

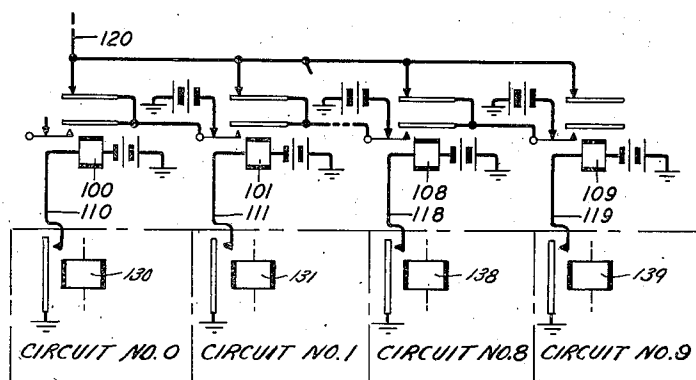
July 27, 1937.

A. J. BUSCH

2,088,318

RELAY CIRCUIT

Filed March 11, 1936



INVENTOR
A. J. BUSCH
BY
P. C. Smith

ATTORNEY

UNITED STATES PATENT OFFICE

2,088,318

RELAY CIRCUIT

Aloysius J. Busch, Bellerose, N. Y., assignor to
Bell Telephone Laboratories, Incorporated,
New York, N. Y., a corporation of New York

Application March 11, 1936, Serial No. 68,240

6 Claims. (Cl. 179—18)

This invention relates to telephone systems and has for its object to increase the reliability of such systems.

In the cross-bar system disclosed in the application of W. W. Carpenter Serial No. 681,102, filed July 19, 1933, first choice is given to groups of equipment, senders for example, in which two or more are idle. In that application a marginal relay arrangement is employed for identifying such groups, requiring careful adjustment of the relay and therefore continuous attention.

In accordance with the present invention, an arrangement is provided for identifying groups containing at least two idle circuits by means of a set of relays, one for each circuit, which operates when the circuit is busy. An indicating circuit is provided which extends in parallel to the back contacts of all of these relays and this circuit is completed only if two relays have their back contacts closed. Each relay is equipped with a pair of connected armatures having two back contacts and one front contact and the indicating circuit extends over the two back contacts of two relays and may include one or more front contacts of intermediate relays.

This arrangement is disclosed in connection with a complete cross-bar system in the application of W. W. Carpenter Serial No. 68,262, filed March 11, 1936.

The invention is illustrated in the accompanying drawing which shows four of a set of ten relays. Relays 100 to 109 are individual respectively to the ten circuits of a group No. 0 to No. 9 connected thereto over conductors 110 to 119. When a circuit, for example circuit No. 0, is busy, relay 130 of that circuit is operated and ground is connected to the corresponding conductor 110 and the individual relay 100 operated. The condition of the group of circuits is indicated to the test equipment (not shown) over conductor 120. This conductor extends in parallel to the outer back contacts of all of the relays 100 to 109. When a relay, for example relay 100, is unoperated, indicating that the corresponding equipment No. 0 is idle, the conductor is connected over its outer armature to the inner contact of the next relay in the chain, relay 101. If relay 101 is also unoperated, indicating the existence of a second idle circuit, this inner contact is closed to battery, thereby connecting battery to conductor 120 as an indication that this group of circuits includes two idle ones and is ready for preferred use.

If the No. 1 circuit is busy so that relay 101 is operated, its inner contact is connected to the

inner contact of the next relay of the chain, where the circuit may extend to battery or to the inner contact of the following relay.

Each relay in operating disconnects its outer armature from conductor 120, opening one of the group indicating circuits and at its inner armature transfers another group circuit from battery to a subsequent relay. Each relay in operating, withdraws from the two chain circuits which are controlled over its contacts.

If only relay 101, for example, were idle, the circuits over the back contacts of relay 100, the relays intermediate relays 101 and 108 and relays 108 and 109 would all be open, the circuit prepared at the outer back contact of relay 101 would be open at the inner back contacts of the intermediate relays and relays 108 and 109.

On the other hand, if none of the relays 100 to 109 were operated, conductor 120 would receive battery over nine circuits, including one over the outer back contact of relay 100 and the inner back contact of relay 101, one over the outer back contact of relay 108 and the inner back contact of relay 109 and seven circuits including contacts of relays not shown.

If relays 100 and 109 were the only relays not operated, conductor 120 would receive battery over the outer back contact of relay 100, the front contacts of relay 101, the intermediate relays and relay 108 and the inner back contact of relay 109.

What is claimed is:

1. In a telephone system, means for indicating when more than a given number of circuits are idle comprising a relay for each of said circuits, means in each circuit for operating the corresponding relay when said circuit is busy and a chain circuit completed over the back contacts of said given number of relays.

2. In a telephone system, means for indicating when more than a given number of circuits are idle comprising a relay for each of said circuits, means in each circuit for operating the corresponding relay and an indicating circuit extending in parallel to the back contacts of all of said relays, said circuit being completed over the back contact of any relay only if the back contact of a succeeding relay is also closed.

3. In a telephone system, a group of circuits, means for marking said circuits as busy or idle, a relay for each of said circuits, each relay having at least two back contacts and one front contact, and a circuit for indicating the availability of said groups of circuits, said circuit extending in parallel to one back contact of each of said re-

lays and completed over one of said back contacts only if the second back contact of a succeeding relay is also closed.

4. In a telephone system, a group of circuits, 5 means for marking said circuits as busy or idle, a relay for each of said circuits, each relay having at least two back contacts and one front contact, and a circuit for indicating the availability of said group of circuits, said circuit extending in parallel to one back contact of each 10 of said relays and completed over the front contact of operated relays and the other back contact of a second unoperated relay.

5. A chain of relays for indicating the availability of a group of circuits, each of said relays 15 being operated when the corresponding circuit

is unavailable, including two connected armatures on each relay having two back contacts and one front contact, and an indicating circuit closed over the two back contacts of two of said relays. 5

6. A chain of relays for indicating the availability of a group of circuits, each of said relays being operated when the corresponding circuit is unavailable, including two connected armatures on each relay having two back contacts and 10 one front contact and an indicating circuit closed over the two back contacts of two of said relays, said circuit including the front contacts of operated relays intermediate said two relays. 10

ALOYSIUS J. BUSCH. 15