

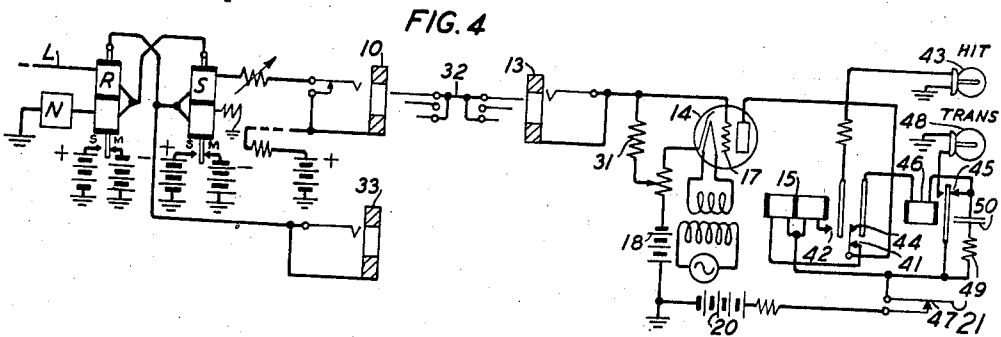
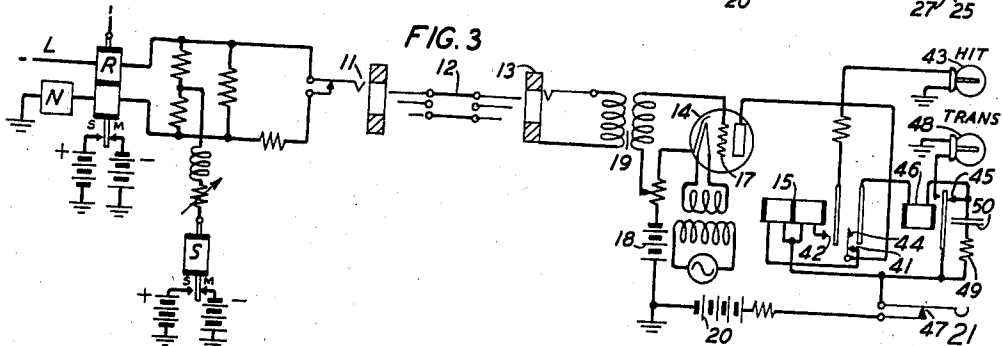
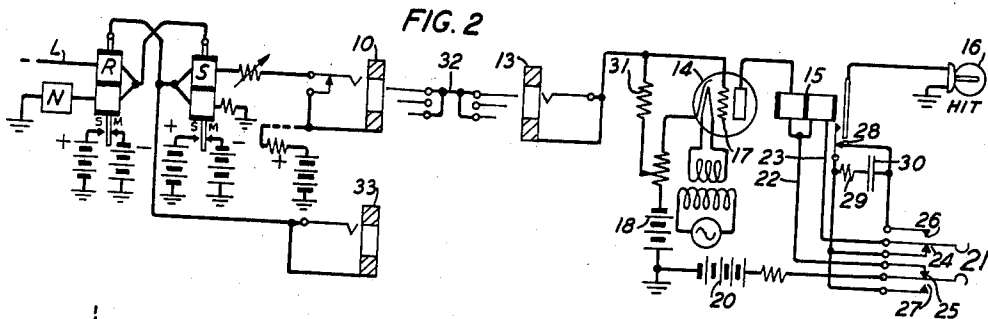
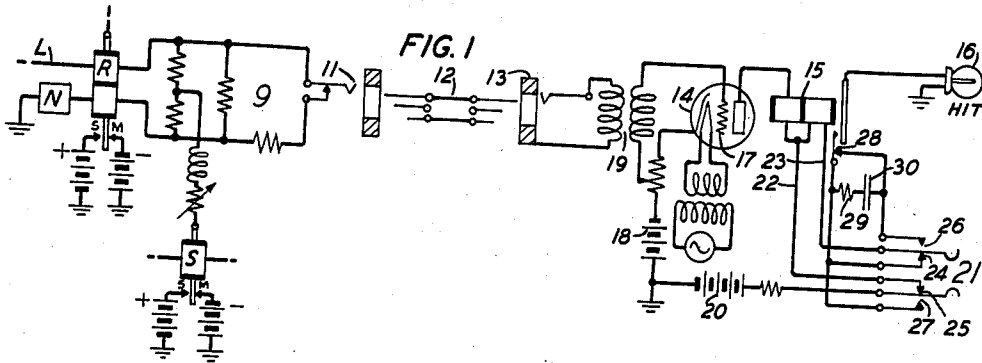
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ALARM SYSTEM

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ALARM SYSTEM

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9 Claims. (Cl. 178—69)

This invention relates to alarm systems and particularly to "hit" indicators for electrical circuits such as telegraph systems.

Line "hits" are defined as short open pulses or other forms of line interference which impair transmission over the line. Since these hits produce errors in the messages received, they must be detected and the fault must be eliminated as promptly as possible. A number of alarm systems for this purpose have been proposed heretofore and when such systems are used at repeater stations of a telegraph system, they are effective to indicate line trouble when the line is idle or when signals are being transmitted from the repeater to the line under test. However, when the direction of transmission reverses the alarm is operated even when there is no line trouble as the system is incapable of discriminating between line interference and signals being received from the line.

The object of this invention is an efficient and reliable "hit" indicator circuit by means of which an attendant may distinguish readily between line interference and a reversal in the direction of transmission over the line being tested.

According to the invention, as applied to a telegraph system, a gas-filled trigger tube is associated with the line in such a way as to be flashed upon the occurrence of a line "hit" or an incoming signal pulse thereby completing a circuit including a recording device or an indicating device such as a lamp. In one embodiment of the invention a key is provided for resetting the tube, extinguishing the lamp and preparing an alternate control circuit for the lamp of such a nature as to produce a flashing of the lamp at a predetermined frequency if signals are being received from the line. When the lamp is lighted the attendant operates the key and if the lamp flashes he does not regard the first operation as an indication of trouble unless the signal is repeated after the incoming signals cease.

In another embodiment of the invention the first flash of the gas-filled tube lights the hit lamp and automatically prepares a control circuit for a second lamp which flashes as long as signals are being received. When transmission ceases, the attendant resets the tube and disregards the first hit indication unless the hit lamp only is relighted.

The invention and the manner in which it may be utilized in systems of various types will be more clearly understood from the following detail description and the accompanying drawing in which

Fig. 1 shows an alarm system or hit indicator according to the invention which has only a single indicating device and which is adapted for use with telegraph repeaters wired for test board answering;

Fig. 2 shows a similar system adapted to be connected as a loop leak or armature leak circuit;

Fig. 3 shows an alternate alarm system having separate hit and transmission indicators and adapted for use with test board answering repeaters; and

Fig. 4 shows the alternate system of Fig. 3 adapted for use as a loop leak or armature leak circuit.

In Fig. 1 the hit indicator circuit is shown associated with a telegraph repeater and the line L. The repeater comprises the usual receiving relay R, the armature of which cooperates with the marking contact *m* and the spacing contact *s*, and the sending relay S together with the other apparatus (not shown) which is usually associated therewith. The repeater shown is also provided with a jack 11 and a cord 12 whereby the repeater circuit is extended to a jack 13 at the test board where the hit indicator circuit is located so as to be readily available for use on any one of a number of such repeater circuits.

The indicator comprises a gas-filled tube 14 having in its output circuit a relay 15 for controlling the lamp 16 or other indicating or recording device. When the line is idle or when signals are being sent out from this station, the armature of the relay R is normally at rest on its marking contact *m* as shown. The potential drop in the resistor 9 maintains a steady current in the primary of the transformer 19 and the grid 17 of the tube is negatively biased by the battery 18 so that under this condition the tube is blocked and no current flows in the plate circuit.

The transformer 19 is connected to the repeater with the proper polarity so that for changes in the line current which would tend to make the armature of the relay R leave its marking contact *m*, the potential induced in the transformer secondary reduces the bias on the grid 17 and permits a current to flow in the plate circuit of the tube. This current operates the relay 15 which lights the lamp 16 and completes a holding circuit for the relay extending from the grounded battery 20 through the key 21, conductor 22, the holding winding on the relay conductor 23, key 21, the contacts of the relay to ground at the lamp 16. While the change in potential across the resistor 9 when a hit occurs on the line will ordinarily be only a few volts the trans-

former 19 is preferably selected so that the voltage induced in the secondary is relatively large. Under this condition the system is very sensitive and may be adjusted to detect even line disturbances which are not of sufficient magnitude to produce a false operation of the receiving relay.

The attendant observing that the lamp is lighted operates and holds the key 21. The breaking of the normally closed contacts 24 and 25 breaks holding circuit of the relay and the plate circuit of the tube thereby releasing the relay, resetting the tube, and extinguishing the lamp. The making of contacts 26 and 27 prepares the plate circuit through the two windings and contact 28 of the relay but if the lamp was lighted by a line hit the relay does not reoperate since the tube has been reset. If, however, the direction of transmission has reversed and signals are coming in, the next space impulse again flashes the tube, operates the relay and opens contact 28 so that the plate current is diverted through the resistor 29 and the condenser 30 and is gradually reduced to zero as the condenser is charged. This delays the resetting or deionization of the tube and the release of the relay but when the current reaches some lower value the relay releases, extinguishing the lamp and closing contact 28 to discharge the condenser through the resistor 29. After the tube has reset the next space impulse repeats this cycle and the lamp 16 flashes at a frequency determined by the values of the resistor 29 and the condenser 30. Due to the thermal lag of the filament, the lamp cannot flash at the frequency of the line signals and in the absence of the condenser and resistance would remain either lighted or out, but with a suitable circuit of the type shown it may be made to flash at a lower frequency to produce a characteristic indication of reversed transmission.

The hit indicator portion of the circuit of Fig. 2 is quite similar to that of Fig. 1 except that the transformer 19 is replaced by a coupling resistor 31, which is connected to the repeater by means of a single conductor cord 32. This type of hit indicator input circuit is particularly applicable for connection to points in the system where the change in voltage when a hit occurs is large enough to flash the tube without the use of a transformer. This is true, for example, when the indicator is used in a subscriber's loop by plugging the cord 32 into the jack 10 or when it is connected to the armature of the receiving relay at jack 33. In either case when a hit occurs the normal bias on the grid 17 of the tube will be reduced, the tube will flash and the indicator will function in the same manner as already described in connection with Fig. 1.

The indicator of Fig. 3 has an input circuit of the type shown in Fig. 1 and the indicator of Fig. 4 has an input circuit of the type shown in Fig. 2. In the circuits of both Figs. 3 and 4, a hit or an initial space impulse flashes the tube 14 and operates the relay 15 over a circuit extending from the battery 20 to key 47, the operating winding of the relay, relay contact 41 to the plate of the tube. The operation of the relay closes contact 42 to lock in the relay and the hit lamp 43 and opens contact 41 to reset the tube and closes contact 44 thereby transferring the plate circuit of the tube to the battery 20 through the winding and contact 45 of the relay 46. If the foregoing operations were caused by a line hit, nothing further occurs, the attendant records the hit and momentarily opens the key 47 to release the relay 15 and extinguish the lamp. If,

however, the lamp 43 was lighted by a reversal of transmission, the relay 46 will be operated by succeeding space impulses and will flash the transmitting lamp 48 at a predetermined frequency determined by the values of the resistor 49 and the condenser 50 as in the circuit of Fig. 1. It will be observed that the hit indicator of Figs. 3 and 4 distinguishes between line hits and transmission without any action on the part of the attendant. This is a material advantage in that the attendant, when busy on some other work at a distance from the indicator, may ignore the hit lamp 43 as long as the lamp 48 is flashing. When transmission from the line ceases, he momentarily opens the key 47 to extinguish the lamp 43 and condition the indicator to respond to any subsequent hits.

While the invention has been disclosed with reference to its application to a telegraph repeater, it will be understood that it may be used to indicate faults or circuit operations in connection with systems of various other types. It will also be understood that the several circuits for connecting the indicator to the circuit under observation are merely illustrative and that the invention is intended to be limited only by the scope of the following claims.

What is claimed is:

1. The combination with a normally blocked gas-filled tube, means for flashing the tube and an indicating device, of a relay controlling the device and having normally closed contacts, an output circuit for the tube extending through the winding and the closed contacts of the relay, and means comprising a condenser shunting said contacts effective upon the opening of the contacts to delay the resetting of the tube.

2. In a hit indicator for telegraph circuits, the combination with a normally blocked, gas-filled tube adapted to be flashed by an impulse from a telegraph circuit and indicating means operated in a first manner by the flashing of the tube in response to a hit or a reversal in the direction of the transmission of signal pulses, of means for conditioning the tube to reset automatically after a predetermined delay and means for subsequently operating said indicating means in a second manner, in response to a reversal in the direction of transmission of said pulses.

3. The combination with a normally blocked gas-filled tube, means for flashing the tube and an indicating device operated by the tube, of means for resetting the tube and the device, means for conditioning the tube to reset automatically at a first rate, and means comprising a condenser temporarily effectively in series between the anode of said tube and positive battery operative when the tube is so conditioned for changing said rate of resetting of the tube.

4. The combination with a normally blocked gas-filled tube, means for flashing the tube, an indicating device and a relay controlling the device and having normally closed contacts, of an output circuit for the tube including a winding on the relay, means for resetting the tube, means for extending the output circuit through the normally closed contacts to form an automatic resetting circuit for the tube and a resistor and a condenser connected across the normally closed contacts of the relay and effectively in series between the anode of said tube and positive battery when said contacts are open.

5. The combination with a normally blocked gas-filled tube, means for flashing the tube and two indicating devices, of a first relay controlling

one of the devices and adapted to operate when the tube is flashed, a second relay controlling the other device and adapted to operate when the tube is flashed while the first relay is operated, and means associated with the second relay for automatically resetting the tube.

6. The combination with a normally blocked gas-filled tube, means for flashing the tube and two indicating devices, of a relay controlling each device and having normally closed contacts, an output circuit for the tube including the closed contacts and winding of one of the relays, a second output circuit for the tube completed by the operation of said one relay and extending through the winding and closed contacts of the other relay.

7. A telegraph circuit, a hit indicator connected to said circuit, means comprising a normally blocked gas-filled tube and an indicating device in said indicator for indicating both a circuit disturbance and a change in the direction of the transmission of telegraph signals in said circuit, means also in said indicator comprising a condenser effectively in series between the anode of

said tube and positive battery for discriminating between said disturbance and said reversal.

8. In a telegraph circuit hit indicator, means for discriminating between a circuit disturbance and a reversal in the direction of telegraph signal transmission, said means comprising a gas-filled tube having two different anode circuits, one of which contains a condenser in series with the anode and positive battery, said condenser being switched into said anode circuit intermittently.

9. In a hit indicator, a normally blocked gas-filled tube, an output circuit for said tube extending through the winding of a relay, a device controlled by said relay for indicating that said tube has flashed due to either of two conditions, means for maintaining said device in the indicating condition, means in said hit indicator comprising a condenser effectively in series between the anode of said tube and positive battery for resetting said tube and said device so as to discriminate between the said two conditions.

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