Sept. 8, 1942. T. J. JUDGE ET AL 2,295,217

FLASHING SYSTEM FOR INDICATING LAMPS

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FIG. 1.

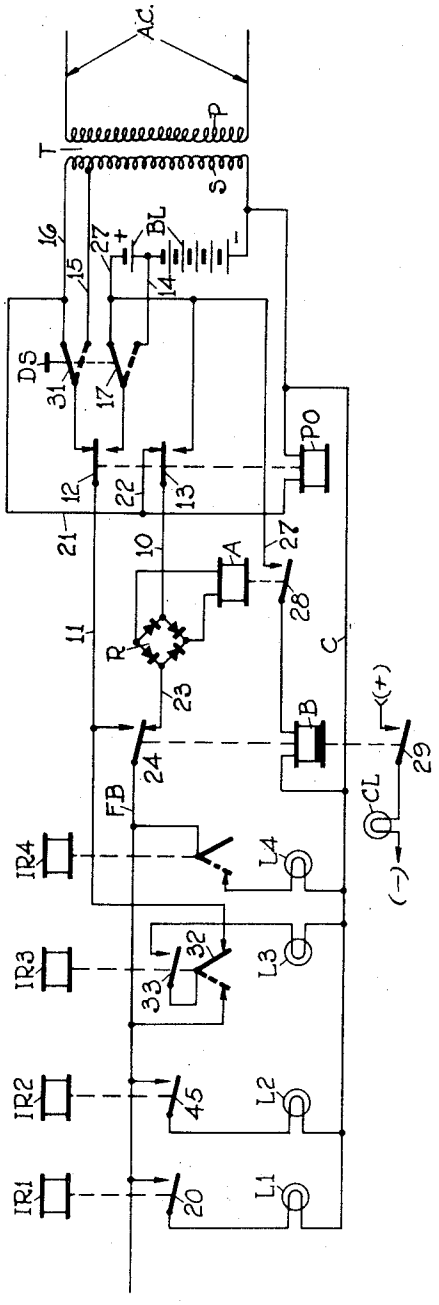
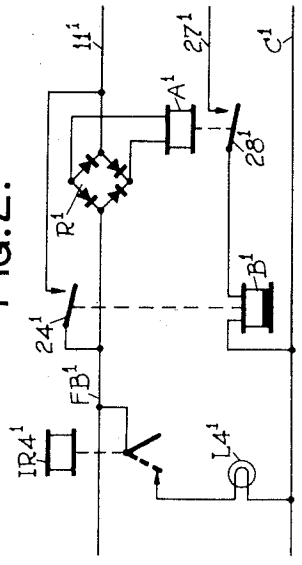


FIG. 2.



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FLASHING SYSTEM FOR INDICATING LAMPS

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9 Claims. (Cl. 177—329)

This invention relates to flashing mechanism for producing an interrupted current for at times energizing indicating lamps to produce a distinctive flashing indication.

In systems of centralized traffic control, such, for instance, as shown in prior Preston patents, Nos. 2,082,462 and 2,139,562, granted June 1, 1937, and December 6, 1938, respectively, or in interlocking systems of the type such as illustrated in the prior application of Preston, Ser. No. 183,499 filed January 5, 1938, Patent No. 2,265,249 granted December 9, 1941, a particular one of three distinctive indications is sometimes desired to be given by the same indicating lamp. These indications may, for instance, be the lamp lighted, the lamp dark and the lamp flashing. In the type of systems above referred to the miniature track layout usually has a very large number of indicating lamps most of which are extinguished under normal conditions and these lamps are energized by continuous energy or by flashing energy, as conditions require, during movement of traffic through the track layout or other changes in traffic conditions. For this reason it is only necessary to have available interrupted current to produce a flashing indication when a flashing indication is to be given, and consequently it is desirable to keep such flashing mechanism dormant at all other times.

In systems of this type, as just pointed out, there may be times when none of the lamps are to be energized with interrupted current, there are other times when one or only a few lamps are energized by such flashing current, and there are still other times when a large number of the lamps must be energized by flashing current. It is thus seen that the usual form of interrupter included in series with the lamp energizing source cannot be employed for a variation in the number of lamps used because proper flashing of the circuit cannot be accomplished and the degree of illumination would vary when there is a large variation in the quantity of current drawn, dependent upon the number of lamps that are to be flashed at a particular time. Also, the system proposed by the present invention contemplates a substantially constant rate of flashing independently of the number of lamps which are to be energized by flashing current.

In view of the foregoing problems, and other considerations, it is proposed in accordance with the present invention to employ electrically operated flashing apparatus having a coil included directly in a circuit in series with one or more indicating lamps but which circuit is of such high impedance that such indicating lamp or lamps will not be illuminated irrespective of whether there is only one lamp in the circuit or there are a plurality of such lamps included in multiple in such circuit, together with means controlled by such flashing apparatus for intermittently connecting the indicating lamps directly to the source of current. Although this invention may take many forms in one form of the present invention as specifically disclosed the indicating lamps are alternately included in series with the electro-magnetically controlled flashing apparatus and connected directly to the source of current, whereas in a modified form of the present invention indicating lamps are at all times included in series with the electro-magnetically operated flashing mechanism, but this flashing mechanism at times is shunted out by a contact controlled by itself as a result of which the indicating lamps are intermittently connected directly to such source of current.

Other objects of the present invention reside in the provision of flashing mechanism which will operate on either alternating current or direct current at substantially the same flashing rate, and the provision of a power-off relay through the medium of which the apparatus may be automatically connected to an auxiliary battery upon failure of the commercial alternating current source, and the provision of a dimming switch, whereby the indicating lamps may be connected to a lower voltage source irrespective of whether alternating or direct current is used at the time and may at other times, as during bright daylight, be connected to a higher voltage source.

Other objects, purposes and characteristic features of the present invention will in part be understood from the following description and will in part be obvious from the accompanying drawing, in which:

Fig. 1 shows one embodiment of the present invention in which the flashing mechanism is intermittently connected in series with the indicating lamps; and

Fig. 2 is a modified form of the invention in which the electro-magnetically controlled flashing mechanism is continuously connected in series with the indicating lamps but has its coil intermittently shunted.

Fig. 1—Structure

In Fig. 1 have been illustrated four indicating lamps L1, L2, L3 and L4 which are respectively

controlled by the indicating relays IR1, IR2, IR3 and IR4. These indicating relays may be controlled in any suitable manner and may form part of any suitable centralized traffic controlling system or interlocking system such as referred to above and these relays are provided with contacts to control these indicating lamps. These indicating lamps are connected through the medium of contacts of these relays between the flashing bus bar FB and the common return wire C. The flashing mechanism for intermittently energizing the flashing bus comprises flashing relays A and B, the relay A being connected across the D. C. terminal posts of a full-wave rectifier which rectifier has its alternating current posts included in series with the wire 10. This rectifier is employed to afford proper control of the relay A by either alternating current or direct current. By proper control is meant reliable operation at the proper number of oscillations per minute which is determined by the time of pick up and of release of relays A and B. Although a considerable latitude in construction is contemplated, the alternating current source preferably comprises a transformer T having a high voltage and a low voltage tap on its secondary winding S, its primary winding P being connected to a suitable alternating current line A. C. The power-off relay PO is preferably directly connected across the entire secondary winding S of this transformer T, as shown. The full voltage alternating current source is also supplied to the wires 10 and 11 so long as the power-off relay PO is energized and so long as the dimming switch DS is in its normal high-voltage position. If, however, the power-off relay PO is deenergized due to alternating current power failure, the contacts 12 and 13 of this power-off relay will assume their retracted position and will connect the wires 10 and 11 directly to the high voltage positive terminal of the battery BL and the contact 17 of the dimming switch, respectively, the negative terminal of this battery BL as well as the lower end of the secondary winding S of the transformer T being preferably connected directly to the common return wire C. It is readily apparent that if the dimming switch DS is moved to its dotted position that low voltage will be applied to the wire 11 irrespective of whether direct current or alternating current is then employed, that is, irrespectively of whether the power-off relay is energized or deenergized, this wire 11 with the dimming switch DS in its dotted position being connected to the low voltage tap 14 of the battery BL when the power-off relay PO is deenergized and being connected to the low voltage tap 15 of the transformer T when the power-off relay PO is energized.

The flashing relay A is preferably a single contact relay which operates on a current necessarily below the glow point of one lamp, and which is rather quick acting. The relay B, on the other hand, is preferably provided with contacts which are capable of carrying a large current and is preferably constructed to be somewhat slow in picking up and extremely slow in dropping away after its energizing circuit has been broken. The flashing relays A and B are so interconnected that picking up of the relay A will energize the relay B and picking up of the relay B will deenergize the relay A. It is thus seen that these relays will produce a galloping or oscillatory action and will produce intermittent energization of these relays alternately. The relay B preferably has pick-up and drop-away characteristics such that when interconnected with the relay A as shown it will produce about 100 flashes per minute of the indicating lamps controlled thereby.

Operation of Fig. 1

Let us assume that alternating current is available at the transformer T as a result of which the power-off relay PO is energized. Let us also assume that indicating relay IR1 is energized. A circuit is now completed from the high voltage tap 16 of the transformer T, through wires 16, 21 and 22, front contact 13 of the power-off relay PO, wire 10, one pair and then the other pair of the elements of the rectifier R alternately included in series with the relay A, wire 23, back contact 24 of the relay B, the flashing bus bar FB, front contact 20 of the indicating relay IR1 and lamp L1, to the common return wire C connected to the other terminal of the secondary winding S of transformer T. The current flowing in the circuit just traced is of such low value that the indicating lamp L1 will not be illuminated appreciably. The current will, however, be of sufficient value to pick up the flashing relay A.

With the flashing relay A energized a circuit is completed, starting from the high voltage tap 27 of the battery BL, through front contact 28 of the relay A, winding of the relay B to the terminal (—) of the battery BL. The closure of this circuit for the flashing relay B will cause it to pick up its contacts 24 and 29 thereby lighting the check lamp CL, and interrupting the circuit for the relay A at back contact 24 and closing a circuit for the indicating lamp L1 extending directly from the high voltage tap 16 of the secondary winding S, through contact 31 of the dimming switch DS, through front contact 12 of the power-off relay PO, through wire 11 and front contact 24 of the relay B and contact 20 of the relay IR1 directly to the indicating lamp L1, so that this lamp is energized to full brilliancy. Lifting of the contact 24 of relay B will, however, deenergize the relay A and will cause deenergization of the relay B after a short interval of delay. This operation will be repeated intermittently about one hundred times per minute to cause flashing of the indicating lamp L1 at that rate.

If a large number of the indicating relays IR close circuits to their respective indicating lamps at the same time all of these lamps will be included in multiple with each other and in series with the rectifier R and the relay A. Since the relay A is rather quick acting the time required to pick up this relay A will not be materially changed irrespective of the number of lamps that are included in multiple with each other and in series with the relay A. Also the amount of current flowing in relay A is largely dependent on the impedance of the relay A, which is high, and almost independent of the number of lamps in multiple included in series with this relay A. In other words, the flashing rate of the relays A and B will not be materially changed irrespective of whether one or a large number of indicating lamps are included in the circuit at the same time. Also, these indicating lamps will be flashed to substantially the same brilliancy irrespective of the number of indicating lamps that are connected in multiple across the source of current, this by reason of the fact that the intervening wires and contacts introduce very little resistance or impedance.

Let us now assume that the alternating current

has failed due to line failure or the like, and that for this reason the power-off relay PO has been deenergized. With the power-off relay PO deenergized the rectifier R and its associated relay A are connected directly to the high voltage tap 27 of the battery BL through the back contact 13 of this relay PO. Likewise, the wire 11 is connected directly to the high voltage tap 27 of the battery BL through the medium of back contact 12 of the relay PO and contact 17 of the dimming switch. If, however, the dimming switch DS is in its dotted position the wire 11 is connected to the low voltage tap 14 of the battery BL, whereas the rectifier R and its associated relay A are still connected to the high voltage tap 27 of the battery BL. It should be noted that the flashing relay B which performs the principal timing function is at all times controlled through a circuit leading to the high voltage tap 27 of the battery BL. It is thus seen that the dimming switch DS can only apply low voltage either from the transformer T or from the battery BL to the indicating lamps L and that the rectifier R and its associated relay A are always controlled from the high voltage taps, either the high voltage tap 16 of the transformer T or the high voltage tap 27 of the battery BL. Attention is directed to the fact that the indicating relays IR3 and IR4 are preferably of the polar-neutral type including both a neutral armature and a polar armature. Also that with the indicating relay IR3 energized to the right the indicating lamp L3 will be continuously energized through the contacts 32 and 33 and in this case the flashing relays A and B are not operated unless some other indicating lamp is connected to the flashing bus FB. Even if the flashing bus FB is intermittently energized while the neutral contact 33 is up and the polar contact 32 is to the right, this will not change the continuous and non-interrupted lighting of the indicating lamp L3. This is not the case when the indicating relay IR3 is energized toward the left. It is thus seen that the indicating lamp L3 is capable of giving three distinctive indications of steady bright, flashing and dark. It is of course understood that said power-off relay and said dimming switch are auxiliary features and may be omitted if desired.

Structure Fig. 2

In Fig. 2 of the drawing like parts have been designated by like reference characters as in Fig. 1 with an exponent one (1) added. The only difference between the structure shown in Fig. 1 and Fig. 2 is that the rectifier R^1 is connected directly to the flashing bus bar FB^1 and that this rectifier R^1 is shunted through the medium of the front contact 24^1 when the relay B^1 is energized. In other words, instead of having the contact 24 shift the indicating lamps L from one circuit to another as is the case of Fig. 1, the contact 24^1 merely shunts the rectifier R^1 and its associated relay A^1 out of the circuit so that the relay A^1 is deenergized, and at the same time the indicating lamps will be supplied with current directly from the source of supply without intervening resistance or impedance.

Operation Fig. 2

The operation of Fig. 2 is exactly the same as that of Fig. 1 because lifting of the contact 24^1 of Fig. 2 will cause deenergization of the relay A^1 in the same way as opening of back contact 24 of relay B of Fig. 1 will cause deenergization of the relay A. Also, lifting of the contact 24^1 of Fig. 2 will cause the indicating lamps and flashing bus FB^1 to be connected directly to the wire 11^1 in the same way as front contact 24 of relay B in Fig. 1 connects the flashing bus FB directly to the wire 11. One advantage of the arrangement shown in Fig. 2 is that the rectifier R^1 also serves the function of a discharge resistance and suppresses sparking on front contact 24^1 of relay B^1.

Instead of having the dimming switch on the secondary side of the transformer T as shown, it may be desirable to have taps on the primary side of the transformer selected by a dimming switch. In this event more turns will be cut into the primary winding when dimmer indications are to be given. Also in this case a separate battery or separate transformer will be used to feed energy to the wire 10 where no reduction in voltage is desired under dimming conditions. The check lamp CL is connected to flash each time any one of the lamps L1, L2, L3, or L4 is flashing, it being energized from the terminals (+) and (—) of a suitable source of current and through the front contact 29 of the relay B.

Having thus shown and described several embodiments of the present invention it is desired to be understood that these embodiments have been shown rather conventionally and have been selected as illustrations of the form the invention may take and it should be understood that changes, modifications and additions may be made to these embodiments as required by the particular problem encountered in practicing the invention all without departing from the spirit or scope of the invention except as demanded by the scope of the following claims.

What we claim as new is:

1. In combination; a plurality of indicating lamps; a control contact in series with each lamp; a full-wave rectifier; a first relay connected to the direct current terminals of said full-wave rectifier and responsive to the current derived from such rectifier; a first circuit including said full-wave rectifier connected in series in said circuit by its alternating current terminals, a plurality of indicating lamps in multiple each lamp having its control contact in series and a source of current which may be either direct current or alternating current; a second circuit including a front contact of a second relay, said indicating lamps in multiple each lamp having its control contact in series and said source of current; said front contact of said second relay also causing deenergization of said rectifier and said first circuit upon lifting of said front contact; an energizing circuit for said second relay including a front contact of said first relay; whereby if a control contact is closed said relays will alternately be energized and the associated lamps will be flashed and said relays will be deenergized if said control contact is again opened.

2. A system of control according to claim 1; and a power-off relay energized from the alternating current source and having contacts for connecting said alternating current source to said system when said power-off relay is energized and connecting said direct current source to said system when said power-off relay is deenergized; whereby due to the employment of said rectifier the flashing rate will be the same irrespective of whether said power-off relay is energized or deenergized.

3. In combination; an indicating lamp; a normally open control contact included in series

with said lamp; a pair of relays one energizable through a back contact of the other and the other energizable through the front contact of said one relay; means for rendering said other relay slow dropping; a first circuit including said indicating lamp, said control contact, said back contact of said other relay, the winding of said one relay and a source of current in series; a second circuit including only said indicating lamp, said control contact, a front contact of said other relay and said source of current in series; said first circuit having such high impedance that said indicating lamp will not be illuminated but said one relay will be operated to its energized position and said second circuit having substantially zero impedance exclusive of the resistance of said indicating lamp to result in illumination of said indicating lamp; whereby said indicating lamp is illuminated during closure of said second circuit but is extinguished during closure of said first circuit, and whereby irrespective of whether a single or a plurality of lamps with their control contacts in series and all connected in multiple are employed said circuits are alternately established by reason of alternate energization of the relays of said pair to cause operation of said relays and flashing of said indicating lamp or lamps to full brilliancy only during closure of said control contact or contacts.

4. In combination; one or more indicating lamps; a normally open control contact included in series with each of said lamps; a pair of relays one deenergizable by the shunting of its winding by a front contact of the other relay, and the other relay energizable through the front contact of said one relay; means for rendering said other relay slow dropping; a first circuit including one or more of said indicating lamps in multiple each having its respective control contact in series therewith, said winding of said one relay and a source of current in series; a second circuit including only one or more of said indicating lamps in multiple with their respective control contacts individually in series, a front contact of said other relay shunting the winding of said one relay and said source of current; said first circuit having such high impedance by reason of the impedance of said one relay that said indicating lamps will not be illuminated but said one relay will be energized to assume its energized position and said second circuit having substantially zero impedance exclusive of the impedance of said indicating lamps by reason of shunting of said one relay; whereby said indicating lamps are illuminated during establishment of said second circuit but are extinguished during establishment of said first circuit, and whereby said circuits are alternately established by reason of the alternate energization of said pair of relays to cause flashing of said indicating lamps only during closure of one or more of said control contacts, and whereby said lamps are energized by the full voltage of said source and without impedance voltage loss irrespective of the number of lamps connected in multiple.

5. In combination; a plurality of indicating lamps; a control contact included in series with each of said lamps, a first circuit including one or more of said lamps, with their respective control contacts in series all connected in multiple, a relay and a source of current; a second circuit including said one or more lamps in multiple with their respective control contacts individually in series therewith and a front contact of a second relay: said second relay when deenergized establishing said first circuit and when energized establishing said second circuit; an energizing circuit for said second relay including a front contact of said first relay, said first relay including means for when energized deenergizing said second relay; whereby said relays will be alternately energized when one or more of said control contacts are closed; said first circuit having sufficient impedance to prevent illumination of said lamps but allowing enough current to flow to effectively energize said first relay and said second circuit having substantially zero impedance exclusive of the resistance of said one or more lamps; whereby said one or more lamps will be flashed when one or more of said control contacts are closed and said lamps and relays will be deenergized if said control contacts are all open.

6. In combination; a plurality of indicating lamps; a control contact included in series with each of said lamps; a first circuit including one or more of said lamps, with their respective control contacts in series all connected in multiple, a full-wave rectifier and a source of current; a quick acting first relay connected to receive current from said rectifier; a second circuit including said one or more lamps with their respective control contacts individually in series all connected in multiple, and a front contact of a slow dropping second relay; said second relay when deenergized establishing said first circuit and when energized establishing said second circuit; and an energizing circuit for said second relay including a front contact of said first relay; whereby said relays will be alternately energized when any one or more of said control contacts are closed; said first circuit having sufficient impedance to prevent illumination of one or more of said lamps but allowing enough current to flow to effectively energize through the first relay through the medium of said rectifier, and said second circuit having substantially zero impedance exclusive of the resistance of said lamp or lamps; whereby said lamps will be flashed when one or more control contacts are closed and said relays and lamps will be deenergized if all of said control contacts are open, and whereby due to the provision of said rectifier the time characteristics of said first relay will be the same irrespective of whether said source is a direct current source or an alternating current source.

7. Flashing apparatus for flashing one or more of a plurality of indicating lamps at the same time comprising; a first relay included in a first circuit including one or more of such indicating lamps in multiple and a source of current; a second relay; contacts operated by said second relay for deenergizing said first relay and connecting such indicating lamps in multiple directly to a source of current when said second relay becomes energized; an energizing circuit for said second relay and including a front contact of said first relay, said first relay having sufficient impedance to prevent illumination of one or more of said lamps when said first circuit is closed; a control contact for each of said lamps included in series therewith; whereby said relays will be alternately energized if one or more lamps are connected to said flashing apparatus through the medium of their control contacts to cause flashing of said lamps to the same brilliancy irrespective of the number of lamps included in multiple in said first circuit and whereby when such lamps are again disconnected said relays become dormant.

8. A signal system including flashing mecha-

nism for producing interrupted current in indicating lamps comprising; a source of current; a first relay; a second relay; an out-put circuit including one or more of said indicating lamps in multiple and a winding of said first relay when said second relay is deenergized, but including such indicating lamp or lamps and excluding said first relay and including a front contact of said second relay when such second relay is in an energized condition and also in both instances including a source of current; and an energizing circuit for said second relay including a front contact of said first relay and a source of current; said first relay having sufficient impedance so that when it is included in series with said indicating lamps in said out-put circuit with said second relay deenergized such lamps will not be illuminated but such lamps will be illuminated upon the exclusion of the winding of said first relay due to the picking up of said second relay.

9. In combination; a plurality of indicating lamps, a control contact included in series with each such lamp; a first electro-responsive device; a first circuit including said first electro-responsive device, any given one or more of said lamps in multiple each including a control contact in series therein and a source of current; said first circuit by reason of the impedance of said first electro-responsive device having sufficient impedance not to illuminate said lamp or lamps but allowing sufficient current to flow to effectively energize said first electro-responsive device; a second circuit including said one or more lamps, with their respective control contacts in series and all connected in multiple and said source of current, and having substantially zero impedance exclusive of the resistance of said one or more lamps; said first electro-responsive device being operated to one position when said first circuit is closed and being operated to another position when said first circuit is opened; and a second electro-responsive device including a flashing contact and controlled by said first electro-responsive device to be effective upon intermittent energization and deenergization of said first electro-responsive device to alternately effectively energize and deenergize said second electro-responsive device to alternately cause said flashing contact to assume one position to establish said first circuit and assume another position to establish said second circuit; whereby said first electro-responsive device and said second electro-responsive device remain at rest so long as no control contact is closed but operate upon closure of one or more of said control contacts to illuminate said lamp or lamps intermittently to substantially the same brilliancy irrespective of the number of lamps included in multiple.

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