Aug. 11, 1942. R. H. JORDAN 2,292,565

WHISTLE-ACTUATING AND CONTROL MEANS FOR TOY TRAINS

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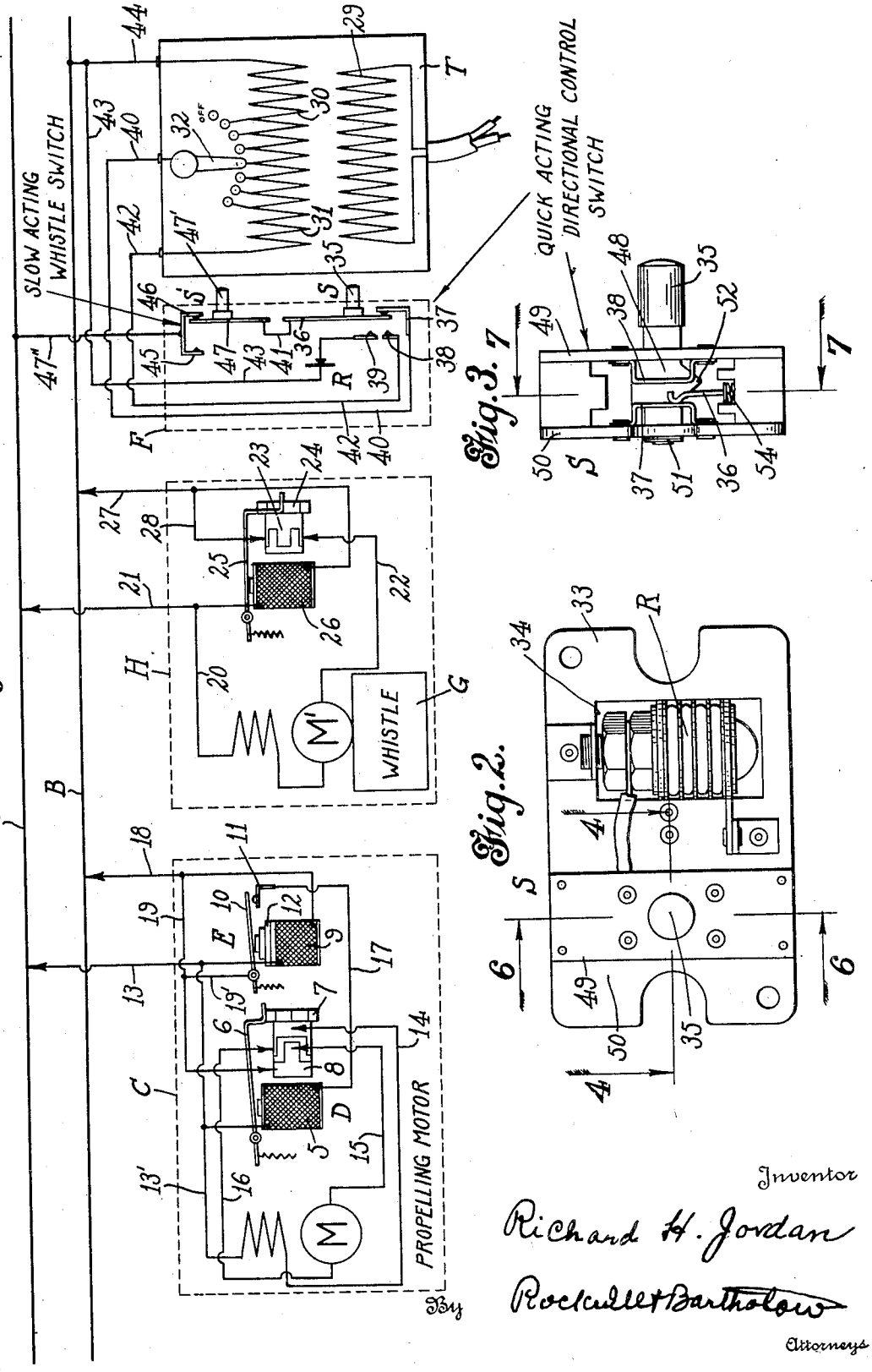



Fig. 1.

Fig. 3.

Fig. 2.

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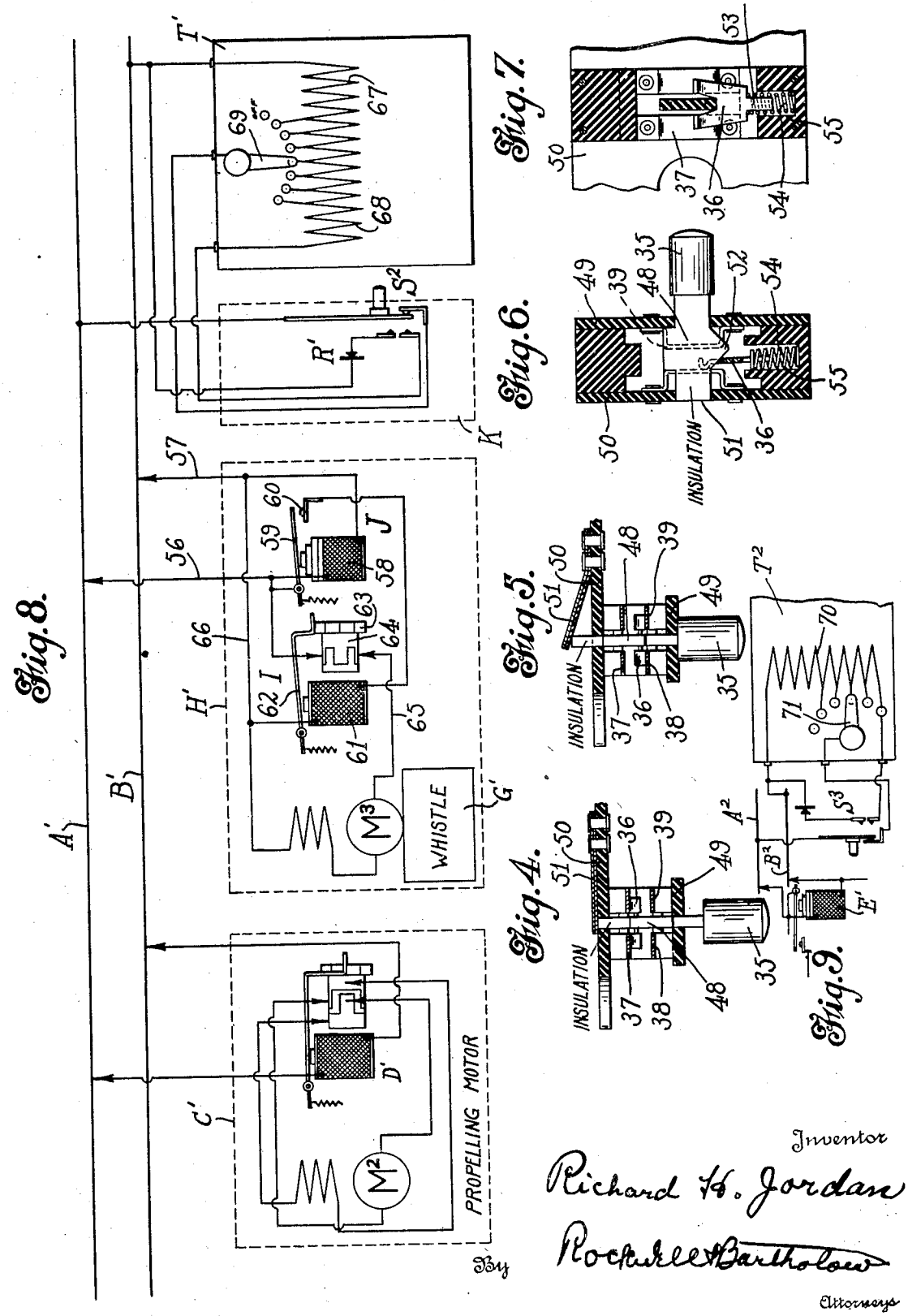
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# UNITED STATES PATENT OFFICE

2,292,565

## WHISTLE-ACTUATING AND CONTROL MEANS FOR TOY TRAINS

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Application May 6, 1940, Serial No. 333,535

2 Claims. (Cl. 104—150)

This invention relates to whistle-actuating and control means for toy trains, and more particularly to electric toy train systems in which an accessory such as a pneumatically operated whistle carried by the train is controlled from a distance so as to be operable either when the train is running or standing still.

This application is a continuation in part of my application Serial No. 271,834, filed May 5, 1939.

One of the objects of the invention is to provide an improved toy train outfit of simple, inexpensive character, in which the accessory motor as well as the propulsion motor of the train can be controlled in an effective manner from a suitable station along the right of way.

Another object is to provide an apparatus in which the propulsion control and the whistle or like control are coordinated in a simple manner such that the propulsion motor and the whistle motor can be controlled without interference one with the other and in a manner which is very convenient for the operator.

Another purpose of my invention is to provide an electric control circuit and signalling circuit for toy trains in which difficulties and drawbacks incident to surges of current in the track rails are largely overcome.

To these and other ends the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a diagrammatic view showing an electric toy train system embodying my improvements;

Fig. 2 is a plan view of certain parts used in the construction of the control box, such parts including a half-wave rectifier and a quick-acting push button switch controlling the direction in which the train is run;

Fig. 3 is an end view of the assembly shown in Fig. 2;

Fig. 4 is a section on line 4—4 of Fig. 2;

Fig. 5 is a view similar to Fig. 4 showing the switch in another position;

Fig. 6 is a section on line 6—6 of Fig. 2;

Fig. 7 is a section on line 7—7 of Fig. 3;

Fig. 8 is a diagrammatic view of a toy train set or outfit of somewhat modified form; and

Fig. 9 is a diagrammatic view showing a modification of a portion of the control circuit shown in Fig. 1, particularly as regards the arrangement of the transformer.

In the diagram shown in Fig. 1, A and B are assumed to be the wheel-bearing rails of a two-rail track circuit, although it will be understood from what appears hereinafter that my improvements are also applicable to a third-rail system. In the drawings the locomotive unit of the train is shown at C, said unit being equipped with a propelling motor M, whose operation is controlled by an electromagnetically operated switch mechanism D and a relay or circuit closer E. The locomotive unit may or may not comprise a tender on which some of the parts just mentioned are carried. The track rails are supplied with alternating current by a transformer T, and associated with the transformer is a control box F by means of which the locomotive is controlled for stopping, starting and reversing, and by means of which also an accessory such as an electrically operated whistle carried by the train can be controlled from a distance. In the embodiment shown, a pneumatically operated whistle device G having a motor M' is carried in a separate whistle car, diagrammatically indicated at H, but variation can be made in this respect. The remote control for the whistle in this particular form is arranged within the control box F, previously referred to, but if desired a separate control box can be used. The single control box F, indicated diagrammatically by the dotted lines in Fig. 1, may in this particular form be assumed to contain two push button switch devices, of which one, indicated generally at S, is for the purpose of controlling the operation of the propulsion motor M, while the other, S', is for controlling the operation of the whistle motor M'. One form of switch which is suitable for controlling the operation of the propulsion motor is shown by way of example in Figs. 2 to 7, inclusive.

The propulsion motor M is of the usual or any preferred type. The switch mechanism D comprises a solenoid 5 and a spring-pressed pivoted armature 6 cooperating therewith, adapted to actuate a ratchet wheel 7 carried on a commutator 8, so that the commutator 8 is adapted to be rotated step by step for making different circuit connections. The electromagnetic step-by-step switch can be of the kind which is illustrated in detail in the patent of James E. McLoughlin, No. 2,196,319, dated April 9, 1940, but in any event it is believed that its operation will be obvious from the drawings herein. The relay or circuit closer E comprises a solenoid 9 adapted to be operated by pulsating unidirectional current, as hereinafter described, and having in association therewith a spring-pressed armature 10, which, when the solenoid 9 is energized, makes contact with a contact member 11 to close a circuit. For pre-

venting alternating current in the system from operating the solenoid 9, shading coils 12 of any appropriate kind are preferably embodied in the solenoid.

It will be understood that the commutator 8 of switch mechanism D has a number of positions arranged in series of four, and that in each of such series there is, first, an operating position in which the propelling motor is caused to rotate in one direction, second, a position in which the motor is stopped, third, a position in which the direction of rotation of the motor is reversed, fourth, a position in which the motor is stopped.

The field coil of motor M is connected to rail A by circuit legs 13 and 13', and said field coil is connected by circuit leg 14 to a contact member bearing against commutator 8. Circuit leg 15 connects one terminal of the armature winding of motor M to a contact member bearing against commutator 8, and another circuit leg 16 connects the other terminal of said winding with a contact member bearing against the commutator. Solenoid 5 is connected to legs 13' and 13, and thus with rail A. Solenoid 5 is connected to fixed contact 11 by circuit leg 17. Solenoid 9 is connected to circuit leg 13, and to another circuit leg 18, the latter being connected to rail B. The contact members bearing against the rails A and B and designated by arrow heads in the diagram (Fig. 1), may be collectors or shoes of the conventional type. A circuit leg 19, connected to leg 18 at one end, is connected at the other end to a brush bearing against a portion of commutator 8. A leg or lead 19' leads to leg 19 from armature 10.

The motor M' operating the whistle has its field winding connected by a circuit leg 20 with a leg 21 provided with a collector bearing against rail A. The armature of the motor is connected to a circuit leg 22 having a collector bearing against the surface of a barrel switch or commutator 23. This commutator is similar to commutator 8, except that it provides simply for the opening and closing of the motor circuit on alternate steps. A ratchet wheel 24 is provided on the commutator adapted to be operated on an armature 25 under the influence of a solenoid 26. The armature 25 is similar to the armature 6, previously mentioned. Springs connected to these armatures normally hold them out of contact with the respective solenoid cores. The solenoid 26 is connected at one side with circuit leg 21 bearing against rail A, and at the other side with circuit leg 27 bearing against rail B, and from circuit leg 27 a leg 28 is carried to a brush or collector bearing against commutator 23.

The transformer T has a primary 29 and a secondary coil composed of two sections, 30 and 31, respectively. Section 30 is controlled by the usual movable arm 32, and depending upon adjustment of the arm 32, section 30 of the secondary will impress say from 7 to 15 volts of alternating current on the track rails through connections hereinafter described. By including section 31 in the circuit in series so that it acts cumulatively, as hereinafter described, an additional voltage variation may be provided.

In connection with the switch mechanism S, previously mentioned, and preferably within the control box F, a half-wave rectifier R is provided. The function of the switch mechanism S is to disconnect the propelling motor M from the transformer, or, in other words, the alternating current source, shunt the half-wave rectifier R across the rails, and insert into the circuit in series the extra transformer coil 31, so that the rectifier will furnish pulsating unidirectional current of proper voltage to the relay E for actuation thereof. The construction of solenoid 9 is such that only this kind of current at this stated voltage will actuate armature 10. When switch S is actuated in the manner above mentioned, relay E is actuated, and this in turn causes an actuation of the stopping, starting and reversing device D.

A preferred form of the switch S is shown in detail in Figs. 2 to 7, and it will be noted that the switch mechanism in this instance is associated with an insulated base plate 33 adapted to be placed in a suitable location in control box F, and carrying half-wave rectifier R in a cut-away portion 34 of the base plate. The switch S embodies in its construction a suitably mounted and guided push button element 35 and a swinging element or leaf 36 actuated by the push button in such a manner as to provide a quick-acting switch having a snap action, as hereinafter described. This movable element or leaf 36 of the switch is adapted to cooperate with a fixed contact 37 when the leaf is in one position, as shown diagrammatically in Fig. 1, and in the other position of the leaf 36 it makes contact with and bridges two fixed contacts 38 and 39, which are also diagrammatically shown in Fig. 1. Contact 37 is connected by circuit leg 40 with the movable arm of the transformer. Leaf 36 is connected by circuit leg 41 and by switch S' and by leg 41'' to track rail A. The remote end of transformer winding 31 is connected by circuit leg 42 with contact 38. Contact 39 is connected to the in-put end of rectifier R, and the out-put end of the rectifier is connected by circuit leg 43 to rail B by way of a portion of circuit leg 44, which latter is connected to transformer winding 30. The switch S' has two spaced fixed contacts 45 and 46, between which operates a swinging leaf 47 under the influence of a sliding push button 47' embodied in the whistle-controlling switch S'. The contacts 45 and 46 are preferably spaced well apart, so that there is a perceptible interval of time as member 47 is moved out of engagement with one of the contacts and into engagement with the opposite one.

In the preferred construction of the switch S, the push button 35 has a shank 48 guided between spaced parallel walls 49 and 50 of insulating material, and a spring 51 acting on the inner end of the shank normally holds the button in the projected position shown in Figs. 3 and 4. The shank 48 is of insulating material and of a flat form, and at one side it is provided with a V-shaped cam projection 52 coacting with the leaf or element 36. The latter is constituted by a small plate forked at one extremity to straddle the cam portion of the shank 48. At its rear portion (Fig. 7) the leaf 36 is provided with a shank 53 entering a spring coil 54 that is received in a socket 55. The spring yieldingly holds the leaf 36 against the cam on the shank of the button. The extremities of the two sides of the fork at the outer end of leaf 36 are suitably bent so that one of them makes good electrical contact with contact member 37 when the button is in the outer position, and both make good electrical contact with contact members 38 and 39 when the button is in the inner position. By actuation of button 35

it is possible to break contact with contact member 37 and almost instantaneously make contact with the contact members 38 and 39 at one and the same time. Upon release of the push button 35 after it has been pushed inwardly it will be forced outwardly again by the spring 51, and contact with contact member 37 quickly re-established. When the push button is pushed inwardly, the action of its cam-equipped shank is such as to move one extremity of the contact fork across contact member 37 to a certain extent while maintaining contact, and then, as the point of the cam passes through the fork, the extremities of the fork move by a snap action into contact with the contact members 38 and 39.

In the position of the parts shown in Fig. 1, the connections are such that the propulsion motor M is being operated to run the train in one direction. Now if it be desired to stop the train, the push button 35 is depressed. This causes a separation of switch member 36 from contact 37, which interrupts the supply of alternating current to the rails, and almost instantaneously the rectifier R is shunted across the rails, and, by the circuit connections described, the secondary winding 31 inserted in series to act cumulatively with that portion of winding 30 which is being used. In this manner the voltage derived from the rectifier is increased to a substantial degree over what it would otherwise be, and a proper voltage of unidirectional current supplied to relay E. The result is that relay E is energized by a pulsating unidirectional current, the armature 10 is sharply attracted to make contact with contact member 11, and the solenoid 5 is thereby energized. When this occurs, armature 6, acting on ratchet wheel 7, advances commutator 8 one notch to a position in which the supply of operating current to the propulsion motor is interrupted, stopping the train. The unidirectional current operates the electromagnetic devices 9, 10 and 5, 6 very quickly, and the reversing switch device is very effectively operated, even should the pressure on button 35 be rather quickly released. When the button is released its associated spring mechanism will quickly restore it to the initial position. The solenoid armatures 6 and 10 will be restored to their initial positions by their respective springs. Switch mechanism D will remain in the "off" position until further operation of the button 35. Upon a further depression of this button, the operations described above will be repeated except that the next movement of switch mechanism D will be one which will cause the train to start up and travel in a direction opposite to that first mentioned.

The arrangement above described has the advantage that the usual surges of current incident to the interruptions of the circuit which take place in the operation of toy trains are not effective to operate the switch controlling the operation of the propulsion motor. This is because of the fact that the motor control mechanism can only be actuated by a voltage of predetermined high value, which in practice is never, or hardly ever, reached merely as a result of interrupting the circuit. The ordinary result of interpolating the half-wave rectifier into the circuit would be approximately to have the voltage, but it is evident that by the arrangement described the voltage is built up at this time in a very simple manner and may approximate an average of the A. C. voltages used in operating the motors, and this result is brought about, furthermore, without the necessity of cutting out resistances or the like or eliminating loads.

The operation of switch mechanism S for controlling the train movements does not in any way interfere with the mechanism in the whistle circuit. It will be noted that, when the parts are in the position shown in Fig. 1 and the whistle is not being sounded, alternating current passing through leads 21 and 27 and acting on solenoid 26 holds armature 25 in a position in which commutator 23 holds open the circuit of motor M'. There is a certain amount of lag involved in the movement of armature 25 to the free or outward position when the supply of A. C. to solenoid 26 is interrupted, and the operation of switch S, as above described, does not bring about movement of commutator 23 because of the rapidity with which switch S operates. The supply of alternating current is interrupted by leaf 36 moving away from contact 37, but current flow is so quickly re-established by contact of leaf 35 with contacts 38 and 39 that armature 25 will continue to be held in its inward position, and there will be no actuation of the whistle.

Inasmuch as electromagnet 26, 25 is slow acting (in a relative sense) under its actuating current, I provide a whistle-operating switch (S') which will meet this condition. When it is desired to operate the whistle, the button of switch S' is depressed, thus opening the circuit, and before the circuit is re-established by contact of leaf 47 with contact 45, armature 25 will be able to move to the outward limit of its movement, thus disengaging the ratchet wheel 24. As soon as contact is established between 47 and 45, the armature is pulled inwardly again, thus moving the commutator one notch to a position in which the circuit of motor M' will be closed. The motor M' then starts, builds up to speed, and the whistle sounds. The whistle continues to sound as long as its motor circuit remains closed by the button continuing to be depressed. When the button is released the ratchet is again stepped ahead one notch and this disconnects the motor from the line.

It will be seen, therefore, that the propulsion mechanism and the whistle can be selectively operated in a very convenient manner without interference between the two, and that notwithstanding this, the apparatus employed can be of a relatively simple and inexpensive character. The apparatus in the control box or boxes is quite simple, and can be made readily accessible for adjustment and repair. The device for controlling the operation of the propelling motor is very effective in use and gives very desirable controls of the train operation. A car or other vehicle carrying the whistle apparatus can be provided at relatively low expense, and the whistle control mechanism easily combined, if desired, with the control mechanism of the propulsion motor. A transformer of the type usually employed with train outfits can be used with only slight modification of its structure.

In the modified form of apparatus shown in Fig. 8, the propelling motor $M^2$ is not controlled by a special switch. It is mounted in a locomotive C' and equipped with a starting, stopping and reversing device D' of the character previously described, which is caused to be actuated by interruptions of the current which may be produced, for example, by interrupting the circuit at the transformer. A whistle car H' is provided having a whistle G' operated by motor $M^3$. On the whistle car is an on-and-off step-by-step

electromagnetic switch device I, and a unidirectional current relay J. Relay J is connected to rails A' and B' by circuit legs **56** and **57**, respectively. Relay J has a coil **58** and an armature **59**, said armature adapted to make contact with a contact member **60** to close the circuit of coil **61** of device I. The coil **61** acts on an armature **62**, which operates a ratchet wheel **63** carried by the on-and-off commutator **64**. The motor $M^3$ has a lead **65** provided with a collector bearing on commutator **64**, and the motor also has a lead **66** connected to circuit leg **57**.

A transformer T' is provided which is similar to the transformer T having secondary windings **67** and **68**, and an operating arm **69**. In one position of this operating arm **69** it will open the circuit. This opening of the circuit will affect the propelling motor control causing the controlling device to be advanced one step or notch following each interruption.

A control box K is provided for controlling the operation of the whistle. The whistle operation in this case is effected by unidirectional pulsating current operating on relay J, which relay controls through device I the stopping and starting of the whistle motor. A quick-acting switch device $S^2$, similar to the device S previously described, is employed in connection with control box K for causing the sounding of the whistle. In connection with the switch $S^2$ a half-wave rectifier R' is arranged, and there are connections to the transformer and to the rails similar to those previously described.

The operation of this form of the apparatus will be obvious for the most part from the foregoing description. The control of the propelling motor is in this particular case effected from the transformer arm, which is operable to break the supply circuit, so that after interruption of the current and on re-establishment the controlling device D' will be actuated to turn the controlling commutator one step and thereby change the circuit connections to the propelling motor. At this time the whistle device will not be affected, on account of the fact that it is placed in operation only by unidirectional current of proper voltage supplied to the relay J. To supply such operating current to relay J for the purpose of operating the whistle motor, the button of switch $S^2$ is depressed, so as to shunt the rectifier R' across the rails and increase the voltage in the same manner as described in connection with the form of Fig. 1. By this operation relay J is energized, closing the circuit of solenoid **61** so that the electromagnetic device I is actuated to close the circuit of motor $M^3$, which thereupon starts, builds up speed, and blows the whistle. The commutator **64** remaining in the position to which it has been shifted, the operation of motor $M^3$ and the sounding of the whistle continue. In order to discontinue the sounding of the whistle it is necessary to effect the further actuation of switch $S^2$. The operation of switch $S^2$ for initiating and arresting the sounding of the whistle in the manner described does not adversely affect the operation of the propelling motor $M^2$, because of the quick action of the switch, which, while it definitely interrupts the supply of alternating current to the rails, does not interrupt current flow sufficiently long to cause any undesirable slowing of the propelling motor.

In the form of my invention shown in Fig. 9, there is a modification of the system or motor control circuit of Fig. 1 in that there is a difference in the transformer. In this case a transformer $T^2$ is used, of a type which is found on the market and which has no extra or added secondary winding. I have omitted the showing of the primary coil, but the secondary is shown at **70**, and it will be observed that the entire secondary can be introduced into the track circuit $A^2$, $B^2$ for operating the motors. The voltage is increased or decreased by movable arm **71** adapted to cut in and out progressively a number of turns of the coil; and in one position of the arm the circuit is open. A switch $S^3$, similar to switch S, is employed, and in this case relay E', associated with the propelling motor, is constructed so as to be operable only by a unidirectional pulsating current of a voltage impressed through the rectifier by the entire secondary coil. In this form, the full voltage furnished by the secondary may be less than in the form of Fig. 1, furnishing say 15 volts, while according to the arrangement of Fig. 1 the full voltage may be in the neighborhood of say 22 volts. In both of these forms, however, the full or entire secondary of the transformer is used for furnishing the voltage of the current generated by the rectifier when the latter, after the interruption of the A. C. supply, is shunted into the circuit; and the relay is actuated by a current having a voltage comparable in value to the average motor-operating voltage.

One of the advantages of an arrangement of the kind shown in Figs. 1 and 9 is that when the transformer is cut off so as not to supply current to the motors, the push button switch can be actuated to move or set the directional switch of the propelling motor, so that the train can be caused to start up in the reverse direction as soon as the transformer knob is brought into operation again. This is due to the fact that a depression of the directional control button of switch S or $S^3$ under such conditions will cause a circuit to be completed including the transformer secondary and the leads **44** and **47''** and rails, thus actuating relay E or E' which in turn causes the switch device D to be actuated, this time by the unidirectional current. Owing to the rapidity of action of the switch S or $S^3$ the whistle switch will not be actuated.

Another advantage of my invention which is of considerable importance arises from the fact that in operation the whistle motor is operated by alternating current only, and therefore the tone of the whistle is steady, realistic and pleasing.

While I have shown and described three forms of apparatus embodying my invention, it will be understood that the invention is capable of use in many other forms and that various modifications and changes in the organization of parts and in the details can be made without departing from the principles of the invention or the scope of the claims.

What I claim is:

1. In a motor control apparatus for toy trains, in combination, track rails, a transformer having a secondary supplying said rails with alternating current and provided with means for regulating the supply of current to the rails, a train carrying a propelling motor operated by said current, a relay for controlling the operation of said propelling motor, inoperative by said alternating current but operative by pulsating unidirectional current of a predetermined voltage, a half-wave rectifier normally out of circuit, means including a quick-acting switch and connections for interrupting the supply of alternating current to

the rails and shunting the rectifier across the rail circuit in order to supply said relay with an actuating current of said predetermined voltage, an accessory motor carried by said train, and switch means selectively operable independently of said last-named switch and comprising a slow acting switch for controlling the operation of the accessory motor.

2. In a motor control apparatus for toy trains, in combination with a track circuit supplied with alternating current, translating devices carried by the train and operated by said current, selective means for controlling remotely the operation of the respective translating devices including remotely located manipulable control switches one of which is quick acting and the other of which is slow acting, one of said devices having a control circuit including a relay operable by unidirectional current, and the other device provided with a control circuit including an electromagnetic device having an appreciable time lag, the slow-acting switch being operable to actuate said last-named device and the quick-acting switch being operable without affecting said last-named device to cut off the alternating current and introduce a unidirectional current into the circuit, the said time lag being of sufficient duration to prevent operation of said last-named device during normal operation of said quick-acting switch but sufficiently short to cause operation of said last-named device during normal operation of said slow-acting switch.

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