

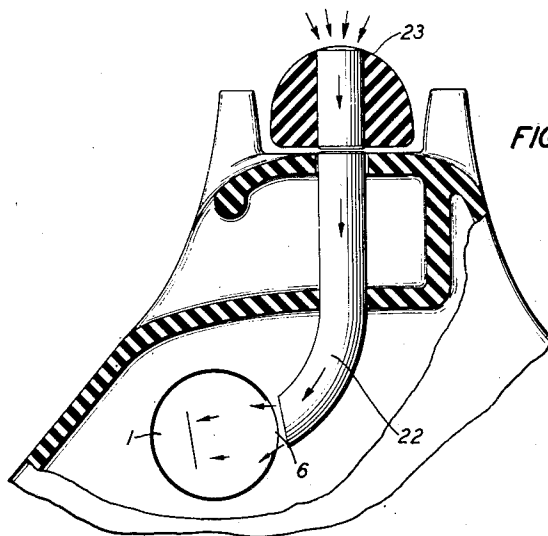
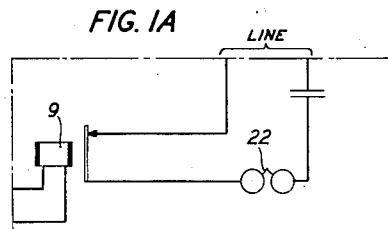
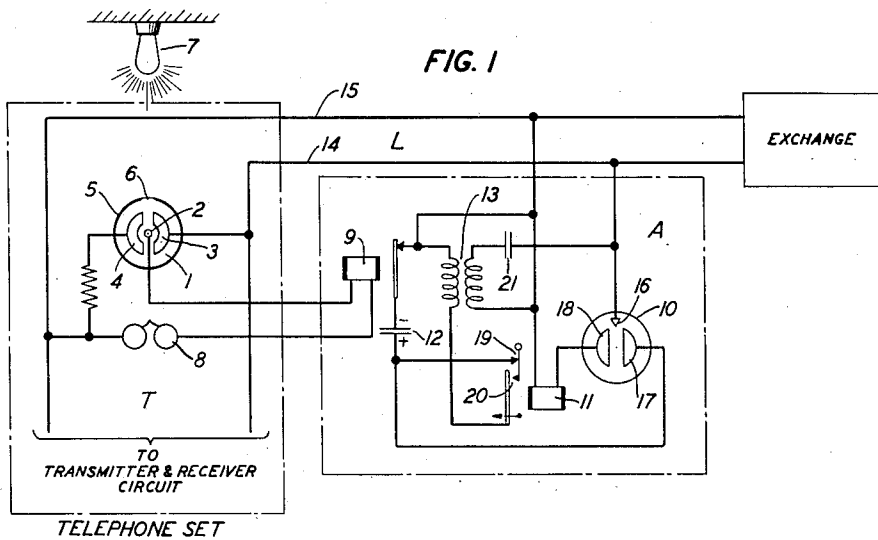
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TELEPHONE ALARM SYSTEMS

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TELEPHONE ALARM SYSTEM

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This invention relates to circuit arrangements for indicating the failure of illumination at a telephone station, as for example an electric lamp located in close proximity to the telephone.

Arrangements of the above character are useful in bank vaults, corridors of buildings, etc., where it is desired that a lamp shall be constantly lighted and when the station is rung the ringer will respond in the usual manner if the lamp is burning but if the lamp is extinguished an alarm device, as for example, a loud ringing bell, will be operated or a signal, as for example a characteristic click, will be transmitted to the calling station.

More particularly, the invention relates to arrangements of the above character for use at telephone stations employing a gas-filled discharge tube the anode-cathode discharge path of which is connected in series with the telephone ringer as disclosed, for example, in Patent 2,088,311, issued July 27, 1937 to L. J. Stacy.

Discharge tubes used in such systems usually comprise a glass envelope filled with gas, such as neon, and contain a plurality of electrodes so spaced with respect to each other that when ringing voltage exceeding a predetermined value is impressed across the electrodes, the tube conducts and passes sufficient current to actuate the ringer. In this connection, however, it has been found that such discharge tubes have the characteristic of being sensitive to light, i. e., that light has the effect of causing the tube to conduct at a somewhat lower voltage than when light is absent, that the reduction in breakdown voltage is a function of the intensity of the light, and, further, that the breakdown voltage of such devices is most nearly constant when light is completely excluded from the enclosing envelope and, therefore, to insure proper and uniform operation of such discharge tubes in ringing systems, it is the practice to exclude light from the interior of the tube which, in the case of glass tubes, is effected by applying an opaque coating thereto, all as fully described and claimed in Patent 2,112,327 to D. W. Bodle, issued March 29, 1938. Further, such discharge devices are usually mounted in the apparatus box or compartment forming a part of the telephone and are therefore further shielded from exterior light rays.

An object of the invention is to make use of the beforementioned light sensitive property of such discharge devices, at stations where it is desired that a guard be maintained on a source of illumination, to effect the response of means for

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indicating the absence of such illumination when the station is called.

A feature of the invention resides in locating a transparent opening or window in the otherwise opaque envelope of the discharge tube used in the ringer circuit of the telephone and a corresponding light transmitting opening in the wall of the compartment in which the device is housed, in such a manner that light rays from an adjacent lamp or other source of illumination will fall on the tube electrodes and, further, in so adjusting the tube characteristics that when ringing current is applied the tube will ionize and permit a glow discharge only if the electrodes thereof are subjected to light rays of a predetermined intensity but will remain nonconducting if no light is present, and further in providing means responsive to said glow discharge for controlling the operation of an indicating means.

A related feature of the invention, applicable to desk sets of the handset type in which the discharge tube, ringer, and other associated apparatus are mounted in the base of the stand on which the handset is cradled, resides in inserting a light conducting rod of suitable material, such as "Lucite," through the top center of the base which terminates at its upper end directly under the handset handle, and at its other end, opposite and adjacent the transparent window in the discharge tube and, further, in inserting a second section of rod through the handle of the handset to register with the top end of the first section whereby rays from a light source above the set will be directed to and impinge on the electrodes of the tube.

The invention will be understood from the following description when read in connection with the accompanying drawing:

Fig. 1 of which shows a circuit arrangement, embodying the invention, at a called station which functions to transmit a signal to a distant calling station in the event that the illumination at the called station is below a predetermined normal intensity.

Fig. 1A shows a circuit arrangement which may be used as an alternative for, or in addition to, the signal transmitting arrangement of Fig. 1 to provide an alarm signal at the called station (or any other desired location) in the case of failure of the illumination at the station; and

Fig. 2 shows a means for conducting light rays to the interior of the desk telephone of the handset type and for directing them to a light window in a gas-filled discharge tube of the character described.

Referring to Fig. 1 a telephone station T on a line L is shown having a gas-filled discharge tube 1, comprising an anode 2, a cathode 3, and a control electrode 4, which tube is connected in a well-known manner to the line L in series with the station ringer 8 and a relay 9, to be later referred to.

The discharge tube 1 also comprises an opaque casing or envelope 5 and is in all respects identical to discharge tubes commonly used in connection with telephone ringers except for a window 6 in the opaque envelope through which light rays from an adjacent source of illumination 7 are able to pass and impinge on the enclosed electrodes 2, 3 and 4 for the purpose of rendering the tube responsive to ringing current voltages of a lower potential than when all light is excluded from the interior of the tube, all as before referred to.

Also located at the subscriber's station T and associated with the line L is an auxiliary circuit arrangement A comprising the relay 9 before referred to, a gas-filled glow-discharge tube 10 having an anode 16 and two parallel cathodes 17 and 18 having a rectifying characteristic, a slow-release relay 11 having a so-called make-before-break contact spring arrangement, a condenser 12, and a transformer 13, all connected as shown on the drawing, and whose function and operation will appear from the following description.

Let it be assumed that the telephone T, equipped as described, is in a location where it is desired that a lamp 7 shall be kept burning at all times and that an attendant or operator at the telephone exchange in which the telephone line L terminates is charged with the responsibility of periodically checking to ascertain, during periods such as at night when the telephone station is unattended, whether the lamp at the telephone is lighted or not. To make this test, the attendant will connect to the line and ring the station in the usual manner. If it is assumed that the lamp 7 is extinguished at this time the discharge tube 1 is disabled due to absence of illumination of its electrodes and therefore the voltage of the ringing current transmitted from the exchange will be insufficient to cause a glow discharge between the anode and cathode and therefore the tube will be nonconductive and the ringer 8 and relay 9 will not respond. Under this condition with relay 9 closing its normal or back contact, condenser 12 of the auxiliary circuit A will receive a charge from the ringing current on the line in series with back contact of relay 9 and anode 16 and cathode 17 of the gas-filled tube 10 which tube is constructed and arranged to fire or discharge between its anode 16 and either of the other two electrodes in response to application of ringing current voltages thereto. A parallel path for the ringing current also exists at this time including relay 11, anode 16 and electrode 18 of tube 10 which causes relay 11 to operate.

When the ringing current is disconnected from the line, relay 11 releases slowly and due to the arrangement of its contact springs contact 19 will close before contact 20 opens thereby momentarily closing a circuit to discharge the previously charged condenser 12 in series with the primary winding of transformer 13, the secondary of which is bridged across the line in series with condenser 21. This discharge of condenser 12, stepped up in voltage by the ratio of the primary to the secondary winding of the transformer, is transmitted over the line to the exchange where

it causes a sharp "click" in the attendant's receiver which it is assumed is connected to the line at the time. This indicates to the attendant that the lamp at the station is extinguished.

A modified arrangement discloses means for operating an alarm, such as an auxiliary ringer, when the station is rung during an interval when the lamp at the station is extinguished, is shown in Fig. 1A. This auxiliary signal can be located as desired either at or near the station telephone or at some remote point, for example at a police station and controlled over an auxiliary line. In this figure the relay 9 corresponds to the same numbered relay of Fig. 1 and is connected in the same manner to the line, i. e., in series with the station ringer 8 and the gas-filled tube.

Under the same conditions just described for Fig. 1, i. e., when the lamp at the station is extinguished, when ringing current is applied to the line, the auxiliary alarm signal 22 will operate from the line due to the fact that relay 9 is not operated at the time and consequently its back contacts are closed.

Again referring to Fig. 1, under normal conditions, i. e., when the lamp at the station is lighted, a ring on the line causes the tube 1 to conduct thus operating the station ringer 8 and relay 9 due to the fact that the light falling on its electrodes renders it responsive to the ringing current voltage. Operation of relay 9 opens the charging circuit of condenser 12 and the attendant will not receive a signal when ringing is disconnected.

Fig. 2 shows a method of conducting light rays from an exterior source to the gas tube 1 located in the base of a handset type telephone. In the arrangement of Fig. 2 a light conducting rod of suitable material, such as lucite, is inserted through the top center of the base of the telephone at a point directly under the handle of the handset when in its resting position in the cradle, and terminates at its other end opposite the window 6 and further a second short section of light conducting rod 23 is inserted through the handle of the handset to register with the upper end of the rod 22 whereby rays from a light source above the telephone set will be directed through the window 6 of the gas tube 1 and to the electrodes contained therein.

Another modification of Fig. 1, not shown, may be made by omitting condenser 12 from the signal transmitting circuit A and utilizing, in its stead the condenser employed in the telephone set for preventing direct current passing through the receiver, which dual use would have no detrimental effect when the telephone is in use.

The present invention may be useful in serving to indicate the fact that the handset at a station of the type shown in Fig. 2, has been removed and not replaced in its cradle. In this case the light rays for the lamp 7 will continue to sensitize the tube 1, but due to the fact that the tube 1 and ringer 8 are shunted due to removal of the handset, and the consequent operation of the switchhook contact, the relay 9 will not operate if the station is rung at this time and consequently the condenser 12 of the auxiliary signal circuit A (Fig. 1) will receive a charge and discharge when ringing ceases, or the signal bell 22 of Fig. 1A will operate, thus indicating a non-standard or trouble condition at the station.

What is claimed is:

1. In a telephone system, a line, a station thereon, a telephone at said station, a source of continuous illumination for said telephone which it

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is required shall not be below a predetermined degree of brilliancy, a source of ringing current of predetermined potential for connection to said line, and means for giving an alarm signal when ringing current is connected to the line in case said station illumination is below said predetermined intensity, said means comprising a gas-filled discharge tube exposed to said illumination and connected to said line which tube is arranged to conduct said ringing current when the illumination is of said predetermined brilliancy but to be nonconductive at a lesser degree of illumination.

2. In a telephone system, a line, a source of ringing current for connection to said line, a telephone station on said line comprising a ringer and a gas-filled discharge tube connected in series to the line, said gas tube having the characteristic of increasing its conductivity in accordance with an increased intensity of the illumination of its electrodes, a source of variable intensity illumination for said gas tube electrodes, a relay in series with said ringer having a normally closed contact opened when said gas tube conducts ringing current of a predetermined value, a condenser and circuit means therefor, including said closed relay contacts, adapted to charge said condenser from said line when ringing current is applied thereto and means responsive to disconnection of said ringing current to discharge said condenser,

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while said relay contacts are closed, to transmit a high voltage impulse to the line.

3. In a telephone desk set of the handset cradle type having an enclosed compartment in the base in which apparatus comprising a light sensitive gas-filled discharge device is mounted, means for transmitting light rays from the exterior of the set to said light sensitive device comprising a section of light conducting rod of a substance having a large critical refraction angle, extending through an opening in the base compartment directly under the handle of the handset, when the handset is resting on its cradle, and the other end of the section adjacent and opposite said discharge device, and a second section of light-conducting rod extending through the handle of the handset to register with the upper end of the first section.

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