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ELECTRIC CIRCUIT TRACER

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Fig. 1

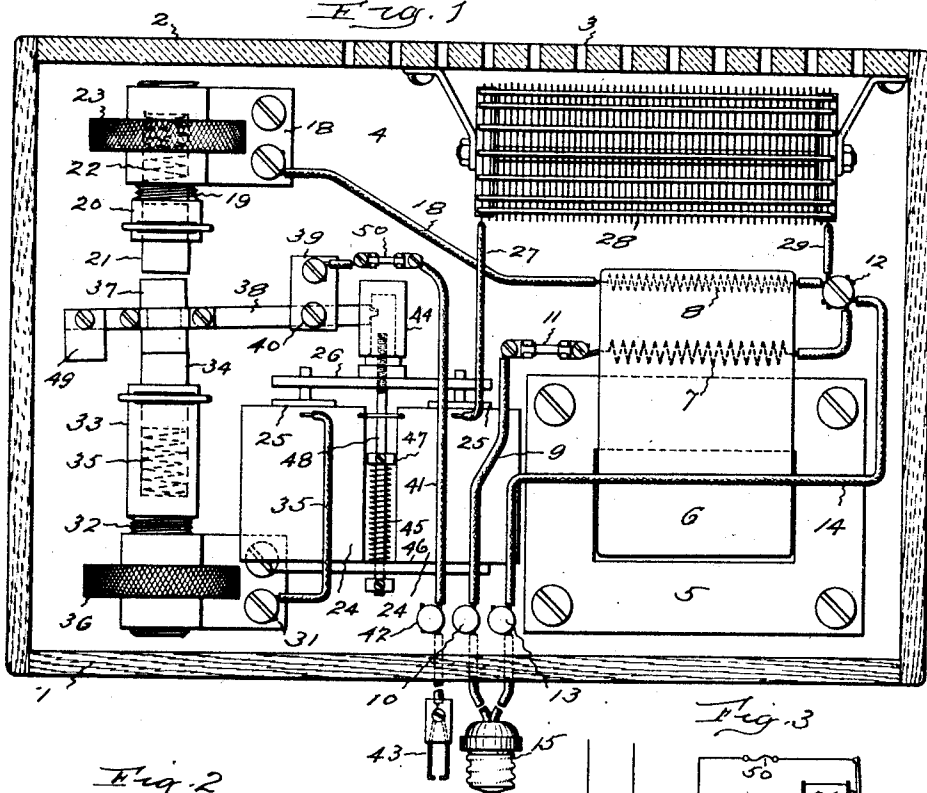


Fig. 2.
Service

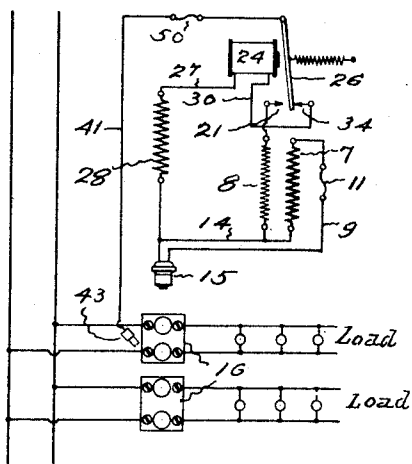
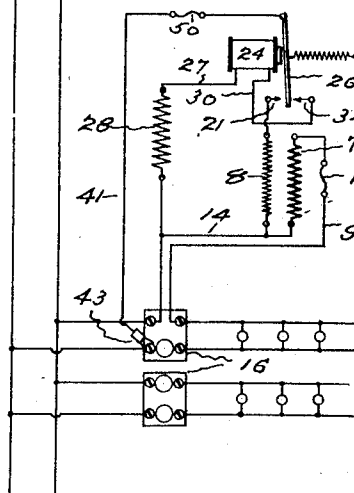


Fig. 3



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ELECTRIC-CIRCUIT TRACER.

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This invention relates to means which are designed for the use of wire inspectors, contractors, installers and others interested in tracing concealed electrical circuits, that is, in ascertaining what lamps, heaters, motors or other electrical apparatus or implements are on a particular circuit.

The object of the invention is to provide an inexpensive device for this purpose which is easily transported and simple to use and that will give a visual indication of what apparatus or implements are in the circuit to which it is applied without interrupting or interfering with the supply of current to the load on that circuit.

This object is attained by arranging in a portable box, a transformer and a magnetic circuit control, with suitable resistance and ample protecting means, and means for introducing the transformer in series with a line and the control across the line or other source of current, whereby when the proper connections are made with a circuit there will be a variation of the voltage of the circuit which will cause a distinguishable effect in the action of the apparatus or implements in that circuit, but not in any other circuit connected with the same mains.

In the accompanying drawings Fig. 1 shows a vertical section of the box provided with one arrangement of means for accomplishing the object of this invention. Fig. 2 is a diagram of the elements and their connections in the relative positions occupied before being connected with the circuit to be traced. Fig. 3 is a diagram showing the apparatus connected with a circuit, the armature of the magnet oscillating between the contacts of the control and one winding of the transformer.

The case or box 1 may be made of wood or any other suitable material. The top 2 of the box is desirably made of an insulating compound with perforations 3 for allowing ventilation, while the front of the box preferably is an insulating panel 4 with the active elements fastened thereon.

The transformer is a common type comprising a core 5 and windings 6. For the purpose of illustration the output winding is indicated by 7 and the input winding is indicated by 8. The output winding 7 is designed to be connected in series with the load on the circuit to be traced and it has sufficient capacity to carry the full current flowing in the circuit, that is, the impedance

of this winding is such that no appreciable loss of power occurs by introducing it into the circuit. In the particular embodiment of the invention illustrated one terminal of the output winding is connected by a wire 9 with a binding post 10 on the front panel, a fuse 11 of common type being inserted in this connection for the purpose of protection. The other terminal of the output winding is connected with a post 12 leading from which to the binding post 13 on the front panel is a wire 14. The opposite sides of a common plug 15 are removably attached to these posts. In approved light and power circuits there are cutouts, these being represented in the diagrams by 16. When the tracer is to be used one of the cutouts, which may be a fuse plug, is removed and the plug connected with the output winding of the transfer is inserted in its place, thus putting this winding in series with the load on that circuit. The tracer plug could, of course, be inserted in a lamp socket if there was no fuse socket.

The input transformer winding 8 which is indicated as having greater resistance than the output winding, is adapted to be connected with a source of electrical energy, preferably across the circuit to be traced, and the energy of this winding is controlled by means of a vibratory circuit make and break. One terminal of the input winding is connected with the post 12 that, as above described, is electrically connected with the plug 15. The other terminal of the input winding is connected by wire 17 with a conducting plate 18 fastened to the front panel. This plate is in electrical engagement with a screw 19 that carries a sleeve 20 holding a carbon contact 21. A spring 22 is arranged in the sleeve to cushion the contact. Connected with the screw is a finger nut 23, by turning which the exact position of the end of the carbon contact may be determined.

The make and break illustrated includes an electromagnet shown as having two connected coils 24 with cores 25 and armature 26. One terminal of the magnet winding is connected by wire 27 with one end of a resistance 28 of known type, that is fastened to the top of the box. The other end of the resistance is connected by wire 29 with the post 12 that, as above stated, is connected with one side of the attachment plug 15. The other terminal of the magnet winding is connected by a wire 30 to a conducting plate

31 attached to the front panel. This plate is in an electrical engagement with a screw 32 that carries a sleeve 33 which holds a carbon contact 34. A spring 35 is arranged in the sleeve to cushion this contact. Connected with this screw is a finger nut 36 by turning which the end of this contact may be adjusted.

Arranged between these relatively stationary contacts is a movable carbon contact 37 that is carried by the long arm of a conducting lever 38 which is pivoted to plate 39 by screw 40. This plate is connected by a wire 41 with a post 42 to which a clip 43 may be connected. A fuse 50 may be inserted in this line, if desired. The other arm of the contact carrying lever is loosely engaged with a block 44 that is mounted upon the top of the armature. A spring 45 is arranged between a plate 46 at the bottom of the magnet and a collar 47 on the pin 48 which is fastened to the armature. This spring tends to lift the armature from the magnet cores and raise the block and swing the short arm of the lever in such manner that the movable contact carried by the lever will normally remain in engagement with the fixed contact 34. There is a small lost motion engagement between the block 44 and the end of the short arm of the lever so that the contact will not be disengaged the instant that the armature moves, but will hold for a short interval. A weight 49 is attached to the end of the long arm of the movable contact lever, and the block 44 also has some weight, the inertia of which is utilized to reduce the rapidity of oscillation of the movable contact, or insure a relatively slow reciprocation of the movable contact when the device is being used.

To ascertain what apparatus or implements are in a particular circuit a cutout or fuse is removed from that circuit and the plug of the tracer is substituted. This puts the output or low impedance winding of the transformer in series with the load on that circuit. The clip is then engaged with a live part of the opposite leg of the circuit to be traced. This connects the magnet winding and input winding of the transformer across the circuit to be traced. As this is done the magnet is energized and drawing the armature causes a break in the magnetic circuit and completes the circuit across the line through the input winding of the transformer. This allows current to flow through the input winding of the transformer which of course affects the voltage in the output winding. As the magnet circuit breaks the spring withdraws the armature and remakes the magnet circuit. This action repeats as long as the clip is held in contact with the line. Owing to the lost motion between the armature and the movable contact carrying lever that lever does not move to disengage

the contacts instantly the armature moves, while the inertia of the weights adds to this slowing of movement of the movable contact, and yet insures a good contact when made.

Adjustment for the wear of the contacts is readily made by means of the finger nuts, and the blows of the movable contact against the stationary contacts are cushioned by the springs back of the stationary contacts.

The change of energy in the input winding of the transformer due to the opening and closing of the circuit in which it is located causes a variation in the current of the output winding and this in turn causes a distinguishable variation in the voltage of the circuit being tested which, for instance if the load is lighted lamps will cause all of the lamps in that circuit to flicker or glow with a different degree of brightness from normal and thus show what is connected in the circuit to which the tracer is connected.

The invention claimed is:—

1. A portable electrical circuit tracer comprising a transformer having output and input windings, means for detachably connecting the output winding in series with the load on the circuit to be traced, means for detachably connecting the input winding across the circuit to be traced, and electromagnetic means for making and breaking connection to said input winding.

2. A portable electrical circuit tracer comprising a transformer having output and input windings, means for detachably connecting the output winding in series with the load on the circuit to be traced, means for detachably connecting the input winding across the circuit to be traced, and electromagnetic means with means for connecting said electromagnetic means across the circuit to be traced, adapted to make and break connection to said input winding and to said electromagnetic means.

3. A portable electrical circuit tracer comprising a transformer having a winding with circuit connections adapted to introduce said winding in series with the load of the circuit to be traced and a winding with circuit connections adapted to connect said winding across the circuit to be traced, and electromagnetic means adapted to open and close the circuit through said second mentioned transformer winding and thereby vary the voltage in the circuit of the first mentioned winding.

4. A portable electrical circuit tracer comprising a transformer having an output winding of low impedance with circuit connections adapted to introduce said winding in series with the load of the circuit to be traced and an input winding at high impedance with circuit connections adapted to connect said winding across the circuit to

be traced, and electromagnetic means adapted to open and close the circuit through the transformer input winding and thereby vary the voltage in the circuit of the output winding.

5 5. A portable electrical circuit tracer comprising a transformer having an output winding with circuit connections adapted to introduce said winding in series with the
10 load of the circuit to be traced and an input winding with circuit connections adapted to introduce said winding across the circuit to be traced, an electromagnet with circuit
15 windings across the circuit to be traced, and means subject to the magnet for alternately opening the magnet circuit and closing the input circuit.

20 6. A portable electrical circuit tracer comprising a transformer having an output winding with circuit connections adapted to introduce said winding in series with the load of the circuit to be traced and an input
25 winding with circuit connections adapted to connect said winding across the circuit to

be traced, an electromagnet with circuit connections adapted to connect the magnet windings across the circuit to be traced, and an armature subject to the magnet, a contact actuated by said armature and adapted to
30 alternately open and close the circuits through said magnet and input winding, there being a lost motion connection between the armature and said contact.

7. A portable electrical circuit tracer 35 comprising a circuit containing a transformer output winding, a fuse and means adapted to connect said circuit in series with the load of the circuit to be traced, a circuit containing a transformer input winding 40 and means adapted to connect said circuit across the circuit to be traced, a circuit containing an electromagnet and means adapted to connect said circuit across the circuit
45 to be traced, and means adapted to alternately open and close the circuits containing said transformer input winding and said magnet.

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