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RELAYING ARRANGEMENT

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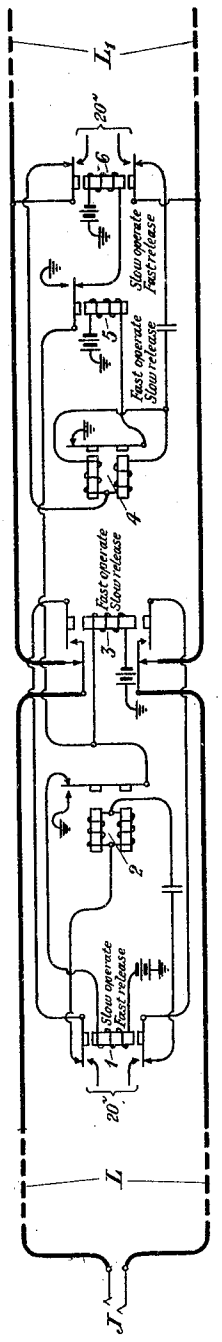


Fig. 1

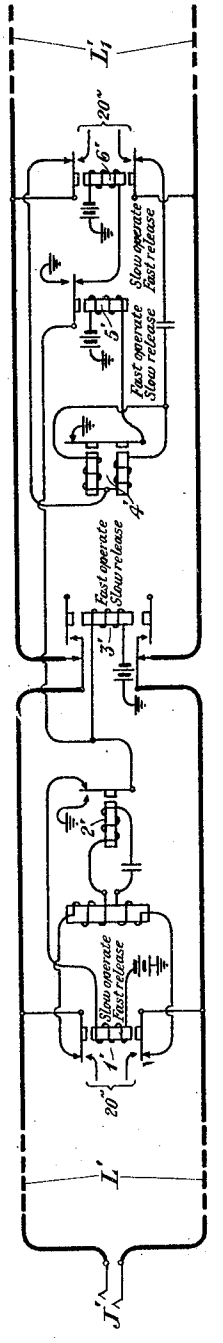


Fig. 2

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RELAYING ARRANGEMENT.

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This invention relates to improved arrangements for relaying signaling or ringing currents transmitted over a line, the characteristics of which are such that currents of this type might need reinforcement in strength before arrival at their destination.

A particular illustration, wherein a device of the invention might be utilized, is in a telephone system where it is desired to transmit low frequency signaling current, such as 20-cycle current, from a composite ringer at a central office to a toll subscriber connected thereto over a toll circuit, the overall length or characteristic of which exceeds the signaling range of the composite ringer at the frequency utilized. Accordingly, the relaying device of this invention would be inserted at a desired intermediate point in this toll circuit and upon responding to signaling current sent out by the central office, would transmit similar signaling current toward the subscriber's end of the toll circuit with sufficient strength to operate apparatus thereat. The device of the invention accordingly has been illustrated as embodied in a toll circuit of this type. However, it is understood that this is for purposes of illustration only, and that the relaying arrangements may be utilized in many other types of circuits and with a number of different types of signaling currents.

The invention may be more fully understood from the following description together with the accompanying drawing, in the Figures 1 and 2 of which are shown circuit diagrams embodying a preferred form of the invention and a modification thereof.

The arrangements of the invention as shown in Fig. 1 are embodied in a toll circuit comprising the line sections L and L_1. The line section L will terminate in a jack J at a central office, whereby it would be connected to a circuit which would transmit signaling current, such, for example, as 20-cycle current, to the line section. The line section L_1 would lead to a distant subscriber's station. Let it be assumed that a 20-cycle signal is applied from the central office to the line section L to the relaying arrangements of this invention, and this signaling current flows through the ringing bridge involving relay 4 in series with a condenser, thereby causing this relay to operate. Its operation causes the release of the relay 5, thereby completing the circuit from battery through the winding of relay 3 and the contact of relay 5 to ground, as well as completing the circuit through relay 1 to ground. Relay 3 is a faster operating relay than relay 1. As relay 3 operates it connects the ringing bridge involving relay 2 across the circuit and opens the circuit between the source of signaling current and the ringing bridge involving relay 4. Relay 2 immediately responds to the incoming signal, and completes the circuit from battery through the winding of relay 3 to ground before this latter relay, which is of the slow-release type, has released. The operation of relay 2 also opens the circuit through the winding of relay 1 before relay 1 has operated and prevents that relay from operating. The release of relay 4 has caused the operation of relay 5, and a circuit is now completed from battery through relay 6, contacts of relays 5 and 2, to ground. Relay 6, upon operating, disconnects the ringing bridge involving relay 4 from the circuit and applies 20-cycle signaling current towards the subscriber's loop. When the incoming signal ceases, relay 2 releases, causing the release of relays 3 and 6. Since relay 6 releases slightly before relay 3, a ring back towards the central office is prevented.

Assuming that a 20-cycle signal is being received over the line section L_1 from the subscriber's loop, relay 4 will be operated, causing the release of relay 5. The release of relay 5 causes the operation of relay 3 and relay 1. Relay 1 removes the ringing bridge, involving relay 2, from the circuit and applies 20-cycle signaling current over line section L to the central office. Relay 3 operates slightly faster than relay 1, thereby preventing a ring back. When the incoming signal ceases, relay 4 releases, causing relay 5 to operate. Relays 3 and 1 then release, relay 1 releasing slightly faster than relay 3 thereby preventing a ring back.

In the modification illustrated in Fig. 2 similar parts, with respect to Fig. 1, have been designated with the same reference characters, with the added designation of prime (′). In the modification shown in Fig. 2, two ringing bridges are employed rather than one

ringing bridge as in Fig. 1. Let it be assumed that 20-cycle signaling current is applied to the relaying device from the switchboard through the jack J′ and over line section L′. This signaling current will pass through both ringing bridges operating relay 2′ and relay 4′. The operation of relay 2′ causes the cut-off relay 3′ to operate. Relay 3′ is a fast operating-slow release relay. The operation of relay 3′ stops any further flow of the original 20-cycle signaling current through the windings of relay 4′ and causes that relay to release. During the interval that relay 4′ was operated, relay 5′, which is a slow release-fast operating device, may have released. However, it was prevented from causing the operation of relay 1′, since the operation of relay 2′ opened the circuit between the armature of relay 5′ and the winding of relay 1′. As soon as relay 5′ returns to its normal operating condition the circuit through the winding of relay 6′ to ground is completed through the contacts of relay 5′ and relay 2′. The operation of relay 6′ removes the ringing bridge, consisting of relay 4′ in series with a condenser, from the circuit and causes 20-cycle signaling current to be applied to line section L_1' leading to the subscriber. Both relays 6′ and 3′ and 1′ are of the slow-release type. However, relays 1′ and 6′ release slightly sooner than does relay 3′, and this fact prevents the application of 20-cycle signaling current back over line section L′ to the central office. When the incoming signaling current ceases, relay 2′ releases, thereby causing both relays 3′ and 6′ to release.

Assume that a 20-cycle signaling current is applied to the relaying arrangements from the subscriber's set over line section L_1'. Signaling current will flow through the two ringing bridges, causing relays 4′ and 2′ to operate. The operation of relay 2′ will complete the circuit through relay 3′ to ground, causing it to operate. The operation of relay 4′ will cause relay 5′ to release, which also completes the circuit through the winding of relay 3′ to ground, thereby keeping relay 3′ in its operative position or bringing relay 3′ to its operated position if relay 2′ has not already responded to the signaling current. The release of relay 5′ also opens the circuit between the winding of relay 6′ and the ground which is on the contact of relay 2′, thereby preventing the operation of relay 6′. Relay 3′ is a faster operating relay than relay 6′. As soon as the cut-off relay 3′ operates, the signaling current is cut off from the ringing bridge involving relay 2′ and that relay releases, completing the circuit from battery through the winding of relay 1′, contacts of relays 2′ and 5′ to ground. Relay 1′, upon operating, disconnects the ringing bridge involving relay 2′ from the circuit, and also causes 20-cycle signaling current to be applied over line section L′ to the central office. As the incoming signal ceases, relay 4′ releases, causing relay 5′ to operate, which in turn causes the release of relays 3′ and 1′.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is to be understood that it is capable of embodiment in many other and widely varied forms without departing from the spirit of the invention as defined in the appended claim.

What is claimed is:

A transmission line comprising two line sections interconnected over the contacts of a cut-off relay, a bridge across one of said line sections including a signal responsive relay, means controlled by said signal responsive relay for operating said cut-off relay, a bridge circuit adapted to be connected across the other of said line sections by the operation of said cut-off relay, signal responsive means in said bridge circuit, means to complete a holding circuit for said cut-off relay directly over the contact of said last mentioned signal responsive means, and means controlled by said last mentioned signal responsive means for applying signaling current to said first mentioned line section.

In testimony whereof, we have signed our names to this specification this 19th day of November, 1926.

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