stacking of the copy paper in the copying machine at the time of false opening of the power switch is completely eliminated. If a sheet of copy paper remains in the copying machine after a copy operation. such sheets causes troubles in the next following copying operation.

Other objects and a fuller understanding of the present invention may be had by referring to the following description, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a basic circuit diagram of an embodiment of the present invention; and

FIG. 2 is a circuit diagram of essential portions of an electric circuitry in an embodiment of the copying machine according to the present invention.

Generally speaking, a known electronic copying machine comprises a copy paper feeding means, a main driving means feeding said copy paper to a predetermined image receiving section while charging said copy paper so as to impart to it photosensitivity, a means exposing the photosensitive copy paper to the image of an original to be copied, a developing means developing the copy paper thus exposed, and a means drying and fixing the copy paper thus developed.

Referring to the circuit diagram of FIG. 1, illustrating the fundamental construction of a copying machine according to the present invention, the reference numeral 1 represents an electric power source, 2 a power switch, 3 a holding switch which is a normally open contact of a relay 4 and is in parallel with the power switch 2, 5 a timer, 6 an operating or copy cycling switch, and 7 a load. The timer 5 is connected to the power source 1 through a timer switch 8, which is gang-operated with the power switch 2. The relay 4 is actuatable by the power source 1 through a relay switch 9 being actuatable by the timer 5.

The load 7 generally consists of various mechanical and electrical parts of the copying machine, such as a copy paper feeder of the copying machine, a motor for driving a fan, a heater for drying a developed copy paper, a magnetic clutch between the feeder and its driving mechanism, a light source for scanning a original and exposing the copy paper to the image of the original, etc. In the circuit of FIG. 1, it is possible to classify the aforesaid loads or parts of the copying machine into a first group consisting of those parts which should be continuously operated and a second group which can be intermittently operated in each copying operation of an original, so as to connect the second group of parts in parallel with the series circuit consisting of the relay 4 and the relay switch 9.

In operation, the power switch 2 is manually closed to open, by gang-operation, the time switch 8 in series with the timer 5. At the same time, the load 7 is started, to make the copying machine ready for copying. After inserting an original, which is to be copied, into an input end of the copying machine, an operator manually close the operating switch 6. At this moment, the relay 4 is energized to close the holding switch 3. With the operating switch 6 thus closed, the remaining parts, e.g., the intermittently operable parts, of the copying machine are actuated, so as to start the copying operation.

If the power switch 2 is opened during the copying operation by mistake, the holding switch 3 remains as closed thanks to the action of the relay 4, while the timer switch 8 is closed by the gang-operation with the power switch 2, so as to actuate the timer 5. After a certain predetermined delay time, the timer 5 opens its contact or the relay switch 9 to de-energize the relay 4. Thereby, the relay contact or the holding switch 3 opens. As a result of it, the power supply to the entire copying machine is interrupted, and the copying machine comes to stop.

By setting the delay time of the timer 5 equivalent to the time necessary for completing a copying of an original, the copying operation of each original being copied is carried out to its completion even if the power switch 2 is opened by mistake in the midst of the copying operation. Thereby, waste of the copy paper can be prevented, and the danger of plugging of the copying machine due to the copy paper left therein by the preceding copying operation can be eliminated. Furthermore, overlapping of the copy paper due to the remaining copy paper of the preceding copying operation can also be prevented.

According to the present invention, the operating switch 6 need not be a manual switch, but it can be an automatic switch, which for instance, can be closed automatically in response to the insertion of an original into the copying machine.

FIG. 2 shows the electric circuitry of an embodiment of the copying machine of the present invention, in which parts corresponding to those of the circuit of FIG. 1 are represented by like numerals. In this example, a relay consists of latching relay 4 and an unlatching relay 4', while a timer 5 consists of a capacitor 10, resistors 11, and transistors 12. The delay time of the timer 5 is determined by the transient phenomena of the capacitor 10 in the charging thereof. In order to charge the capacitor 10 by a direct current voltage, a transformer 13 and a rectifier 14 are provided in the copying machine.

An operating switch 6 of this embodiment is automatic reset type, or the operating switch 6 automatically opens upon removal of manual closing force therefrom, and thus the latch relays 4 and the unlatching relay 4' provide a holding circuit (not shown) to the operating switch 6. The holding circuit of the operating switch 6 is apparent to those skilled in the art, and it is not shown here.

One of the resistors 11 of the timer 5 is variable, so that the delay time of the timer 5 can be adjusted by controlling the variable resistance of that resistor 11.

In operation of the embodiment, upon closing of a power switch **2**, a relay **15** is actuated to close its contacts **16** for completing the power supply circuit to a load **7**. At the same time, a switch contact **8** of the timer **5** is turned, by gang-operation from a stationary contact *b* to a stationary contact *a*, so as to discharge the residual electric charge in the capacitor **10**. Then, upon manual actuation of the operating switch **6**, the latching relay **4** is energized to close a holding switch **3**, in parallel with the power switch **2**.

When the power switch **2** is opened by mistake in the midst of copying operation, the timer switch **8** is gang-operated to turn its swingable contact from the stationary contact *a* to the stationary contact *b*. Thus, the charging of the capacitor **10** starts. When the voltage at a junction P between the capacitor **10** and the resistor **11** is reached to a certain predetermined value, the transistors **12** become conductive to energize the unlatching relay **4'** for opening the holding switch **3**. Thus, the entire copying machine comes to stop. It is apparent that the actuation of the latching relay **4** and the actuation of the unlatching relay **4'** represent the completion and interruption of the series circuit consisting of the relay **4** and the relay switch **9** of the circuit of FIG. **1**, respectively.

As described in the foregoing, according to the present invention, with the copying machine of the aforesaid construction, the operation of the copying machine is not interrupted at the instant of the opening of the power switch **2**, but it continues its normal operation until the copying operation of an original being copied is completed. Thus, waste of copy paper and detrimental effects to the succeeding copying operation can be prevented.

Furthermore, if the power switch **2** is once closed and then opened without actuating the operating switch **6**, the copying machine once starts and then stops, because the holding switch **3** remains as open. In other words, if the operator once closes the power switch **2** with an intention of making a copy and then he changes his mind or finds that the copy is not needed any more, he can immediately stop the copying machine by opening the power switch **2**. Therefore, useless power consumption at the copying machine can be prevented under such conditions.

Although the present invention has been described with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A circuit for controlling a current supply for loads of a copying machine comprising a main power switch, an operating switch separate from said main power switch and controlling cycling of the copying machine, a latching relay **4** having a relay contact acting as a holding switch in parallel with said main power switch, said latching relay being energized upon closing said operating switch to close said holding switch to continuously supply said loads with electric current even if the main power switch is accidently opened during copying operation, a timer starting with the opening of the main power switch and means **4'** coupled to said relay contact for retaining said holding switch in closed condition after opening said operating switch, said means being responsive to said timer to open said holding switch after the lapse of time substantially as necessitated for one cycle operation of the copying machine from the opening of said main power switch.

2. A circuit according to claim **1** in which said means for energizing and de-energizing the timer is a switch contact connected in series therewith and actuated by the main power switch.

3. A circuit according to claim **1** in which the duration of the delay time of the timer is adjustable.

4. In a copying machine including an electrically energized copying machine device **7**, a control network comprising first means for connecting said device **7** to a current source **1** including a first switch **2** connected to energize said device **7** upon the closing of said first switch, a second normally open switch **3** connected in parallel with said first switch **2**, a timer **5**, a second means **8** responsive to the opening of said first switch for actuating said timer, a cycling switch **6**, means including a first solenoid **4** responsive to the closed condition of said cycling switch **6**, and means including a second solenoid **4'** responsive to said timer **5** for opening said second switch after the timing interval of said timer.

5. The control network of claim **4** wherein said timer comprises an electronic timing network including an RC timing circuit and said second means comprises a third switch **8** coupled to and simultaneously operable with said first switch **2** to close said third switch **8** with the opening of said first switch **2**, said timing network being connected through said third switch to a current source.

6. The control network of claim **4** including means **11** for adjusting said timing interval.

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