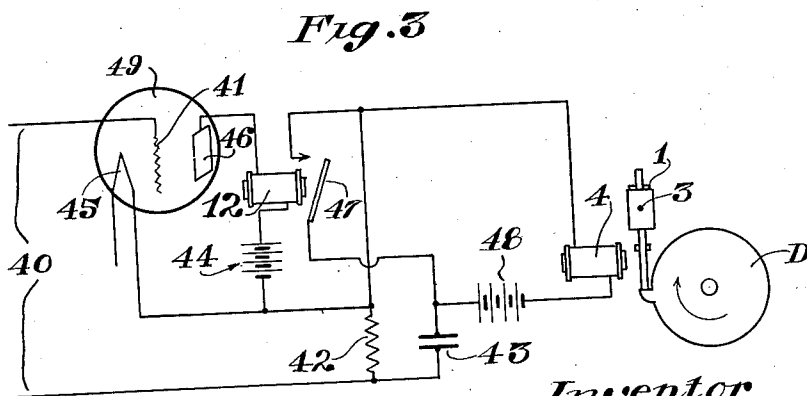
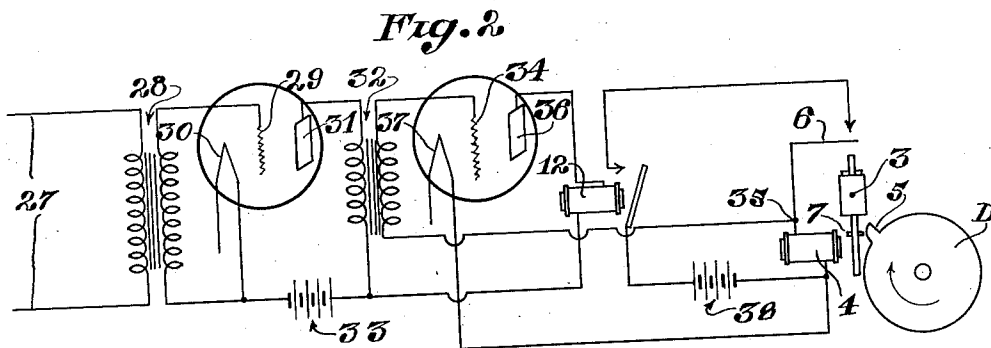
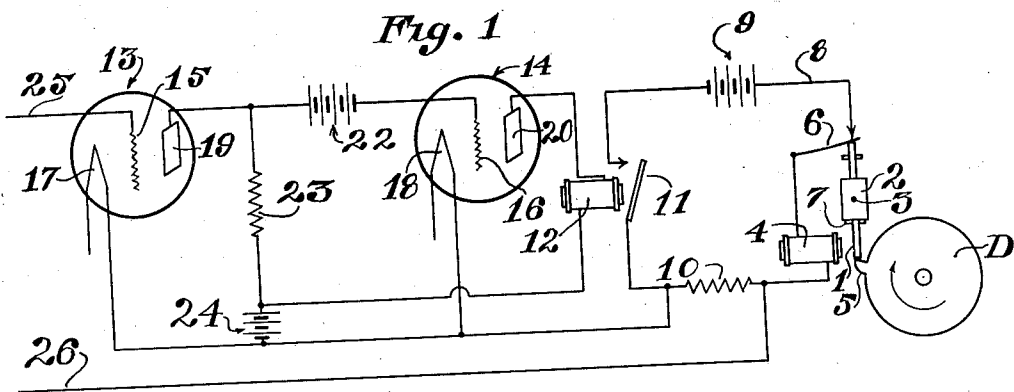


Jan. 7, 1930.

A. G. COOLEY
RELAY LOCKING MEANS
Filed April 11, 1928

1,742,235



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UNITED STATES PATENT OFFICE

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RELAY-LOCKING MEANS

Application filed April 11, 1928. Serial No. 269,090.

When the contacts of mechanical relays close there is a tendency for the contacts to rebound, thereby reopening the circuit momentarily and causing unnecessary arcing; and the object of this invention is to provide means to prevent this tendency, which is particularly applicable to apparatus in which the relay is operated or controlled through an audion or amplifier tube of the type having a grid or other current-controlling element. While the invention has many applications, it is particularly applicable to photo-telegraphic systems.

For the purpose of illustrating the genus of the invention, typical embodiments are shown in the accompanying drawings, in which

Fig. 1 illustrates a system in which the locking potential is obtained from a voltage drop across a resistance in the relay contact circuit, this potential being applied to the grid of the first tube of a series of amplifiers adapted for direct current amplification;

Fig. 2 illustrates a modification in which the locking potential is obtained from a voltage drop across a load in the relay contact circuit, and is applied to the tube directly controlling the relay; and

Fig. 3 illustrates still another embodiment in which the locking potential is obtained from a voltage drop across a resistance produced by the discharge of a normally charged condenser when the relay circuit is closed.

In the particular embodiments chosen for the purpose of illustration, the invention is shown as applied to a photo-telegraphic system in which the drum D at the receiving station is stopped once each revolution and then started by an impulse over the line when the corresponding drum at the transmitting station reaches a predetermined point in each revolution, thereby to maintain the two drums in synchronism. The mechanism diagrammatically illustrated in the drawings for stopping the drum D comprises a plunger 1 sliding vertically in a guide 2, which is pivoted to swing clockwise about the axis 3 when the relay 4 is energized, thereby to disengage the plunger 1 from the stop 5 on the drum and permit the drum to continue its rotation

in the direction of the arrow in each figure. When the stop 5 engages the lower end of the plunger, the plunger is lifted to raise the spring contact 6 against a fixed contact, the flange 7 limiting the upward movement of the plunger, and when the plunger has been oscillated clockwise to disengage the drum, the plunger drops from the position shown in Fig. 1 to the position shown in Fig. 2, thereby opening the circuit at contact 6.

In Fig. 1 the circuits for controlling the trip magnet 4 comprises a circuit 8 including a source of potential 9, a resistance 10, a relay switch 11, as well as the switch contacts above described. The switch 11 is closed by a relay 12 which receives current through the control or amplifier tubes 13 and 14 comprising grids 15 and 16, filaments 17 and 18, and plates 19 and 20. A source of potential 22 is connected between the plate 19 and the grid 16, a resistance 23 and a source of potential 24 are connected in series between the plate 19 and the filament 17, and the relay 12 is connected on one side to the plate 20 and on the other side to the source 24. One side 25 of the input circuit is connected to the grid 15 and the other side 26 of the input circuit is connected to one side of the resistance 10, the other side of resistance 10 being connected to the filaments 17 and 18.

The operation of the apparatus shown in Fig. 1 is as follows: When a relay-closing impulse is received over the input circuit 25 and 26, it is amplified by the amplifiers 13 and 14 and the amplified impulse causes the relay 12 to close the switch 11. Switch 6 having already been closed by the stop 5 on drum D, the closing of switch 11 completely closes the circuit 8, thereby energizing trip magnet 4 and producing a drop of potential across the resistance 10. This drop of potential is applied to the grid 15 and instantly produces a change in the electrical state of the amplifiers to supply more current to the relay 12, thereby locking the switch 11 closed and preventing rebound. When the trip magnet 4 is energized the plunger 1 and support 2 are swung clockwise about pivot 3 to release the drum D, the plunger 1 and switch contact 6 then descending to the position

shown in Fig. 2 to open the circuit of relay 4 as above described. When the circuit 8 is thus opened the relay 12 is unlocked and the switch 11 opens preliminary to another cycle of operations as described.

The arrangement shown in Fig. 2 is similar to that illustrated in Fig. 1 except in that it is adapted for alternating-current operation and the drop of potential utilized to lock the relay 12 is derived from the load 4 instead of a separate resistance 10. In this figure the input circuit 27 is connected across the primary of a transformer 28, the secondary of which is connected to the grid 29 and filament 30 of the first amplifier tube. The plate 31 of this tube is connected to the primary of a transformer 32 and thence to a source of potential 33 to the filament 30. The secondary of the transformer 32 is connected on one side to the grid 34 of the second amplifier tube and on the other side to a point 35 which completes the circuit to the filament 37 through the trip magnet 4. A relay 12 is connected on one side to the plate 36 and on the other side to the battery 33. The operation of this modification will be evident inasmuch as it is similar to that of Fig. 1 except in that the drop of potential for locking relay 12 is the drop across the load 4 instead of resistance 10.

In the arrangement shown in Fig. 3 the input circuit 40 is connected on one side to the grid 41 and on the other side to the resistance 42 and the condenser 43. The relay 12 is connected through a battery 44 to the filament 45 and on the other side to the plate 46. The other side of the resistance 42 is connected to one side of the switch 47 and to the filament 45, the other side of the switch being connected to the condenser 43. Thus the condenser 43 discharges through the resistance 42 and the potential drop across the resistance 42 is applied to the filament 45 and the grid 41. The condenser 43 is charged by battery 48 and when the switch 47 closes the condenser is discharged through the resistance 42, thereby applying increased potential to the grid 41 to prevent the switch 47 from rebounding when it pulls up.

It is understood that the input circuits 25-26 and 40 are complete electrical circuits that will permit the flow of direct current to the grid of the tube 13 or 49.

In view of the above illustrations of typical embodiments of the invention, many other applications of the invention will be evident to those skilled in the art.

I claim:

1. Apparatus of the character described comprising a tube of the type having a current controlling element, a relay responsive to changes in the electrical state of said element, a circuit controlled by said relay, and means for changing the electrical state of

said element when said circuit is closed by said relay to maintain the circuit closed.

2. Apparatus of the character described comprising a relay, a controller for energizing the relay, a circuit closed by the relay, a source of energy in said circuit, and a feedback connection between said circuit and said controller whereby said source causes said controller to supply more energy to said relay the moment it is closed.

3. Apparatus of the character described comprising a relay, an amplifier for energizing the relay, a circuit closed by the relay, means for instantly causing the amplifier to supply more energy to the relay when said circuit is closed by the relay, and means responsive to the closing of said circuit for subsequently opening the circuit.

4. Apparatus of the class described comprising a relay, a controller for energizing the relay, a circuit closed by the relay, a source of energy in said circuit, a feedback connection between said circuit and said controller whereby said source causes said controller to supply more energy to said relay the moment it is closed, and means responsive to the closing of said circuit for subsequently opening the circuit.

Signed by me at New York, New York,
this fourth day of April, 1928.

AUSTIN G. COOLEY.