May 13, 1941. C. E. J. MODJESKI 2,241,471

CONTROLLING MECHANISM FOR MODEL RAILROADS

Filed Feb. 13, 1939 2 Sheets-Sheet 1

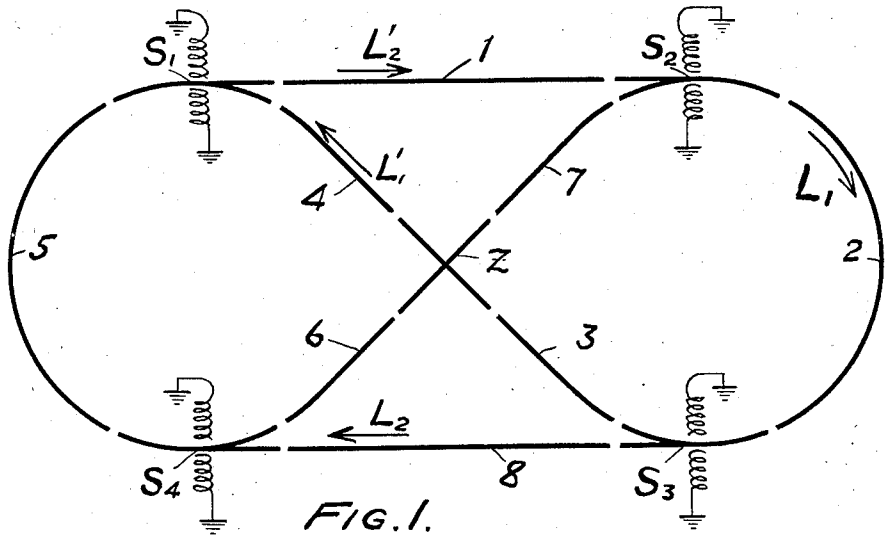


FIG. 1.

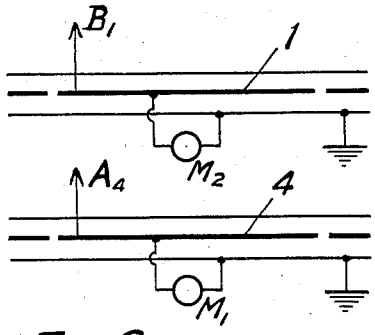


FIG. 2.

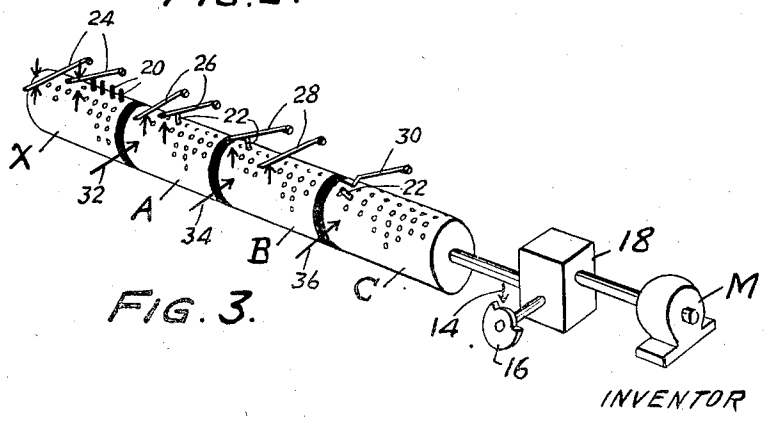


FIG. 3.

INVENTOR

WITNESS:

Robt. P. Kitchel.

Charles E. J. Modjeski

BY

Bruesch & Harding

ATTORNEYS.

May 13, 1941. C. E. J. MODJESKI 2,241,471

CONTROLLING MECHANISM FOR MODEL RAILROADS

Filed Feb. 13, 1939 2 Sheets-Sheet 2

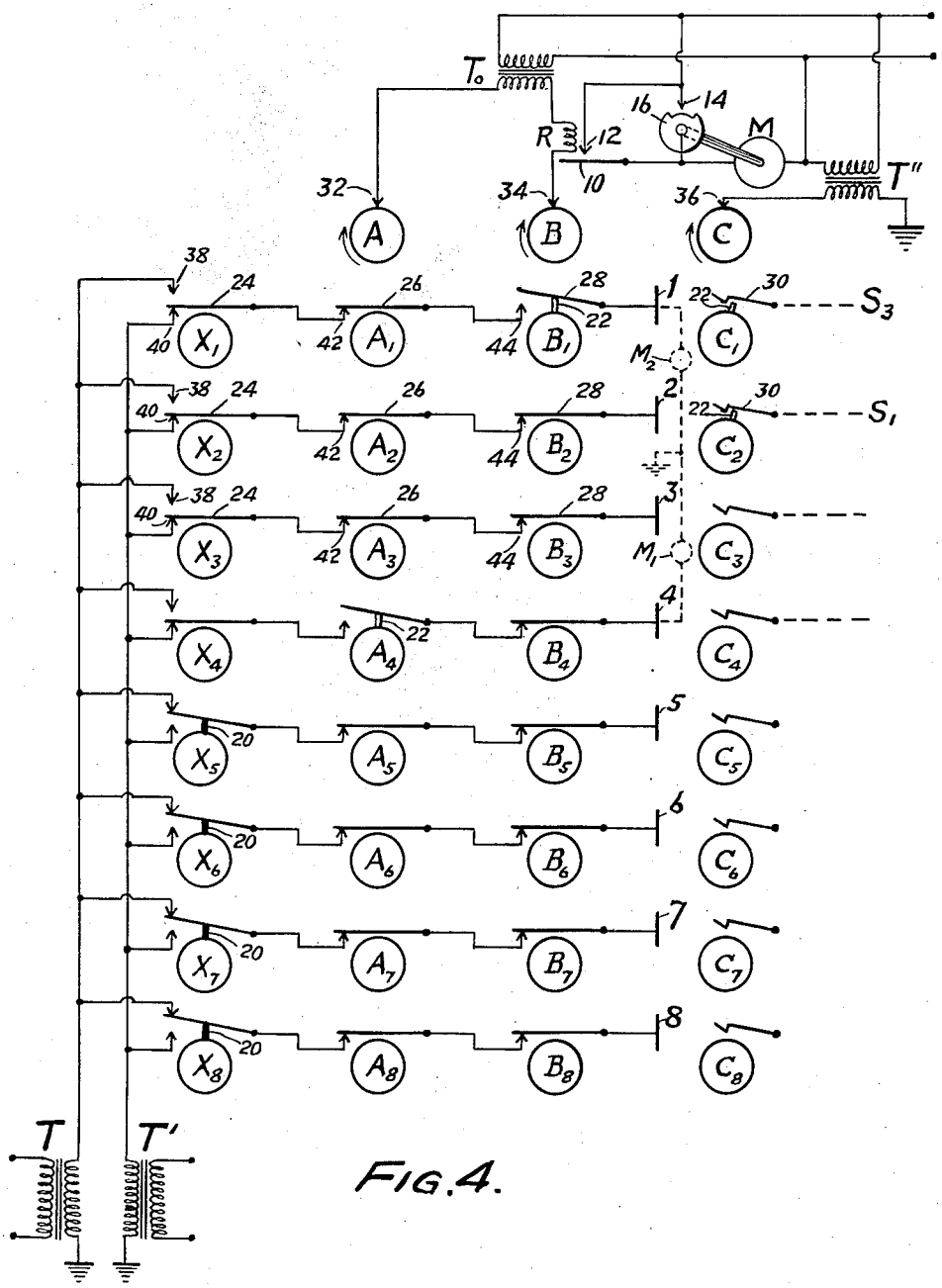


FIG. 4.

INVENTOR

Charles E. J. Modjeski

BY Bruesch & Harding

ATTORNEYS.

WITNESS:

Robt. R. Mitchel.

Patented May 13, 1941 2,241,471

UNITED STATES PATENT OFFICE

2,241,471

CONTROLLING MECHANISM FOR MODEL RAILROADS

Charles E. J. Modjeski, Philadelphia, Pa.

Application February 13, 1939, Serial No. 256,037

4 Claims. (Cl. 104—149)

This invention relates to a controlling mechanism for model railroads, particularly designed for the control of elaborate cycles of operation of a plurality of trains.

In the use of model railroads, it is generally desired by an operator to effect more than a monotonous repetition of a single cycle of operation. Accordingly, it is quite common for operators of such railroads to provide automatic switches actuated by relays to provide interlocking controls for a plurality of trains to effect their operation without collisions. Usually, such arrangements involve the control of one train by another if a collision is imminent.

Such systems are generally subject to several drawbacks. The first is that the relay system very rapidly increases in complexity and cost with increase in elaborateness of the control. Secondly, such arrangements generally fall short of expectations because the desired complication of operation is prevented by the fact that one train will operate faster than the other and so eliminate the possibilities of operation which would occur if the slower train sometimes beat the faster train to a control point. A third objection is that the small motors used in trains are subject to large speed variations for small changes in applied voltage, and accordingly when the power supply system is unloaded by the cutting off of current from one train, the other will generally speed up to an objectionable extent. When the two are running, furthermore, "robbing" of one by the other occurs and usually attainment of nearly equal speeds is impossible.

The main object of the present invention is the provision of a controlling system which overcomes the disadvantages referred to above. By its use extremely elaborate cycles of operations may be provided with relatively simple mechanism which does not have an increased cost dependent upon the elaborateness of the cycle. In addition to securing proper operation, furthermore, it is of such nature as to challenge the ingenuity of the operator, who is able to change the cycles quite freely in accordance with his desires, but in doing so must be able to clearly foresee the matters which he must take into consideration. Thus the apparatus provides an extremely interesting puzzle for the operator to work out to insure operation in accordance with his desires. A single controlling mechanism merely by adjustment of its variable elements may be made to control operation on widely divergent track layouts.

The improved controlling system, furthermore, provides for the independent supply of power to the various trains, which may be operated so as to prevent their robbing each other to thereby insure smooth operation.

Broadly stated, the improved controlling mechanism involves the use of a controlling means adapted to be intermittently advanced to occupy positions predetermining the ends of separate periods of operation. The end of each such period results upon the occurrence of predetermined simultaneous events which, in general, take the form of simultaneous location of the various trains of the system on certain parts of the track. Immediately upon the termination of any such period by the simultaneous events, the controlling mechanism is advanced to effect continued operation and predetermine future simultaneous events which will terminate the new period. The controlling means is then again advanced and so on.

The broad and specific objects of the invention will become apparent from consideration of the accompanying drawings, in which:

Figure 1 is a diagrammatic view of the third rail arrangement of a track layout utilizing the controlling mechanism;

Figure 2 is a further diagrammatic view illustrating the nature of conditions arising when there occur the simultaneous events ending one cycle and beginning the next;

Figure 3 is a perspective view of diagrammatic nature indicating the mechanical parts of the controlling mechanism; and

Figure 4 is a wiring diagram illustrating the mode of operation of the controlling mechanism.

In Figure 1 there is illustrated a typical track layout which will serve for purposes of illustration. In this figure there are illustrated only the third rail sections of the track, which are insulated from each other as indicated by the breaks. It will be obvious that the invention is applicable to a two rail system merely by having one of the rails comprise insulated sections similar to the insulated sections of third rail of the modification which is disclosed. In order to avoid confusion, the following description will be made with respect to a three rail system.

The track layout illustrated in Figure 1 comprises the third rail sections 1, 2, 3, 4, 5, 6, 7 and 8, which are to be variably and selectively energized. In addition, the layout comprises such sections as the switch sections S_1, S_2, S_3 and S_4 and the cross-over section Z, which sections may be continuously energized by either one of the transformers used in the selective parts of the

system or by a separate transformer. In addition to these sections there may, of course, be continuously energized straight or curved sections which are not to take part in the selective operation. The outer rails of the system may be connected together electrically and will be considered for purposes of description as grounded.

Referring now to Figure 3 there is disclosed therein the mechanical selecting arrangement comprising cylinders X, A, B and C, insulated from each other and from a common shaft, which is driven through reduction gearing 18 by a motor M. Driven also through the reduction gearing 18 is a contact segment 16 with which cooperates a fixed brush 14. The member 16 may be in the form of a disc having a portion of its periphery cut away as illustrated. It will be evident hereafter that the cylinders may be advanced by a solenoid operated ratchet arrangement with suitably modified connections.

The cylinders X, A, B and C are preferably made of metal tubing, though, as will be obvious hereafter, the cylinder X may be made of some insulating material. Each of these cylinders is provided with a number of axially extending columns of holes which also form circular rows about the cylinders. The number of columns of holes in this array is dependent upon the number of periods which are to comprise a single cycle of operation. In general, it is desirable to have the number of these columns from eight upwards. The complexity of the cycle, as will be seen, is dependent upon the number of these columns.

The number of circular rows of holes is also desirably fairly large to take care of complicated track layouts. If the maximum complexity of the track layout is to involve eight control sections, as indicated in Figure 1, there would be needed only eight rows of holes, but it is desirable to provide more than this number so as to take care of more complicated track layouts.

Insulating pins 20 and conductive pins 22 are provided to be variably inserted in the various holes of the cylinders, the insulating pins being used in cylinder X and conductive pins in cylinders A, B and C. These pins are adapted to act upon switch elements 24, 26, 28 and 30, illustrated particularly in the diagram of Figure 4, there being a number of these switch elements corresponding to the circular rows of holes of the cylinders.

Brushes 32, 34 and 36 are provided to make continuous contacts with the metal cylinders A, B and C, respectively.

The drive of the cylinders and the segment 16 is so arranged that the segment 16 will make a complete revolution for each such part of a revolution as will carry the cylinders through the angular spacing between successive columns of holes and the pins therein. The intermittent operation of the motor will become apparent from the description of the wiring diagram.

The wiring diagram of the apparatus is illustrated in Figure 4. To insure proper independent operation of two trains there are provided the two power transformers T and T'. If the system is to be operated on direct current, it will be obvious that the various transformers would be replaced by suitable batteries. Proper driving power may also be secured from either an alternating or direct high voltage source through dropping resistors. The switch members 24, adapted to be lifted by insulating pins 20 on the cylinder X, may selectively engage upper contacts 38 connected to transformer T and lower contacts 40 connected to transformer T'. The subscripts used in Figure 4 are for the purpose of indicating the corresponding circular rows of holes in the cylinders.

Each switch member 24 is connected to a corresponding contact 42 adapted to be engaged by a corresponding switch member 26 cooperating with the cylinder A. The conducting pins 22 of the cylinder A have a dual function of lifting the switch members 26 away from contacts 42 and of completing electrical connections between the switch members 26 and the cylinder A and brush 32.

Each of the switch members 26 is in turn connected to a corresponding contact 44 engageable by a corresponding switch member 28 associated with the cylinder B. The conducting pins 22 on the cylinder B function in the same fashion as the pins of cylinder A to lift their switch members away from contact 44 and complete electrical connection between the switch members 28 and cylinder B and brush 34.

The switch members 28 are respectively connected to the track sections numbered 1 to 8 and illustrated diagrammatically in Figure 4. Thus it will be seen that the rows of holes in the cylinders X, A and B, their pins and corresponding switch members bearing a certain subscript in Figure 4 relate to control of the rail section having the same number as the subscript.

The cylinder C, its conducting pins 22 and switch members 30 are not related to the track sections, as in the case of the other cylinders, but are rather arranged for the actuation of switches, signals and other desirable auxiliaries, such as whistle controlling devices, during the cycle of operation. In other words, the cylinder C provides for the possibility of variously controlling auxiliaries in the various periods of a cycle of operation, being preferably provided with a number of axially extending columns of holes corresponding to the axially extending columns of holes of cylinder A or cylinder B. The auxiliaries need not bear any particular relationship to the track sections. The control of auxiliaries is preferably effected through a separate transformer T'' so that their operation will not be affected by and will not affect the operation of the trains.

At the upper portion of Figure 4 there is illustrated the wiring arrangement for control of operation of the motor M. A transformer indicated at T_0 has its secondary connected in series with a relay R to brushes 32 and 34, which make continuous contact with the conducting cylinders A and B. The armature 10 of the relay R is adapted to be attracted when the relay is energized to close a contact at 12 placing the motor M across the line. In parallel with this contact is arranged the brush 14 and segment 16. The provision of the relay in conjunction with the segment is to insure that the segment will be given a complete revolution at each operation of the motor with a corresponding completion of advance of the cylinders through the angular spacing between adjacent columns of holes.

The operation of the arrangement may be best described by consideration of a specific period of a cycle of operation involving the use of the track layout of Figure 1. For any given position of the cylinders, it will be obvious that the absence of a pin in corresponding rows and columns of cylinders A and B will result in energization of the corresponding rail sections. The presence

of pins, for example, at B_1 and A_4 will result in deenergizing the corresponding sections 1 and 4 of rail. For purposes of preliminary discussion of the operation, it may be assumed that contacts 42 are connected to a power source without considering whether the power is supplied by transformer T or T'.

Assume that the trains are initially on the sections 2 and 8 of the track, as indicated at L_1 and L_2. Assume also that the cylinders A and B have been turned sufficiently to result in the breaking of the contact at B_1 between contact 44 and switch member 28 and at A_4 as illustrated in Figure 4. Both sections 2 and 8 of the rail will be energized and the trains L_1 and L_2 can start travelling about the track.

As the trains travel around the track they will now find sections 1 and 4 deenergized. At the same time, however, track 1 is connected through switch member 28, pin 22 in row B_1 and cylinder B to the brush 34 and section 4 is connected through a switch member 28 and contact 44 and a switch member 26 and contact 22 at A_4 to the cylinder A and brush 32. Let it be assumed that switch S_3 was thrown by a momentary contact at C_1 so as to direct the train L_1 from the section 2 through S_3 to section 3 and thence through Z to 4. Switch S_1 will also have been set to direct train L_2 through S_4 and 5 and S_1 to the section 1. Eventually, therefore, both the trains will assume the positions indicated at L'_1 and L'_2. As they enter the dead sections 1 and 4 they will come to rest or coast.

As soon as both trains reach these sections 1 and 4, however, there occurs a completion of the relay circuit R, as will be evident from Figures 2 and 4. Figure 2 shows that the motor M_1 of the train L_1 will be across the third rail section 4 and the outer grounded track rail. Likewise, the motor M_2 of the train L_2 will be across the third rail section 1 and the grounded outer rail. This, it will be evident, will effect connection, as indicated by the arrows B_1 and A_4 in Figure 2, to the pins in these positions now engaging switch members 26 and 28, and hence the circuit of the secondary of transformer T_0 is completed through the motors of the trains. Since the relay R is designed to operate on relatively little current, the current flowing through the motors M_1 and M_2 will not suffice to operate the trains, but relay R will be energized to attract its armature 10 and close contact at 12. As soon as that contact is closed, the motor M starts operating to advance the cylinders. The arrangement is preferably such that the advance of the cylinders takes place quite rapidly, though sufficiently slowly to throw the switches as described below. The contact of brush 14 and segment 16 takes place almost immediately, and at any rate, before relay R is deenergized, and consequently the motor will continue to be energized from the shunt circuit. The rotations of the pins 22 at B_1 and A_4 will serve first to close the contacts at 42 and 44 to energize the sections 1 and 4 and then break contacts between the pins 22 and the switch members 26 and 28, thus opening the relay circuit and permitting it to drop its armature 10. The motor will continue to operate until a complete revolution of the segment 16 is effected, whereupon its circuit will be opened and it will come to rest. As it comes to rest and the completion of the step of advance of the cylinders takes place, new pins carried by the cylinders A and B will come into play to deenergize two of the sections 1 to 8 of the track layout so as to predetermine another pair of stopping positions for the trains. One or both of these newly deenergized sections may be the same as the sections previously deenergized, if it is desired to have a train remain in the same section through an entire succeeding period. In such case it is desirable to provide a bridging member instead of pins 22 to prevent momentary energization of the train as the cylinders revolve. The bridging member may take the form of two pins connected by a bar to keep the contact broken during movements of the cylinder.

During the advance of the cylinders the auxiliaries, such as the switches, may be variously arranged to direct the trains through proper paths to the next pair of deenergized sections. When such sections are reached, the trains will come to rest or coast and the selecting mechanism will be again operated to predetermine the next period of operation.

To prevent undue heating of the switching solenoids, they are preferably only momentarily energized during movements of the cylinders. Hence the stationary positions of the cylinders involve absence of contacts between pins 22 and switches 30, the pins making and breaking contact with the switches during cylinder movements, as indicated in Figure 4.

It will be seen from the above that the arrangement requires considerable ingenuity in the proper placement of the pins in the cylinders to secure the desired operative sequence of periods. Thus, an interesting puzzle is provided, though for securing the ultimate ends desired no more mechanical manipulation is involved than changing of positions of pins in the cylinders and possible changes in wiring to the various sections of the tracks and auxiliaries. For each switch there should, of course, be provided two contact members 30, energization of one of which will throw the switch in one direction and energization of the other of which will throw the switch in the opposite direction. Thus the four track switches illustrated would require eight switch members 30. Additional switch members may be provided for other auxiliary devices.

The use of a pair of transformers T and T' and energization of the various track sections from the alternative transformers through the cylinder X takes care of separate energizations for the trains. During any period, for example, the sections in the path of one of the trains may be energized by the transformer T and the sections in the path of the other by the transformer T'. Thus neither of them will interfere with the operation of the other. In some instances, it may be necessary to have them energized from the same transformer, but that is not particularly objectionable if both trains have already acquired considerable momentum. What is avoided, however, is the objectionable feature involved in having one of the trains run away when the connections to the other are interrupted, though adjustments are made for normal speeds with both running. The transformers T and T' should, of course, be similar in output voltage and phase connections so that under certain circumstances they might operate in parallel without producing any short circuit. It may be remarked that momentarily accidental connections may result, for example, from energization of tracks 1 and 4, while they are still connected in the relay circuit. Any auxiliary energization of the relay at this time, however, is not objectionable, since it will oc-

cur only during a period of operation of the motor M. It may be avoided, however, by staggering slightly the pins in A and B with respect to each other.

It will be obvious that the invention may be adapted with slightly more complex arrangement to the control of more than two trains, in which case provision should be made to insure change of period when all three trains reach predetermined positions. This may be readily effected in line with the disclosure, utilizing three or more cylinders instead of the two cylinders A and B with proper interconnection with a motor controlling relay.

What I claim and desire to protect by Letters Patent is:

1. Apparatus for the control of a plurality of toy trains on a track arrangement having a plurality of propulsion current supplying sections comprising a controlling device adapted to assume a plurality of positions, each of which determines selective energization or deenergization of said sections, and means for advancing said controlling device intermittently by reason of attainment of a predetermined position by each of a plurality of the trains to effect variations in the selective energization or deenergization of said sections.

2. Apparatus for the control of a plurality of toy trains on a track arrangement having a plurality of propulsion current supplying sections comprising a controlling device adapted to assume a plurality of positions, each of which determines selective energization or deenergization of said sections, and means for advancing said controlling device intermittently by reason of attainment of a predetermined position on a deenergized section of the track arrangement by each of a plurality of the trains to effect vartions in the selective energization or deenergization of said sections.

3. Apparatus for the control of a plurality of toy trains on a track arrangement having a plurality of propulsion current supplying sections comprising a cyclically moving controlling device adapted to assume a plurality of positions, each of which determines selective energization or deenergization of said sections, and means for advancing said controlling device intermittently by reason of attainment of a predetermined position by each of a plurality of the trains to effect variations in the selective energization or deenergization of said sections.

4. Apparatus for the control of a plurality of toy trains on a track arrangement having a plurality of propulsion current supplying sections comprising a cyclically moving controlling device adapted to assume a plurality of positions, each of which determines selective energization or deenergization of said sections, and means for advancing said controlling device intermittently by reason of attainment of a predetermined position on a deenergized section of the track arrangement by each of a plurality of the trains to effect variations in the selective energization or deenergization of said sections.

CHARLES E. J. MODJESKI.