

March 11, 1952

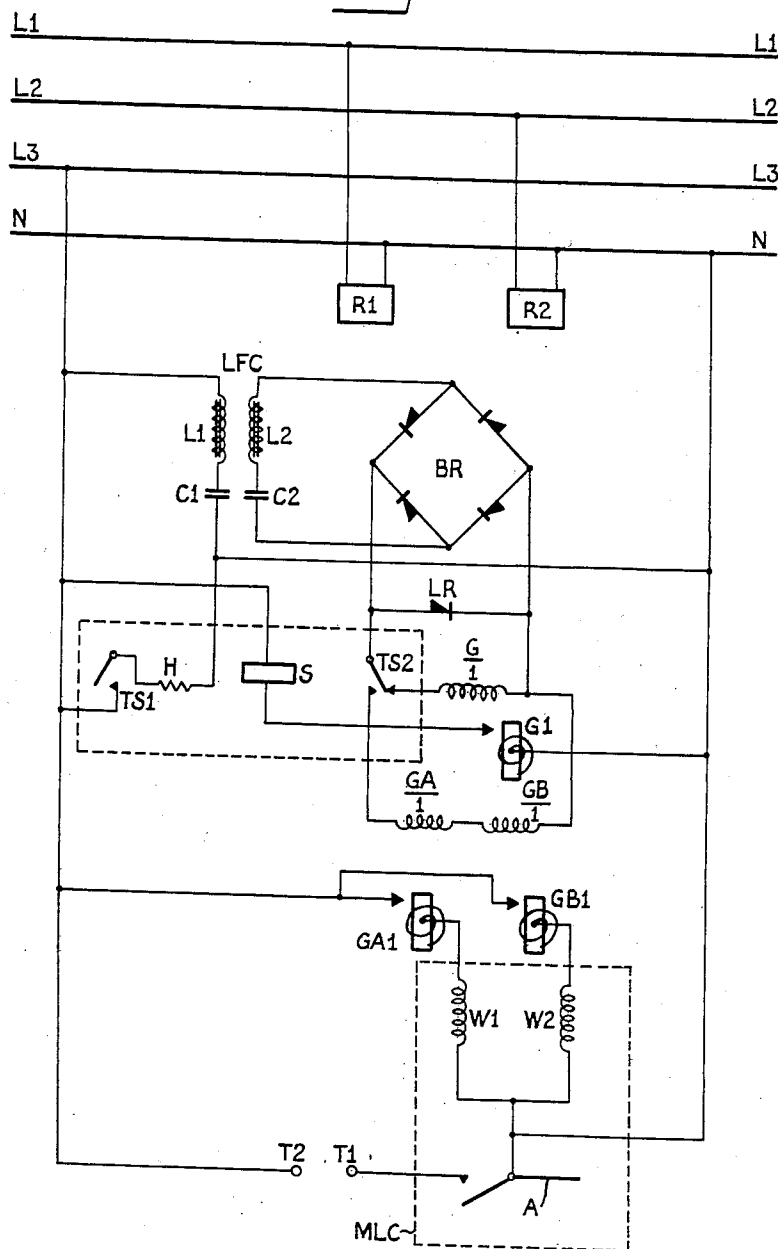
P. N. ROSEBY
ELECTRICAL SIGNALING SYSTEM

2,588,767

Filed April 8, 1946

2 SHEETS—SHEET 1

Fig. 1



.INVENTOR

PHILIP N. ROSEBY

By: *Young, Emery & Thompson*
Atty's.

March 11, 1952

P. N. ROSEBY

2,588,767

ELECTRICAL SIGNALING SYSTEM

Filed April 8, 1946

2 SHEETS—SHEET 2

Fig. 2

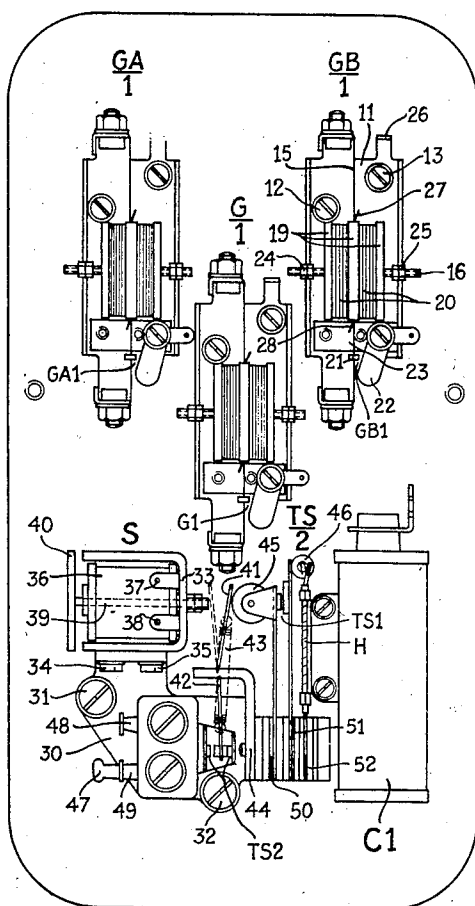
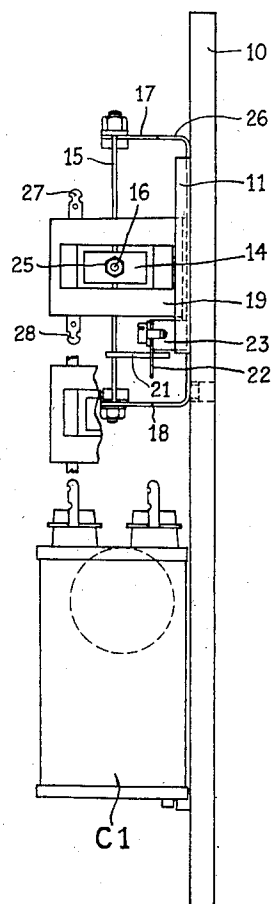


Fig. 3



Inventor
Philip N. Roseby
By Young, Emery & Thompson
Attys.

UNITED STATES PATENT OFFICE

2,588,767

ELECTRICAL SIGNALING SYSTEM

Philip Norton Roseby, Liverpool, England, assignor to Automatic Telephone & Electric Company Limited, Liverpool, England, a British company

Application April 8, 1946, Serial No. 660,333
In Great Britain May 19, 1945

2 Claims. (Cl. 177—353)

1
The present invention relates to electrical signalling systems and apparatus for use therein and is more particularly concerned with systems of the type in which signalling is effected by the use of high frequency currents superimposed on electric supply mains. It will be understood that the expression "high frequency currents" as used herein implies that the currents concerned are of a frequency which is high compared with the power frequency, for instance, audio frequency, and is not intended to be limited to high frequency currents as normally understood in the radio art.

Systems of this general type are already well known and an example is disclosed in British Patent No. 566,122, in which the arrangements are such that signals intended to produce different effects all comprise currents of the same high frequency to which the responding equipment is tuned but the different effects are produced by interrupting these currents with a characteristic rhythm or cadence which is different for each signal. The above-mentioned specification moreover is concerned with a system in which in order to reduce the possibility of false operation by parasitic currents, each operative signal is preceded by a preliminary signal of a different cadence, the effect of which is to render the equipment responsive to the operative signals subsequently transmitted. The preliminary signal is transmitted for a sufficient length of time to operate a thermal switch which then effects the necessary circuit change-over and the operative signal is then transmitted while the circuits remain in this condition during the cooling period of the thermal switch.

It has been found in practice that with an arrangement of this type the operating period of the thermal switch may not be sufficiently definite as it is dependent on the closing of the heating circuit intermittently by a relay of the galvanometer type and the chief object of the present invention is to produce an arrangement which shall be more reliable in operation while working on the same general principles and giving as good or better protection against parasitics.

According to one feature of the invention in an electrical signalling system employing high frequency currents superimposed on electric supply mains, false operation by parasitic currents is prevented by arranging that the equipment which responds to the characteristic signal corresponding to the switching operation it is

2
desired to produce is only rendered effective on the receipt of a preliminary signal of different characteristics and is then rendered ineffective after a predetermined interval.

According to another feature of the invention in an electrical signalling system employing high frequency currents superimposed on electric supply mains, in response to a preliminary signal of different characteristics from those of the signal producing the desired switching operation the equipment for responding to the said operative signal is rendered effective and remains in that condition for a predetermined time independent of any further transmission of the preliminary signal.

A further feature of the invention is that in a responding unit for use in electrical signalling systems employing high frequency currents superimposed on electric supply mains, equipment responsive to a preliminary signal of different characteristics from those of any signals employed for effecting switching operations is arranged on operation to render effective equipment adapted to respond to one or more operative signals and to initiate the operation of a timing device which after a predetermined time renders ineffective the equipment responsive to operative signals.

The invention will be better understood from the following description of one method of carrying it into effect which should be taken in conjunction with the accompanying drawings, comprising Figs. 1 to 3. Fig. 1 is a circuit diagram of a single responding unit while Figs. 2 and 3 show respectively front and side elevations of a responding unit in accordance with the invention.

Considering first the circuit arrangement of Fig. 1, it is assumed that signalling is being effected over a three-phase four-wire network with line conductors L1—L3 and neutral conductor N. The method of applying the signalling currents is assumed to be such that the signalling currents appear at substantially equal strength on the different phase leads so that the responding units may be connected to any one of these leads as is most convenient. It will be seen that the responding unit illustrated is connected between the phase lead L3 and the neutral conductor N and the signalling currents are supplied to an acceptor type filter LFC comprising an inductor L1 and capacitor C1 in the primary circuit and an inductor L2 and capacitor C2 in the secondary circuit, the inductors being loose-

3

ly coupled and the values of the components being chosen so that a broad tuning effect is obtained to the signalling frequency. From the secondary circuit connection is extended to a rectifier bridge BR, the output of which is shunted by a further rectifier LR which serves for limiting purposes and avoids any danger of the equipment being damaged by strong signalling currents such as may be received by a responding unit located in close proximity to the transmitting point. The incoming signalling energy is then fed over normally closed contacts TS2 to the winding G of the oscillating movement responsive to the preliminary signal.

Each of the three oscillating movements G, GA and GB is of the general type disclosed in British Patent No. 518,877, and comprises essentially a length of wire carrying one or more permanent magnets which is located in the field of an operating coil to which the rectifier signalling currents are fed. The magnets are loaded so as to oscillate at a predetermined frequency which will be different for each switching operation catered for, and when the oscillations attain a given amplitude a suitable contact closure is effected.

Accordingly when the preliminary signal is received, the movement G responsive thereto is set in operation and after a short interval closes its contacts G1 thereby energising the electromagnet S from the mains. As will be more clearly understood from the description of the actual construction as shown in Figs. 2 and 3, the energisation of magnet S changes over contacts TS1 and TS2 and these contacts then remain in the operated position until they are restored by means of a thermal switch. The closing of contacts TS1 energises the heating coil H of the switch TS whereby the movement of a bimetallic strip is initiated. Contacts TS2 disconnect the winding G and connect up in its place windings GA and GB in series. These are assumed to control complementary switching operations, for instance, the switching on and off of street lights in response to signals of different rhythms or cadences. The preliminary signal persists for a short time only and thereafter the operative signal is transmitted and this will be assumed to be of such rhythm as to operate effectively the movement having the winding GB. When the signal has persisted for long enough to build up the necessary oscillation of the associated movement, contacts GB1 close and a circuit is completed for the right-hand coil W2 of the mechanically-locking contactor MLC. Thereupon the mains are connected over the armature A to the terminals T1 and T2 to which the load is assumed to be connected so that in this case the street light is switched on. Shortly thereafter the thermal switch completes its operation and restores the contacts TS1 and TS2 to their original position thereby disconnecting the heating coil H and hence even if the operative signal persists, no further effect is produced on the responding equipment since this signal will not be of a suitable rhythm to operate the unit G.

When it is desired to switch the lights off, the preliminary signal is again sent whereupon contacts G1 close and energise magnet S. The thermal switch is then set in operation and coils GA and GB are connected up and in this case the rhythm of the following operative signal will be such as to have the effect of closing contacts GA so that the left-hand winding W1 of the contactor is energised and thus the armature is re-

4

stored to the position shown in which the load is disconnected.

A detailed description will now be given of a suitable mechanical construction for the responding unit as shown in Figs. 2 and 3, Fig. 2 being a front elevation and Fig. 3 a side elevation in which the apparatus which is situated on the back of the base plate has been omitted.

On the front of the insulating base plate 10 are mounted the three oscillating movements or rhythm relays G, GA and GB together with the electromagnet S, thermal switch TS, and capacitor C1. The remaining components are mounted on the back of the base plate for instance in the general manner disclosed in British Patent No. 524,685.

Considering now a rhythm relay such as GB in more detail, it is assembled on an individual metal base 11 which is secured to the main base plate 10 by screws such as 12 and 13, and has a galvanometer type movement involving a pair of small permanent magnets such as 14, which are clamped with like poles adjacent on opposite sides of a stretched wire 15 by means of a pair of nuts (not shown) which are carried on the screwed rod 16 through a central hole in which the stretched wire extends. The wire 15 may comprise a strip of rustless material such as nickel-chromium alloy, and is secured at each end to two projecting lugs 17 and 18 on the base plate 11. Also secured to the base plate 11 is a synthetic resin coil former 19 which carries the energising coil 20, the wire 15 extending freely through suitable holes in the sides of the former 19. The stretched wire carries near to its lower end an electric contact-making member 21 which is adapted, when the oscillating movement attains its full amplitude to effect electrical connection with the adjustable fixed contact member 22 which is mounted on a block 23 secured to the base 11, the pair of contacts 21 and 22 also being together designated contacts GB1. Tuning of the relay to the required rhythm is effected by means of adjustable balance weights in the form of nuts such as 24 and 25 which are carried on the rod 16. Electrical connection with the moving contact 21 is had via the wire 15, lug 17 and tag 26 on the base 11, while connection with the coil 20 is had via wiring tags 27 and 28.

The electromagnet S and thermal switch TS are mounted on a common base-plate 30 which is secured to the main base plate 10 by screws such as 31 and 32. The U-shaped yoke 33 of the electromagnet is secured to a projecting lug on the base plate 30 by screws 34 and 35 and carries the coil 36 which is provided with wiring tags 37 and 38. Through the hollow core of the coil extends the plunger 39 which terminates at one end in a circular magnetic plate 40 which is attracted towards the yoke when the coil is energised. The other end of the plunger is normally in engagement with the upper blade 41 of a pair of blades 41 and 42 which, by virtue of the helical linking spring 43 are urged into V notches in the horizontal upper portion of the bracket 44 so as to cause them to function with a toggle action. The lower blade 42 is provided with contacts and forms the moving element of the changeover spring set TS2. The upper blade 41 on being moved over from its normal position (shown dotted) to the operated position, engages with the roller 45 of the moving spring of the spring set TS1 and so closes these contacts, whereupon an electric circuit is completed to the thermal switch heater winding

5

H which is wound on a bi-metal strip. At the same time contacts TS2 are operated to connect relays GA and GB to the tuned circuit. The heater H in due course causes the bi-metal strip to deflect to the left and in so doing to carry with it the spring set TS1 via the intermediary of the insulating buffer 46. The upper toggle switch blade 41 is also moved until it passes its dead centre position with respect to the lower blade 42, whereupon the blade 41 will snap over into the normal position shown dotted. The contacts TS1 and TS2 will then be restored to their normal positions and the circuit to the heater winding H of the thermal switch TS will be opened and the preliminary rhythm relay G will be reconnected to the tuned circuit. Electrical connection to the contacts TS2 and TS1 and to the heater H is had via wiring tags 47-52.

The invention therefore provides a very simple and compact construction of responding unit which may be made extremely sensitive to signalling currents and yet highly selective so as to respond only to those intended for its operation.

I claim:

1. In an electrical signalling system for effecting the remote control of a plurality of devices by high frequency currents superimposed on electric supply mains, first means associated with each device and responsive to signalling currents of one character, second means associated with each device and responsive to signalling currents of a different character, an electromagnet energized on the operation of said first means, a blade pivoted about one end, means operated by said electromagnet for moving said blade about its pivot, a second blade substantially in line with said first blade and pivoted about its end adjacent to the pivot point for said first blade, a tension spring connecting said blades substantially along the line of their length whereby when said first blade is moved by said electromagnet said second blade will move past its dead center position, means operated by said first blade for energizing a thermally operated switching means, contacts carried by said second

6

blade for disconnecting said first responding means and connecting up said second responding means, and means operated by said thermally operated switching means for moving said first blade back to its original position whereby said thermally operated switching means is deenergized and said second blade is moved to connect up said first responding means again in place of said second responding means.

2. In an electrical signalling system for effecting the remote control of a plurality of devices by high frequency currents superimposed on electric supply mains, first means associated with each device and responsive to signalling currents of one character, second means associated with each device and responsive to signalling currents of a different character, an electromagnet energized on the operation of said first means, first contacts operated by said electromagnet for disconnecting said first means and connecting up said second means and second contacts controlled by said electromagnet for energizing thermally-operated switching means, said thermally-operated switching means being arranged to restore said first and second contacts to their original condition after a predetermined time, said means responsive to signalling currents comprising a permanent magnet supported on a stretched wire so as to be capable of torsional oscillations, a coil encircling said magnet, circuit arrangements for feeding signalling currents to said coil, and contacts operated when said magnet attains a predetermined amplitude of swing.

PHILIP NORTON ROSEBY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,714,967	Wensley	May 28, 1929
2,131,164	Chauveau	Sept. 27, 1938
2,255,162	Hart	Sept. 9, 1941
2,394,786	Korneke	Feb. 12, 1946