April 13, 1943. J. L. BONANNO 2,316,551

TOY TRAIN CONTROLLER

Filed May 7, 1941 2 Sheets-Sheet 1

Fig. 1.

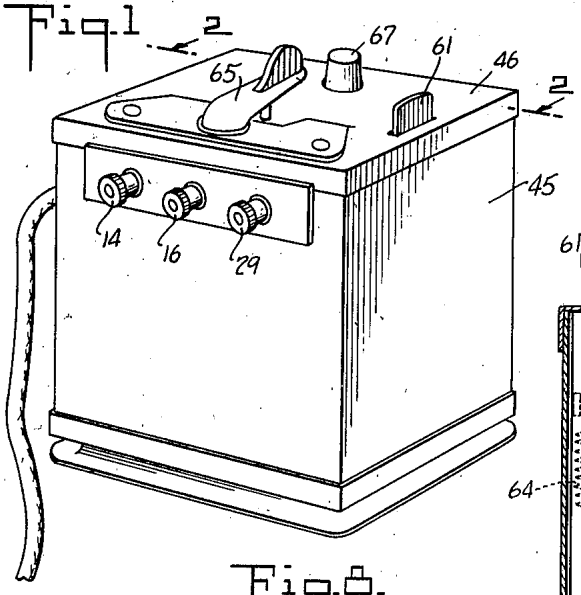

Fig. 2.

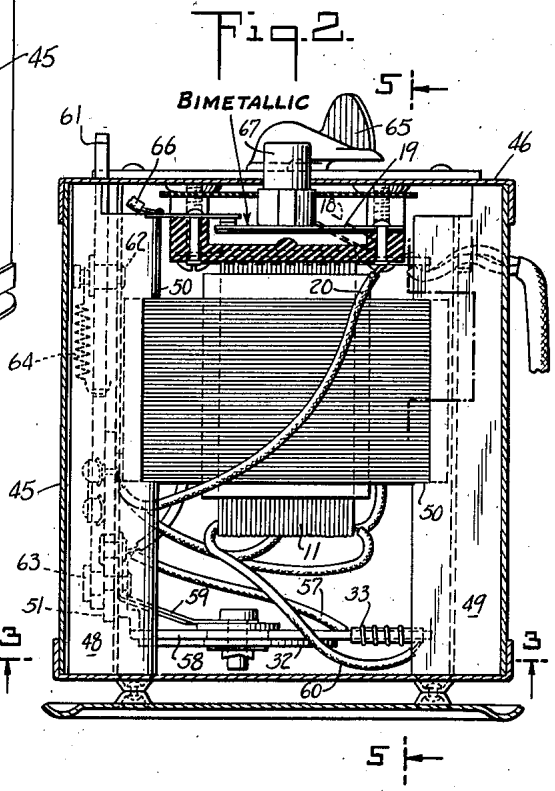

Fig. 4.

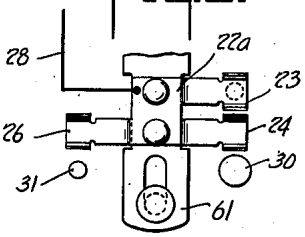

Fig. 3.

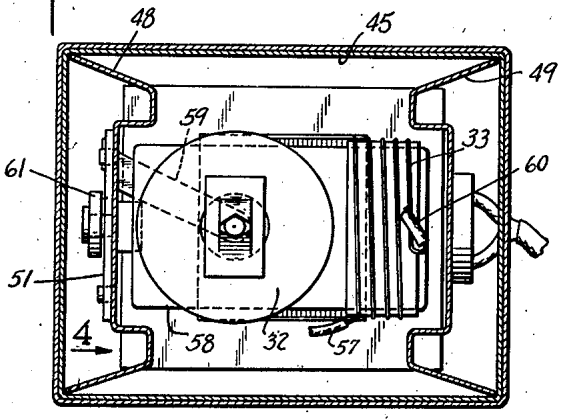

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Fig. 4.

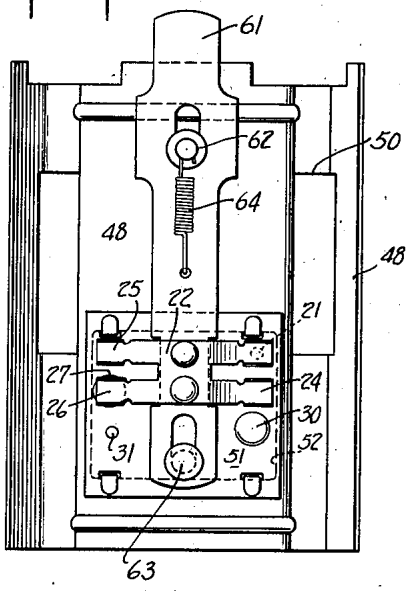


Fig. 5.

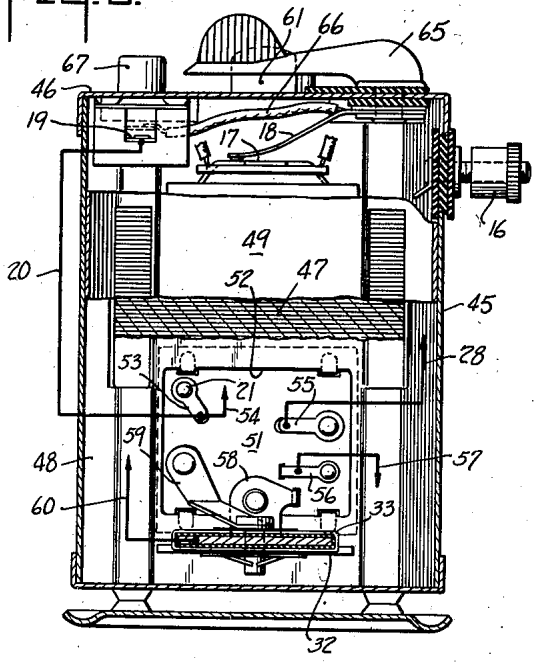


Fig. 6.

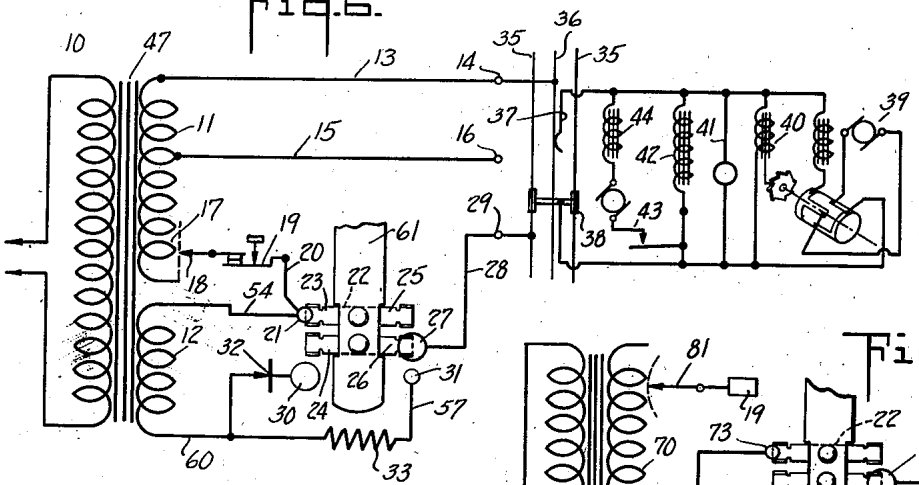


Fig. 9.

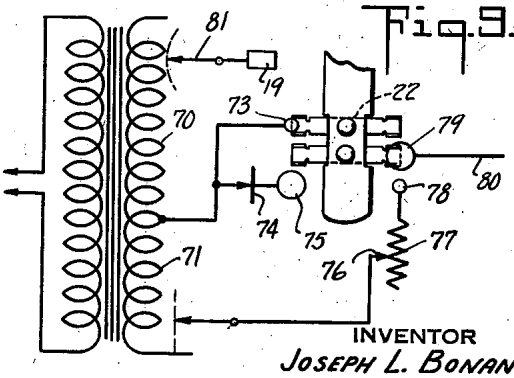
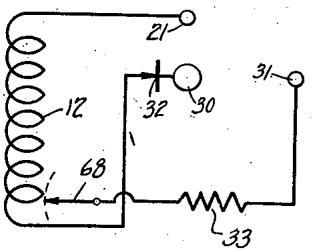


Fig. 7.



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UNITED STATES PATENT OFFICE

2,316,551

TOY TRAIN CONTROLLER

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Application May 7, 1941, Serial No. 392,287

13 Claims. (Cl. 171—97)

The present invention relates to toy train controllers, and is more particularly directed to toy train controllers each made in the form of a combined transformer and controller for the track circuit of a toy railroad.

The present invention contemplates a device embodying both the transformer and controller for the track circuit of toy railroads, wherein one is able to provide the track circuit with variable voltage over a predetermined range of voltages for ordinary train operation and to provide the track circuit with alternating current on which is superposed a small direct current potential for purposes of controlling the operation of devices energized from the track circuit such as a whistle.

According to the present invention the device is embodied in a transformer having a main secondary coil adapted to supply potential for ordinary train operation and a supplemental secondary coil connected to the first in such a way as to boost the output voltage at the terminals of the two coils, and this supplemental coil is connected with the half-wave rectifier and resistance which may be inserted into the circuit in a predetermined sequence without opening the circuit so that the direct current component may be furnished as well as a boosted voltage.

According to the present invention the switching arrangement is preferably such that the half-wave rectifier is momentarily introduced into the circuit to be in series with the two coils and the load so that a greater direct current component is momentarily delivered to the circuit than subsequently flows when the rectifier has been placed in parallel with the resistance.

In the preferred arrangement the resistance is such that the R. M. S. voltage delivered to the track circuit when the transformer is operating at its rated output is substantially the same, irrespective of whether pure alternating current is supplied the track circuit or alternating current with the direct current component added. In this way the speed of the train and brightness of the lights are not sensibly affected by the introduction of the supplemental coil into the circuit.

It is also an object of the present invention to provide a modified form of circuit and switching arrangement according to which the rectifier may be inserted into the circuit without increase in voltage, and the increased voltage may be applied to the circuit through a resistor after the rectifier has been brought into the circuit and without opening the rectifier circuit.

Another object of the present invention is to provide a combined transformer and controller for these purposes having a bi-metallic circuit breaker in series with the load so as to protect the coils of the transformer against overloading, and this bi-metallic circuit breaker is employed as the movable contact of a push button switch adapted to open the power supply circuit to the track, whereby the locomotive may be started, stopped and reversed.

Other and further objects will hereinafter appear as the description proceeds.

The accompanying drawings show, for purposes of illustrating the present invention, one of the many embodiments in which the invention may take form, together with modifications of certain parts, it being understood that the drawings are illustrative of the invention rather than limiting the same.

In these drawings:

Figure 1 is a perspective view of a toy transformer for supplying current to a single track circuit;

Figure 2 is a vertical sectional view taken on the line 2—2 of Figure 1;

Figure 3 is a sectional view on the line 3—3 of Figure 2 looking in the direction of the arrows;

Figure 4 is an elevational view of the clamp plate and switch taken on the arrow 4 of Figure 3;

Figure 5 is a sectional view taken on the line 5—5 of Figure 2 with parts broken away;

Figure 6 is a wiring diagram illustrating one form of circuit connection;

Figure 7 is a slight modification of the wiring diagram of Figure 6;

Figure 8 is a fragmentary view illustrating a slight modification of construction; and

Figure 9 illustrates a further modified wiring diagram.

In the wiring diagram of Figure 6 the primary of a transformer is indicated at 10. The main secondary coil is indicated at 11 and a supplemental secondary coil at 12. One end of the secondary coil 11 is connected by a lead 13 with an output terminal or binding post 14 and where an intermediate voltage is desired a tap is brought out, as indicated at 15, and connected to a bonding post 16. A portion 17 of the secondary coil 11 is exposed and adapted to cooperate with a movable contact 18 so that variable voltages may be taken off the secondary coil 11. The movable arm 18 is connected through a bi-metallic, thermostatically operated circuit breaker 19 and wire 20 to contact 21. The con-

tact 21 is normally engaged by a movable switch contact 22 having spring tips, indicated at 23, 24, 25 and 26, the latter bearing on a large fixed contact or button 27 connected by wire 28 with an output terminal 29.

One end of the supplemental secondary coil 12 is connected with the contact 21, while the other end is connected to contacts 30 and 31 through half-wave rectifier 32 and resistor 33. The contact 30 is a wide contact and it is adapted to be engaged by the tip 24 of the movable switch contact 22 before the tip 23 leaves the contact 21, so that the rectifier 32 may be brought into the circuit without opening the circuit. The upper spring tip 25 of the contact 22 engages the contact 27 before the tip 26 leaves it and then the tip 26 on further movement is brought against the contact 31 so that the resistor is brought into circuit. The structural arrangement of the parts just described is shown in Figures 1 to 5, inclusive, and will be described in detail later.

The transformer may be connected to a track having the usual wheel bearing rails 35 and third rail 36. Current may be collected off these rails by the usual contact 37 and truck 38. The train load may include a locomotive having a motor 39, a motor reverser 40, a lamp load 41, and a relay coil 42 adapted to close the circuit at 43 through a whistle motor 44.

When the connections are made, as indicated in Figure 6, the output of the coil 11 may be supplied to the track circuit under the control of the movable arm 18 and the circuit protected by the circuit breaker 19. When it is desired to operate the whistle the movable contact 22 is shifted downwardly. This shunts the coil 12 through the half-wave rectifier and then brings the half-wave rectifier into series with the track circuit. There will be a momentary reduction of alternating current voltage in the track circuit and a substantial direct current component. As soon as the contact is moved down to bring the tip 26 against the contact 31, the rectifier will be shunted by the resistance 33 so that the half-wave interfered with by the rectifier can pass through to the track circuit.

With the connections as shown the supplemental coil 12 boosts the available voltage an amount depending upon the number of turns in the coil. The useful voltage applied to the track circuit is, however, reduced by the combined resistance of 33 in parallel with rectifier 32, and where a fixed resistance is employed fixedly connected in circuit this resistance is preferably such that the track circuit voltage is substantially the same when the load is such as to take the rated output of the transformer. A variable resistance may be substituted, if desired. The characteristics of each type of dry rectifier commercially available is relatively fixed therefore the voltage compensation is most readily varied by means of the resistor.

In the structure shown in Figures 1 to 5, the device is shown as having a sheet metal, box-like housing 45 of rectangular configuration closed by a cover 46. The transformer core 47, together with the primary and secondary windings, are formed into a unit with suitable leads and connections for wires. The core is held in place in the housing by two clamp plates 48 and 49. These clamp plates are notched, as indicated at 50, to fit the core and are of the proper size and shape to slide down along the corners of the case or housing 45.

These clamp plates are long enough to space the transformer core a substantial distance above the bottom of the housing, as will be apparent from the drawings. The fixed contacts 21, 27, 30 and 31 are secured to an insulating plate 51 fastened across an opening 52 in the clamp plate 48. The inner face of the insulating plate 51 carries a soldering lug 53 for connection with the wire 20 and with a lead 54 extending to the coil 12, a soldering lug 55 connected to the wire 28 and a soldering lug 56 connected by a wire 57 with the resistor 33. The insulating plate 51 also carries a bracket arm 58 which supports the rectifier 32 and the resistor 33. The rectifier is connected to the contact 30 by a strap 59. The bracket arm 58 is connected by a wire 60 with the other end of the coil 12.

A vertically reciprocable insulating plunger 61 is guided on a pin 62 carried by the clamp plate 48 and a pin 63 carried by the insulating plate 51. The plunger is urged upwardly by a spring 64 and carries the movable contact member 22 with its spring tips positioned properly relative to the fixed contacts. This plunger extends out through the cover of the transformer housing so that it can be conveniently manipulated.

The cover 46 supports a knob 65 connected with the swingable contact arm 18 so that the output voltage of the transformer may be readily controlled. This arm is connected by a wire 66 with the circuit breaker 19 above referred to. This circuit breaker is adapted to flex on overload to open the circuit, and it is here shown as being operable by a button 67 projecting out through the top of the transformer so that when this button is depressed the circuit may be opened so as to start, stop and reverse the locomotive.

Figure 7 shows a modification of the transformer according to which a portion of the secondary coil 12 is exposed and cooperable with a contact 68 connected to the resistor 33. This makes it possible to secure a variable supplemental voltage with a fixed resistance.

In the modification shown in Figure 8 the lead 28 is permanently connected with the movable contact 22*a* and the fixed contact 27 and soldering lug 55 omitted.

While in the illustrated embodiment of the transformer here shown the controller is designed for a single track circuit, it is obvious that the invention may be applied to transformers having a plurality of movable contacts cooperable with the secondary for supplying a variable voltage to a plurality of independent track circuits.

In the arrangement shown in Figure 9 the main secondary coil is shown at 70 and the supplemental coil at 71. These coils may be continuous and a tap 72 is brought out and connected to a contact 73 and rectifier 74, the latter being connected with a contact 75. The other end of the coil 71 is here shown as being connected through a movable contact 76 with a resistor 77. The resistor is connected to a fixed contact 78. Another fixed contact 79 above the contact 78 is connected to an output terminal 80. The principal voltage control is obtained by movable arm 81 connected to an output terminal 82.

In the arrangement shown in Figure 9 the structure may be the same as that above shown and described with the wiring connections altered. Here the manipulation of the movable switch 22 will first introduce a direct current component without increase of available voltage, and will then bring about an increase in the voltage and at the same time maintain a direct cur-

rent component. The values of this will depend upon the constant employed. Under some circumstances this arrangement may be substituted for that shown in Figure 6. It, however, is not as flexible in operation as it does not make it possible to have variable voltage taps all controllable from a single movable arm.

It is obvious that the invention may be embodied in many forms and constructions within the scope of the claims and I wish it to be understood that the particular form shown is but one of the many forms. Various modifications and changes being possible, I do not otherwise limit myself in any way with respect thereto.

What is claimed is:

1. In a combined transformer and controller for the track circuit of a toy railroad, a secondary winding adapted to provide a maximum alternating current voltage across its ends, an output terminal, a tap intermediate the ends for providing a lesser voltage between the tap and said output terminal and connected to a fixed contact, a second output terminal, a movable switch contact normally connecting said fixed contact and second terminal, a half-wave rectifier having one end connected to the secondary and the other end to a fixed contact normally out of engagement with the movable contact but engageable thereby before the movable contact leaves the first fixed contact so that a direct current component may be introduced into the circuit supplied from said terminals, and a resistance connected to the end of the winding remote from the first terminal and to another fixed contact, the last-mentioned fixed contact being engageable by the movable contact after it leaves the first contact and while it is in engagement with the rectifier connected contact so that the maximum voltage is impressed on the circuit including the resistance.

2. The combination of claim 1, wherein the rectifier and resistance have a common connection with the coil so that when the rectifier is introduced into the circuit the overall voltage available is increased.

3. The combination of claim 1, wherein the rectifier is connected to the tap and resistance to the end of the coil whereby the increased voltage is available only with both rectifier and resistance in circuit.

4. A controller for toy railroad track circuits comprising two transformer coils, one adapted to provide a predetermined train operating voltage, the other adapted to provide additional voltage and connected at one end with the first coil, a rectifier and a resistance each connected to the other end of the second coil, and switch means for shunting the second coil by the rectifier, then connecting the rectifier in series with both coils and the load, and then shunting the rectifier by the resistance.

5. A controller such as claimed in claim 4, wherein the alternating current voltage to a load drawing a variable wattage from the transformer with the switching means in either extreme position is substantially constant.

6. In a combined transformer and controller for the track circuit of a toy railroad, a main secondary coil having one end permanently connected to an output terminal and an exposed winding at the other end, a movable contact connected to another output terminal and cooperable with the exposed winding to vary the output voltage, a supplemental voltage boosting coil connected to the movable contact, a half-wave rectifier and a resistance each connected to the other end of the boosting coil, and switch means for connecting the resistance and rectifier in parallel with one another and in series with both coils whereby the voltage added to the circuit is uniformly increased irrespective of the setting of the movable contact on the exposed winding.

7. A combined transformer and controller for the track circuit of a toy railroad comprising, a transformer with primary coil, a main secondary coil and a supplemental secondary coil and a core, a portion of the main coil being exposed, its other end being connected with an output terminal, an enclosing housing having a cover carrying a swingable contact cooperative with the exposed portion and connected permanently with the supplemental coil and to a fixed contact, a second fixed contact below the first and connected to the other end of the supplemental coil through a half-wave rectifier, an additional fixed contact connected through a resistance to said other end of the supplemental secondary coil, a vertically reciprocable switch operator projecting through the cover and carrying a switch contact continuously connected to a second output terminal and movable from a position where it connects the upper two contacts together to a position where it connects the two latter mentioned contacts, and a spring biasing the switch operator upwardly.

8. In a combined transformer and controller for the track circuit of a toy railroad, a main secondary coil having one end connected to an output terminal, a supplemental secondary coil having one end connected to a fixed switch contact which is connected to the other end of the main secondary coil, the other end of the supplemental coil being connected to two other fixed contacts through a half-wave rectifier and a resistance respectively, a movable switch member continuously connected with a second output terminal and shiftable from a position to connect the first contact to the second terminal so that the output of the main coil only is supplied the terminals, to a position where the first contact is disconnected and the second and third contacts are connected together so that the outputs of both coils and of the rectifier, less resistance losses, are supplied the terminals.

9. The combination of claim 8, wherein the movable switch member engages the rectifier connected contact before it is disengaged from the first contact or is connected to the resistance connected contact so that the rectifier is in series with the track circuit before the rectifier is shunted by the resistance whereby the initial direct current voltage is higher than the final direct current voltage.

10. The combination of claim 8, wherein the switch member is biased toward the first mentioned position.

11. In combination, an upwardly opening box-like housing, a transformer core carrying a primary coil, a main secondary coil having an exposed winding at the top and its opposite end connected to a binding post, a cover carrying a movable contact bearing on the exposed winding, a supplemental secondary coil, a pair of core clamping plates slidably received in the housing and extending below the core to space it above the bottom of the housing, a bracket arm insulatedly carried by one of the plates below the core and carrying a rectifier and a resistor each connected with the arm, a wire connecting the arm with the supplemental coil, an insulating

contact carrier secured to the said plate and having a contact connected to the cover carried movable contact and to the other end of the supplemental coil, a contact connected to the resistor, a contact connected to the rectifier, a second binding post, a plunger carried by said clamping plate and projecting through the cover, and a bridging contact carried by the plunger continuously connected to the second binding post and movable over said fixed contacts.

12. Means for controlling the current supply to a toy railroad track circuit having a load, part of which is responsive to either alternating current alone or to alternating current with superposed direct current, and part of which is responsive only to the alternating current with superposed direct current, comprising a transformer secondary normally connected to the track circuit to supply a predetermined alternating current voltage, a supplemental transformer secondary normally connected to one side of the first secondary and at the other side to a rectifier and to a resistor in parallel with the rectifier, the latter being otherwise disconnected from the load, and switching means for placing both secondaries in series with the rectifier and load to supply a direct current component to the load and for thereafter shunting the rectifier by the resistance.

13. Means such as claimed in claim 12, wherein the value of the resistance is such that the drop in voltage across it at or near full load of the transformer is substantially equal to the voltage developed in the supplemental coil.

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