

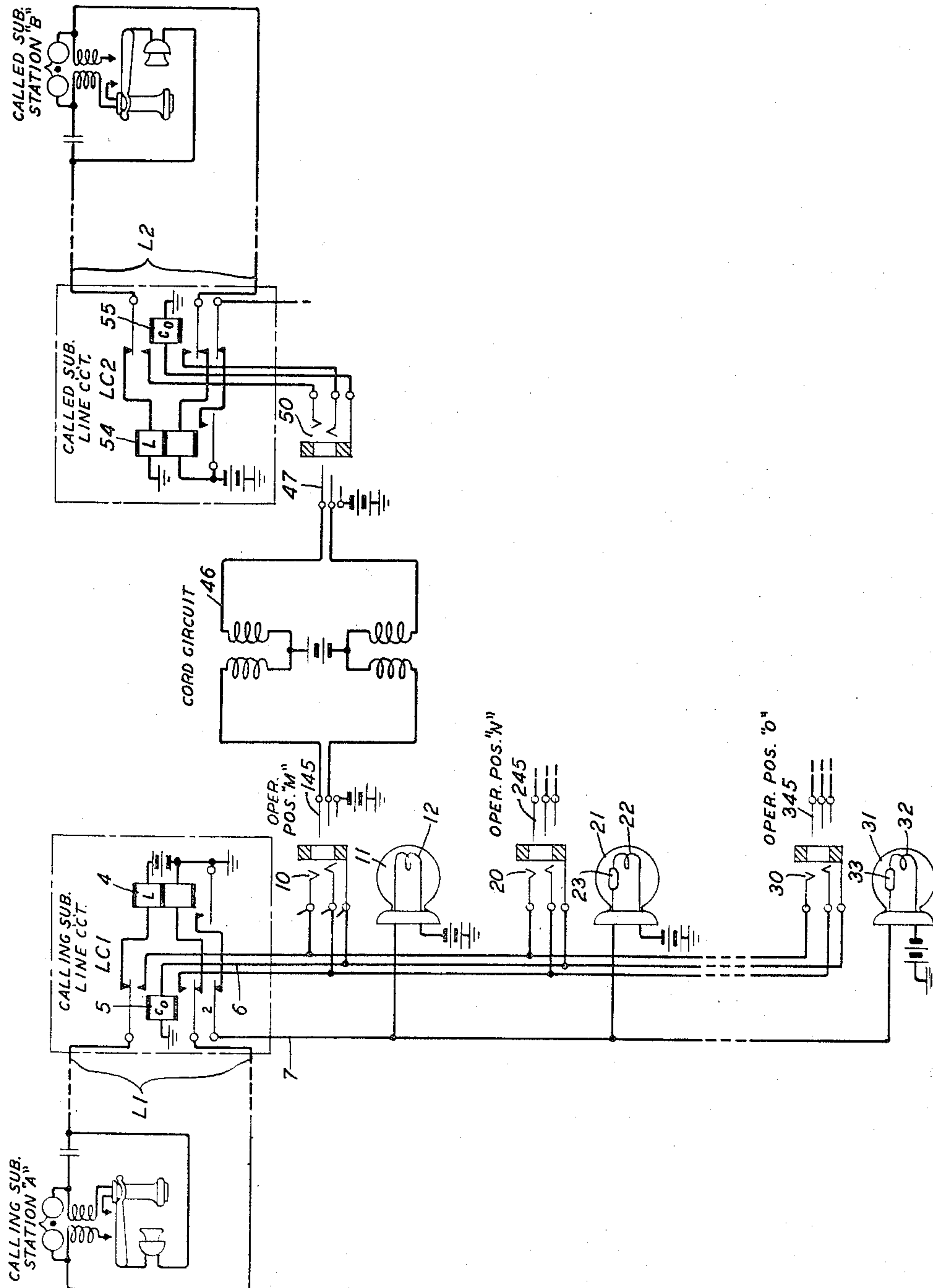
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DELAYED SWITCHBOARD LAMP SYSTEM

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DELAYED SWITCHBOARD LAMP SYSTEM

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1

This invention relates to electrical signaling and more particularly to signaling systems employing lamps or other devices for producing multiple signals.

The objects of the invention are to secure improved operation in electrical signaling; to effect the successive lighting of multiple answering lamps at manual telephone switchboards; and in general to improve the construction of signaling devices so as to increase the efficiency of the systems in which they are employed.

In the past it has been the practice in manual telephone systems to provide simultaneous lamp appearances in multiple switchboards for each subscriber's circuit. During the periods when the traffic on such switchboards is well within the capacity of the operators, there occurs what is known as "fighting for lights". For every call answered by an operator, several other operators make a start toward answering the same call. The wasted motion and nervous strain of these false starts tends to fatigue the operators and decreases their efficiency.

According to the present invention improvements are obtained in signaling systems of the above-mentioned character by successively delaying the lighting of the signal lamps associated with a subscriber's line thereby eliminating the simultaneous lighting of the lamps of a parallel group and the consequent "fighting for lights" by the operators.

A feature of this invention resides in equipping the filament circuits of the signal lamps with a resistor, such as boron, silver sulphide, or other material having a high negative temperature coefficient of resistance, the resistor being mounted in series with the filament, so that the lighting of the lamp is delayed until the resistor heats sufficiently to lower its resistance and allows adequate current to pass to light the lamp. Successive lighting of parallel appearance lamps is then obtained by varying the size, shape, or structure of the resistor at the individual lamps or even omitting it at one lamp of a multiple group. With this arrangement, it is possible to select resistors with varying heating intervals so that each successive lamp will light after a predetermined interval.

The foregoing and other features of this invention will be described more fully in detail in the following specification.

Referring to the drawing, each of the subscriber's lines such as the line L1 appears in the central office in a suitable connecting device. The line L1 is shown terminating in answering

2

jacks 10, 20 and 30, and is provided with an individual line relay 4 and cut-off relay 5. In addition the line L1 is provided with individual line lamps 11, 21 and 31 mounted in any suitable position before the operators. The operator's positions are equipped with the usual cord circuit such as cord 46.

The line lamps 11, 21, 31 comprise a glass bulb, a luminous filament, a resistor, and exterior terminals. The filament is sealed within the glass bulb and is connected in series with the resistor. This resistor may be either inside or outside the bulb but the preferable position is inside the bulb.

A brief description will now be given of the manner in which the system of the drawing operates. When the subscriber of line L1 removes his telephone receiver from the hook to initiate a call, a circuit is closed through the line relay 4 of the calling subscriber's line circuit LC1. This relay operates and closes a circuit from ground through its armature and contact, through the contact and armature 3 of the cut-off relay 5, the filament 12 of the line lamp 11 to battery, and the line lamp 11 lights to attract the attention of the operator at position M. The line lamps 21 and 31 do not light immediately since the resistors 23 and 33 have not had time to heat and the resistance is high so as to prevent the passage of sufficient current to light the lamps 21 and 31.

Assuming that the operator at position M is available, she answers the call by inserting the plug 45 of the cord 46 in the jack 30 of the calling line.

The insertion of the plug in the jack completes a circuit from battery through the sleeve of the plug 45 and jack 30, through the line C and the winding of the cut-off relay 5 to ground. The cut-off relay 5 operates and disconnects the line relay 4 from the subscriber's line. The line relay 4 releases and extinguishes the filaments of all the line lamps.

The operator completes the connection by inserting the plug 47 into the jack 50 of the called subscriber's line circuit LC2. This establishes a circuit from battery through the sleeve of the plug 47 and jack 50, through the cut-off relay 55 to ground. The cut-off relay operates and disconnects the line relay 54 from the called subscriber's line L2 so that any associated line lamps will not light when the called subscriber answers the call.

When the conversation is completed, the operator removes her cord circuit thereby permitting the cut-off relays to release and reconnect the line relays to the subscriber's circuit.

3

If the operator at position M does not answer the call within a reasonable interval, for example one second, the current through the resistor 23 will cause its temperature to rise and as the temperature rises the resistance drops. When the resistance has dropped sufficiently the increased current will light the lamp 21 thereby attracting the attention of the operator at position N. If the call remains unanswered at the end of the second interval, the line lamp 31 at operator position O, with the two-second delay will then light.

This procedure will continue until an available operator answers the call by inserting the plug of her cord circuit into an answering jack of the calling line in the manner described.

What is claimed is:

1. In a signaling system, the combination comprising a plurality of signaling devices, a plurality of resistors having a negative temperature coefficient of resistance each individually connected in series with a different one of said signaling devices, each of said resistors undergoing a different change in its current carrying characteristics when heated by current and being effective to delay the operation of said signaling devices, electrical circuits including said signaling devices and said resistors, and means for energizing said circuits whereby the operation of each of said signaling devices in succession is effected.

2. The combination in a signaling system of a plurality of signal lamps, a plurality of resistors having a negative temperature coefficient of resistance, each individually connected in series with a different one of said lamps, each of said resistors undergoing a different change in its electrical characteristics when heated by electric current and being effective to delay the illumination of the series connected lamp, electrical circuits including said lamps and resistors, and means for energizing said circuits in response to a signaling condition whereby the lighting of each of said lamps in succession is effected.

3. The combination in a signaling system of a plurality of lamps, said lamps comprising a plurality of glass bulbs, a plurality of filaments each within a different one of said glass bulbs, a plurality of resistance elements having a negative temperature coefficient of resistance each mounted within a different one of said bulbs and electrically connected in series with the said filaments, each of said resistance elements undergoing different changes in its electrical characteristics when heated by electric current and being effective to delay the illumination of the series connected filament, electrical circuits including the said filament and said resistance elements, and means operatively responsive to a signaling condition for supplying current to said circuits whereby the lighting of each of said lamps in succession is effected.

4. In a multiposition switchboard of a telephone system, a line, a plurality of answering lamps for said line, one lamp at each position, means individual to said line and operatively responsive to a calling condition for energizing the plurality of lamps individual thereto, and a plurality of resistance elements having a negative temperature coefficient of resistance each individ-

4

ually connected in series with a different one of said lamps, each of said resistance elements differing in its heating interval and being effective to delay the illumination of the lamp to which it is individual whereby the lighting of each of said lamps in succession is effected.

5. In a multiposition switchboard of a telephone system, a line, a plurality of multiple answering jacks and lamps for said line, one jack and lamp at each position, means individual to said line and operatively responsible to a calling condition for energizing the plurality of lamps individual thereto, a plurality of resistance elements having a negative temperature coefficient of resistance each individually connected in series with a different one of said lamps, each of said resistance elements differing in its heating interval and being effective to delay the illumination of the series connected lamp, whereby the lighting of each of said lamps in succession is effected, and means at each switchboard position for answering incoming calls.

6. In a multiposition switchboard of a telephone system, a line, a plurality of multiple answering lamps for said line, one lamp for each position, said lamps comprising a plurality of glass bulbs, a plurality of filaments, each within a different one of said bulbs, and a plurality of resistance elements having a negative coefficient of resistance each mounted within a different one of said bulbs and connected in series with the said filaments, each of said resistance elements differing in its heating interval and being effective to delay the illumination of the series connected filament, means individual to said line and operatively responsive to a calling condition for energizing the plurality of lamps individual thereto whereby the lighting of each of said lamps in succession is effected.

7. In a multiposition switchboard of a telephone system, a line, a plurality of multiple answering jacks and lamps for said line, one jack and lamp for each position, said lamps comprising a plurality of glass bulbs, a plurality of filaments each within a different one of said bulbs, and a plurality of resistance elements having a negative temperature coefficient of resistance, each mounted within a different one of said bulbs and connected in series with the said filaments, each of said resistance elements differing in its heating interval and being effective to delay the illumination of the series connected filament, means individual to said line and operatively responsive to a calling condition for energizing the plurality of lamps individual thereto whereby the lighting of each of said lamps in succession is effected, and means at each switchboard position for answering incoming calls manifested by the lighting of its position lamps.

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