Dec. 23, 1941. H. E. GOLDSTINE 2,267,606

TRANSMITTING CONTROL MECHANISM

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Fig. 1

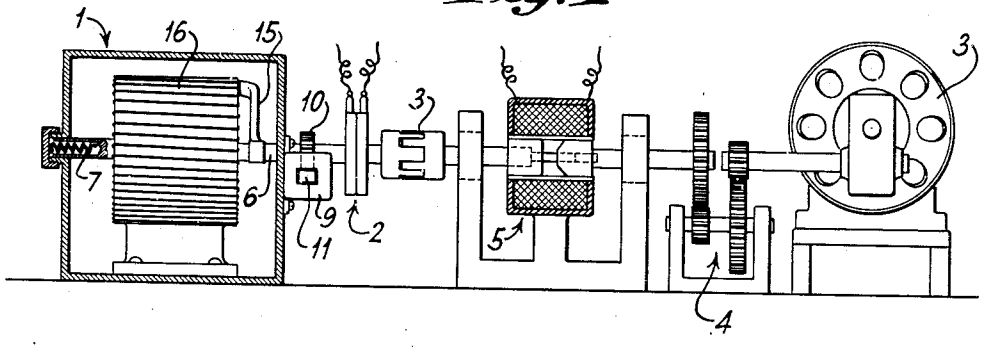

Fig. 4

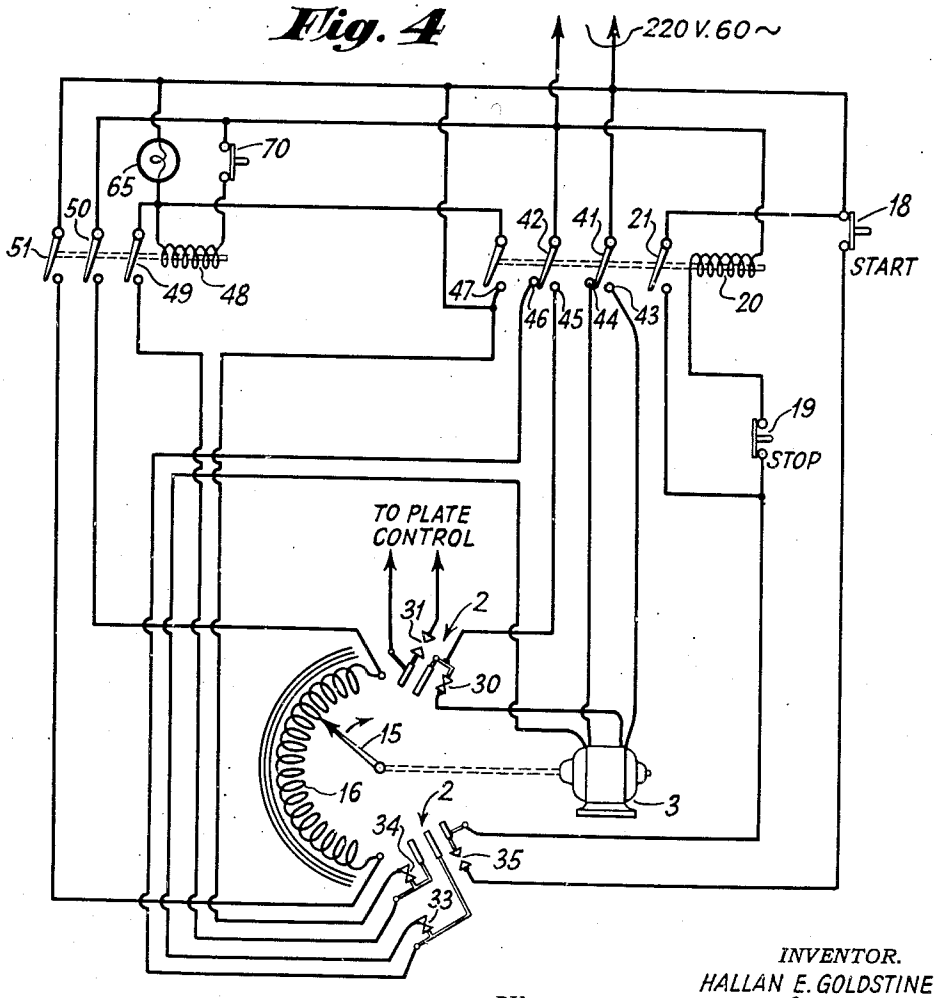

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Fig. 3

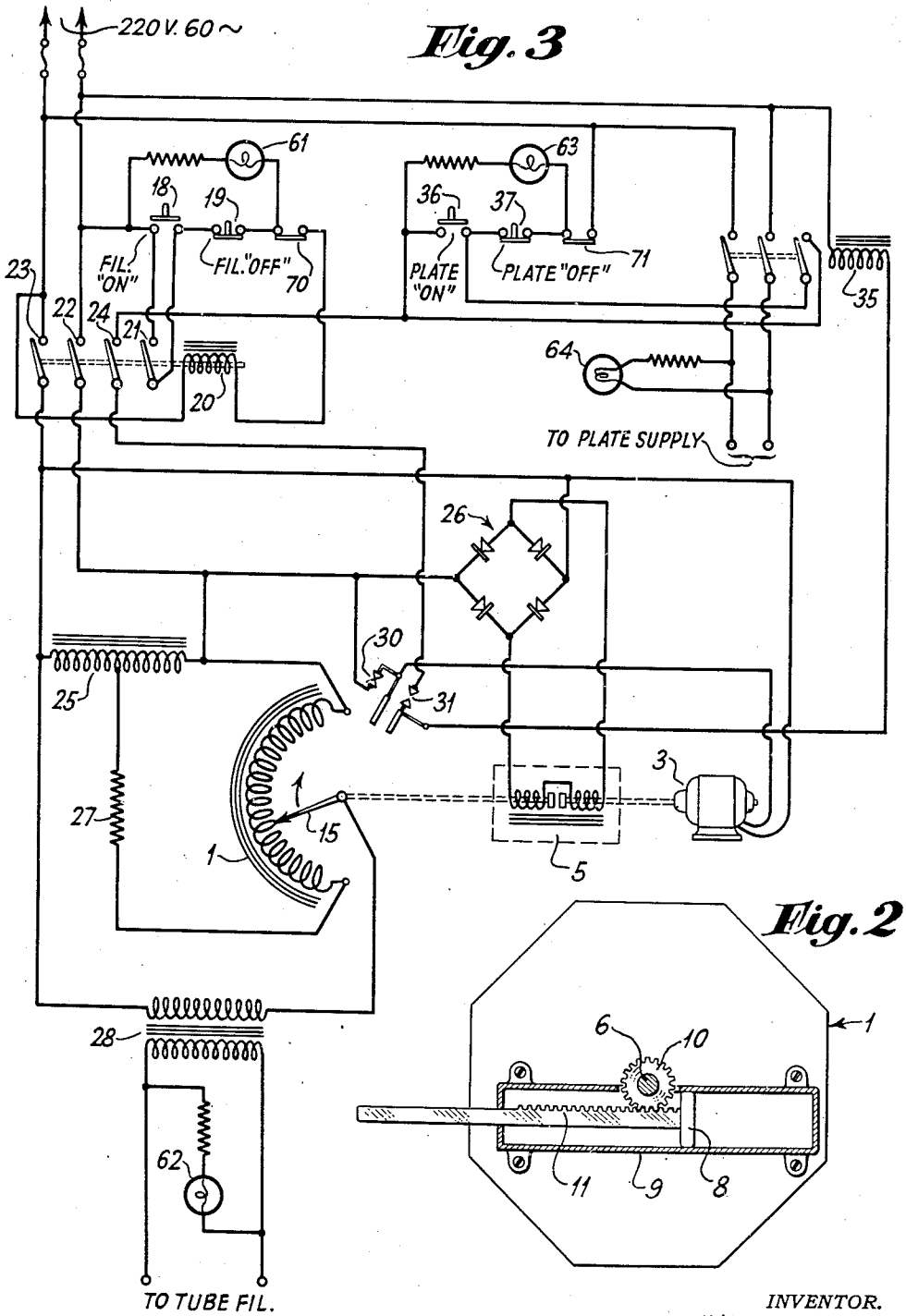

Fig. 2

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UNITED STATES PATENT OFFICE

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TRANSMITTING CONTROL MECHANISM

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Application March 30, 1938, Serial No. 198,880

5 Claims. (Cl. 171—119)

This invention relates to the art of controlling transmitters and, more particularly, to the control of the filament supply to the transmitter and, also, to the energization of other parts of the transmitter after a certain predetermined time delay.

An object of this invention is to apply or disconnect the power from the transmitter filaments from a remote point. A further object is to gradually increase the filament exciting voltage from zero to a predetermined value in an invariable fixed operating time and to supply plate voltage after the filaments are completely excited.

Still another object of my invention is to so interlock the control circuits of the radio transmitter that the filament voltage can only be initially applied at a zero value which is later increased to the operating value.

My invention consists primarily of a motor-driven variable transformer for the filament supply of a radio transmitter. Upon the application of power to the system the motor is started and slowly moves a sliding brush around the periphery of a toroidally wound auto transformer thus gradually increasing the power supply to the filaments. When a predetermined value of voltage is reached the motor power is disconnected and the transformer contact maintained in a fixed position. In the event the power fails the brush automatically returns to the zero value.

Referring to the accompanying drawings for a more complete disclosure of my invention, Figure 1 shows the mechanical construction of my invention while Figure 2 shows an enlarged view of the construction of a portion of Figure 1 partly in section; Figure 3 shows a diagram of the control circuits and Figure 4 is a modification of Figure 3.

In Figure 1 the variable transformer 1 is composed of a hollow cylindrical core with a toroidal winding 16 around the periphery of the cylinder. A movable brush arm 15 supported on shaft 6 is arranged to contact successive turns around the periphery of the transformer winding 16. Coil spring 7 within the hollow shaft of the transformer provides the restoring torque for the transformer arm to return it to the zero position. In order to prevent the contactor arm from returning to zero too rapidly from an advanced position an air check is provided. The air check as shown in Figure 2 comprises a plunger 8 which is a fairly close fit in cylinder 9. The plunger is moved by gear 10 which meshes with rack 11 on the plunger. Gear 10 is keyed to shaft 6 of the variable transformer. The plunger 8 offers very low resistance to the rotation of the arm of the transformer in one direction but slows the operation considerably on the return sweep, thus preventing excessive jar when it strikes the zero stop position. Attached to the shaft 6 of the variable transformer is a control switch 2 which will be described in more detail in connection with the control circuits. Motor 3, which is provided with reduction gearing 4 of any desired step-down ratio, is connected by means of magnetic clutch 5 and shaft coupling 3 to the shaft 6 of the variable transformer. The magnetic clutch when energized forms a direct mechanical connection by means of the friction of the clutch faces to the variable transformer.

Referring, now, to Figure 3, when starting switch 18 is closed relay 20 is actuated and through contacts 21 locks in its actuated position. The operation of relay 20 closes contacts 22 and 23 and applies power to transformer 1 through auto transformer 25. Current is also supplied to the motor 3 which starts revolving. The magnetic clutch 5 is also actuated through rectifier 26 and the variable contact of the transformer 1 is moved across the windings thereby gradually increasing to the rated value the voltage applied to the filaments of the tubes. Contact 24 of the relay 20 also closes completing a control circuit for the plate supply which will be later energized. Connected between the intermediate contact of the auto transformer 25 and the low voltage end of transformer winding of variable transformer 1 is a fixed resistor 27. Since the cold resistance of the filaments of radio tubes is comparatively low it is desirable to limit the value of the current which may flow through the filaments even at reduced voltages. This resistance 27 which is in series with the transformer 1 limits the current value through the filaments at the lower values of voltage. As the contact arm 15 is moved over the winding of transformer 1, the effect of resistance 27 becomes progressively less and less until its effect is zero at the fully energized position. Filament transformer 28 is provided to reduce the line voltage to the proper value for the filaments of the tubes.

The control switch 2 comprises limit switches 30 and 31. Limit switch 30 in the motor circuit is normally closed and when the moving arm of the variable transformer reaches a predetermined position these contacts open, thus stopping

the motor. At the same time contacts 31 in series with contacts 24 of the control relay, which are normally opened, are closed and actuate relay 35 to supply power to the plate control circuits of the transmitter. On and off plate control switches 36 and 37 are provided for manual operation if desired. Should the power fail when the transmitter is fully energized magnetic clutch 5 will open, due to its being de-energized and remove the connecting link between the gears and the contact of the variable transformer. The contact arm is then returned to its starting position by spring 7. When the power is again restored the magnetic clutch 5 is again energized, the motor is also energized and the apparatus repeats its normal starting cycle. The flexible shaft coupling shown in the diagram allows freedom of movement of the shaft on which the magnetic clutch is fastened and the small amount of clearance necessary for the proper operation of the magnetic clutch is also obtained in this flexible shaft coupling.

Referring, now, to Figure 4, which shows a modification of the control circuits of my invention, as before, when starting switch 18 is closed relay 20 is actuated and locked into position by contacts 21. Contact arms 41 and 42 engage with contacts 43 and 44, respectively, and apply power to motor 3 to drive it in its forward direction. The brush arm 15 is, as before, moved over the winding 16 of the variable transformer until the operating voltage for the filaments of the transmitter is reached. At this point limit switch 30 opens and stops the motor. At the same time, switch 31 closes and actuates the plate control circuits to apply plate power to the tubes. In the event of power failure with this modification the locking circuit for relay 20 releases and allows contact arms 41 and 42 to drop back and engage contacts 44 and 46. Now, when the power is again restored motor 3 is energized in the reverse direction and the movable contact arm 15 is returned to its zero position. The motor may be arranged to rotate at a greater speed in the reverse direction than in the forward direction if desired. Until it reaches the zero position, contacts 33, which are normally closed, prevent the application of power to the winding 16 of the variable transformer. Contacts 34 are also provided which break the motor reverse circuit at the zero position. At the same time contacts 35 are closed which energizes relay winding 20, thus initiating the normal starting up cycle of the apparatus.

It will be seen that the modification shown in this figure is somewhat simpler than that shown in the preceding figures in that no magnetic clutch or rectifier is required, nor is the spring return and air check necessary. While no reduction gears are shown in either Figure 3 or 4, it will be understood that in the actual embodiment of the device they appear as shown in Figure 1. These reduction gears may be of any satisfactory ratio which is determined by the permissible speed of bringing the filament voltage up to the normal operating voltage and the necessary time between the energizing of the filaments and the second operation such as putting on the plate supply.

Automatic means for maintaining the filament voltage constant in the running position may also be included but is not shown.

I have shown in the figures indicator lights 61 and 62 which show respectively that the filament circuit is ready and that it is on and also corresponding "plate ready" and "plate supply on" indicator lights 63 and 64. In Figure 4 a "water ready" indicator light 65 has been indicated. Interlock switches 70 and 71 are shown in the circuits which may be arranged to prevent operation in case the water supply fails or doors to the transmitter have been left open.

While I have indicated and described particular arrangements for carrying my invention into effect, my invention is by no means limited to the particular arrangement shown and described and modifications may be made without departing from the scope and the spirit of the invention.

What I claim as new and desire to secure by Letters Patent is:

1. In a system as described, a source of power, an output circuit, a variable transformer connected therebetween including a winding and a movable contact arm, means for automatically varying the transformation ratio of said variable transformer including a motor coupled to said movable contact arm and having a pair of windings, means for connecting said variable transformer winding and one of said motor windings to said source of power whereby said contact arm is moved over said transformer winding to gradually increase the voltage in said output circuit from a minimum to a predetermined maximum value, means actuated by said contact arm for disconnecting said motor winding from said source of power at the maximum value, and means responsive to a de-energization of said source of power for disconnecting said variable transformer from said source of power and for connecting the other of said motor windings to said source of power whereby said contact arm is returned to the minimum output voltage position when said source of power is again energized.

2. In a system as described, a source of power, an output circuit, a variable transformer connected therebetween including a winding and a movable contact arm, means for automatically varying the transformation ratio of said variable transformer including a motor coupled to said movable contact arm and having a pair of windings, means for connecting said variable transformer winding and one of said motor windings to said source of power whereby said contact arm is moved over said transformer winding to gradually increase the voltage in said output circuit from a minimum to a predetermined maximum value, means actuated by said contact arm for disconnecting said motor winding from said source of power at the maximum value, means responsive to a de-energization of said source of power for disconnecting said variable transformer from said source of power and for connecting the other of said motor windings to said source of power whereby said contact arm is returned to the minimum output voltage position when said source of power is again energized, and means actuated by said contact arm for disconnecting said other motor winding from said source of power at the minimum voltage value.

3. In a system as described, an input circuit, a first auto transformer having its winding connected across said input circuit, a second auto transformer having a variable tap on its winding, an output circuit, a connection from one end of the winding of said first auto transformer to said output circuit, a connection from the other end of the winding of said first auto transformer to one end of the winding of said second auto

transformer, a connection from the variable tap on said second transformer to said output circuit and a series resistor connected between the other end of the winding of said second transformer to an intermediate connection on said first transformer whereby the current in the output circuit is limited by said resistor in proportion to the position of said variable tap with respect to said other end of said variable transformer.

4. In a system as described, a source of power, an output circuit, a movable contact arm adapted to be operated between a first and a second predetermined position, a motor coupled to said arm and having a pair of windings, means for connecting one of said motor windings to said source of power when said arm is in the first of said predetermined positions whereby said arm is moved to said second predetermined position, means for connecting said output circuit to said source only in response to movement of said arm from said first position, means actuated by said arm at said second predetermined position for disconnecting said motor winding, means for connecting the other of said motor windings to said source, means for disconnecting said output circuit from said source, said last two mentioned means being responsive to a de-energization of said source of power whereby said arm is returned to said first predetermined position and said output circuit is maintained de-energized until said arm reaches said first position upon re-energization of said source of power.

5. In a system as described, a source of power, an output circuit, a movable contact arm adapted to be operated between a first and a second predetermined position, a motor coupled to said arm and having a pair of windings, means for connecting one of said motor windings to said source of power when said arm is in the first of said predetermined positions whereby said arm is moved to said second predetermined position, means for connecting said output circuit to said source only in response to movement of said arm from said first position, means actuated by said arm at said second predetermined position for disconnecting said motor winding, means for connecting the other of said motor windings to said source, means for disconnecting said output circuit from said source, said last two mentioned means being responsive to a de-energization of said source of power whereby said arm is returned to said first predetermined position and said output circuit is maintained de-energized until said arm reaches said first position upon re-energization of said source of power, and means actuated by said arm for disconnecting said other motor winding from said source of power at said first predetermined position.

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