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IMPULSE MECHANISM

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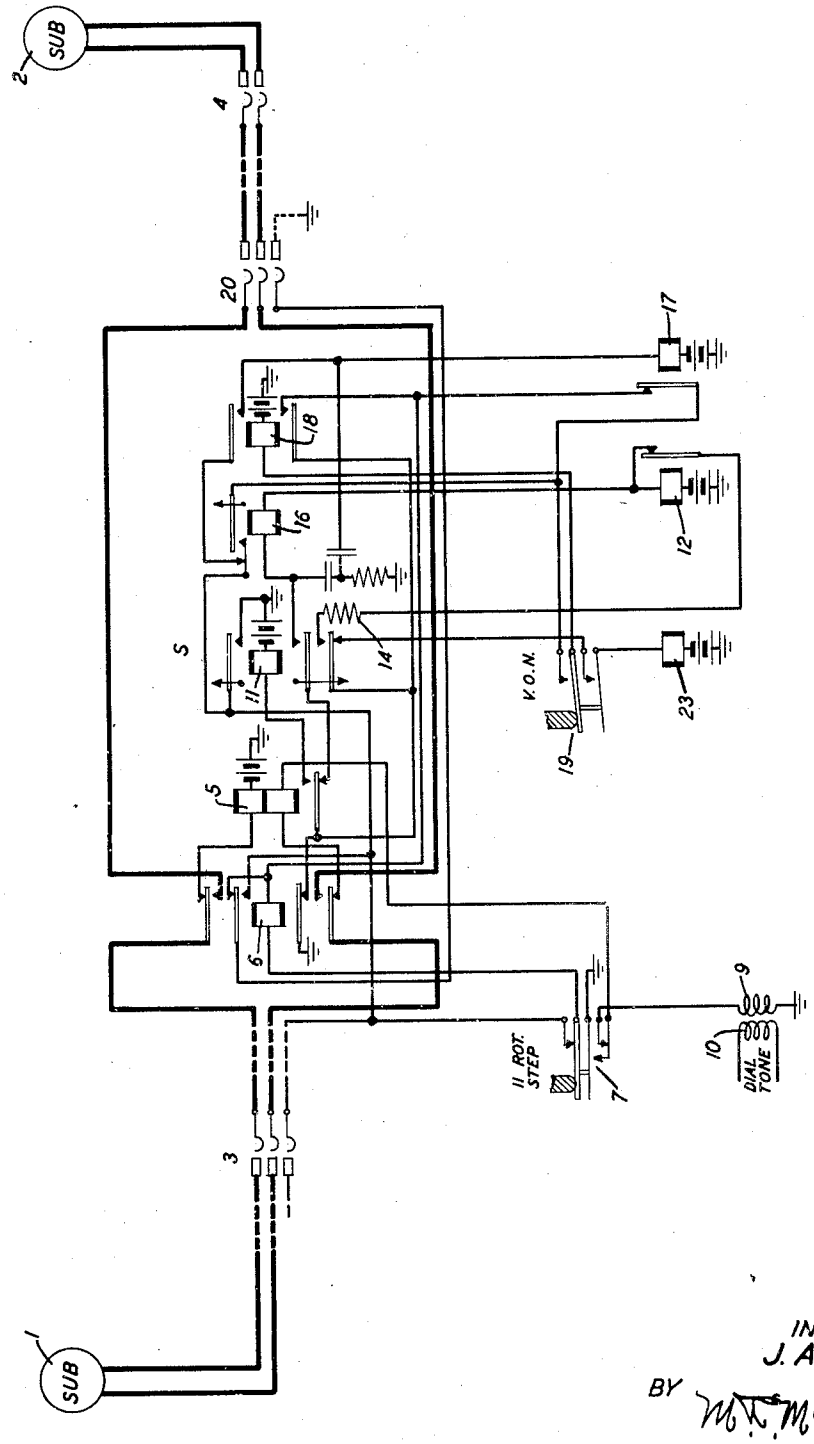

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IMPULSE MECHANISM

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4 Claims. (Cl. 179—18)

This invention relates to impulse mechanisms and particularly to impulse operated switches, such as those used in automatic telephone systems.

An object of the invention is to provide circuit arrangements for controlling the operations of impulse mechanisms which are faster, more reliable, more positive in operation, and more accurately responsive to the operating impulses.

Heretofore circuit arrangements have been used for operating step-by-step mechanisms in response to signaling impulses, for example, selector switches, and pulsing circuits therefore have been used in which a pulsing relay is responsive to dial pulses to close a circuit for actuating a stepping magnet to operate the switch one step for each impulse received. In such system the operation and release periods of the pulsing relays may vary and cause corresponding variations in the functioning of the stepping magnets.

It is a feature of the present invention to improve said functions by providing a pulsing circuit arrangement in which the stepping magnet acts quickly after energization of the pulsing relay to permit the response thereof to impulses received at a fast rate and regardless of the variation in the operating and release characteristics of the pulsing relay. The arrangement consists of a circuit closed by an auxiliary relay through self-interrupting contacts of the stepping magnet and the winding thereof to preenergize the stepping magnet so that it will pull up quickly, said circuit being opened on the energization of the magnet by the pulsing relay to remove the preenergization and permit the magnet to release at the normal rate.

The invention has been illustrated in the accompanying drawing in which an automatic telephone system has been shown with a selector circuit arrangement shown in detail to illustrate the application of the invention to selector circuits.

Referring now to this drawing, an automatic system is disclosed diagrammatically with the selector circuit to which the applicant's invention has been applied shown in detail. In this system a connection may be established from a calling subscriber's station 1 to a called subscriber's station 2 in any well-known manner over a line finder 3 and the connector 4 and in accordance with the invention through a selector S. If it is assumed that the connection has been established through a line finder 3, the closure of this connection causes pulsing relay 5 to operate over a circuit from battery through the upper winding of relay 5, contacts of relay 6, over the subscriber's loop through the line finder 3, contacts of relay 6, lower winding of relay 5, contacts of the eleventh step off-normal contacts 7, coil 9 to ground. Coil 9 is associated through a coil 10 with a dial tone source so as to indicate to the subscriber at station 1 that he may begin dialing when he receives a tone from this source. Relay 5, in operating, closes a circuit for relay 11 from battery through the winding of this relay, contacts of relays 5 and 6 to ground.

When the subscriber receives the dial tone and begins dialing, the pulsing relay 5 will respond by releasing for each impulse, while relay 11 will remain operated during the pulsing. It should be noted that on the operation of relay 11 a circuit is completed for preenergizing the winding of the vertical magnet 12 from battery through the winding of this magnet, its armature and back contact, resistance 14, contacts of relays 11 and 6 to ground. Resistance 14 may be of such character as to permit the winding of the vertical magnet 12 to receive a certain amount of preenergization but not sufficient to cause it to operate. On the first release of the pulsing relay 5 in response to the first digit a circuit will now be completed for this vertical magnet to completely energize it to step the selector switch one step. This circuit may be traced from battery through the winding of the vertical magnet 12, winding of relay 16 and contacts of relays 11, 5 and 6 to ground. Th operation of the magnet 12 opens the previously traced preenergizing circuit and the magnet is now held solely by the energizing circuit as traced above. Relay 16 which is included in this circuit will also operate and as it is slow to release it will be maintained operated during the pulsing. When this first impulse ceases, that is when relay 5 again operates, the energizing circuit for magnet 12 is opened at the armature and back contacts of this relay and the magnet releases. The preenergizing circuit is now again closed, through the armature and back contact of this magnet to preenergize it for the reception of the next impulse. Therefore on each impulse received by the vertical magnet 12, a certain amount of preenergization is always present to permit it to respond quickly to impulses received from the calling subscriber. Thus the impulses as received by the operation and release of the pulsing relay 5 may vary considerably in relation to the open and closed periods of the armature with its front and back contacts, and the impulses may be received from

the calling subscriber at a much faster rate than was hereinbefore possible due to this preenergizing of the magnet.

When the first series of impulses ceases, the relay 16 will release and a circuit will be completed for the operation of the rotary magnet 17 due to the energization of relay 18 after the first vertical step of the switch at which time the circuit through the vertical off-normal contact 19 was closed, the circuit for relay 18 being traced from battery through the winding of this relay, vertical off-normal contacts 19, contacts of relays 16 and 11 to ground and a locking circuit for this relay was closed from battery, winding of relay 18, vertical off-normal contacts 19, contacts of rotary magnet 17, and contacts of relays 18 and 6 to ground. Therefore the circuit for the rotary magnet may now be traced from battery through the winding of this magnet, contacts of relay 18 and the now closed make-before-break contacts of relay 16 through contacts of relay 11 to ground. This first operation of the rotary magnet 17 will advance the brushes 20 of the selector circuit to land on the set of terminals leading to the first connector. If this connector is idle, it will be noted that the rotary magnet will not take any additional steps but will release due to the fact that relay 18 will release on the operation of the rotary magnet 17 as the locking circuit for relay 18 is now opened as the armature and back contact of this magnet 17. On the other hand if the first connector encountered is busy, there will be a ground on the tip terminal of this connector and this will close a circuit for the reoperation of relay 18 from battery through the winding of this relay, vertical off-normal contact 19, armature and back contact of magnet 17, contacts of relay 6, the sleeve brush of selector S and the sleeve terminal of the first busy connector to ground. Relay 18 in reoperating again closes a circuit for the operation of the rotary magnet 17 to take another step to advance the brushes of selector S to the next connector circuit. These operations and release of the rotary magnet 17 and relay 18 will continue until an idle connector is found.

When this condition prevails there will be no ground on the sleeve terminal of the idle connection circuit and consequently ground on the sleeve from the line finder will cause the operation of relay 6 from battery through the winding of relay 18, vertical off-normal contacts 19, armature and back contact of the rotary magnet 17, winding of relay 6, the eleventh step off-normal contacts 7 to the ground on the sleeve of the line finder. Relay 6, as stated, will operate over this circuit but the resistance of the winding of relay 18 is such that this latter relay will not operate in this circuit and there will, therefore, be no circuit for the reoperation of the rotary magnet 17 so that the brushes of the selector S will now remain on the terminals of the idle connector. Relay 6 in operating opens the circuit for the pulsing relay 5 which releases and this relay in turn causes the release of relay 11. Relay 6 in operating connects the tip and ring conductors through its outer upper and lower armatures and front contacts to the brushes of the selector S to extend the connection to the idle connector for the reception of the succeeding series of impulses to operate the connector, and when these impulses have been received the connector will establish a connection to the called subscriber's line 2. As relay 6 is held by the ground from the line finder, this relay will release when the calling subscriber hangs up his receiver. When this ground is removed the release magnet 23 will operate from battery through the vertical off-normal contacts 19, contacts of relays 11, and 6 to ground, thus releasing the selector to normal and the associated connector.

What is claimed is:

1. In an impulse mechanism, an impulse relay, an auxiliary relay, an operating magnet, means for actuating said auxiliary relay in response to the operation of the impulse relay, a circuit for partially energizing said magnet in response to the operation of said auxiliary relay, means for fully energizing said magnet to operate in response to the release of the impulse relay and the operation of the auxiliary relay, and means for opening said circuit in response to the operation of said magnet.

2. In an impulse mechanism, a step-by-step device, an operating magnet therefor, an impulse receiving relay and an auxiliary relay, a circuit for operating said auxiliary relay in response to the operation of said impulse receiving relay, a circuit for partially energizing said operating magnet in response to the operation of said auxiliary relay, a circuit for fully energizing said magnet in response to the release of said impulse receiving relay and operation of said auxiliary relay, and contacts controlled by the operation of said magnet for opening said second circuit.

3. In a control system, an impulse relay, an operating magnet, and means responsive to the operation and release of the impulse relay for operating said magnet, a circuit for partially energizing said magnet prior to each operation thereof operative on the operation of said relay, and contacts operated on the operation of said magnet for opening said circuit.

4. In an impulse mechanism a step-by-step device, a stepping magnet for said device, an impulse receiving relay, an auxiliary relay, a circuit for operating said auxiliary relay in response to the operation of said impulse receiving relay, a circuit for partially energizing said stepping magnet including contacts controlled by said stepping magnet, said last-mentioned circuit being operative in response to the operation of said auxiliary relay, a circuit for fully energizing said stepping magnet including contacts of said auxiliary relay and operative in response to the release of said impulse receiving relay, said contacts in the circuit for partially energizing said stepping magnet operative on the full operation of the stepping magnet to open said circuit and operative on the full release of the stepping magnet to close said circuit.

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