Nov. 3, 1936. A. D. DOWD 2,059,564

STARTING SYSTEM

Filed March 3, 1934

FIG. 1

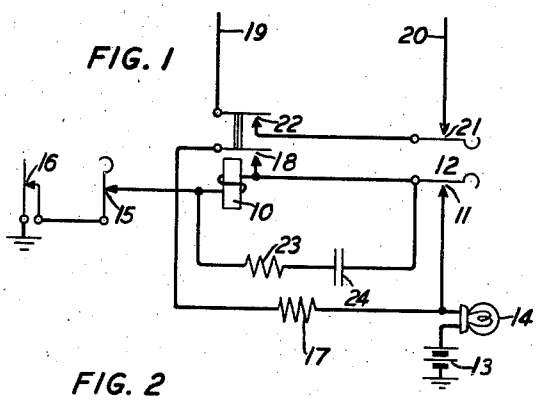
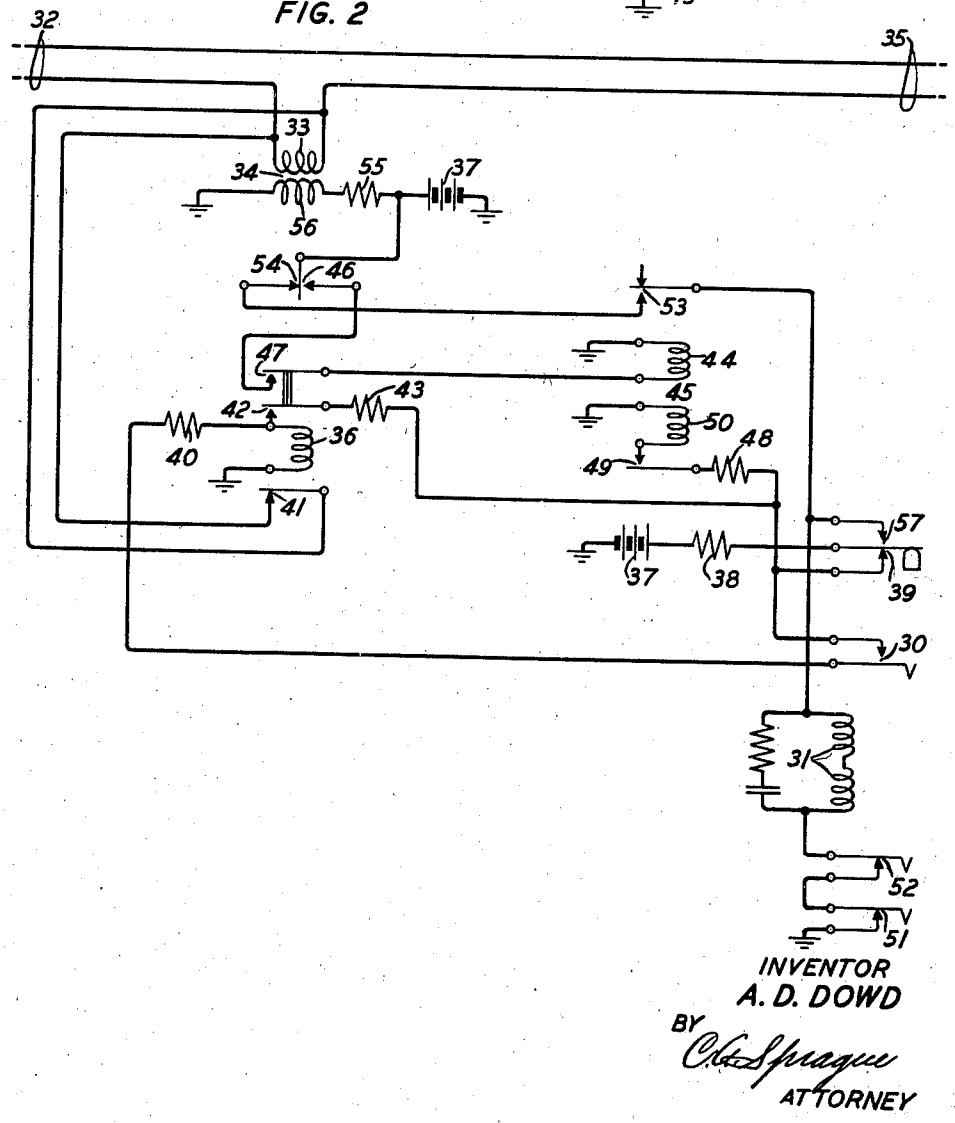


FIG. 2



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STARTING SYSTEM

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Application March 3, 1934, Serial No. 713,826

8 Claims. (Cl. 178—69.5)

This invention relates to an arrangement for controlling the movement of movable elements and more particularly to an arrangement for starting in phase the movable elements of an electro-optical picture reproducing system.

An object of the invention is to provide a starting arrangement for the movable elements at different stations, respectively, of a picture reproducing system which is novel, simple, and effective in operation.

In accordance with the embodiment of the invention herein shown and described for the purpose of illustration, there is provided at the receiving station of a picture reproducing system a circuit arrangement which may be conditioned for operation by momentarily closing a single switch. After being thus conditioned the circuit is set to be operated by the interruption of unmodulated carrier current received from the transmitting station and when thus operated a clutch magnet is energized to connect the movable elements of the picture receiver to a driving motor. After the receiving circuit has been conditioned for operation the actual transmission of the picture is initiated by momentarily closing at the transmitting station a switch which simultaneously causes the interruption of the carrier current which is normally transmitted to the receiving station and the energization of a clutch magnet which connects the movable elements of the picture transmitter to a driving motor. When the clutch magnet at the receiver is subsequently deenergized, as for example after a complete picture has been transmitted, it cannot again be energized except by operating the circuit conditioning switch at the receiver and subsequently operating the starting switch at the transmitter. False operation of the clutch magnet is thus avoided.

The invention may be better understood by referring to the accompanying drawing in which

Fig. 1 shows schematically the starting control circuit for the transmitter of a picture reproducing system; and

Fig. 2 shows schematically the starting control circuit for the receiver of a picture reproducing system.

The invention is particularly applicable to picture transmission systems of the type in which the driving motors for the movable elements at the two stations are continuously operated and in which means are provided for disconnecting the movable elements of the system, the picture drums for example, from the motors. Systems of this type are disclosed for example in Patent 1,606,227 granted to Joseph W. Horton et al., November 9, 1926, and in a copending application of Frederick W. Reynolds Serial No. 713,939, filed March 3, 1934. In systems of this type means are provided for operating the motors in synchronism and the variations corresponding to the tone values of the successively scanned elemental areas of the picture are transmitted in the form of a modulated carrier current.

Referring now to Fig. 1 of the drawing there is provided a clutch magnet 10 which, when operated, connects the movable elements of the picture transmitter to a driving motor. This clutch magnet is operated by the closure of contact 11 of switch 12, the circuit being completed from grounded battery 13, through lamp 14, contact 11, winding of clutch magnet 10, auxiliary stop switch 15 and the adjustable stop contact 16 to ground. The clutch magnet when operated is held up due to the completion of a circuit from grounded battery 13 through lamp 14, resistive element 17, contact 18 of the clutch magnet, the winding of the clutch magnet 10, auxiliary stop 15 and the adjustable stop contact 16 to ground. The winding on the clutch magnet is shunted by the circuit including resistive element 23 and condenser 24 for the purpose of preventing sparking at the contacts of the switches 15 and 16 when the circuit is broken. The key 12 when momentarily operated also causes the interruption of the carrier current which is at the time being transmitted from the transmitting station to the receiving station. This is accomplished by completing the circuit from the source of carrier current connected to the leads 19 and 20 through the contact 21 of the start switch and the contact 22 of the clutch magnet. The contacts 11 and 21 of the start key 12 are so adjusted that the contact 21 closes before the contact 11 is closed. This is done to insure that the short circuit which is placed on the transmitted carrier current will be made at the instant that the clutch magnet is operated. The auxiliary stop 15 is provided to permit the attendant at the transmitting station to release the clutch at any time, thereby stopping the transmission of the picture. There is also provided an adjustable contact 16 on the base of the picture machine supporting the movable elements which contact is automatically opened after the picture has been transmitted. The opening of this contact stops the machine. The position of this contact is adjustable so as to adapt the apparatus to transmit pictures of various sizes without unnecessarily consuming line time. When the start key 12 is released, it being of the non-locking type, the

short circuit which was placed across the source of carrier current is removed due to the opening of contact 21, and, due to the operation of the movable elements of the picture transmission apparatus by the driving motor, there is transmitted to the receiving station a modulated carrier current, the modulations being in accordance with the tone values of the successively scanned elemental areas of the picture.

At the receiving station the circuit shown in Fig. 2 is conditioned by momentarily operating the start key 30 so that when the carrier current is interrupted at the transmitting station the clutch magnet 31 is energized to connect the movable elements of the picture receiving apparatus to a driving motor. The received carrier current after being rectified at the receiving station is impressed upon the circuit at 32. This circuit is connected through the winding 33 of relay 34 to the light controlling apparatus of the picture receiver at 35.

When the start key 30 is momentarily operated the winding of relay 36 is energized by completing the circuit from grounded battery 37 through resistive element 38, through contact 39 of the clutch magnet 31, the contact of start key 30, resistive element 40, and the winding of relay 36 to ground. The operation of relay 36 removes a short circuit across the winding 33 of relay 34 by opening the contact 41. The relay 36 when operated remains energized after the start key 30 is opened due to the completion of a circuit at contact 42 of relay 36. This energizing circuit may be traced from the battery 37 through resistive element 38, contact 39 of the clutch magnet, resistive element 43, contact 42, and the winding of relay 36 to ground. The winding 44 of relay 45 is connected to the contact 46 of relay 34 through the contact 47 of relay 36. Due to the opening of the contact 41 of relay 36 the carrier current received over the line operates the relay 34 so that its armature rests against the contact 46. A circuit is thus completed from grounded battery 37 through the contact 46 of relay 34, contact 47 of relay 36, and the winding 44 of relay 45 to ground, thus operating the relay 45. After being operated the relay 45 remains energized due to the completion of the circuit from grounded battery 37 through resistive element 38, contact 39 of the clutch magnet, resistive element 48, contact 49 of relay 45, and relay winding 50 to ground. The operation of relay 45 completes the circuit from ground through adjustable contact 51, auxiliary stop switch 52, clutch magnet winding 31, contact 53 of relay 45 to contact 54 of relay 34.

After the receiving circuit has been conditioned by momentarily operating the start key 30 as just described the transmitting operator is informed that the circuit is set up for receiving a picture. The transmitting operator then operates the start key 12 as before described to interrupt the transmitted carrier.

The interruption of the carrier causes the relay 34 to operate due to the bias current flowing from grounded battery 37 through resistive element 55, winding 56 to ground. This causes the armature of the relay to close the contact at 54. For this condition the clutch magnet is energized by current from grounded battery 37 through the circuit including contact 54 of relay 34, contact 53 of relay 45, winding of clutch magnet 31, auxiliary stop key 52, adjustable contact 51 to ground. The operation of the clutch magnet thus connects the movable elements of the picture receiving apparatus to the driving motor. The energization of the winding of the clutch magnet causes the opening of the circuit at contact 39 and the closing of the circuit at contact 57. The clutch magnet thus remains energized by current from battery 37 through a circuit which may be traced from grounded battery through resistive element 38, contact 57, winding of clutch magnet 31, auxiliary stop switch 52, adjustable stop contact 51 to ground. Due to the opening of the circuit at contact 39 of the clutch magnet, relays 36 and 45 are deenergized, that is, the circuit between battery 37 and the winding 50 and also the circuit between battery 37 and the winding of relay 36 are opened. The deenergization of relay 36 closes the circuit at contact 41 and short circuits the winding 33 of relay 34. The short circuit across the winding 33 of relay 34 prevents the introduction of a loss in the picture transmission circuit while the picture is being transmitted.

When the transmission of the picture is completed a contact 51 located on the base which supports the movable elements of the picture receiving machine is automatically opened which releases the clutch and stops the rotation of the movable elements. This contact is adjustable along the base of the machine to permit the machine to stop at the proper time for various sized pictures. An auxiliary stop key 52 is provided which opens up the clutch energizing circuit and is used to stop the machine at any time if required. However, whenever the receiving machine is stopped it can only be started again by first momentarily operating the start key 30 to condition the starting circuit as above described and subsequently operating the start key 12 at the transmitting station to cause the transmission of the carrier current to be interrupted.

In addition to the system disclosed in the Horton et al. patent and the Reynolds application referred to above there is disclosed in a copending application of Walter A. Phelps, Serial No. 713,817, filed March 3, 1934, a system of the type to which this invention is applicable.

What is claimed is:

1. In a picture transmission system, means to produce unidirectional current from alternating carrier current, a clutch magnet to effect the movement of a scanning device when energized, a first relay arranged to be energized by said unidirectional current, a second relay controlling the energization of said first relay, a third relay controlling the energization of said clutch magnet, a first clutch magnet contact closed when said clutch magnet is deenergized, a second clutch magnet contact closed when said clutch magnet is energized, means to temporarily energize said second relay through said first clutch magnet contact to effect energization of said first relay, a contact on said second relay closed when the relay is energized to energize said third relay through a contact on said first relay closed when said first relay is energized, a locking winding on said third relay energized through said first clutch magnet contact, a locking contact on said second relay closing a circuit for said second relay also through said first clutch magnet contact, means to deenergize said first relay independently of said second relay to complete the energizing circuit for the clutch magnet under control of said third relay, and means to energize said clutch magnet over a circuit including said second clutch magnet contact.

2. In a picture transmission system according to claim 1 in which the means to deenergize said first relay independently of said second relay

comprises a second clutch magnet, a first contact closed when said second clutch magnet is energized, means in series circuit with said first contact to complete a carrier interrupter circuit, and means to energize said clutch magnet just subsequently to the operation of said series means.

3. In a picture transmission system having a plurality of movable elements one at each of a plurality of spaced stations, independent driving means for said movable elements, and a clutch for connecting each movable element to its driving means, the combination of a circuit at one of said stations which may be conditioned to effect the operation of the clutch at said station in response to an electric signal received from a distant station, said circuit including means for preventing the operation of said clutch prior to the conditioning of said circuit, a single manually controlled switch for conditioning said circuit, means at said distant station for energizing the clutch at said distant station and simultaneously causing the transmission of said electric signal, thereby simultaneously starting the movement of said movable elements at the two stations, and means effective upon the operation of said clutch to automatically restore said circuit to its original condition.

4. In a system for starting movable devices, a source of unidirectional current, a clutch magnet which when energized effects the rotation of a rotatable device, a biased relay having an armature movable from a back contact to a front contact when the relay is energized by unidirectional current from said source, a second relay arranged to short circuit said source when deenergized, a third relay having a contact for completing an energizing circuit for said clutch magnet when said biased relay is deenergized, means to energize said third relay over a circuit including the front contact of said biased relay and a contact of said second relay which is closed when the relay is energized, and means to temporarily energize said second relay whereby said biased relay is also energized by current from said unidirectional source to condition the energizing circuit for said clutch magnet.

5. In a picture transmission system having an electrically operated clutch, a magnet for operating said clutch, a contact cooperating with said clutch magnet which is closed when said clutch magnet is not energized, means including said contact to effect energization of the clutch magnet due to the interruption of carrier current, and another contact cooperating with said clutch magnet closed by the energization of the clutch magnet to render its operation independent of said means.

6. In a picture transmission system having a plurality of movable elements one at each of a plurality of spaced stations and a source of current, relay means to start the operation of one of said movable elements upon the interruption of the current from said source being supplied thereto, a second means to start the operation of the second of said movable elements, means to partially set up a circuit for interrupting the current from said source to said relay means and to complete shortly thereafter, a circuit for energizing said second means to start the movement of said second movable element, and circuit closing means operated in response to the operation of said second means to complete said interrupting circuit.

7. In a picture transmission system having a plurality of movable elements one at each of a plurality of spaced stations and a source of current, means to start the movement of said first movable element upon the interruption of said current, a clutch magnet for starting the second of said movable elements, circuit closing means operated in response to the energization of said clutch magnet to partially set up a circuit for interrupting said current, a second circuit closing means in series circuit with said first circuit closing means to complete the circuit for interrupting said current, and means to energize said clutch magnet subsequently to the operation of said second circuit closing means.

8. In a picture reproducing system having a plurality of movable elements one at each of a transmitting and a receiving station respectively, the combination of clutch magnets at each of said stations which when energized effect the operation of said movable elements, means at the receiving station for preventing the energization of the receiving station clutch magnet, means under the control of the receiving operator to condition said first mentioned means to permit the clutch magnet to be operated only in response to a signal received from the transmitting station, means at the transmitting station for transmitting a signal to the receiving station for causing the energizing of the receiving station clutch magnet when the first mentioned means has been conditioned, and means responsive to the energization of the clutch magnet for restoring said first-mentioned means to its original condition.

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