Dec. 19, 1950 A. C. KELLER 2,534,354

PLUG-IN MAGNETIC SWITCH HOUSING

Filed Oct. 8, 1947

FIG. 2

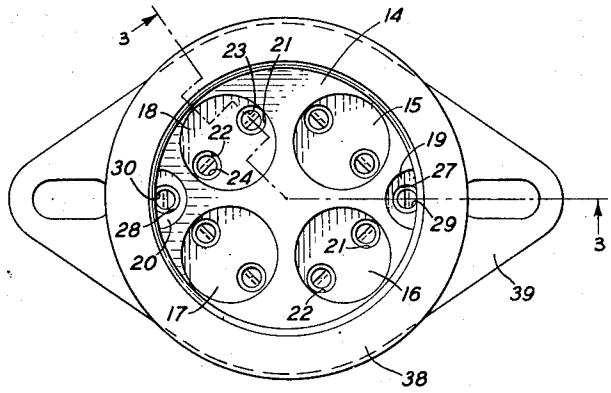


FIG. 1

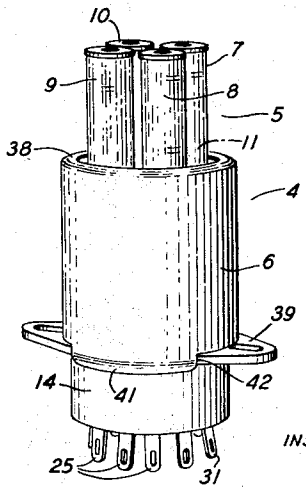


FIG. 3

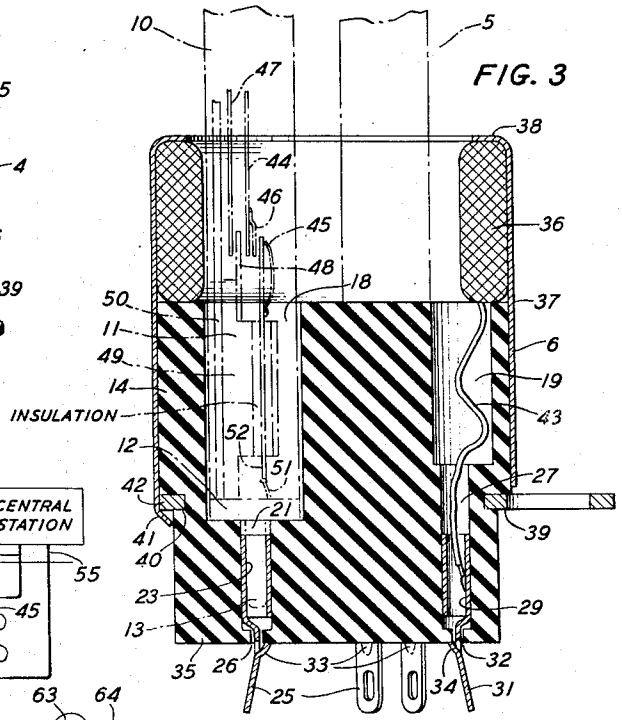
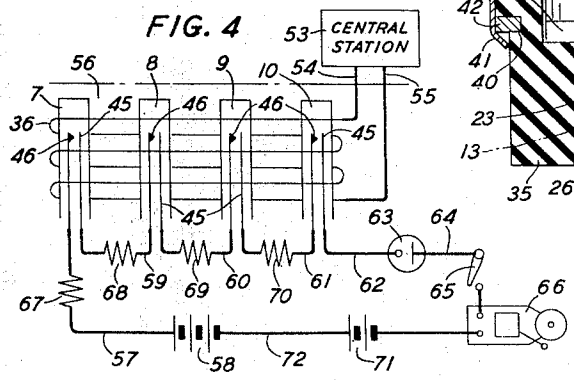


FIG. 4



INVENTOR
A. C. KELLER
BY J. MacDonald
ATTORNEY

Patented Dec. 19, 1950

2,534,354

UNITED STATES PATENT OFFICE

2,534,354

PLUG-IN MAGNETIC SWITCH HOUSING

Arthur C. Keller, Bronxville, N. Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N. Y., a corporation of New York

Application October 8, 1947, Serial No. 778,524

1 Claim. (Cl. 200—87)

1

This invention relates to electrical relays or selectors and more particularly to electrical relays or selectors operable for use as selector devices in a signaling system.

The object of the invention is to provide a selective relay which will operate in a required manner when signal currents of a plurality of different predetermined frequencies are applied to the relay.

A feature of the invention resides in an operating unit for a plurality of electrical switch devices, the operating unit having a coil common to the plurality of switch devices.

In the drawings:

Fig. 1 is a view in perspective of an electrical relay embodying the invention;

Fig. 2 is an enlarged top plan view of the relay shown in Fig. 1;

Fig. 3 is a view, in vertical cross-section, of the relay and taken on the lines 3—3 in Fig. 2; and

Fig. 4 is a schematic illustration of an electrical signaling system in which the relay of this invention is included.

In selective signaling systems and apparatus employed in selectively signaling substations from a central station the selective signaling may be accomplished, in part, by sending out from a central station signaling currents of a plurality of different predetermined frequencies. Each substation may be provided with a plurality of switch devices each of which is sensitive to and operable to close contacts when signaling currents of a predetermined frequency are received at the substation. Each switch device at a substation may be sensitive to signaling currents of a frequency different from the frequency to which another switch device is sensitive and each switch device may be provided with its own operating coil. The switch devices and their individual operating coils require considerable space at a substation for their accommodation. The space available at a substation for accommodation of the switch devices and their operating coils may be quite limited.

In my invention the electrical relay comprises a plurality of switch devices and a single operating unit common to the switch devices.

As shown in Fig. 1 the relay 4 of this invention comprises a set 5 of switch devices and an operating unit 6 for and common to the switch devices in the set 5. Four switch devices are shown in the set 5 but the invention is not limited to this number since a smaller or larger number of switch devices might be employed without de-

2

parting from the spirit of the invention. It will be assumed, however, merely for example, that the set 5 comprises the switch devices 7, 8, 9 and 10.

Each switch device 7, 8, 9 and 10 comprises a tubular casing 11 equipped at one end as shown in Fig. 3 with a base 12 in which paired pin-type terminals 13 are mounted in spaced relation, the pin-type terminals 13 projecting downwardly from the base 12. Within the casing 11 is an electromagnetically operable switch structure having a vibratile contact carrying element operable at a predetermined frequency to close and open contacts in the switch device during part of each operating cycle of vibration. Each switch device 7, 8, 9 and 10 is operable at a different frequency from another of the switch devices in the set 5.

The switch devices 7, 8, 9 and 10 are removably supported in the operating unit 6 which comprises an insulating body 14 having spaced recesses 15, 16, 17 and 18 formed therein to receive respectively the switch devices 7, 8, 9 and 10. Spaced recesses 19 and 20 are formed in the insulating body 14 for a purpose to be later explained. The base of each recess 15, 16, 17 and 18 is apertured at spaced points 21 and 22 to accommodate tubular terminals 23 and 24 respectively, each of which has an apertured tab portion 25 extending through an aperture 26 in the lower end of the insulating body 14. The base of each recess 19 and 20 is apertured at 27 and 28 respectively to accommodate tubular terminals 29 and 30 each of which has an apertured tab portion 31 extending through an aperture 32 formed in the lower end of the insulating body 14. Each tab portion 25 and 31 is provided with an offset tongue 33 and 34 respectively to engage the lower end 35 of the insulating body 14 to prevent upward movement of the tubular terminals in the insulating body 14.

The insulating body 14 forms a support for the switch devices 7, 8, 9 and 10 which may be thrust endwise into the respective recesses 15, 16, 17 and 18 in the insulating body 14 and so that each of the paired pin-type terminals 13 enters and frictionally engages a tubular terminal. For instance, when the switch device 10 is thrust endwise into the recess 18 one of the pair of pin-type terminals 13 on the switch device 10 enters and frictionally engages the tubular terminal 23, the tubular terminal 24 in the recess 18 being entered and frictionally engaged by the other pin-type terminal 13 on the switch device 10.

Supported on the top of the insulating body 14

is an operating coil 36 to provide means by which the vibratile elements of the switch devices 7, 8, 9 and 10 may be made to vibrate. The operating coil 36 is dimensioned to surround the set 5 of switch devices 7, 8, 9 and 10 and is held in place on top of the insulating body 14 by means of a tubular casing 37. A portion of the tubular casing 37 extends downwardly about a portion of the insulating body 14 and another portion of the tubular casing 37 extends upwardly about the operating coil 36. The upper end of the tubular casing 37 is bent inwardly over the upper end of the operating coil 36 as shown at 38. An apertured mounting bracket 39 is supported on the insulating body 14 and extends into a groove 40 formed in the insulating body 14. Flange portions 41 of the tubular casing 37 extend over outer edge portions 42 of the mounting bracket 39 and are bent inwardly under the mounting bracket 39 to prevent upward movement of the tubular casing 37 relative to the insulating body 14.

The operating coil 36 is provided with a pair of lead wires 43, one of which extends downwardly through the recess 19 and into the aperture 27 to the tubular terminal 29, the lead wire 43 extending into the aperture 27 being electrically connected to the tubular terminal 29. The other lead wire 43 extends through the recess 20 and is electrically connected to the tubular terminal 30.

Each switch device 7, 8, 9 and 10 as shown in Fig. 3 comprises a vibratile member 44 operable at a predetermined frequency and relative to a contact 45. The vibratile member 44 may carry a contact piece 46 to make contact with the contact 45 when the vibratile member 44 is set in vibration. The vibratile member 44 may be part of a tuning fork and form one of the tines of the tuning fork, the other tine being a vibratile member 47. The vibratile members 44 and 47 are magnetically operable under influence of the operating coil 36 and are disposed on opposite sides of a pole-piece 48 extending from a permanent magnet 49 mounted on a non-magnetic but electrical conducting bar 50 supported on the base 12. The permanent magnet 49 and its pole-piece 48 produce a magnetic field in the vicinity of the free ends of the vibratile members 44 and 47. The conducting bar 50 is in electrical connection with one of the pin-type terminals in the pair 13. The other pin-type terminal in the pair 13 is in electrical connection through a conductor 51 with a conducting plate 52 which is in electrical connection with the contact 45. The conducting plate 52 is insulatingly mounted on the permanent magnet 49 and is provided with an opening through which the contact piece 46 may pass to engage the contact 45.

It will be seen that the operating coil 36 extends around those parts of the switch devices 7, 8, 9 and 10 in which the magnetic field prevails and in which the contacts 45 and 46 and pole-piece 48 are located. Energization of the coil 36 will therefore affect in some measure the magnetic field in each of the switch devices 7, 8, 9 and 10. When the operating coil 36 is energized with curent of a frequency corresponding to the frequency to which a particular switch device in the set 5 is tuned the switch device tuned to that frequency will operate to successively close and open the contacts 46 and 45. The vibratile elements in the switch devices not tuned to that frequency will not operate to close and open their contacts. The operating coil 36 may be simultaneously energized with currents of different frequencies corresponding to the frequencies required to operate a plurality of the switch devices in the set 5.

Assuming that each switch device in the set 5 is tuned to operate at a frequency different from another switch device in the set 5 and that the operating coil 36 is simultaneously energized with currents of frequencies corresponding to the frequencies required for operation of all switch devices in the set 5 the switch devices in the set 5 will all be operated to close and open their contacts.

As shown in Fig. 4 the electrical relay of this invention may serve as a selective relay in a signaling system in which a central station 53 has conductor lines 54 and 55 leading to a substation 56 in which apparatus shown below the dot-dash lines in the figure is provided. In this case the switch devices 7, 8, 9 and 10 and the operating coil 36, above described, are located at the substation 56. Contact 46 in the switch device 7 is in connection through a conductor 57 with a source of current supply 58. Contact 45 in switch device 7 is in connection with contact 46 in switch device 8 through a conductor 59. Contact 45 in switch device 8 is in connection with contact 46 in switch device 9 through a conductor 60, contact 45 in switch device 9 is in connection with contact 46 in switch device 10 through a conductor 61 and contact 45 in switch device 10 is in connection through a conductor 62 with the gas tube 63, the plate element of which is connected by conductor 64 to a telephone switch hook 65 controlling a bell signal 66. The conductors 54 and 55 extending from the central station 53 are in connection with the operating coil 36 at the substation 56.

Although the central station 53 is shown in Fig. 4 as being in connection with substation 56 through a wire system it is to be understood that signaling between the central station 53 and the substation 56 may be by radio transmission. When the central station 53 sends out signaling current of a frequency corresponding to the frequency required for operation of a switch device in the set 5 and the signaling current of that frequency energizes the operating coil 36, the switch device tuned to that frequency will operate to close and open its contacts.

When the central station 53 simultaneously sends out signaling currents of a plurality of frequencies and corresponding to the frequencies to which the switch devices in the set 5 are tuned the switch contacts of all the switch devices in the set 5 will close and open and this closing and opening of the contacts will be repeated periodically during the energization of the switch devices. During the operation of the switch devices there will occur a coincidence of closing of all the contacts in the switch devices in the set 5 to complete a circuit to and through the gas tube 63 as follows: battery 58, conductor 57, resistance 67, contacts 46 and 45 of switch device 7, resistance 68, conductor 59, contacts 46 and 45 of switch device 8, resistance 69, conductor 60, contacts 46 and 45 of switch device 9, resistance 70, conductor 61, contacts 46 and 45 of switch device 10, conductor 62, gas tube 63, conductor 64, switch hook 65 (closed), bell signal 66, battery 71, conductor 72 to battery 58. When the contacts in the switch devices 7, 8, 9 and 10 coincidentally close and the gas tube 63 is fired the bell signal 66 operates to indicate that the substation 56 is being called by the central station 53.

If other substations are included in the system

and these substations are equipped with the selective relay of this invention the selective relay at each substation may be made to be operative under a different combination of signals from those assigned to other substations simply by having the switch devices in the set **5** at each substation constructed to operate on signaling currents of frequencies different from the set of frequencies assigned to any other substation.

Under certain conditions in which it is found important to reduce erosion of contacts in the switch devices, resistances are sometimes provided in series with the contacts in the switch devices. The resistances **67**, **68**, **69** and **70** shown in Fig. 4 may be of a relatively low wattage type and connected directly to the contacts in order to avoid in some measure the capacity of the parts of the unit and prevent make contact erosion due to discharge of this capacity.

The switch devices in the set **5** have been shown as being of a type in which a single make contact is provided, the contact being made once for each cycle of operation of the vibratile element. Two contacts might be provided, however, for each vibratile element, one contact being disposed near one side of the vibratile element and the other contact being disposed near the other side of the vibratile element. In this case a make contact would occur once for each half cycle of operation of the vibratile element.

What is claimed is:

An electrical relay comprising an insulating base member having longitudinally extending bores therein, terminals located in the bottom of said bores, said terminals being tubular in

configuration and having a portion thereof extending beyond the bottom surface of said base member, switching devices comprising tubular housings containing electromagnetically operable contacts, removably mounted in said bores and having pin terminals thereon in engagement with said tubular terminals, an electrical energizing coil surrounding said switching devices and positioned on the top of said insulating base member, a mounting plate member positioned on said base member and having ears projecting therefrom for securing the relay to a support, a tubular metallic casing surrounding said coil and a portion of said base member for holding said coil in position, the upper portion of said casing embracing the upper surface of said coil and the lower portion in engagement with the underside of said mounting plate, and terminals on said base member electrically connected to said coil.

ARTHUR C. KELLER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
388,092	Rysselberghe	Aug. 21, 1888
2,152,955	Coyne	Apr. 4, 1939
2,187,115	Ellwood et al.	Jan. 16, 1940
2,289,830	Ellwood	July 14, 1942
2,348,088	Nicholas et al.	May 2, 1944
2,368,953	Walsh	Feb. 6, 1945
2,420,232	Deal	May 6, 1947
2,451,810	Cohen	Oct. 19, 1948