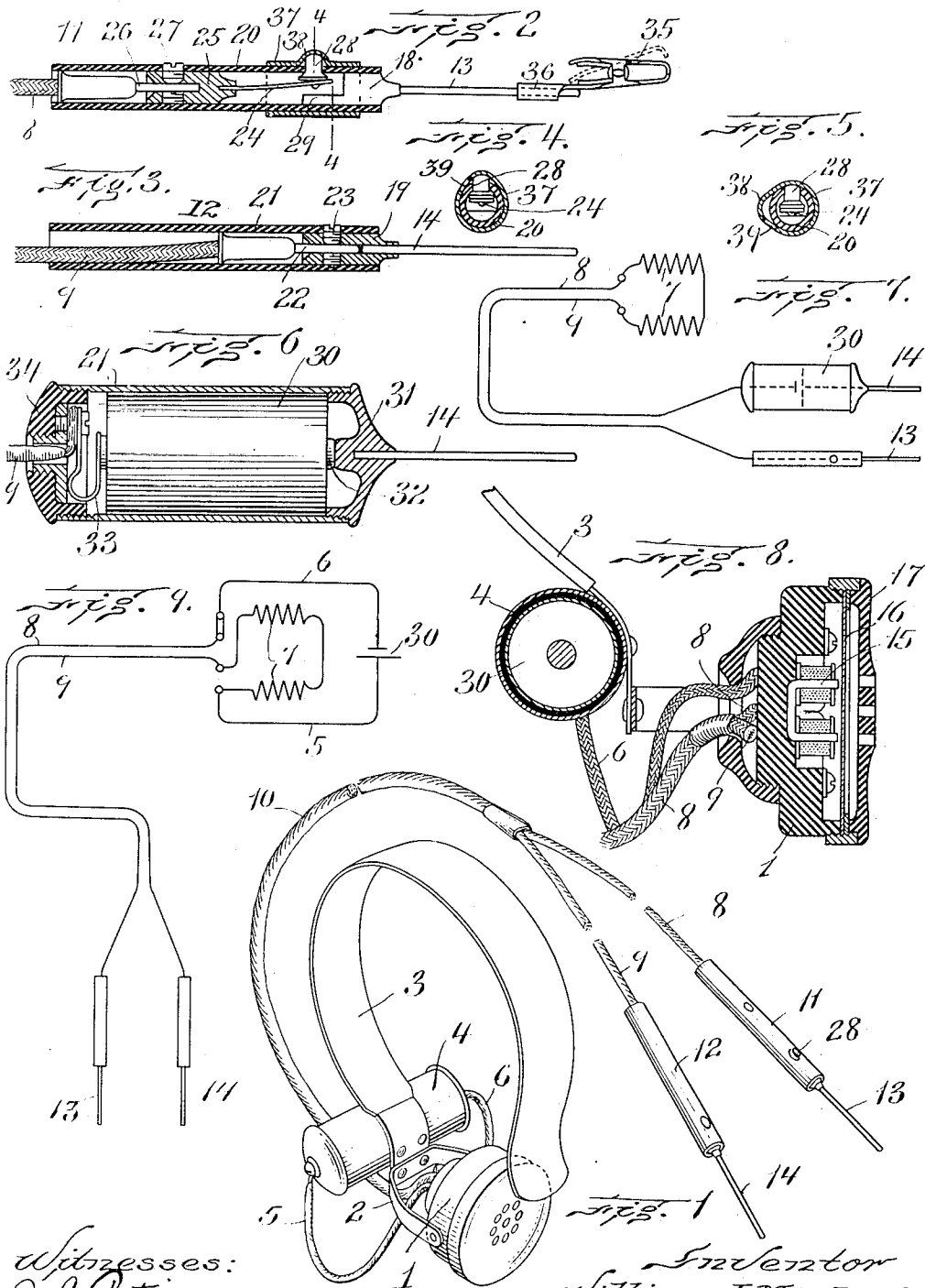


W. J. MURDOCK.
 CIRCUIT DETECTOR.
 APPLICATION FILED FEB. 23, 1909.

1,091,528.

Patented Mar. 31, 1914.



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WILLIAM J. MURDOCK, OF CHELSEA, MASSACHUSETTS.

CIRCUIT-DETECTOR.

1,091,528.

Specification of Letters Patent. Patented Mar. 31, 1914.

Application filed February 23, 1909. Serial No. 479,529.

To all whom it may concern:

Be it known that I, WILLIAM J. MURDOCK, of Chelsea, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Circuit-Detectors, of which the following is a specification.

This invention relates to apparatus for testing electric circuits to determine whether a circuit is complete or whether it is defective by being broken, short-circuited, or grounded.

The invention consists in a pair of contact points at the terminals of electric conductors which may be touched to the conductors of a circuit to be tested so as to make electrical connection therewith, together with a battery and a telephonic receiver which is connected with the battery so that when a circuit is completed through the contact points, the receiver is caused to make an audible sound, which indicates that a circuit is complete.

One of my main objects is to make an apparatus of this character which is as simple as possible, and which gives the user thereof the free use of his hands. To this end there is included in the apparatus a head-piece or spring band which is slipped over the head of the user, and carries the receiver in such a way that the latter is held close to the ear, and the battery is supported either on this head piece or by being attached to or in another part of the apparatus, as one of the handles or holders which carries one of the terminal contact pieces. It is possible also that there may be two or more batteries, of which one may be carried by the head-piece and another by one of the handles or some other member of the apparatus. In furtherance of the foregoing object of permitting the user of the apparatus the greatest possible free use of his hands, I provide a clasp associated with the contact point so as permanently to hold a conductor of a circuit to be tested, while the operator is employing his hands bringing another contact point at other parts of the circuit into contact. Also I provide a holder by which the normally open switch employed in connection with one of the contact points may be kept closed

while such point is permanently held by the clasp in connection with a conductor.

Of the accompanying drawings,—Figure 1 represents a perspective view of the apparatus embodying my invention. Figure 2 represents a sectional elevation of one of the conductor terminals and contact points, showing the manner in which the conductor and the point are contained in a non-conducting holder or handle, the switch employed in connection therewith, and a clasp. Figure 3 represents a similar view of a simpler form of terminal holder and contact point. Figure 4 represents a cross-section on line 4—4 of Figure 2, illustrating the means by which the switch in the terminal holder is kept closed. Figure 5 represents a view similar to Figure 4, showing the switch closer in position to maintain the switch in closed position. Figure 6 represents a sectional view showing a terminal holder equipped for containing a battery cell. Figure 7 represents a diagram of the connections between the terminals, the telephone magnet coils and battery when the latter is carried by a handle. Figure 8 represents a sectional view of the receiver and battery holder when the battery is mounted upon the head band. Figure 9 represents a diagrammatic view of the connections between the battery mounted as in the above figure, with the receiver magnet coils and the terminals.

The same reference characters indicate the same parts in all figures.

Referring to the drawings, the telephonic receiver is designated by the numeral 1 and is pivotally attached to the ends of a stirrup strap 2 which is secured to a band 3 which is adapted to be placed over the head of the user. This band is resilient so as to hold the receiver firmly in place against the ear of the user. Preferably the band 3 is a strip of spring metal suitably covered. The battery is conveniently a dry cell incased in a cylinder 4, which is mounted in a position where it will be out of the way, on one of the members of the apparatus, conveniently the band 3. From the poles of the battery conductors 5 and 6 extend to the receiver casing, and are connected respectively to one of the terminals of the magnet windings 7

and to the conductor 8, as shown in Fig. 9. The other terminal of the magnet winding is connected to a conductor 9 contained with the conductor 8 in a cable 10, such conductors terminating in holders 11 12 carrying the contact points 13 14.

The receiver used may be an ordinary telephone receiver, as shown in Fig. 8, consisting of a case 1 containing a magnet 15 and a diaphragm 16, the latter being gripped between the rim of the case and a cover 17 so as to lie near the poles of the magnet.

The contact pieces 13 and 14 are sections of wire or rods carried by metallic plugs 18 19 which are held in the ends of tubular holders or handles 20 21, respectively. The plug 19 in the holder 21 serves also as a connector for the terminal point 22 of the conductor 9, said point being secured by a binding screw 23.

The conductor 8 is normally out of connection with the contact 13, and is intermittently connected therewith by a switch 24. This switch is a spring tongue carried by a second plug 25 in the holder 20 to which the terminal point 26 of the conductor 8 is secured by a screw 27. A button 28 passes through an orifice in the side of the holder and rests on the spring switch 24. When this is pressed inward, it brings the switch into contact with a tongue 29 on the plug 18 and makes the contact.

One of the holders may be made so as to contain a battery, as shown in Fig. 6. The holder so made is sufficient in diameter to contain a cell 30, and has at one end a detachable head 31 carrying a contact point 14. This head is preferably metallic and bears with an electrical contact against the pole 32 of the battery. The other pole makes contact with a spring 33 carried by the other head 34 of the handle, said spring being connected with the conductor 9. The diagram of connections to include a battery thus mounted is shown in Fig. 7.

In some forms of testing, as where the separate wires contained in a cable are tested to determine if any two of them are in circuit together, it is convenient to hold one conductor in permanent connection with one of the contact points so that the operator may be free to use both hands in touching the other wires of the cable successively to the other contact point. For thus holding a conductor in permanent connection with a contact, I provide any suitable clasp, such as shown at 35 in Fig. 2, which clasp is detachably held by the contact 13 in electrical connection therewith by a sleeve 36 which closely embraces the contact point, but may be slipped from the end thereof. The clasp is preferably of metal so that a circuit is completed through it between the contact point and the conductor. When connection

is made with the conductor through the clasp, it is desirable that the switch 24 should remain permanently closed. For this purpose I provide a sleeve 37 on the outside of the holder 20, which sleeve has a bulging portion 38 the sides of which act as cams to bear on the end of the switch button 28 and press the same inward when the sleeve is turned or moved endwise. This sleeve may be removed entirely from the holder, and has a hole 39 at one side of the protuberance 38 through which the switch button may extend so as to give access therefor for manual actuation.

In the ordinary use of the apparatus the head-piece is slipped over the top of the user's head so that the receiver comes next to the ear, and the terminal holders are then taken one in each hand. The contacts 13 and 14 are placed against two parts of a circuit to be tested and the switch button 28 is pressed. If the circuit to be tested is complete, this causes a current to flow from the battery through the conductors and the receiver magnet coils, attracting the diaphragm and producing an audible sound. This action does not take place unless the circuit is complete, and consequently the apparatus serves to detect at once whether any given circuit is broken. It also serves to detect whether there is a short-circuit between two conductors, or if a conductor is grounded. If a sound is heard from the receiver when the terminal contacts are placed against conductors which ought not to be in circuit, a short-circuit is detected, while if a sound is heard when one contact point is placed against a conductor and the other point against some metallic part of the building in connection with the ground, it is shown that the conductor is grounded.

I claim:—

1. In an apparatus of the character described, a tubular holder, a plug therein, an electrical conductor in electrical connection with said plug, a contact point projecting from said holder, a spring tongue of conducting material connected with said plug and extending toward said contact point, but normally out of contact therewith, a button exposed at the side of said holder movable to press said tongue into contact with the point, and a sleeve mounted exteriorly on the holder and adapted to be placed so as to engage said button and cause the same to maintain the spring in contact with the point.

2. In an apparatus of the character described a tubular holder, a contact point connected to and extending from said holder, a switch member contained within the holder normally out of contact with the contact point, and an electrical conductor in connection with said switch member, a button pro-

jecting through the side of the holder ar-
ranged to bear on said switch member and to
move the latter into electrical engagement
with the contact point when pressed upon,
5 and a sleeve surrounding that portion of the
holder in which the button is contained, said
sleeve having an orifice to give access to the
button and being rotatable about the holder
in such manner as to pass over the button

and hold the same in position to maintain 10
the electrical engagement between the switch
member and contact piece.

In testimony whereof I have affixed my
signature, in presence of two witnesses.

WILLIAM J. MURDOCK.

Witnesses:

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