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ELECTRICAL TIMING ARRANGEMENT

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Fig. 1.

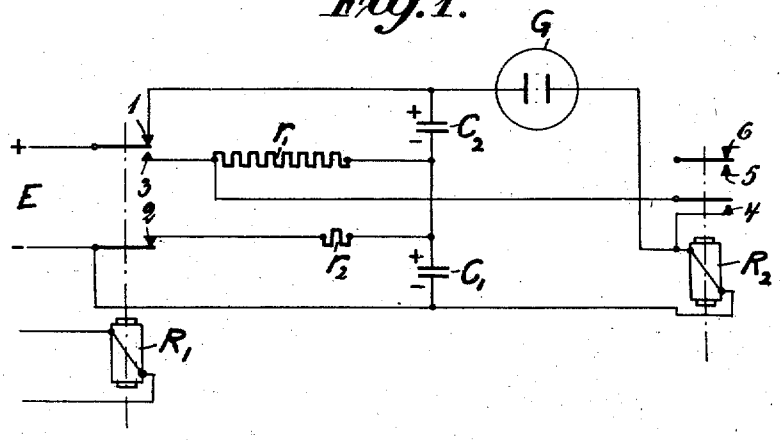
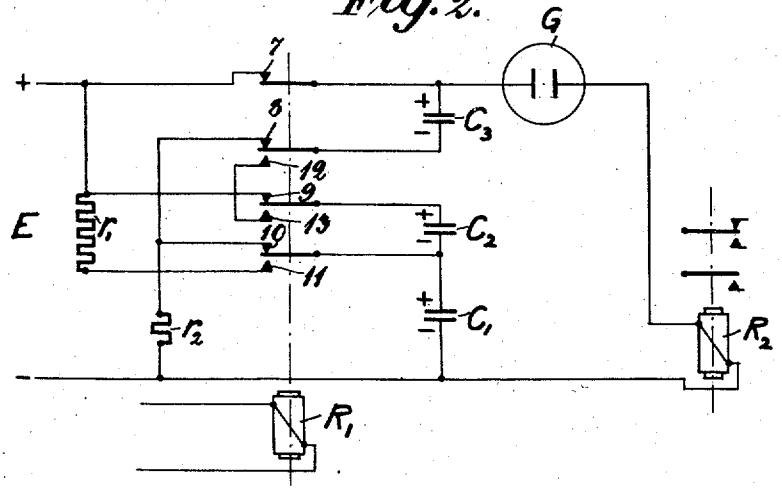


Fig. 2.



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ELECTRICAL TIMING ARRANGEMENT

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The present invention relates to electrical timing devices such as time relays, time switches etc. More especially, the invention relates to such devices in which the timing member is constituted by a condenser in combination with a high charging resistance and a discharge device having a fixed lighting voltage, by way of example a glow lamp or a glow tube. Said elements may, by way of example, be mutually so connected that, upon operation, the condenser is charged over the resistance so that after a predetermined period the condenser voltage has attained the lighting voltage of the discharge device. The condenser then discharges over the discharge device whereby a current impulse is obtained that may actuate the device to be time controlled.

Such timing arrangements afford great advantages by their lack of movable parts, their precision and their adaptability to be adjusted for different lengths of time, from fractions of a second up to several hours, but their application has hitherto been restricted to such cases when the available operating voltage has exceeded the lighting voltage of the discharge device. Existing types of glow lamps and glow tubes generally preferred and used for said purpose are not at present manufactured for lower voltages than 70 to 80 volts and, on account of the nature of the glow discharge phenomenon, a further reduction in the lighting voltage appears impracticable. It has thus not been possible to make use of said timing arrangements at the voltages usually occurring in the communication art, i. e. 24 to 60 volts.

According to the present invention it has been rendered possible to operate such timing arrangements at a lower voltage than the lighting voltage of the discharge device. According to the invention, this is brought about by that, during the charging of the condenser over the charging resistance, one or more other condensers previously charged to the operating voltage are series connected to the former condenser so that the condenser voltages during the charging are added together whereby the lighting voltage of the discharge device may be attained by means of a lower operating voltage.

The invention will now be more closely described with reference to the accompanying drawing in which Figure 1 discloses a circuit diagram of an embodiment of the invention, and Fig. 2 shows another embodiment in a similar manner. On the drawing, Figure 1 is a circuit diagram for a time relay in which the operating voltage is less than the lighting voltage of the glow lamp but higher than one half thereof. G denotes the glow lamp or glow tube, C_1 and C_2 are two condensers of suitable capacity, by way of example four microfarads. The character r_1 denotes a high charging resistance adjusted to the determined period of time, by way of example 0.01 to 50 megohms, whereas r_2 is a short-circuiting resistance, by way of example twenty to fifty ohms. R_1 designates a relay controlling the timing arrangement whereas R_2 is a relay to be energized after the fixed period thus bringing about the desired function. The character E designates the available current source.

The arrangement operates in the following manner. When the relay R_1 is in its inoperative position, the normally closed contacts 1 and 2 remain closed. Over said contacts the condenser C_2 is connected to the current source E, i.e. it is standing by, charged to said potential, which is lower than the lighting voltage of the lamp G. Over the contact 2 the condenser C_1 is short-circuited over the resistance r_2. When the relay R_1 is energized, upon the starting of the timing arrangement, the normally closed contacts 1 and 2 are opened by the relay armature and the normally open contacts 3 closed. The short-circuit of the condenser C_1 is thus removed and C_1 is instead connected to the current source

E over the high charging resistance r_1 and the charging of the condenser starts. The condenser C_2 is disconnected at the same time from the current source but its voltage decreases very slowly on account of the high insulating resistance of the condenser. The two condensers are, as shown, interconnected in such a manner that the voltage of the condenser C_1, continuously increasing during the charging, is added to the voltage of C_2.

When the voltage of C_1 after the fixed period has attained such a value that the resulting voltage is equal to the lighting voltage of the glow lamp the lamp is lighted and the condensers discharge through the lamp and the series-connected relay R_2 until the resulting voltage has fallen below the extinction voltage of the lamp, when the glow discharge ceases. By the discharge impulse the relay R_2 is energized and holds itself in circuit over the contact 4 and makes or breaks, as the case may be, the circuit to be actuated after the fixed period, by way of example an alarm circuit over the contact 5 or 6 respectively.

The relay R_2 is energized so long as the relay R_1 is energized. When the relay R_1 is de-energized the holding circuit of R_2 is interrupted so that said relay also becomes de-energized. At the same time, C_1 is short-circuited over r_2 over the contact 2 and connects C_2 to the current source over the contacts 1 and 2. The circuit arrangement is thus restored to the starting condition.

If the energization of the relay R_1 is of shorter duration than the fixed period, R_1 will, before the discharge has taken place and the relay R_2 has been energized, short-circuit C_1 and charge C_2 to full voltage in above mentioned manner at its normally closed contacts 1 and 2. As soon as R_1 has thus been de-energized the timing arrangement is restored to the starting position and after the re-energization of R_1 the fixed period must again lapse before R_2 operates.

Figure 2 shows a corresponding circuit arrangement for the case that the voltage E is less than about one half but higher than one third of the lighting voltage of the lamp G. Three condensers C_1, C_2 and C_3 are here series-connected during the charging whereas two of them, i.e. C_2 and C_3, are previously each charged to the voltage E.

When R_1 is in inoperative position C_2 and C_3 are, over the normally closed contacts 7, 8, 9 and 10, connected in parallel to the current source E and thus charged to the corresponding voltage. The condenser C_1 is short-circuited over r_2 over the contact 10. When R_1 is energized said short-circuit is interrupted and C_1 is, over the contact 11, connected to the current source E over the charging resistance r_1 for which reason the voltage thereof is gradually increased. Simultaneously C_2 and C_3 are disconnected from the current source and series connected over the contacts 12 and 13. The three condensers are now series connected with one another and the resulting voltage is impressed upon the glow lamp G. When the corresponding lighting voltage is attained discharge current is passing through the relay R_2 so that said relay is energized in above mentioned manner. The re-charging of the condensers C_2 and C_3 and the short-circuiting of C_1 upon the de-energization of the relay R_1 is completely analogous to the manner of operation described in connection with Figure 1.

It is readily understood that it is possible to combine so many part voltages that the lighting voltage of the lamp may be attained also in case of very low operating voltages.

In order to reduce the number of condensers required while maintaining sufficiently strong discharge impulses, it has been found suitable to make the condensers of different capacities. In Figure 1, C_1 or C_2 respectively may thus be smaller than the other one. The force of the current impulse then obtained is still determined by the capacity of the latter condenser.

In certain cases it is evidently not suitable to have condensers permanently connected to the source of current when the timing arrangement is inoperative. The circuit arrangement may then be carried out in such a manner that the condensers C_2 and C_3, in inoperative position, do not stand by in continuously charged condition but, upon the relay R_1 operating for a short moment, by way of example through an auxiliary relay, are connected to the current source before the charging of C_1 begins.

It is readily understood that the characteristic features of the present invention are not restricted only to the embodiments shown in Figures 1 and 2. The invention is evidently completely independent of the function to be performed by the timing arrangement and it may thus be applied in many different kinds of time relays, time switches or the like connected in different manners.

Also in such cases when the operating voltage is comparatively high, for instance 100 volts, and per se sufficient to light commercial discharge devices having a low lighting voltage, it may be preferred to use a discharge device of a higher lighting voltage than the available operating voltage for the reason that the discharge impulses will be stronger, the greater is the difference between the lighting and the extinction voltages and said difference increases with the voltage rating of the discharge device. Then, of course, the present invention may be advantageously applied to attain the required lighting voltage.

I claim:

1. An electrical timing arrangement com-

prising a timing condenser and a plurality of auxiliary condensers, connected in series with one another and with a discharge device, a charging current source having a lower voltage than the lighting voltage of the discharge device, a timing resistance, and a switch adapted, in normal position, to connect the current source in parallel with the auxiliary condensers while separating the timing condenser from the current source and, in timing position, to connect the current source to the timing condenser through the timing resistance while separating the auxiliary condensers from the current source.

2. An electrical timing arrangement as claimed in claim 1 in which the timing condenser has a capacity differing from that of the auxiliary condensers.

3. An electrical timing arrangement as claimed in claim 1 in which the switch is adapted, in normal position, to short-circuit the timing condenser.

4. An electrical timing arrangement comprising a timing condenser and an auxiliary condenser, connected in series with one another and with a discharge device, a charging current source having a lower voltage than the lighting voltage of the discharge device, a timing resistance, and a switch adapted, in normal position, to connect the current source in parallel with the auxiliary condenser while separating the timing condenser from the current source and, in timing position, to connect the current source to the timing condenser through the timing resistance while separating the auxiliary condenser from the current source.

5. An electrical timing arrangement as claimed in claim 4 in which the timing condenser has a capacity differing from that of the auxiliary condenser.

6. An electrical timing arrangement as claimed in claim 4 in which the switch is adapted, in normal position, to short circuit the timing condenser.

In testimony whereof I affix my signature.

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