Nov. 19, 1940. N. L. CASE ET AL 2,221,963

VOICE CONTROLLED TOY TRAIN SYSTEM

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Fig. 1.

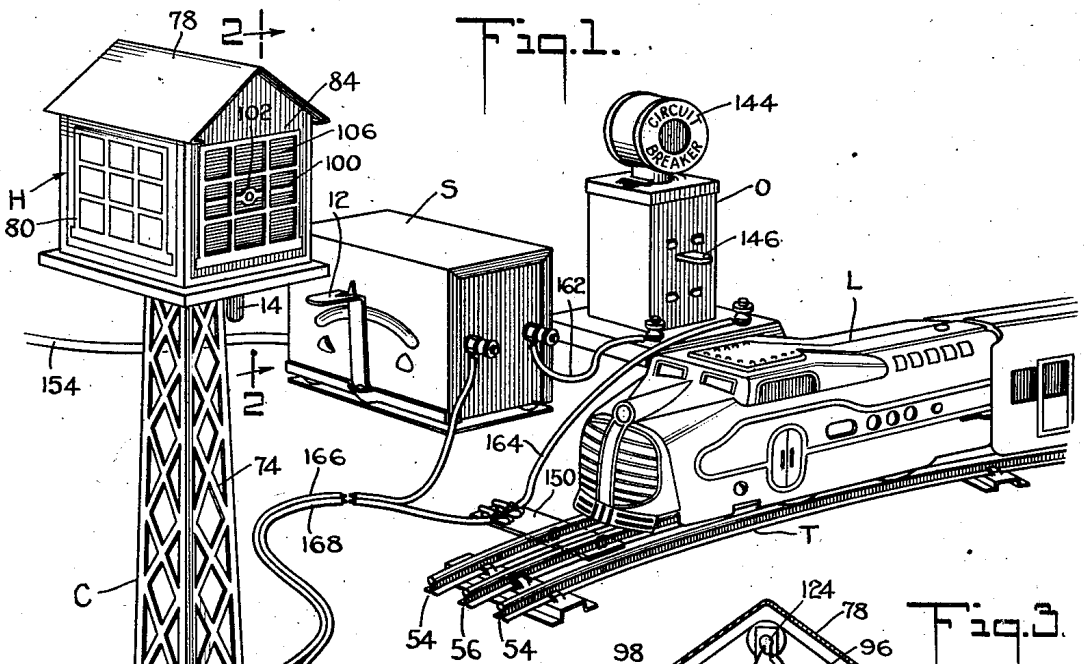


Fig. 3.

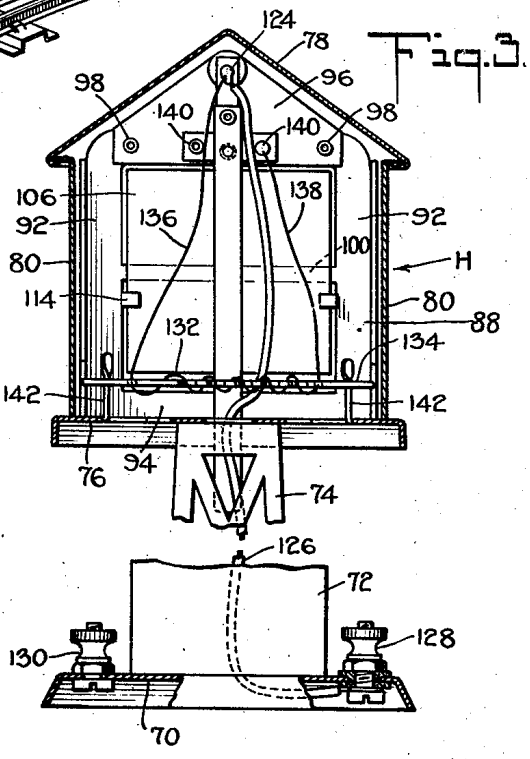
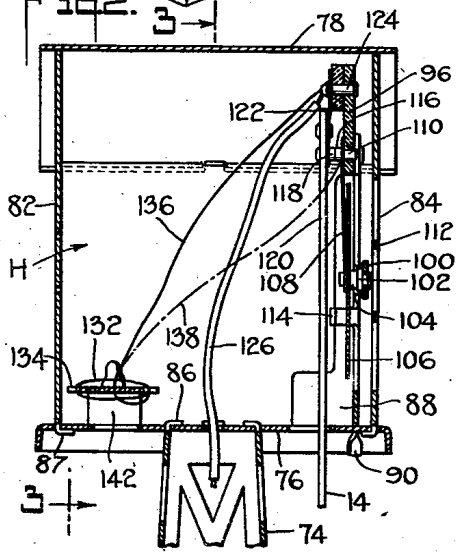


Fig. 2.



INVENTORS
NOEL L. CASE
BERNARD S. FRANKLIN
BY
ATTORNEYS

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Fig. 4.

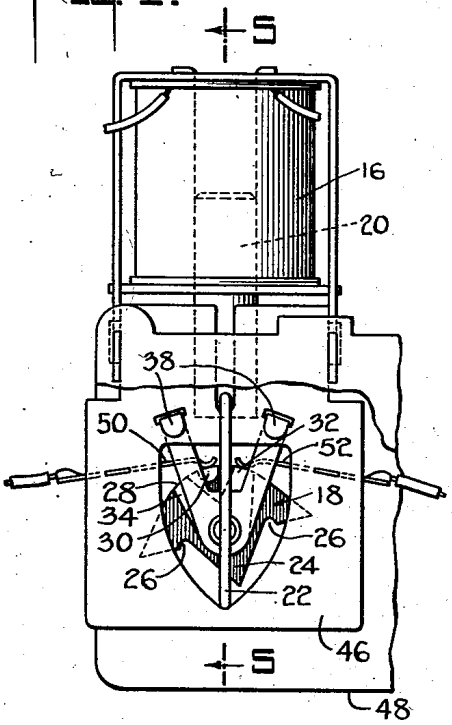
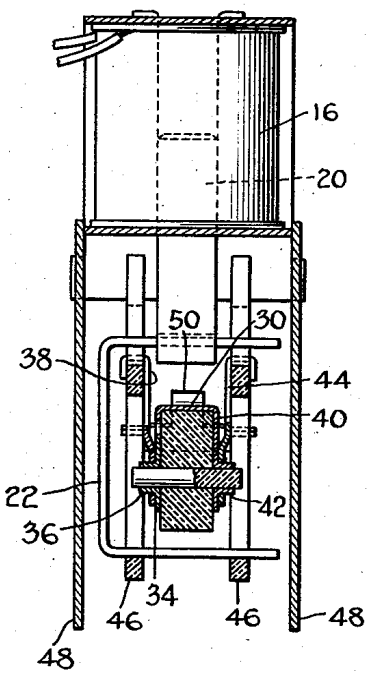


Fig. 5.



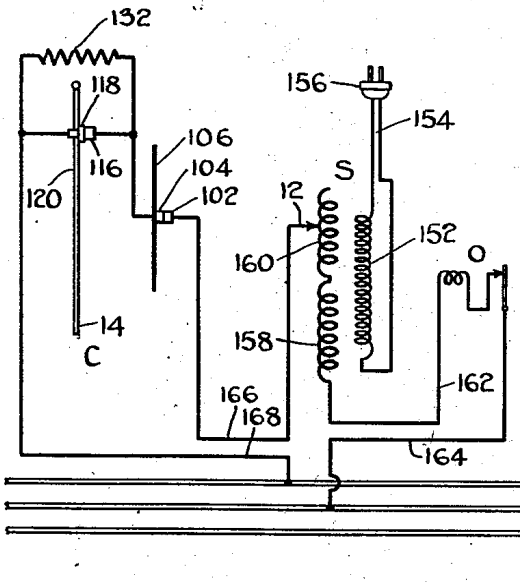
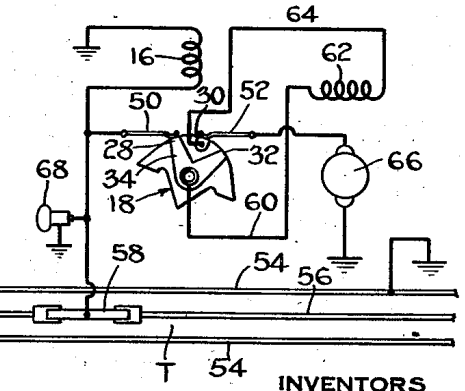


Fig. 6.



INVENTORS
NOEL L. CASE
BERNARD S. FRANKLIN
BY
James & Franklin
ATTORNEYS

Nov. 19, 1940. N. L. CASE ET AL 2,221,963

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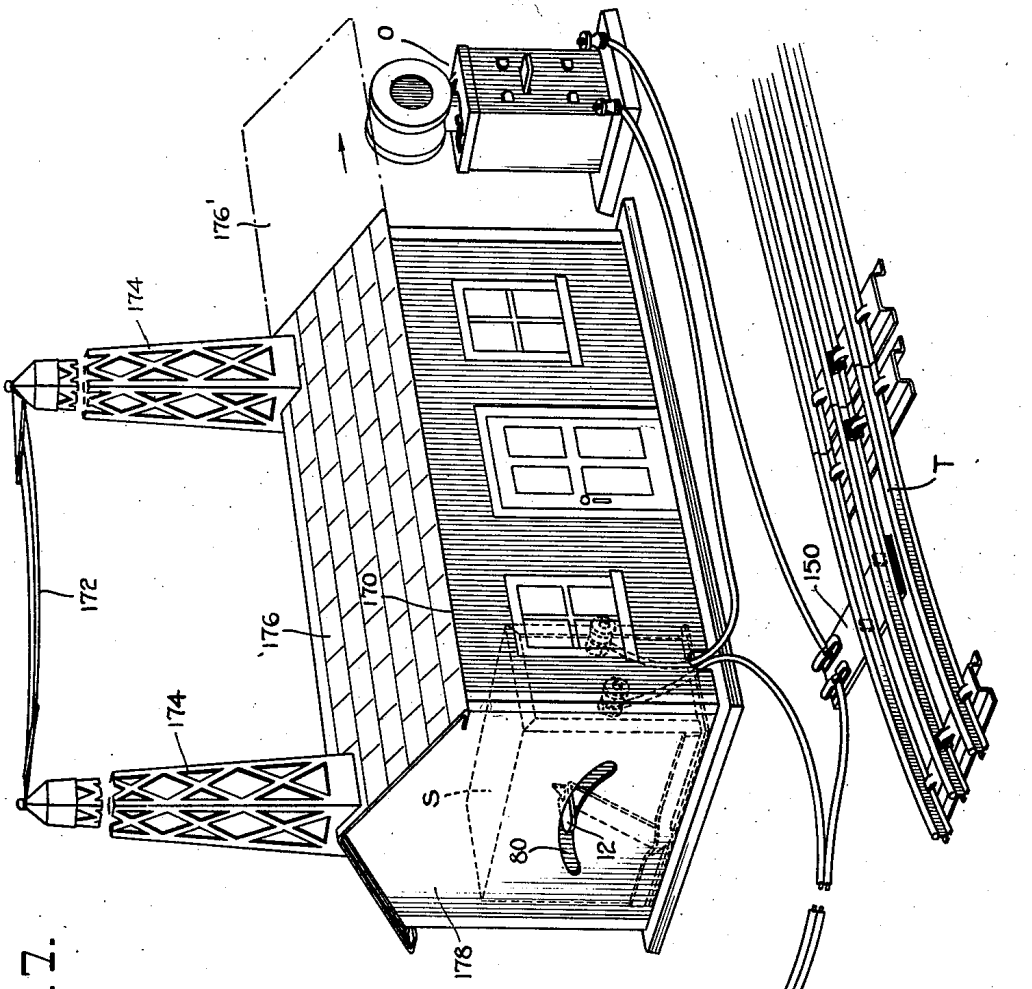

Fig. 7.

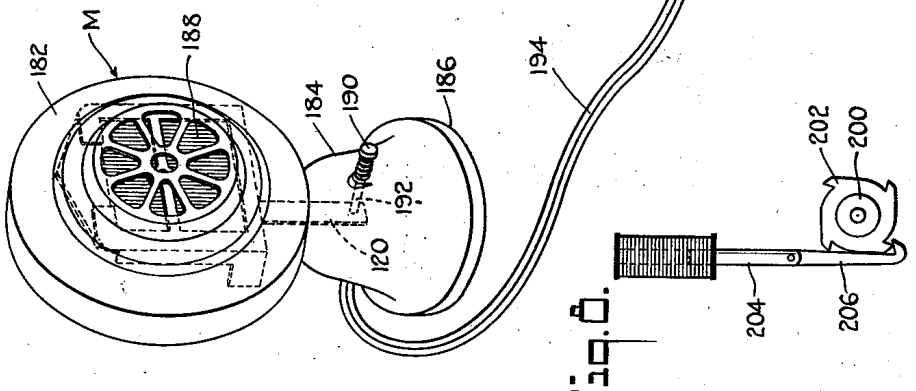

Fig. 8.

INVENTORS
NOEL L. CASE
BERNARD S. FRANKLIN
BY
James & Franklin
ATTORNEYS

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Fig. 9.

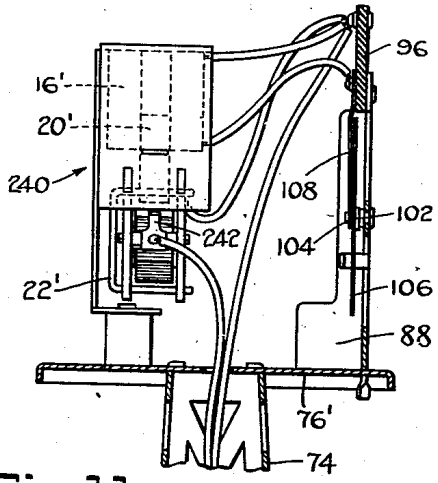


Fig. 10.

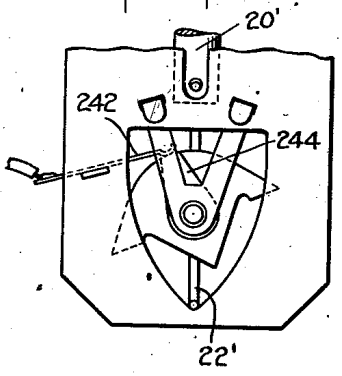


Fig. 11.

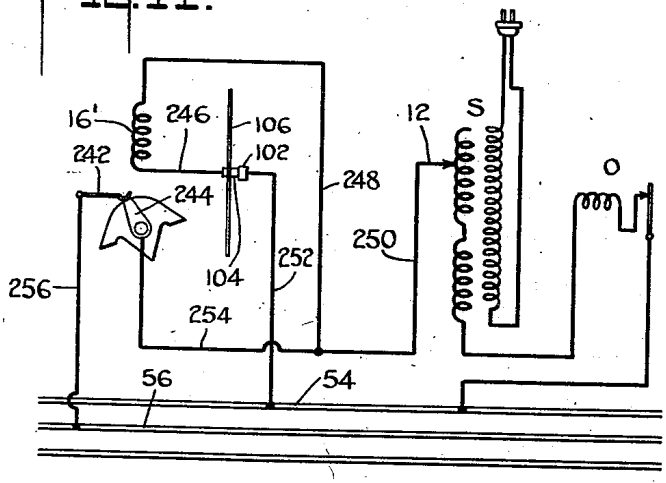
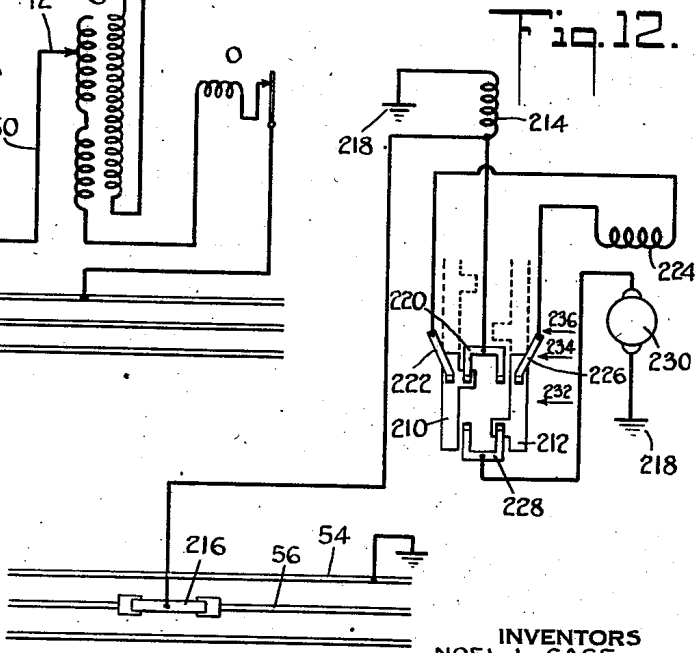


Fig. 12.



INVENTORS
NOEL L. CASE
BERNARD S. FRANKLIN
BY
James & Franklin
ATTORNEYS

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UNITED STATES PATENT OFFICE

2,221,963

VOICE CONTROLLED TOY TRAIN SYSTEM

Noel L. Case, Girard, Pa., and Bernard S. Franklin, New York, N. Y., assignors to Louis Marx & Company, Inc., New York, N. Y., a corporation of New York

Application June 10, 1937, Serial No. 147,444

14 Claims. (Cl. 104—151)

This invention relates to toys, especially remotely controllable toys, and more particularly to toy train systems.

The primary object of the invention is to generally improve toy train systems or other remotely controllable toys. A further object resides in the provision of a simulated voice control, or a simulated radio control for such toy train systems. A more particular object is to remotely control the stopping, starting, and reversal of the train, at least some of these control functions being by voice or breath control, or simulated radio control.

Still another object of the invention is to devise such a system in which the train may be stopped and started by means of inconspicuous manually operable control means mounted directly on a simulated microphone or other speech or breath controlled means, so that a child may, if desired, play with the toy as though it were fully voice controlled, that is, the child may cause the train to go forward or backward by true command or breath control, and may make believe that the train is also stopped and started by command, although actually it is the inconspicuously manually controlled means that is being used for the latter functions. The illusion of true control by voice is heightened and readily maintained, even in this form of the toy, because the train really responds to commands to reverse or to proceed forward or backward.

A further object is to devise other forms of the toy which are fully voice controlled, whether the train carried relay is of the tumbler type, or of the continuous drum type.

To the accomplishment of the foregoing and other objects which will hereinafter appear, our invention consists in the simulated radio remote control elements and their relation one to the other as hereinafter are more particularly described in the specification and sought to be defined in the claims. The specification is accompanied by drawings in which:

Fig. 1 is a perspective view of a part of a toy train system embodying features of our invention;

Fig. 2 is a section taken in elevation in the plane of the line 2—2 of Fig. 1;

Fig. 3 is a transverse section through the control tower, and is taken in the plane of the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of a solenoid-operated motor reversing switch carried in the locomotive of the train;

Fig. 5 is a section taken in the plane of the line 5—5 of Fig. 4;

Fig. 6 is a wiring diagram explanatory of the invention;

Fig. 7 is a perspective view showing a modified form of simulated radio train control system;

Fig. 8 is explanatory of a modified locomotive switch with which the invention may be used;

Fig. 9 is a side elevation of a modified control tower for complete voice control, with the housing removed;

Fig. 10 is a front elevation of the relay tumbler;

Fig. 11 is a wiring diagram explanatory of the invention of Fig. 9; and

Fig. 12 is a wiring diagram explanatory of the invention of Fig. 8.

Referring to the drawings and more particularly to Fig. 1, the speech controlled train system comprises a track generally designated T, a locomotive L operable on said track, a transformer or like current supply source S, an overload circuit breaker O, and a control tower C carrying a simulated control house H.

The locomotive L is provided with a driving motor, not shown, and a solenoid operated reversing switch subsequently described. The train is put into operation, and its speed is controlled by movement of a manually operable speed control lever 12. Assuming the train to be in motion, its operation may thereafter be fully controlled from the remote control tower C. The appropriate commands are spoken into one end of the control house at the top of the tower. At the same time, one hand is preferably placed about the tower, with the thumb resting against the depending control lever 14. By speaking a command, the train is caused to run backward or forward at will. By depressing the lever 14, the train is stopped and remains stopped until the lever 14 is again released, at which time it proceeds in the same direction as it was originally moving. Of course, the child preferably states a command appropriate to stopping or starting of the train even when manipulating lever 14, so that the entire control of the train appears to be by speech or command. In such case the command is spoken less loudly, or partially away from the microphone, or employs such words as will not cause operation of the reversing means.

Considering the arrangement in greater detail and referring now to Figs. 4 and 5 of the drawings, the locomotive-carried reversing

switch comprises a solenoid coil 16 mounted above an oscillatable insulation tumbler 18. Solenoid core 20 is vertically reciprocable in coil 16 and carries a U-shaped link 22 suspended therefrom. The lower arm of link 22 rests beneath tumbler 18. The bottom surface of the tumbler is shaped to form a wedge-shaped guide 24 terminating at its outer ends in recesses 26. The arrangement is such that when the solenoid 16 is energized, core 20 is elevated and link 22 is pulled upwardly against one side of guide wedge 24 to recess 26 whereupon it tilts the tumbler to a position opposite that which it last assumed. For example, in Fig. 4 the tumbler is tilted counter-clockwise and solenoid 16 when again energized will function to tilt the tumbler in a clockwise direction to the position shown in Fig. 6.

The upper surface of the tumbler is cylindrical and carries contact segments 28, 30, and 32, segments 28 and 32 being connected together at one side of the tumbler by the V-shaped member 34. Electrical connection to V-shaped member 34 is obtained through collar 36 and stationary support arms 38. Similarly, contact segment 30 is externally connected through a radial arm 40 on the tumbler, the collar 42 of which is received in and carried by support arms 44. It will be understood that the side plates 46 on which the support arms 38 and 44 are mounted are made of insulation. It may also be mentioned that the metallic plates 48 preferably are the regular metallic side plates or frame plates of the motor truck of the locomotive.

The reversing switch mechanism is completed by a pair of stationary resilient brushes or contact members 50 and 52. It will be manifest that upon each successive energization of solenoid 16, the disposition of brushes 50 and 52 relative to the segments on the tumbler is changed, the brushes resting on segments 30 and 32 when the tumbler has been tilted counter-clockwise as shown in Fig. 4, and the brushes resting on segments 28 and 30 when the tumbler has been tilted clockwise as shown in Fig. 6.

The connections between the reversing switch and the locomotive driving motor are clearly evident from inspection of the right-hand portion of Fig. 6. In that figure, the track T comprises grounded outer rails 54 and an insulated center or third rail 56. The contact shoe 58 of the locomotive slides on third rail 56 and is connected to brush 50 from which it is connected through the tumbler and conductor 60 to motor field 62. The opposite end of the field coil is connected through conductor 64 and through the tumbler segment 30 to spring contact 52 and thence to the motor armature 66. The opposite side of the armature is grounded to the locomotive frame and thence to the outside rails 54 of the track, through the locomotive wheels. It will be manifest that when the tumbler 18 is shifted from the clockwise position shown in Fig. 6 to a counter-clockwise position, the direction of flow of current through the field coil is reversed relative to the direction of flow of current through the armature, and the motor is thereby reversed.

Coil 16 in Fig. 6 is the solenoid coil, and it will be noted that this is kept constantly in circuit, it being shunted across the motor circuit. The same applies to the head lamp 68. The solenoid coil is made of many turns of fine wire, so that it does not draw any appreciable amount of current away from the motor, and with the further object of making the same sensitive to a relatively small holding current which is entirely inadequate to drive the locomotive motor. It will be understood that the solenoid core is normally elevated, but that upon complete open-circuiting of the current supply to the track, the solenoid is deenergized, and when the solenoid is again energized the motor is driven in opposite direction. This will happen even though the supply circuit is only momentarily deenergized, and, as will subsequently appear, such momentary deenergization is obtained in response to spoken command.

The construction of the control tower may be described with reference to Figs. 1, 2, and 3 of the drawings. The control tower comprises a base 70 carrying a pedestal 72 surmounted by a latticed tower 74. This in turn carries the simulated control house H. The control house is made up of a bottom wall 76, a roof 78, side walls 80, and end walls 82 and 84. At least one of these end walls, in this case the end wall 84, is largely cut-away for free flow of air therethrough. The opposite end wall may, if desired, be provided with some perforations in order not to dampen the flow of air through the house, but in ordinary practice this precaution is not found necessary. The working parts in the house may all be mounted in the bottom or base 76. The house is assembled by bodily adding the roof, side and end wall assembly to the bottom wall 76. The latter is permanently secured to the upper end of tower 74 by appropriate bent tongue connections 86, and the house is secured to the bottom wall by bent tongue connections 87.

Fixedly secured on bottom wall 76 near the open end 84 of the house is an upright metallic frame 88, said frame being secured to the bottom wall by appropriate twisted tongue connections 90. The frame is made of relatively heavy-gauge sheet metal, and comprises upright side arms 92 connected at their lower ends by a cross arm 94, and at their upper ends by a generally triangular-shaped piece of insulation 96, the latter being secured to the side arms by rivets or eyelets 98. A strip 100 is left bridging the space between side arms 92 at about the center of the opening therebetween. A stationary contact 102 is connected at the center of arm 100, the working face of this contact being disposed inwardly of the house. Manifestly, with this construction the contact 102 is grounded.

Contact 102 cooperates with a movable contact 104 mounted on a thin light vane or diaphragm 106, the latter being conveniently made of sheet Celluloid or the like. Diaphragm 106 is supported solely by a thin strip 108 of resilient metal such as phosphor bronze, said strip being secured in back of the diaphragm by the rivet of contact 104 which, of course, is disposed on the front of the diaphragm. The phosphor bronze strip 108 extends upwardly from contact 104 and is secured to the insulation bridge 96 by means of a rivet 110. The vane or diaphragm 106 is freely movable, being anchored solely by the thin readily yieldable strip 108. When speech is directed at the open end 84 of the house, the compressive speech wave or the breath discharge during speech readily passes through the windows cut through wall 84, and displaces diaphragm 106 inwardly enough to separate the contacts 102 and 104.

This momentarily opens the circuit through the contacts and causes reversal of the train.

The diaphragm 106 is protected because it is enclosed on all sides by the house, and even the open side 84 has vertical and horizontal cross bars 112 in addition to the frame cross bar 100, all of which protect the diaphragm. Furthermore, a pair of motion-limiting or stop lugs 114 are bent rearwardly and inwardly from the side arms 92 of the frame and are so disposed as to prevent more than a limited inward movement of the diaphragm, this movement being inadequate to permanently deform the strip 108 by exceeding its elastic limit. The side walls 80 of the house may be lithographed or printed to simulate window openings like those actually provided on the end wall 84.

The inner end of rivet 110 preferably acts as a stationary contact 116. A movable contact 118 cooperates with contact 116, the contact 118 being mounted on the forward face of an insulation lever 120. A strip 122 of spring metal or phosphor bronze is secured between rivet 110 and lever 120 and extends upwardly to and is riveted on insulation bridge 96 by a rivet 124. Spring 122 is so designed that it normally holds lever 120 forwardly and keeps the contacts 116 and 118 in engagement. Upon pressing the bottom end 14 of lever 120 rearwardly, that is, toward the tower, the contacts 116 and 118 are separated. It will be manifest that the two sets of contacts are in series so that opening of either pair of contacts opens the series circuit therethrough. An insulated conductor 126 extends upwardly through the tower and is connected to rivet 124. In Fig. 3 it will be seen that the lower end of conductor 126 is connected to a terminal 128 insulatedly mounted on the base 70 of the tower, while another terminal 130 is mounted directly on and grounded to base 70. A circuit is thus established from terminal 128 through wire 126, thence through contacts 116 and 118, thence through contacts 104, 102, and then by way of ground to terminal 130. A command or air wave directed at the open end of the house opens the circuit and similarly, pressure on control button 14 beneath the house also opens the circuit. The latter may be used to stop the train and to keep it in stopped position for as long as desired, whereas the voice control is preferably used to only momentarily open the circuit and thereby reverse the train.

In order that the train may be stopped and started repeatedly while running in the same direction, or in other words, in order to prevent undesired reversal of the train when it is stopped, a small holding potential is preferably fed to the track when stop lever 14 is depressed. For this purpose a resistor 132 wound on a sheet of mica or like refractory insulation 134 is connected across the contacts 116, 118. In the specific construction here shown, the resistor 132 is preferably mounted directly in the house H, for this saves extensive wiring such as would be needed if the resistor were located elsewhere. Moreover, the ends of the resistance wire itself may be used as leads. Thus the end 136 is connected to rivet 124 while the end 138 is connected to one of a pair of eyelets 140 which secure the upper end of phosphor bronze strip 108 to insulation bridge 96. The mica strip 134 is mounted on a pair of supports 142 bent upwardly from the base 76 of the house. With this arrangement it will be seen that in response to speech or a command, the circuit is truly opened, though only momentarily, while in response to movement of handle 14 the circuit is supplied with a small holding potential, that is, it is opened except for the resistor 132 which is then connected in series with the supply circuit.

The transformer S may be of conventional type, and requires no detailed description. It is preferably of the type in which the outer layer of secondary winding is bared and cooperates with a slider movable thereover, said slider being insulatedly connected to and moved by the control handle 12 outside the casing of the transformer. This arrangement is preferable, first, because it provides a gradual voltage change or speed control, and secondly, because the change is accomplished without open-circuiting the secondary circuit, thus avoiding undesired reversal of the direction of operation of the train, such as might occur with spaced transformer taps.

The overload circuit breaker is not essential to the system, and in detail forms no part of the present invention. It is commonly employed in toy railroad systems because of the overload or short-circuiting effect caused when a train is derailed or a metallic object is laid across the track. It is even more desirable in the present system to afford protection of the contacts in the control tower, in order to prevent arcing or burning thereof. The circuit breaker is connected in series between the common supply source S and the track T, as is clearly shown in the drawings. In the particular circuit breaker here illustrated, a lamp is lighted within lamp housing 144 as an alarm to show when the circuit breaker has opened. The lamp is connected across the contacts of the circuit breaker, and is extinguished when the contacts are closed. When the circuit breaker has opened, the contacts may again be closed by pressing restoring button 146.

The actual connection to the track T may be made at any convenient point in the track, a suitable connector 150 being used such that one supply conductor is connected to the outer or grounded rails 54, and the other is connected to the center or third rail 56.

The operation of the system may be conveniently reviewed with reference to Fig. 6 of the drawings. The transformer S comprises a primary winding 152 connected through a suitable flexible cord 154 to a plug 156 which may be plugged into any convenient outlet in an ordinary household lighting system. It will be understood that there are sufficient primary turns relative to the secondary turns to produce the desired voltage step-down from, say, 110 to 12 volts. The secondary may be wound in two layers 158 and 160, the outer layer 160 being exposed to the action of a slidable contact moved by a control arm 12. In this way the voltage may be varied from, say, one-half to maximum value.

The output of the transformer secondary is connected in series through the overload circuit breaker O and the control tower C, and thence to the track T. In the specific arrangement here shown, one terminal of the transformer secondary is connected through lead 162 to the overload circuit breaker O, and thence by way of lead 164 to the third rail of the track. The other terminal of the transformer secondary, in this case the slidable contact, is connected through lead 166 to the control tower C and thence from the control tower through lead 168 to the track. In actual practice the conductors 166, 168 form a united pair (see Fig. 1) which is preferably made of ample length, say twelve feet, so that the con-

trol tower may be spaced remotely from the track, and, if desired, may be elevated to a table for more convenient use when speaking into the same. The wiring within the control tower will be self-evident from inspection of the diagram, the two pairs of contacts being connected directly in series with one another and the resistor 132 being connected around the manually separable pair of contacts. In the specific arrangement here disclosed both pairs of contacts are normally closed, but it will be understood that the manually operable switch may be made of the type which remains in either open or closed position, as desired.

A modified form of the invention is shown in Fig. 7. This arrangement is intended to more closely simulate radio control of the train by using a simulated antenna and microphone. A toy building 170 represents the building of a broadcasting or radio transmitting station. An antenna 172 is supported on towers 174. The supply source S, in this case a transformer like that previously described, is mounted in the building 170, it being readily placed in the building by sliding the roof 176 longitudinally as indicated by the broken line position 176'. The transformer is mounted within the building near one wall thereof, in this case wall 178, and the latter is provided with a slot 180 through which the operating handle 12 of the transformer projects. The transformer is held against movement, as by the use of lugs, not shown, turned up from the bottom of the building. The overload circuit breaker O is similar to that previously described and is connected in similar fashion. While here shown as an independent unit external of the building 170, it will be understood that if desired, the overload circuit breaker may be built into the building with the alarm lamp thereof exposed at one of the windows or at any suitable point in the building, and with the restoring button accessible from outside the building.

The control tower C previously described is replaced by a small simulated microphone M. The housing 182 of the microphone is mounted on a pedestal 184 and a base 186 each large enough so that the microphone may either be placed on a table or held in the hand. The front wall of the housing 182 is cut away or windowed at 188 for free admission of speech or air current. The construction of the contact mechanism within microphone M may be like that previously described in the control tower C. A few minor changes in construction are desirable. One is the use of a depressible push button 190 the inner end 192 of which bears against the manually controlled lever 120. This makes it conveniently possible to dispose the diaphragm mechanism about half way between the front and back of the microphone casing, where it is largest. Another change is to move the resistor 132 to a position extending diametrically across the microphone casing where maximum space to receive the same is available.

As before, a conveniently long flexible double lead 194 is provided for the microphone, and connections to the track T are made through a conventional connector 150. In operation, the child controls the train from the radio transmitting station and starts the train and varies its speed by manipulation of the transformer control lever 12. The microphone is simulatedly connected to and forms a part of the radio transmitting station, and the child delivers his commands or instructions into the microphone. Suitable words are employed to cause the train to go forward or to reverse, and also for the stopping and starting of the train, although this latter function is really controlled by the manually depressible push button 190.

With either form of the invention, great structural simplicity is attained, and the control accessory may be made and sold inexpensively, because the operation is limited to a simple circuit change, namely opening of the circuit by breath control. In other words, no attempt is made at actual understanding of or discrimination between words, and such an arrangement would be prohibitive in cost for toy purposes.

Instead, the vane or diaphragm really desponds to an air current caused by an exhalation of breath accompanying speech. Because of this, the operation may be made more certain and dependable by selecting words which involve consonants accompanied by a preferably forceful exhalation. The word "forward" with emphasis on the "F" or "ahead" with emphasis on the "H," are satisfactory. The words "back" and "reverse" are not effective unless the terminal "K" or "S" is exaggerated. The word "turn" is good because of exhalation accompanying the consonant "T," and the instructions in many cases may conveniently be masked, as by softly saying, "Reverse when you come to the next turn," but with emphasis on the "T" in "turn." Similarly, instead of merely saying "reverse" one may say "halt and reverse," reliance being had on the "H" in "halt." Should the train fail after a given command the child may quickly say, "Can't you hear me," in which case the "H" in "hear" may be relied upon. Various other combinations of instructions may be worked out and the child, after a little practice, can produce a realism in operation which is most baffling and mystifying to onlookers, for the toy seems to actually understand the spoken commands delivered to the microphone.

No difficulty is experienced with multiple syllable commands, because the microphone response is made somewhat insensitive, and also because of the inertia of the reversing relay. The microphone may, if desired, be made very sensitive to almost any spoken word, by using a very delicate slender spring strip for supporting the diaphragm, but it may then be too sensitive to accidental vibration, tilting of the microphone, or stray air currents. This is avoided by stiffening the spring for reduced sensitivity, and in such case the commands may be advantageously selected, as above suggested, in order to obtain dependable response.

The invention may also be used for the control of a reversing locomotive of the type in which the solenoid operates on a drum switch rather than a tumbler switch, the said drum being moved in one direction only. Thus, referring to Fig. 8, a switching drum 200 is provided with ratchet teeth 202, while solenoid core 204 operates through a suitable pawl 206 to advance the drum 200 one tooth for each operation of the solenoid. As is usual, the drum is engaged by a pair of stationary brushes or spring contacts, not shown, and the drum carries appropriately located contact segments for cooperation therewith. These details are conventional. In one well known form, this arrangement is used with only alternate steps on the drum operative, the locomotive motor being de-energized in the intermediate steps. Specifically, one tooth corre-

sponds to "forward," the next tooth corresponds to "stop," the next tooth corresponds to "reverse," and the fourth tooth, again to "stop." Manifestly, the necessary travel of the solenoid core may, if desired, be shortened by using eight instead of four teeth, the contact segments on the switching drum 200 then being doubled to obtain two diametrically opposite "forward" positions, two "reversing" positions, and four "stop" positions between the "forward" and "reverse" positions.

A wiring diagram explanatory of the modification of Fig. 8 is shown in Fig. 12. This wiring diagram applies to the locomotive carried mechanism, and corresponds to the right-hand part of the wiring diagram in Fig. 6, for the left-hand part may be like that shown in Fig. 6 except that the manually controlled switch 14 and the holding current resistor 132 may be omitted. Referring to Fig. 12, the contact strips carried by the drum 200 of Fig. 8 are shown rolled out or developed at 210 and 212. These are engaged by four stationary brushes spaced as shown in the drawings. It will be understood that rotary movement of the drum corresponds to vertical movement of the contact strips 210 and 212 relative to the brushes. The strips have been prolonged upwardly by dotted lines in order to facilitate understanding of the operation by visualizing movement of the brushes relative to the contact strips.

The relay coil for moving the drum is shown at 214, and this is connected continuously between the third rail contact shoe 216 and the car body or ground 218. In the position shown in Fig. 12, current flows from shoe 216 through brush 220, to drum strip 210, thence to brush 222, thence through motor field coil 224, thence to brush 226, drum strip 212, brush 228, and thence through motor armature 230 to ground 218. When the relay coil 214 is de-energized and again energized, the drum is moved until the brushes are positioned at points indicated at 232 and 234. At this time the motor is open-circuited and no longer operates. When the relay coil 214 is again de-energized and energized, the drum is again shifted, thus bringing the lower brush 228 to the position originally occupied by the upper brushes, and bringing the upper brushes to the point 236, or what amounts to the same thing, to the position now occupied by the bottom brush 228 (when using a cylindrical drum instead of a rectilinear development of the drum). At this time current from contact shoe 216 flows through brush 220, to drum strip 212, and thence to brush 226 through motor field 224. The direction of flow through the motor field is opposite that which previously took place. From the motor field the current flows to brush 222, thence to strip 210, and thence through brush 228 to motor armature 230. The flow through the armature is in the same direction as before, and the direction of rotation of the motor is therefore reversed. When the solenoid coil 214 is again de-energized and energized, the brushes are moved to the neutral or open-circuited position, half-way between the inwardly directed enlargements of the drum strips 210 and 212.

With this drum arrangement, a first interruption of the supply circuit to the track causes the train to stop, while a succeeding interruption causes the train to again run, but in opposite direction. To cause the train to instantly reverse, two circuit interruptions in rapid succession are needed. To cause the train to stop, yet be prepared to again run in the same direction, three circuit interruptions in rapid succession are needed, there being then an instantaneous but negligible tendency to reverse between the first and third "stop" positions. When the circuit is again interrupted, thus totalling four interruptions in all, the train will again run in the same direction in which it was originally running.

To apply the present invention to this system, it is merely necessary to connect a tower microphone or a hand microphone or similar voice or breath operated switch in series with the track supply circuit, the said accessory then functioning as a switch to momentarily interrupt the supply current whenever desired. It is neither necessary nor desirable to provide the holding current resistor and the manually operable switch in association with the voice controlled switch.

Our invention may be still further modified to provide full voice control, even when using a simple, two-position tumbler switch on the locomotive instead of a drum switch. Referring to Fig. 9, a modified form of tower microphone is shown, which is provided with a two-piece tumbler relay generally designated 240. The section of Fig. 9 is like that of Fig. 2, except that the housing has been removed. The bottom plate 76' corresponds to plate 76 in Fig. 2, and is similarly mounted directly on the upper end of tower 74. The diaphragm 106 is suspended as before, on the resilient strip 108 depending from an insulation plate 96 mounted across the top of frame 88.

The relay 240 is a tumbler relay which structurally closely resembles that described in Figs. 4 and 5 of the drawings, but differs primarily in using only a single brush 242 adapted to engage a single contact segment 244 when the tumbler is tilted counterclockwise as shown in Fig. 10. The contact segment 244 leaves brush 242 and the circuit is opened when the tumbler is tilted to the clockwise position. The relay coil 16', relay core 20' and depending tumbler actuating link 22' are all identical with those previously described. It will be understood that each time the relay coil 16' is de-energized and again energized, the tumbler changes its position, thus opening or closing the circuit controlled thereby.

The operation will be further understood from consideration of Fig. 11, which is a wiring diagram corresponding to the left-hand part of Fig. 6. As before, there is a transformer or source "S" the voltage of which may be varied by a slidable contact 12. The transformer "S" and the overload circuit breaker "O" need not be described in detail, for they correspond exactly to those shown in Fig. 6. The voice actuated diaphragm 106 functions to open the contacts 102, 104. These are connected in series with relay coil 16' by lead 246, the latter being connected to transformer "S" by leads 248 and 250. The series circuit is completed by means of a lead 252 extending from contact 102 to the outside or grounded track rails 54. The main current supply from the transformer to the track runs from slidable contact 12 through lead 250, lead 254, thence through tumbler switch 244, 242, to lead 256 connected to the center or third rail 56.

It will be manifest that upon a single actuation of diaphragm 106, the tumbler or power switch 242, 244 will be opened, thus stopping the train from further operation. Upon another actuation of diaphragm 106, the tumbler or power switch will be again moved to the closed position, thus again energizing the train. In the meantime,

however, the two-position tumbler or reversing switch on the locomotive (shown and described in Figs. 4 through 6 of the drawings) will have changed position, and the locomotive will therefore run in reverse direction. A third actuation of the diaphragm will again cause the train to stop, and a fourth actuation of the diaphragm will again cause the train to run, but in the original direction.

With either type of fully voice operated toy, a child playing with the toy may utter a single syllable word to cause the train to stop, or he may utter a word having two distinct syllables or a command involving somewhere in it, two syllables accompanied by distinct breath discharge, in order to change the operation from forward-running to backward-running, or vice versa. By uttering a command with three distinct syllables accompanied by breath discharge, the train may be stopped but prepared to again run in the original direction upon utterance of a single-word command. In any case in which the desired command does not include the desired number of syllables for multiple relay operation, it is merely necessary to blow or breath into the microphone, thus adding the equivalent of another syllable and producing another solenoid operation. Various combinations of commands may be thought up and used which will produce a varied and flexible operation of the toy train system.

The tumbler switch arrangement first described is preferably made sufficiently sluggish in operation to discourage more than a single response during the utterance of a single command or group of words. The drum switch arrangement and the tower relay arrangement last described are, however, preferably made comparatively sensitive and rapid in response so that they may be actuated a number of times during a single command, if that is desired.

It will be apparent that while we have shown and described our invention in preferred forms, many changes and modifications may be made in the structures disclosed without departing from the spirit of the invention defined in the following claims.

We claim:

1. An air current controlled toy, a motor for driving said toy, a motor reversing switch associated with said motor, a solenoid for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a power supply source cononected to the motor and solenoid, two switches connected in series between said source and the motor, and a resistor connected across the terminals of one of the switches, whereby the train may be reversed, or may be stopped and started without reversing, one of said switches being operable in response to air current.

2. An air current controlled toy vehicle, a motor for driving said vehicle, a vehicle-carried motor reversing switch associated with said motor, a vehicle-carried solenoid connected to said motor for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a power supply source connected to the motor and solenoid, an air current operated switch connected between said source and the motor and solenoid whereby the vehicle may be reversed by an air current directed at said switch, a manually operable switch connected between the source and motor, said switches being in series so that opening of either opens the circuit to the motor, and a resistor connected across the terminals of the manually operated switch, whereby the vehicle may be stopped or started at will without reversing the train.

3. A simulated speech controlled toy train system comprising a track, a train operable thereon, a motor for driving said train, a motor reversing switch associated with said motor, a solenoid for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a power supply source connected to the track, a normally closed voice operated switch connected between said source and the track whereby the train may be reversed by speech directed at said switch, a manually operable switch connected between the source and the track, said switches being in series so that opening of either opens the circuit to the motor, and a resistor connected across the terminals of the manually operated switch, whereby the train may be stopped or started at will without reversing the train, by opening the latter switch.

4. A control unit for a toy provided with remote control mechanism, said unit comprising a frame, a resilient strip mounted on and depending from the top of said frame, a vane or diaphragm mounted on said strip, a contact connected to said strip and mounted on said vane, a stationary contact normally bearing against said movable contact and mounted on the frame, a manually operable switch in series with the contacts, a resistor connected across the aforesaid manually operable switch, and terminals one of which is connected to the stationary terminal and the other of which is connected to the aforesaid switch, whereby a circuit connected to said terminals may be fully opened by breath directed at the vane, and opened except for the resistor upon operation of the manually operable switch.

5. A control unit for a toy provided with remote control mechanism, said unit comprising a frame, a stationary contact insulatedly mounted at one side of said frame, a resilient strip extending from said contact into the frame, a vane or diaphragm mounted on said strip, a movable contact connected to said strip and mounted on said vane, a center stationary contact normally bearing against said movable contact and mounted on the frame, a manually movable lever carrying a movable contact bearing against the aforesaid stationary contact at the side of the frame, said side contacts being separated by movement of said lever and said center contacts by movement of said vane, a resistor connected across the side contacts, and external terminals one of which is connected to the stationary center contact and the other of which is connected to the movable side contact, whereby the circuit connected to said terminals may be fully opened by speech directed at the vane, and opened except for the resistor upon operation of the manually movable lever.

6. A remote control tower for a toy, said tower comprising a base, a tower mounted above said base, a simulated control house at the top of the tower, one end of said house being open, a resilient strip mounted at the open end of the house, a vane or diaphragm mounted on said strip, a movable contact connected to said strip and mounted on said vane, a stationary contact normally bearing against said movable contact, a manually operable switch connected in series with

said contacts, a resistor connected across said manually operable switch, and terminals on the base of said tower connected to the aforesaid switches in series, whereby the circuit connected to said terminals may be fully opened by air current directed at the vane, and opened except for the resistor upon operation of the manually operable switch.

7. A remote control tower for a toy, said tower comprising a base, a tower mounted above said base, a simulated control house at the top of the tower, one end of said house being open, a grounded frame at the open end of the house, a stationary contact insulatedly mounted at the top of said frame, a resilient strip depending from the top of said frame, a vane or diaphragm mounted on said strip, a movable contact connected to said strip and mounted on said vane, a stationary contact normally bearing against said movable contact and mounted on and grounded to the frame, a manually movable lever carrying a movable contact near its upper end, the lower end of said lever projecting downwardly through the floor of the control house, said movable contact bearing against the aforesaid stationary contact at the top of the frame, said contacts being separated upon movement of the lower end of said lever, a resistor connected across the aforesaid manually separable contacts, and terminals on the base of said tower one of which is grounded thereon and the other of which is connected to the aforesaid manually movable contact, whereby the circuit connected to said terminals may be fully opened by speech directed at the vane, and opened except for the resistor upon operation of the manually depressible lever.

8. A simulated radio controlled toy train system comprising a track, a train operable thereon, a motor reversing switch associated with said motor, a solenoid for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a transformer, a simulated microphone housing a voice operated or breath operated switch, said microphone being connected by a flexible lead in series with the power supply leads from the transformer to the track, a manually operable switch mounted on said microphone and also connected in series with the power supply leads to the track, and a resistor in said microphone connected across the terminals of the manually operated switch, whereby the train may be reversed by speech directed at the microphone and may be stopped or started at will without reversing the train by use of the manual switch.

9. A simulated radio controlled toy train system comprising a track, a train operable thereon, a motor for driving said train, a motor reversing switch associated with said motor, a solenoid for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a simulated radio transmitting station including a building and antenna, a transformer, leads connecting said transformer to the track to supply current thereto, a simulated microphone housing a voice operated or breath operated switch, said last mentioned switch being connected by flexible conductors extending to the radio transmission building and connected in series with the power supply leads from the transformer to the track, a manually operable switch mounted on said microphone and also connected in series with the power supply leads to the track, and a resistor in said microphone connected across the terminals of the manually operated switch, whereby the train may be reversed by speech directed at the microphone, and may be stopped or started without reversing the train by use of the manual switch.

10. A simulated radio controlled toy train system comprising a track, a train operable thereon, a motor for driving said train, a motor reversing switch associated with said motor, a solenoid for shifting said switch, said solenoid being more sensitive than the motor and responsive to a relatively small holding potential inadequate to drive the motor, a simulated radio transmitting station including a building and antenna, a transformer in said building, a control lever on said transformer for varying the output potential, said control lever projecting through a wall of the building for manual manipulation, leads connecting said transformer to the track to supply current thereto, a simulated microphone housing a voice operated or breath operated switch, said microphone being connected by flexible leads extending to the radio transmission building where it is connected in series with the power supply leads to the track, a manually operable switch mounted on said microphone and also connected in series with the power supply leads to the track, and a resistor in said microphone connected across the terminals of the manually operated switch, whereby the train may be reversed by speech directed at the microphone and may be stopped or started at will without reversing the train by use of the manual switch.

11. A simulated hand microphone for simulated radio control of a toy, comprising a shell or housing open at the front and simulating a microphone, a grounded frame inside the housing at the open face thereof, a resilient strip insulatedly mounted on said frame, a vane or diaphragm mounted on said strip, a movable contact connected to said strip and mounted on said vane, a stationary contact normally bearing against said movable contact and mounted on and grounded to the frame, a manually operable switch mounted in said housing and connected in series with said contacts, means projecting through the microphone casing for moving said switch, a resistor connected across the aforesaid manually operable switch, and leads extending from said microphone one of which is grounded to the microphone and the other of which is connected to the aforesaid switches, whereby the circuit connected to said leads may be fully opened by breath directed at the vane, and opened except for the resistor upon operation of the manually depressible lever.

12. A simulated hand microphone for simulated radio control of a toy, comprising a shell or housing open at the front and simulating a microphone, a frame inside the housing at the open face thereof, a stationary contact mounted at the top of said frame, a resilient strip depending from said contact, a vane or diaphragm mounted on said strip, a contact connected to said strip and mounted on said vane, a stationary contact normally bearing against said movable contact and mounted on the frame, a manually movable lever carrying a movable contact near its upper end, said movable contact bearing against the aforesaid stationary contact at the top of the frame, said contacts being separated upon movement of the lower end of said lever, means projecting through the microphone casing for moving said lever, a resistor connected

across the aforesaid manually separable contacts, and flexible leads extending from said microphone one of which is grounded to the microphone and the other of which is connected to the aforesaid manually movable contact, whereby the circuit connected to said leads may be fully opened by speech directed at the vane, and opened except for the resistor upon operation of the manually depressible lever.

13. In an electrically operated toy railroad system, a track, a train operable thereon, remotely controlled means on said train including a switch controlled by a magnet responsive to interruptions in the power supply to the train, a source of power supply, and a simulated railroad control tower connected between said source and the track, said control tower comprising a base, a tower mounted thereabove, a simulated control house at the top of the tower, one end of said house being open, a resilient strip mounted at the open end of the house, a freely movable vane or diaphragm mounted on and movably supported by said strip on the open end of the house, a movable contact connected to said strip and mounted on said vane, a stationary contact arranged for cooperation with said movable contact, and circuit means so connecting the contacts and the power supply circuit that the remotely controlled means on the train may be made to function in response to speech or breath directed at the diaphragm in the control house.

14. In an electrically operated toy railway system, a track, a train operable thereon, an electric motor mounted on said train for driving the same, a reversing switch for said motor mounted on the train, a solenoid mounted on the train for shifting said switch, said train-carried switch being of the two-position or tumbler type with forward and reverse connections to the motor, a source of power supply, a stationary voice or breath operated blow switch, said blow switch including contacts and a diaphragm mechanically connected to one of said contacts to move the same, a stationary solenoid-operated switch of the two-position or tumbler type associated with the stationary blow switch and connected in series between the source and the track, one position of the tumbler serving to connect and the other to disconnect the source from the track, said blow switch being connected to the solenoid of the stationary tumbler switch, whereby the track is energized or deenergized, one such change taking place for each operation of the blow switch, whereby the train is successively started, stopped, reversed, stopped, started, etc., and a desired train operation may be obtained by operating the blow switch an appropriate number of times.

NOEL L. CASE.
BERNARD S. FRANKLIN.