

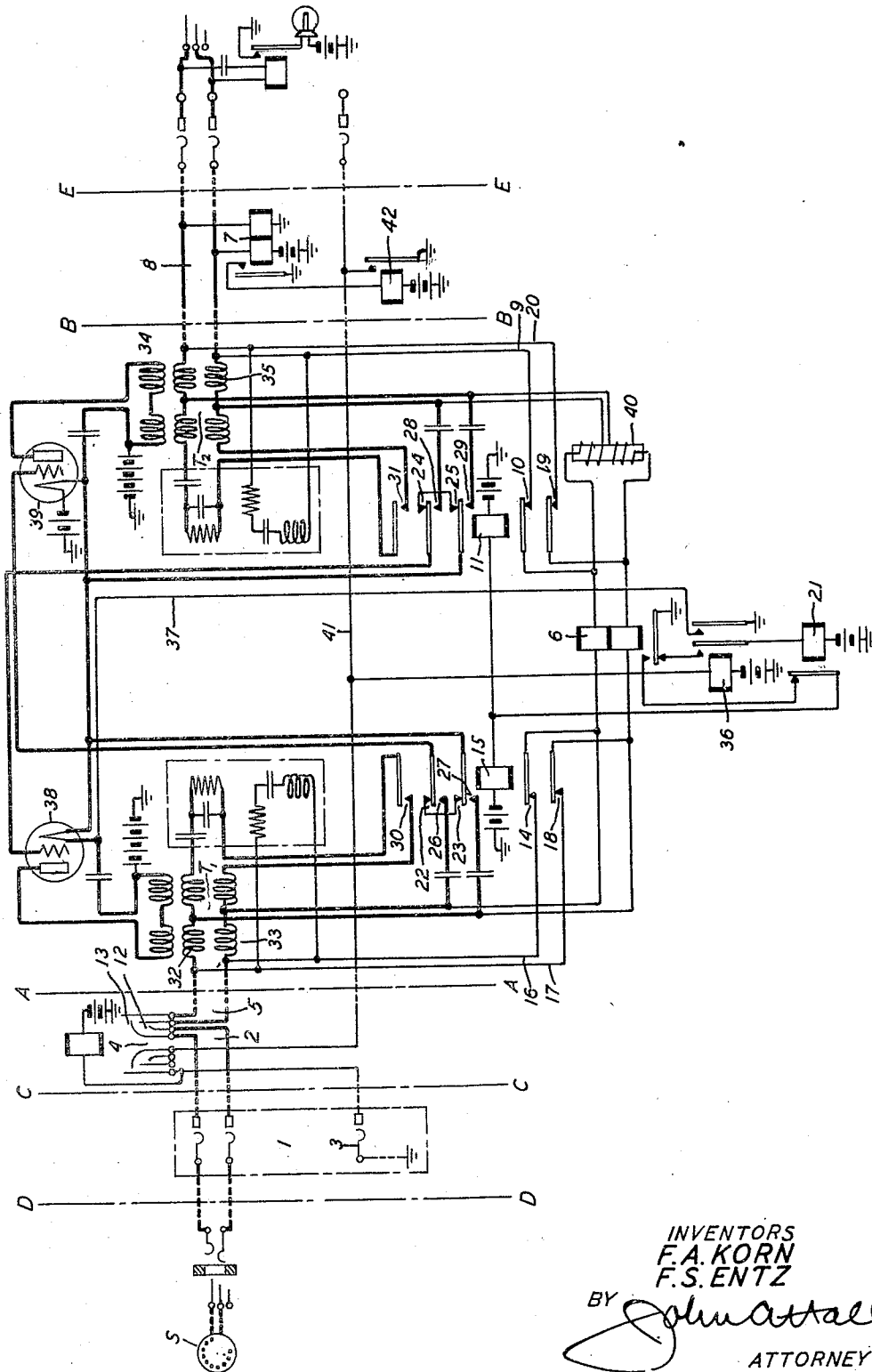
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems, and more particularly to lines, arranged for controlling automatic switches by means of current impulses, in which repeaters or amplifiers are inserted for the purpose of improving the transmission of speech frequency currents.

An object of the invention is to protect the repeaters from the switching impulses and more particularly to prevent the repeater from interfering with or affecting the switching impulses.

A feature of the invention is the provision of means, under joint control of the calling and called ends of the line for disabling and effectively disconnecting the repeater during pulsing.

Another feature relates to an arrangement for controlling the energization of the repeater from the called end of the line.

The invention will be understood from the following description when read in connection with the accompanying drawing which shows, between the vertical broken lines A—A and B—B, a dial pulse by-pass circuits around a standard 2-way telephone repeater.

The apparatus indicated between the vertical broken lines A—A and D—D represent a machine switching or dial office, that to the left of line D—D represents a dial subscriber's line extended to an outward operator's position and that to the right of the line B—B, apparatus at a second dial office for extending the line to a distant operator's positions.

When the line of the calling subscriber S is extended over the selector switch 1 to the contacts of the trunk 2 ground on the third brush 3 of the switch 1 causes the trunk switch 4 to plunge and connect the calling subscriber through to repeater trunk 5. When this repeater trunk is seized a bridge is connected across the tip and ring conductors which causes the line relay 6 in the by-pass circuit to operate in series with the line relay 7 at the distant dial office. This circuit may be traced from battery, left-hand winding of relay 7, ring conductor of trunk 8, conductor 9, contacts 10 of relay 11, upper winding of relay 6, contacts 14 of relay 15, conductor

16, ring conductor of trunk 5, contacts 12 of trunk switch 4, ring conductor of trunk 2, and thence thru the subscriber's equipment to the tip of the line, contacts 13 of trunk switch 4, conductor 17, contacts 18 of relay 15, lower winding of relay 6, contacts 19 of relay 11, conductor 20, and tip of trunk 8 to ground through the right-hand winding of relay 7. Relay 6 in operating causes the operation of relays 15 and 11 in an obvious circuit over contacts of relay 21.

Relays 15 and 11 in operating remove the normal short-circuit across the input terminals of the repeater, this being accomplished by opening contacts 22 and 23 of relay 15, and 24 and 25 of relay 11. The operation of relays 15 and 11 also place the repeater in operative relation with the line by closing contacts 30 and 31, 26, 27, 28 and 29. Further, the operation of relays 15 and 11 open contacts 14, 18, 10 and 19, thereby transferring the previously traced by-pass circuit through the windings 32 and 33 of transformer T₁, impedance coil 40, and windings 34 and 35 of transformer T₂.

The repeater is now in condition to repeat voice frequency current.

When relay 7 operated in series with relay 6 it caused the operation of relay 42 which connected ground to conductor 41 thereby causing the operation of sleeve relay 36. This relay, in operating, prepares a circuit to operate relay 21 when relay 6 releases on the first open circuit impulse from the subscriber's dial. Ground on conductor 41 also serves to hold operated all preceding selector or trunk switches as, for example, trunk switch 4.

Relay 36 in operating also connected ground to conductor 37 which completed an obvious circuit to light the filaments of the vacuum tubes 38 and 39.

When the subscriber S operates his dial the first open circuit impulse causes relay 6 to release thereby completing an obvious circuit for the operation of slow to release relay 21 which opens the previously traced energizing circuit for relays 15 and 11. Relay 6 follows the dial pulses but relay 21, which is slow to release, holds up during pulsing and

therefore relays 15 and 11 remain deenergized during pulsing.

Relays 15 and 11 released again shunt out the windings 32, 33, 34 and 35 of transformers T_1 and T_2 and provide a direct by-pass for the dial impulses through relay 6, by closing contacts 14, 18, 10 and 19. Also by closing contacts 22, 23, 24 and 25, they disable or short-circuit the input of the repeater vacuum tubes 38 and 39. This prevents "singing" during dialing. At the end of the pulsing relay 21 releases and causes relays 15 and 11 to reoperate, thus completing the circuit through the repeater for the transmission of voice current.

When the calling subscriber S hangs up the bridge across the tip and ring conductors of the line is removed, thereby permitting relay 6, as well as line relay 7 of the distant selector mechanism, to release. The release of relay 6 causes relays 15 and 11 to release and relay 21 to operate. Release of the distant line relay 7 causes removal of ground from the conductor 41 which opens the circuit for relay 36 and the holding circuit for trunk switch 4. Release of relay 36 removes ground from the filament control lead 37 of the vacuum tube battery supply circuit and also releases relay 21, whereupon the circuit is restored to normal.

It will be observed from the foregoing description that the repeater is disabled and effectively disconnected from the trunk during transmission of dial impulses by the released condition of relays 15 and 11, these relays being controlled jointly by the dial contacts at the subscribers' station at one end of the line and the line relay 7 at the other or distant end that is, relay 7 holds relay 36 operated thereby providing a path for the energization of slow release relay 21 when relay 6 releases during pulsing. Relay 21, being slow to release, holds open the circuits for relays 15 and 11 during the pulsing interval which short circuits the repeater input and opens one side of the transformers T_1 and T_2 . In other words there must be cooperation between the calling station and the distant end of the line (relay 7) to hold relays 15 and 11 released during the pulsing.

It will also be noted that relay 36, which is controlled by relay 34 at the distant end of the line, controls the activity of the filaments of the repeater tubes.

What is claimed is:

1. In a repeater system, a line having a calling and a called end, a voice current repeater intermediate said ends, and means jointly controlled from said calling and called ends for disabling and effectively disconnecting said repeater from the line.

2. In a repeater system, a line terminating in automatic switching equipment at one end, impulse transmitting means at the other end

voice current repeater in said line intermediate the ends thereof, and means jointly controlled from each end of the line for disabling and effectively eliminating said repeater from the line.

3. In a repeater system, a line terminating in an automatic switch at one end, an impulse device at the other end for alternately interrupting and closing the line to control said switch, a repeating device in said line intermediate the terminals thereof and means controlled by the line interruptions during operation of said device to effectively eliminate said repeater from the line.

4. In a repeater system, a line terminating in automatic switching equipment at one end, impulse transmitting means at the other end adapted to control said switching equipment, a telephone repeater in said line intermediate the impulse transmitting means and said switching means, and means controlled by said switching equipment for effectively eliminating said repeater from said line during the transmission of impulses.

5. In a repeater system, a line terminating in automatic switching equipment at one end, impulse transmitting means at the other end for controlling said switching equipment, a thermionic telephone repeater in said line intermediate the impulse transmitting means and said switching means, and means controlled by said switching equipment for controlling the thermionic activity of said repeater.

6. In a repeater system, a line having a calling and a called end, a telephone repeater intermediate said ends, and means controlled from the called end responsive to a connection with the calling end for energizing said repeater.

7. In a repeater system, a line having a calling and a called end, means for seizing the calling end of said line to initiate a call, a thermionic repeater in said line intermediate the two ends thereof and means controlled from the called end responsive to the seizure of the calling end to thermionically activate said repeater.

8. In a repeater system, a line, means for connecting to one end of said line to initiate a call, a line relay at the other end responsive to said connection, a thermionic repeater in said line intermediate the two ends thereof, and means responsive to the operation of said line relay for thermionically activating said repeater.

9. In a repeater system, a line, means including an impulse transmitter for seizing one end of said line to initiate a call, automatic switching equipment terminating the other end of said line and adapted to be controlled by said impulse transmitter, a normally inert telephone repeater adapted to be connected in said line intermediate the impulse transmitter and the switching mechanism,

means responsive to the seizure of said line for activating said repeater and connecting it in said line and responsive to the actuation of said impulse transmitter to disable and again disconnect said repeater during the actuation of said impulse transmitter.

10. In a switching system, a line divided into two sections, an automatic switch terminating at one end of said line, impulse transmitting means for controlling said switch associated with the other end of the line, a repeating device substantially opaque to said impulses connecting said line sections and means effective during the transmission of impulses for maintaining a connecting path between said line sections independent of said repeater.

In witness whereof, we hereunto subscribe our names this 1st day of August, 1930.

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