Nov. 5, 1946. W. H. EDWARDS ET AL 2,410,434

TELEPHONE

Filed Nov. 25, 1942 2 Sheets-Sheet 1

FIG. 1

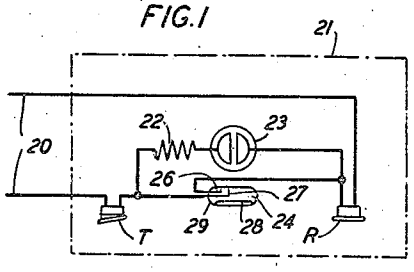


FIG. 2

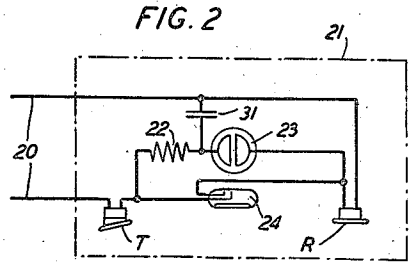


FIG. 3

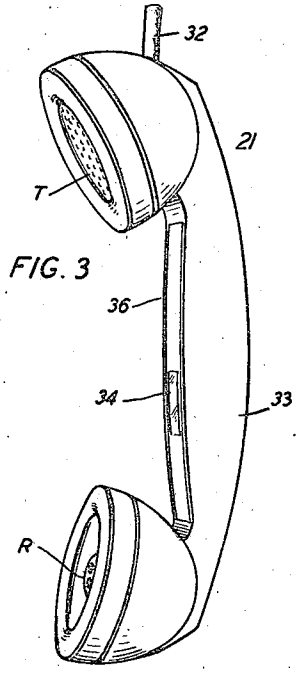


FIG. 4

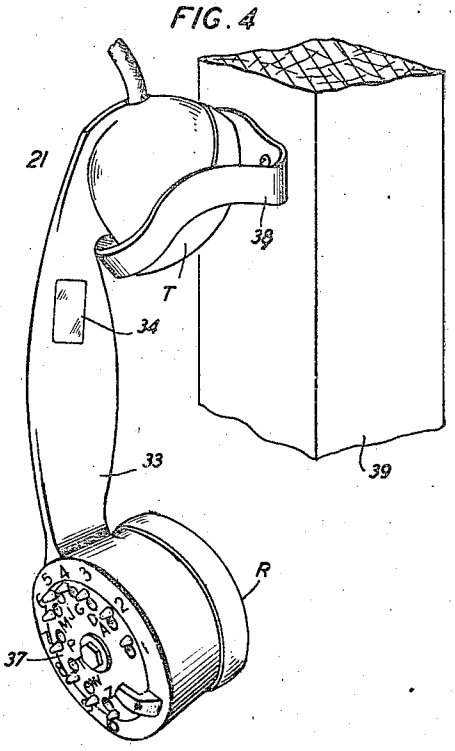
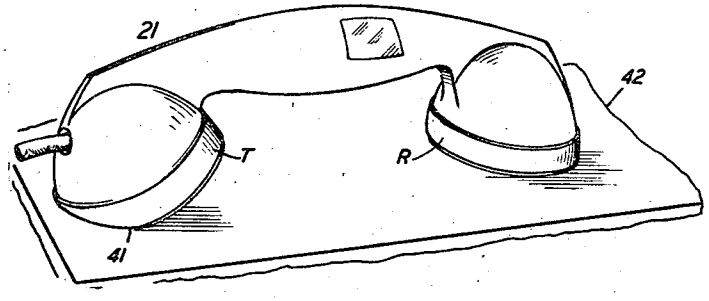


FIG. 5



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FIG. 6

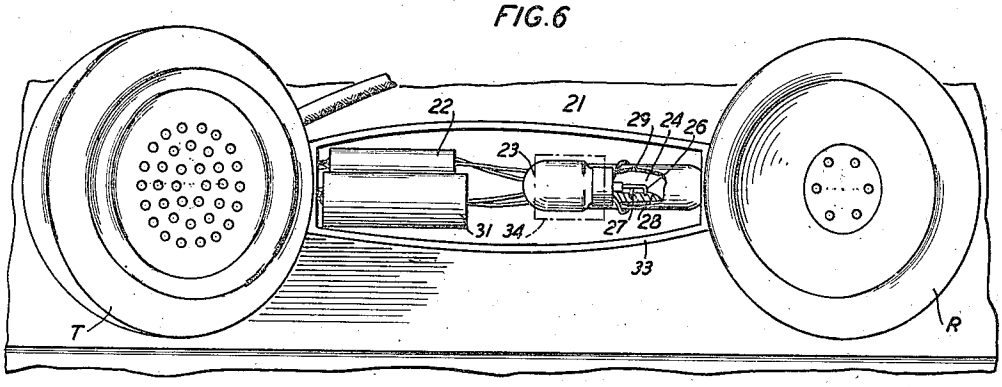


FIG. 7

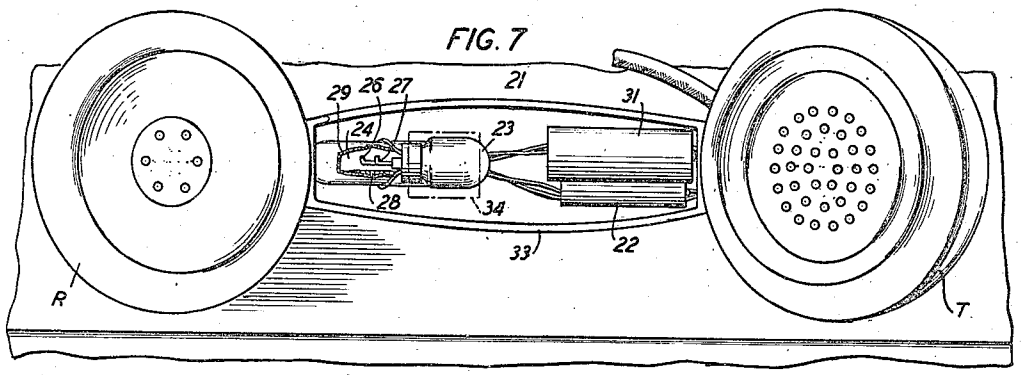
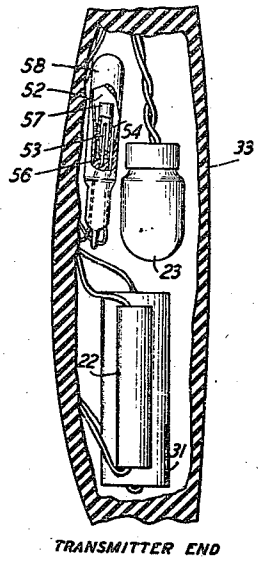


FIG. 10

RECEIVER END



TRANSMITTER END

FIG. 8

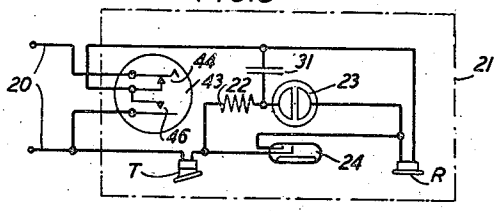
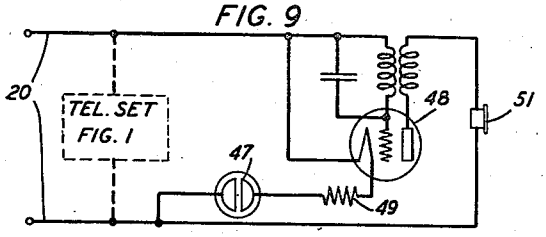


FIG. 9



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UNITED STATES PATENT OFFICE

2,410,434

TELEPHONE

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Application November 25, 1942, Serial No. 466,842

4 Claims. (Cl. 179—103)

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This invention relates to telephones and particularly to improvements in switching and signaling arrangements for hand telephones having a plurality of telephone instruments, such as a transmitter and receiver, mounted upon a common handle.

An object of the invention is to secure an improvement in the subscriber's telephone set by producing a self-contained multipositional handset that can be readily placed in any convenient position by the subscriber.

A further object of the invention is to simplify the design of the telephone set by eliminating the usual switchhook mounting provided therefor and assembling the component parts in a common handle, whereby the handset handle provides a unitary structure for containing the essential elements thereof.

A further object of the invention is to provide a hand telephone which shall be simple in construction, economical to manufacture and to maintain in operation, and which shall require a minimum amount of adjustment.

Another and related object of the invention is a telephone set including in a unitary structure the transmitting and receiving instruments, visual and audible signaling devices, and switching means for controlling these component elements.

With the above objects in view, one embodiment of the invention discloses a telephone substation comprising a hollow handle in which are mounted the essential elements such as a transmitter at one end, a receiver at the other end, and a discharge tube and mercury gravity switch within the shank thereof. The handle may be disposed for its normal or non-talking state either in a horizontal or vertical position. When ringing current is impressed over the subscriber's line, the discharge tube breaks down to give a visual signal, and the receiver, being serially connected with the tube, emits an audible tone. The manual operation of lifting the handle from its position of rest closes a mercury switch, which replaces the usual switch-hook contacts and in turn closes a talking circuit, thereby conditioning the device for talking purposes and shunting the discharge tube.

Another embodiment of the invention discloses a similar hollow handle arrangement in which a dial is added for use in automatic switching systems.

Still another embodiment of the invention is disclosed in a hollow handle arrangement in

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which the audible signaling means is improved by use of a vacuum tube oscillator.

For a better understanding of the invention reference may be had to the accompanying drawings in which:

Fig. 1 is a circuit diagram of the substation circuit;

Fig. 2 is a circuit diagram of an improved substation circuit;

Fig. 3 is a view of the handset arranged for vertical suspension by its cord with the transmitter disposed at the top;

Fig. 4 is a view of the handset provided with a dial at the back of the receiver and suspended from a fixed support;

Fig. 5 illustrates a handset having a partially flattened transmitter face for disposition face downwards on a table or desk;

Fig. 6 illustrates disposition of the handset upon its left side in the operative or talking position;

Fig. 7 illustrates disposition of the handset upon its right side in the non-talking or disconnected position;

Fig. 8 is a circuit diagram of the substation circuit incorporating a dial;

Fig. 9 is a circuit diagram of a vacuum tube oscillator for increasing the audibility range of the receiver during signaling; and

Fig. 10 shows a sectional view of a vertical suspended handset in which the discharge lamp and a mercury switch adapted for vertical mounting are brought out more clearly.

Referring to Fig. 1, a telephone substation line **20** is shown terminated in a subscriber's telephone handset **21** comprising a transmitter T, a current limiting resistance **22**, glow discharge lamp **23**, and a receiver R. Shunting lamp **23** is a mercury positional switch **24**, which comprises a pair of contacts **26**, **27** and a globule of mercury **28** hermetically sealed within a tube **29**. Mercury switch **24** is so disposed within the telephone set that in the normally inoperative position thereof, as hereinafter described, the switch is open while in the talking position the switch is closed. The position of switch **24**, as shown in Figs. 1, 2, and 8, symbolically represents the disconnected or non-talking position, contacts **26**, **27** being separated from each other and also from the mercury globule **28**. Switch **24** replaces the switchhook contacts which are found in the usual telephone receiver and handset mountings and which are subject to contact troubles because of exposure to atmospheric corrosion and dirt.

In response to the usual signaling current over

subscriber line 20 discharge lamp 23 breaks down in an obvious circuit and glows as a visual indication, while receiver R, being serially connected with lamp 23, emits a tone corresponding to the signaling frequency. The subscriber hearing the receiver tone and observing the lighted lamp picks up the receiver from its position of rest, as described hereinafter, and thereupon shifts the position of mercury globule 28 so that contacts 26, 27 of switch 24 become in contact therewith and become short-circuited thereby. Interconnection of contacts 26, 27 shunts out resistance 22 and lamp 23 and renders effective a talking circuit, which can be traced from one side of line 20 through transmitter T, interconnected switch contacts 26, 27, receiver R, and thence back to the other side of line 20. Upon restoral of the handset to its position of rest the mercury globule 28 is disengaged from switch contacts 26, 27, which thereby being open-circuited, discharge lamp 23 is thereupon rendered effective for another call. For originating a call, the procedure consists in picking up the handset whereupon contacts 26, 27 are interconnected by mercury globule 28 to close the customary supervisory circuit at a central exchange. It is to be noted that the usually included telephone induction coil has also been eliminated from the telephone set, as talking tests have indicated that conversations over such a simplified circuit have proven quite satisfactory.

In some cases, particularly where it is desirable to increase the ringing range of receiver R, a small capacitance is bridged thereacross. Fig. 2 shows a circuit arrangement suitable for such a purpose. This figure is identical with that of Fig. 1 except that a small condenser 31 is connected to one side of line 20 and to a junction point between resistance 22 and lamp 23. With the inclusion of condenser 31 in the circuit signaling current impressed over line 20 will produce a more audible tone in receiver R.

Figs. 3, 4, 5, 6, and 7 illustrate various methods of supporting a handset. Fig. 3 shows a handset 21 suspended vertically by its telephone cord 32 comprising the above-mentioned line conductors 20. Cord 32 may be secured to a hook (not shown) or to any suitable support. It is to be noted that the transmitter T is at the top while the receiver R is at the bottom of the suspended handset. While handset 21 is suspended in this manner, mercury switch 24 (see Fig. 1) is so disposed within hollow shank 33 thereof that its contacts 26, 27 are in an open-circuit condition. However, when transmitter T and receiver R are transposed for talking purposes by holding the instrument 21 in the customary manner, mercury globule 28 is moved into engagement with contacts 26, 27 to close the talking circuit as hereinbefore described. This transposition takes place when, responsive to ringing tone, the subscriber grasps the shank 33 of handset 21 in a reverse manner, that is, with the back of his hand facing the observer and thumb at the bottom adjacent to receiver R, and raises the handset to a talking position by reversing the relative positions of transmitter T and receiver R whereby transmitter T assumes a bottom position and receiver R a top position, as is the normal talking position. A window 34 of suitable transparent material such as glass is placed in an insulated plate 36, which covers an opening in shank 33 and which is secured thereto in any convenient manner. Through window 34 a visual indication is given of the discharge lamp 23, which is housed within

shank 33, as shown in Figs. 6 and 7. While window 34 is here placed in plate 36, it may as well be disposed in the shank 33. Furthermore, a window may be dispensed with by providing a hollow handset made of translucent material such as Lucite.

In Fig. 4 is shown a unitary dial handset 21 also adapted for vertical suspension. In this embodiment a dial 37 is mounted at the back of the receiver R while the transmitter T is supported by a hook 38, which is securely fastened to a supporting structure 39. The window 34 in this instance may be placed in the side of shank 33 for better visibility.

In Fig. 5 is shown another embodiment of the invention in which a unitary handset 21 having a partially flattened transmitter face 41 is adapted for horizontal mounting on a desk 42 or any suitable flat surface. In the position of rest as shown handset 21 has the transmitter T and receiver R facing downward towards the surface of the desk. An inherent advantage in this arrangement resides in the fact that ringing tone emitted by receiver R can be made to resonate by reflection from the surface of desk 41 and as a result produces a louder tone. Handset 21, as illustrated, is in the non-talking position and when removed from this position and placed either in an upright position or on either side, is immediately switched to a talking position by the above-described operation of mercury switch 24.

In Figs. 6 and 7 handset 21 is shown with switch 24 disposed therein also for horizontal mounting on a table or desk the normal non-talking position, however, being on one of the side surfaces thereof and the talking or closed circuit position being in an upright or horizontal position on the opposite side thereof. Either side of handset 21 may be arranged for the normal non-talking position by proper disposition of mercury switch 24 therein. As shown in Fig. 7, switch 24 has been so disposed within hollow shank 33 that when the handset is laid on its side with the transmitter T at the right and receiver R at the left (facing the observer) switch contacts 26, 27 are disconnected from each other. the globule of mercury 28 being at the lower side of tube 29. This position of handset 21 represents the normal non-talking condition while the reverse position, as shown in Fig. 6, represents a talking circuit condition in which a subscriber for some reason or other may lay the instrument 21 down without disconnecting the connected party therefrom. It is, of course, understood that the handset 21, as illustrated in Figs. 6 and 7, will be in a talking circuit condition when held in the customary talking position by a person. It is obvious that reversal of switch 24 will correspondingly reverse the horizontal talking and non-talking circuit positions illustrated in Figs. 6 and 7. Figs. 6 and 7 also show in more detail the arrangement of the associated apparatus such as resistance 22, discharge lamp 23, mercury switch 24, and condenser 31 mounted within the hollow shank 33, covering plate 36 being removed therefrom. The dot-dash lines superimposed upon lamp 23 represent the position of window 34 as mounted in Fig. 3.

In Fig. 8 is shown a schematic circuit, which is arranged for dialing. Here the arrangement is similar to that of Fig. 2 except that a dial 43 has been added thereto, pulsing contacts 44 being serially interposed within the upper side of line conductors 20 and off-normal contacts 46 shunt-

ing the telephone set during the dialing operation.

In Fig. 9 is shown a vacuum tube oscillator circuit for further increasing the signaling range of the arrangement shown in Figs. 1 and 2. This circuit, which is bridged to that of Fig. 1, is an improvement of that disclosed in W. H. Edwards Patent 1,860,458 of May 31, 1932. The operation is somewhat similar to that described in the above patent wherein discharge lamp 47 responding to ringing current breaks down to supply filament current for vacuum tube 48 through resistance 49, the plate circuit being in parallel with the discharge lamp-filament circuit. A receiver 51 included in the plate circuit gives an audible signal in response to the ringing current, said signal depending upon the setting of the tuned grid oscillating circuit, as described in the above-mentioned patent.

In Fig. 10 is shown a mercury switch 52, which is particularly adapted for disposition within a handset of the vertical mounting type, as illustrated in Figs. 3 and 4. Only the shank portion 33 of the handset is shown, the transmitter being at the bottom and the receiver being at the top, which is the reverse of that shown in Figs. 3 and 4. In other words, the partial view as shown is illustrative of the talking position of the handset, wherein mercury switch 52 has its two terminals 53, 54 short-circuited by a globule 56 of mercury. It is to be noted that terminal 53 is spaced within a cylindrical metallic tube 57 without touching any portion of the surface thereof while terminal 54 is attached to the outer surface of tube 57. In the normal position of rest the handset would be suspended with the transmitter at the top and the receiver at the bottom and in this position mercury globule 56 would be disposed in the tip portion 58 of tube 52 and thus disengaged from terminals 53, 54. Upon grasping the handset, in the manner heretofore described, mercury globule 56 is quickly attracted through the capillary action of tube 57 to short-circuit terminals 53, 54, thereby conditioning the handset for talking purposes.

While the features of this invention have been disclosed with reference to the specific embodiments described herein, it is, of course, understood that various modifications may be made in the details of construction without departing from the scope of this invention as defined in the appended claims.

What is claimed is:

1. A telephone handset comprising a hollow housing of insulating material including an intermediate hand grip portion and also opposite end portions for a telephone transmitter at one end and a telephone receiver at the other end, a gas discharge tube in said hand grip portion, a circuit for serially interconnecting said transmitter, receiver, and tube, said circuit being responsive to ringing current, whereby said tube provides a visual indication of ringing current and the receiver emits an audible signal, a capacitance bridging said receiver for increasing the audibility of said receiver signal, and a mercury switch disposed in said hand grip portion for shunting said tube and conditioning said transmitter and receiver for talking purposes, said switch adapted to be open when the housing is in its normal position of rest and adapted to be closed when the housing is removed from its position of rest.

2. A telephone handset comprising a hollow housing of insulating material including an intermediate hand grip portion and also opposite end portions for a telephone transmitter at one end and a telephone receiver at the other end, a first gas discharge tube in said hand grip portion, a circuit for serially interconnecting said transmitter, receiver, and tube, said circuit being responsive to ringing current, whereby said tube gives a visual indication and the receiver emits an audible signal, means including an auxiliary gas discharge tube and oscillator for increasing the audibility of said signal, and a mercury switch disposed in said hand grip portion for shunting said first tube and conditioning said transmitter and receiver for talking purposes, said switch comprising a pair of spaced contact terminals and a mercury globule assembled in a hermetically sealed tube, said terminals being separated from the mercury globule when the housing is in its normal position of rest and being interconnected when the housing is removed from its position of rest.

3. A telephone handset comprising a housing of insulating material, including an intermediate hollow hand grip portion and opposite end portions, a telephone transmitter in one of said end portions, a telephone receiver in the other of said end portions, a resistance, a neon lamp and a mercury gravity switch in said hand grip portion, a first and a second external telephone conductor connected to said handset, a first circuit extending in sequence from said first conductor, through said transmitter, through said resistance, through said neon lamp and through said receiver to said second conductor, said circuit for lighting said lamp and producing a ringing tone in said receiver as calling signals in response to an alternating current impressed on said first circuit, and a second circuit extending from the point of junction between said transmitter and said resistance through said switch to the point of junction between said lamp and said receiver, said switch being so disposed in said hand grip portion that, when said handset is in a first position with respect to a fixed plane, said first circuit is closed and said second circuit is open and, when said handset is in a second position with respect to said plane, said second circuit is closed, so as to shunt said resistance and said lamp and interconnect said transmitter and receiver directly through said switch to said first and said second conductors for talking purposes.

4. A telephone handset in accordance with claim 3 having a third circuit consisting of a condenser, of small capacitance, connected directly from the point of junction between said resistance and said lamp and said second conductor, to increase the intensity of said ringing tone produced in said receiver.

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