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(54) POWER SUPPLY UNIT AND RAIL SWITCHING MECHANISM FOR MODEL TRACK LAYOUTS

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(22) Filed: **Jul. 11, 2001**

Related U.S. Application Data

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(51) **Int. Cl.**^{7} **B61L 5/06**

(52) **U.S. Cl.** .... **246/415 R**; 246/221

(58) **Field of Search** .... 246/415 A, 221, 246/225, 231; 33/288, 287

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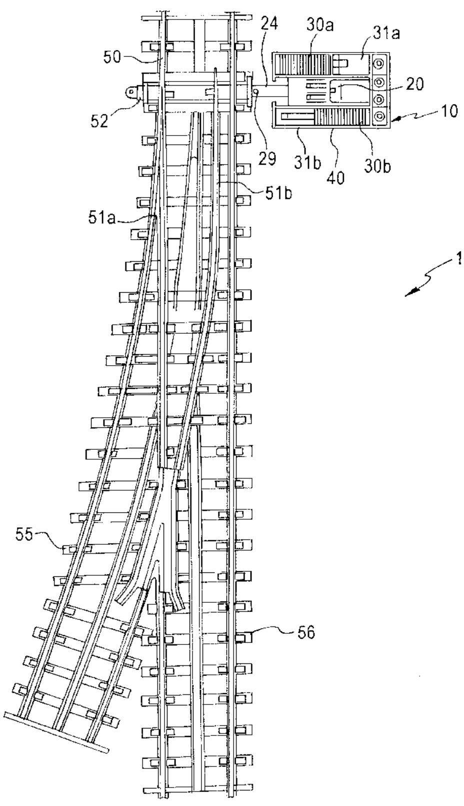
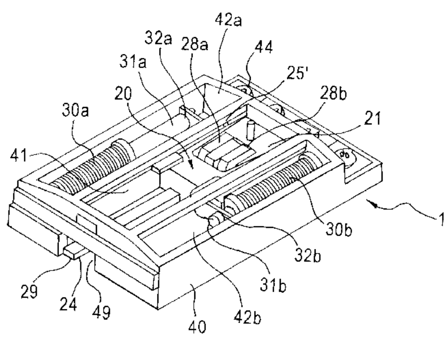
(57) **ABSTRACT**

A distinct power terminal that is independently releasably fitted within a support member of the model track layout. The power terminal is coupled to an external power source through lead wires. The power terminal includes "cave-in" parts at opposing ends of the power terminal which are snap-fit into corresponding openings of the support member. The support member includes side openings to allow the lead wires to extend from the power terminal outwards to the external power source. The power terminal further includes connecting terminals that couple the electric power from the power terminal to the track rails. In addition, a rail converting switch includes two solenoid drivers with corresponding stroke axles positioned on opposing sides of a housing. The stroke axles are connected to a sliding part positioned between the stroke axles, which sliding part includes a supporting axle and connection portion for coupling to, and actuating, a rail coupler. The sliding part further includes a body part which provides therein two springs for buffering movement between the body part and the supporting axle.

27 Claims, 7 Drawing Sheets





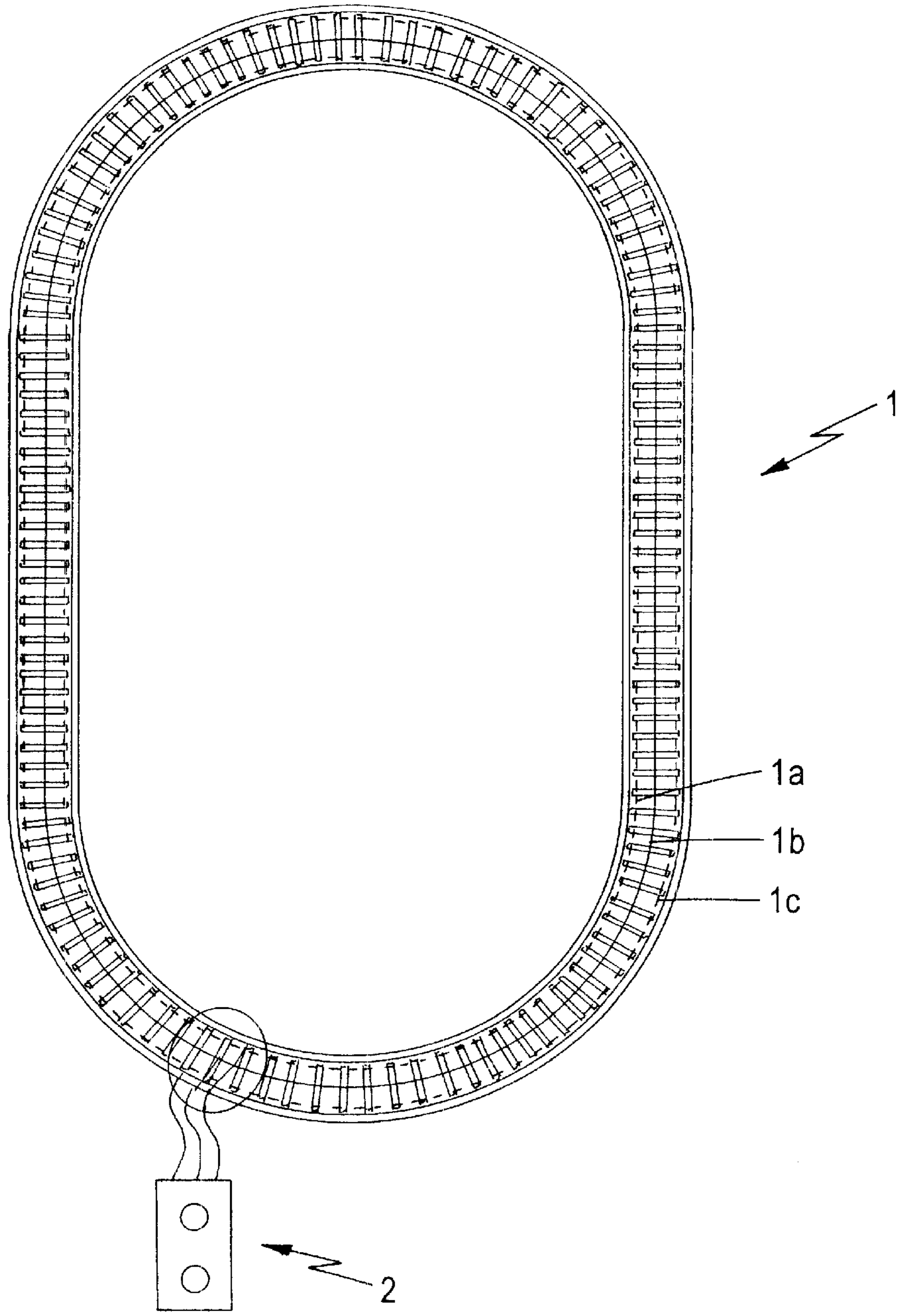


FIG. 1 (PRIOR ART)

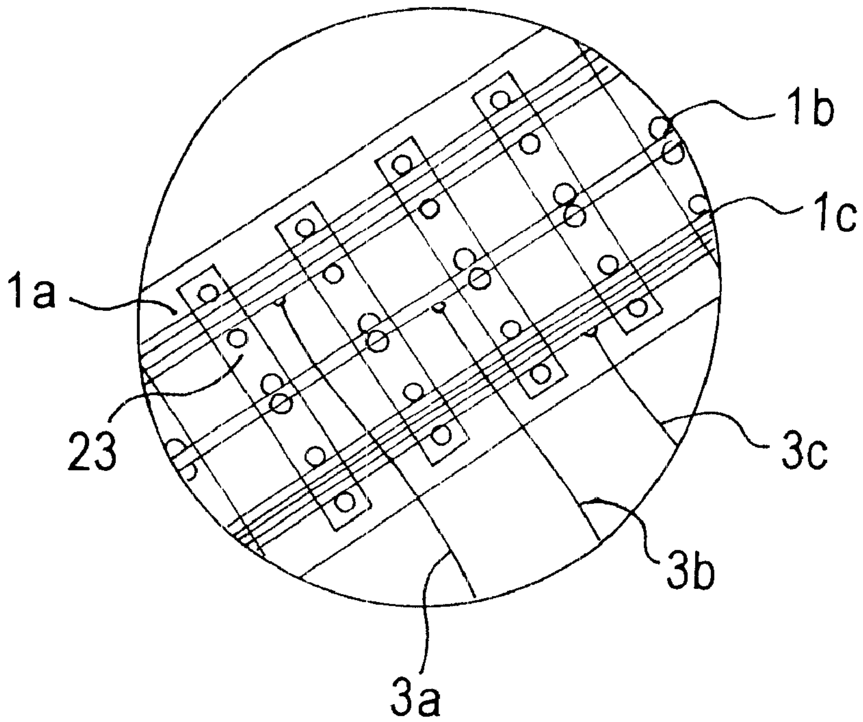


FIG. 2 (PRIOR ART)

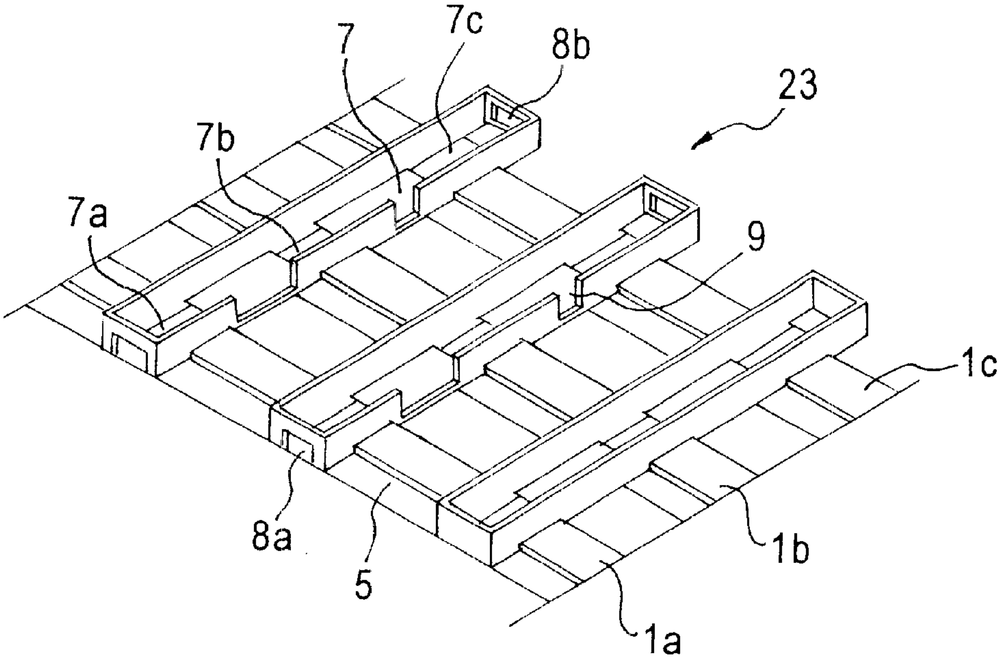

7c
7
8b
23
7b
7a
9
1c
8a
5
1b
1a

FIG. 3

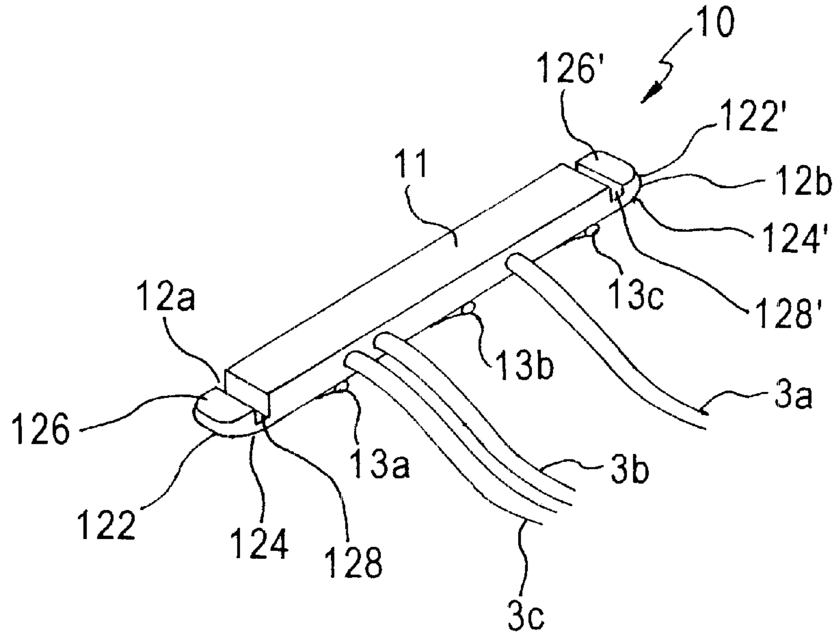

10
126'
122'
11
12b
124'
13c
12a
128'
13b
3a
126
13a
3b
122
124
128
3c

FIG. 4

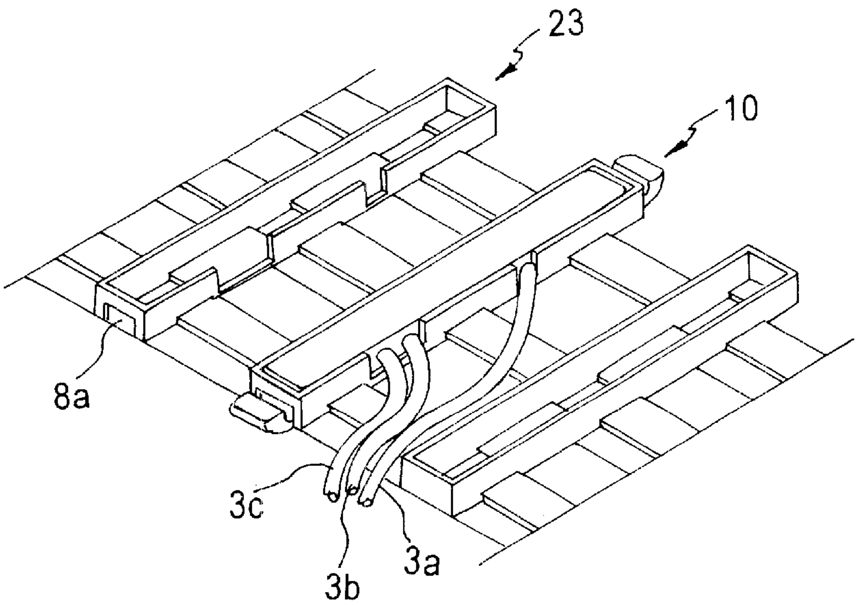


FIG. 5

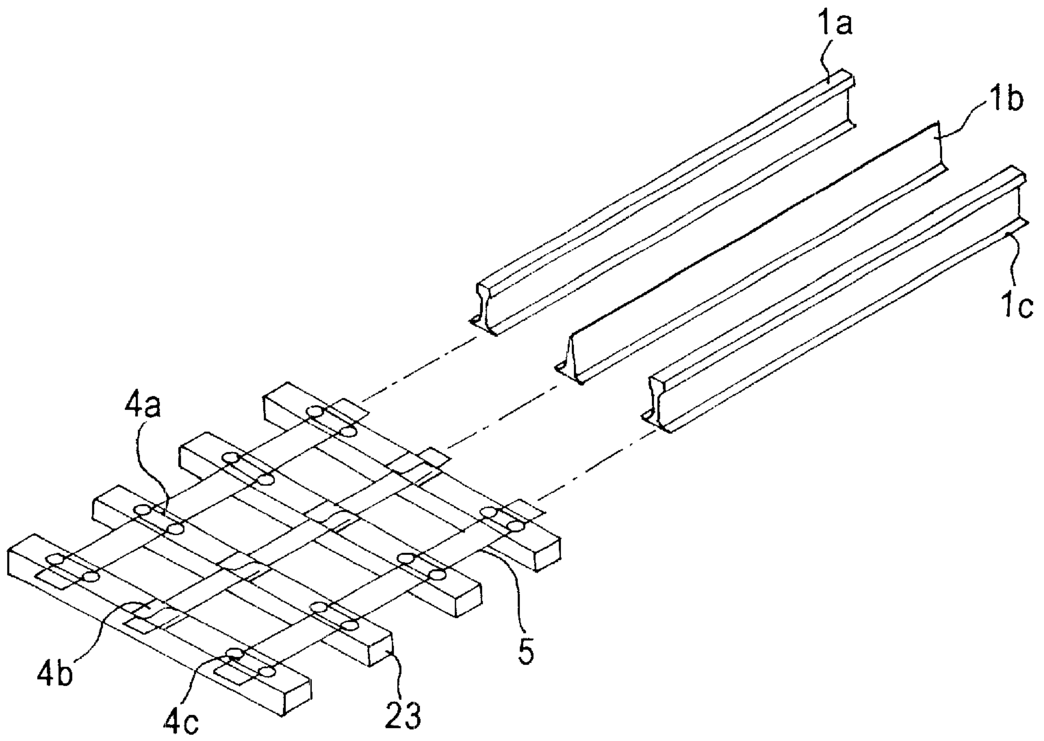


FIG. 6

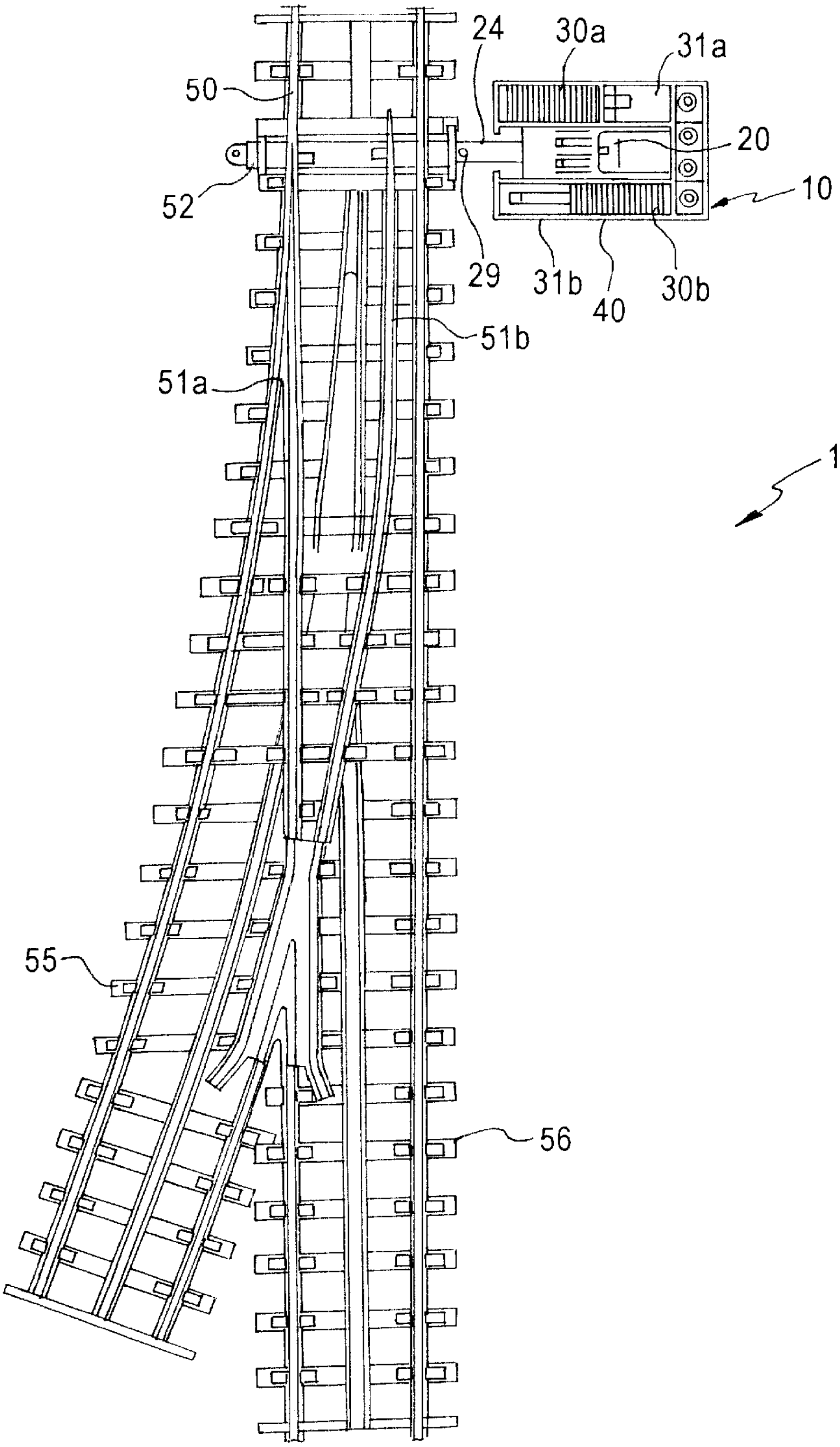


FIG. 7

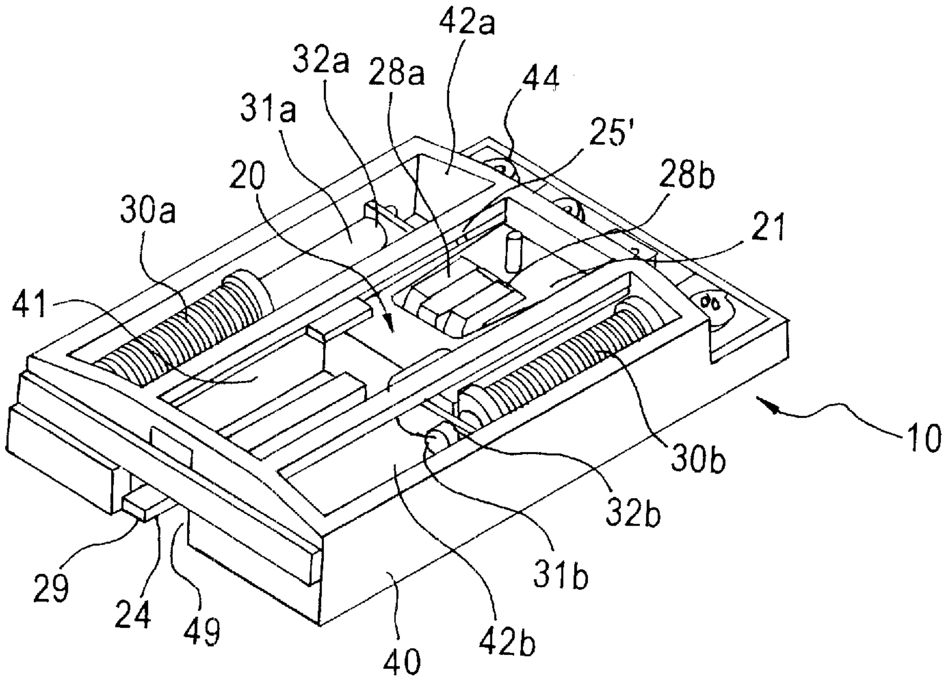

42a
32a
28a
44
31a
25'
20
28b
30a
21
41
10
30b
32b
29
31b
24
49
42b
40

FIG. 8

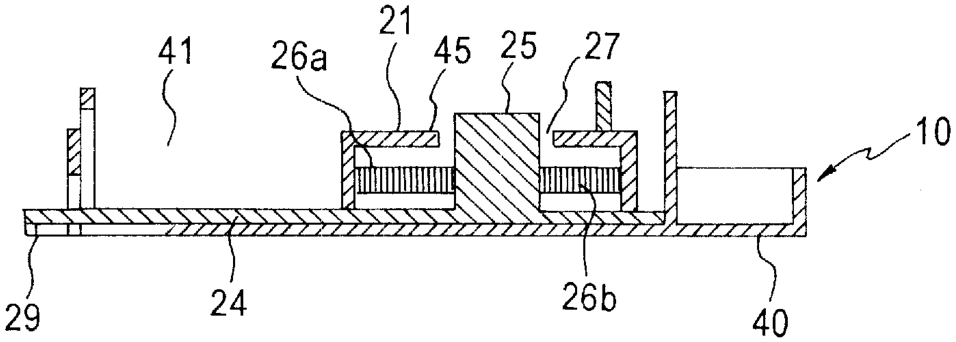

21
41
26a
45
25
27
10
29
24
26b
40

FIG. 9

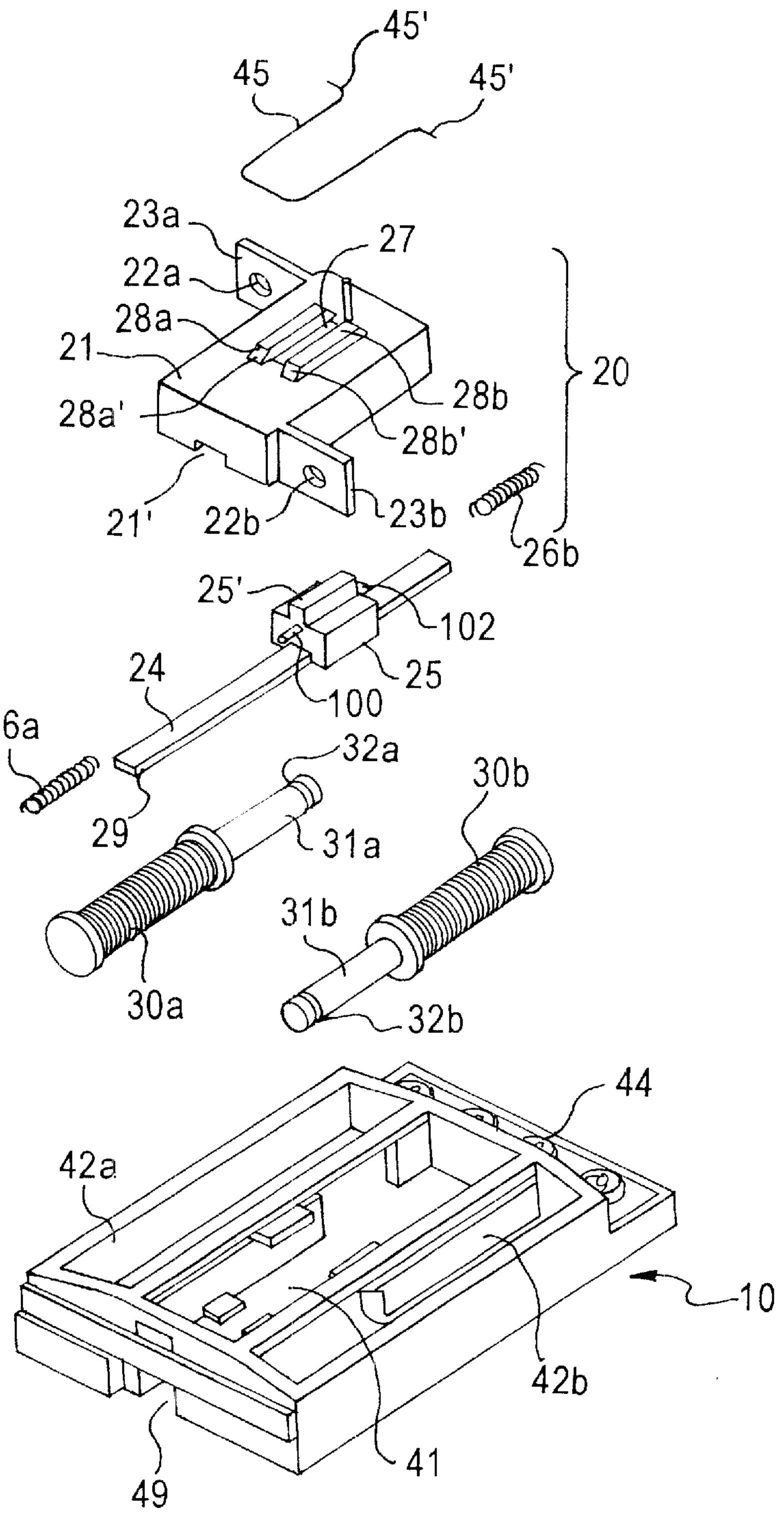

45'
45
45'
23a
27
22a
28a
21
20
28b
28a'
28b'
21'
22b
23b
26b
25'
102
25
24
100
26a
32a
30b
29
31a
31b
30a
32b
44
42a
10
42b
41
49

FIG. 10

POWER SUPPLY UNIT AND RAIL SWITCHING MECHANISM FOR MODEL TRACK LAYOUTS

RELATED APPLICATIONS

This application claims priority from U.S. Provisional Application No. 60/217,481, filed Jul. 11, 2000, incorporated herein by reference.

FIELD OF THE INVENTION

The present invention is directed to a power supply unit for supplying power to a model track layout and a rail switching mechanism for effecting switching between rails of the model track layout.

BACKGROUND OF THE INVENTION

FIG. **1** illustrates a conventional model track layout **1** (e.g., train track). The trains (not shown) are powered to run on the track **1** using one of the following two methods: (1) providing the individual trains with a power source (e.g., battery) therein to drive the train's motor for rotating the wheels or (2) providing an external power supply **2** which supplies power to each of the track rails (**1***a*, **1***b*, **1***c*), which power is then picked up by the wheels/rollers of the train and supplied to the motor for rotating the wheels.

In the second method (i.e., providing power to the track rails **1***a*, **1***b*, **1***c*), the conventional set-up has several disadvantages. FIG. **2** shows a close-up view of a track illustrating the electrical connections made between the power source **2** and the track rails **1***a*, **1***b*, **1***c*. Each of the rails **1***a*, **1***b*, **1***c* is coupled to equally spaced support members **23**, which support members **23** run perpendicular to each of rails **1***a*, **1***b*, **1***c*. Extending from the power source **2** (not shown in FIG. **2**) are three connecting wires **3***a*, **3***b*, **3***c* which couple the track rails **1***a*, **1***b*, **1***c* to the power source **2**.

The connecting wires **3***a*, **3***b*, **3***c* are soldered to, and thereby fixed to, each of track rails **1***a*, **1***b*, **1***c*, respectively. This conventional set-up for coupling the power from power source **2** to the track rails **1***a*, **1***b*, **1***c* is not satisfactory. Accordingly, there exists a need in the art for an improved connection between a power source and track rails.

In particular, the conventional set-up requires a user to break off and re-solder the connecting wires **3***a*, **3***b*, **3***c* to the track rails **1***a*, **1***b*, **1***c* every time he/she wants to assemble or disassemble the track layout **1**. This causes wear and tear on the connecting wires **3***a*, **3***b*, **3***c*. Further, the soldering step requires the additional tools of solder material and a heating gun. Not only does this add cost and impracticality, but it increases the chance of injury to a child who may burn him/herself with the heating gun.

Even further, because the connecting wires **3***a*, **3***b*, **3***c* must be connected to each track rail **1***a*, **1***b*, **1***c*, respectively, the connecting wires **3***a*, **3***b*, **3***c* must be spread out over a wider distance in order to provide adequate spacing between respective wires to reduce the chances of entanglement. Even with wider spacing, which leads to an unseemly and unattractive appearance, tangling of the wires is inevitable because of the fact that each wire is connected to a separate and distinct track rail thereby promoting independent movement between the wires. Such spacing adds further risk to children who may trip and fall over the space-dominating wires. Moreover, the unkept wiring can interfere with vehicle operation when it unintentionally runs over the track rails and thereby tangles with the vehicle's wheels.

Furthermore, the connecting wires **3***a*, **3***b*, **3***c* are vulnerable to becoming unintentionally disconnected from minimal tension that may be asserted, for example, if the wires are pulled or stretched to adjust their positioning, or, if someone accidentally catches the wires with their feet when walking by.

Accordingly, there is a need in the art for a simple, convenient mechanism for supplying power to a track layout that is practical, safe for children, easy to connect/disconnect while maintaining stability, and exudes a neat, professional appearance.

Another aspect of prior art model track layouts that has incurred problems is the rail switching mechanism utilized to effect track switching at intersections. A model track layout using a rail switching mechanism will typically include a main rail that is provided with two direction converting rails. The two direction converting rails are selectively switched onto/off the main rail. A rail coupler connects the pair of direction converting track rails and is held on the main rail. The rail coupler is actuated by a rail converting switch so that it moves between two distinct positions such that the path the model train will take from the main rail is switched between two alternative track rails extending from the main rail.

However, in prior art constructions, the rail converting switch takes up too much space due to inadequate design of the mechanical interrelationship between the moving parts of the switch and the power source that drives the moving parts. Further, prior art constructions are rigidly constructed so that impact on the various parts of the switch resulting from continuous engagement between the switch and the coupler may cause wear and tear, thereby reducing the life of the parts. Forceful impacts could cause the coupler and the switch to unintentionally uncouple, therefore reducing the reliability of the switch. Even further, prior art designs lack an energy absorption means to absorb the energy resulting from impact forces between the direction converting rails and the main rail. Such energy can lead to excessive play between the main rail and the direction converting rails so that they are not fully aligned, which play will inhibit trains from smoothly riding through an intersection.

Accordingly, there is a need in the art for a compact, space-saving rail switching mechanism that absorbs impact on its respective parts during operation so that a reliable switching operation takes place.

SUMMARY OF THE INVENTION

One object of the present invention is to provide an improved power supply mechanism for supplying voltage to a model track layout that is easily replaceable and exudes a neat appearance.

A further object of the present invention is to provide a compact, space-saving rail converting switch that is fully operational.

A still further object of the present invention is to provide an improved rail converting switch that absorbs impact force on the various components of the rail converting switch during switching operations.

In one exemplary embodiment of the novel power supply unit, the present invention provides a distinct power terminal that is independently releasably fitted within a support member of the model track layout. The power terminal is coupled to an external power source through lead wires. The power terminal includes "cave-in" parts at opposing ends of the power terminal which are snap-fit into corresponding openings of the support member. The support member includes side openings to allow the lead wires to extend from the power terminal outwards to the external power source.

The power terminal further includes connecting terminals that couple the electric power from the external power source to the track rails. In such a construction, the power terminal is easily replaceable without dependence on external tools or adhesives.

In one exemplary embodiment of the novel rail converting switch, the present invention provides two solenoid drivers with corresponding stroke axles positioned on opposing sides of a housing. The stroke axles are connected to a sliding part positioned between the stroke axles, which sliding part includes a supporting axle and connection portion for coupling to, and actuating, a rail coupler. The sliding part further includes a body part which provides therein two springs for buffering movement between the body part and the supporting axle. In such a construction, the rail converting switch provides the required functionality with minimal space while eliminating impact forces, thereby increasing reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a conventional power supply for a model track layout;

FIG. **2** shows a close-up of a cut-out portion of FIG. **1**;

FIG. **3** shows one exemplary embodiment of the novel support member of the present invention;

FIG. **4** shows one exemplary embodiment of the novel power terminal of the present invention;

FIG. **5** shows the combination of the novel power terminal coupled to the novel support member of the present invention;

FIG. **6** shows the relative positioning of the track rails with respect to the support members;

FIG. **7** shows one exemplary embodiment of the novel rail switching mechanism of present invention coupled to a track layout;

FIG. **8** shows an oblique perspective view of the novel rail switching mechanism and it's internal components;

FIG. **9** shows a cross-sectional view of the novel rail switching mechanism of the present invention; and

FIG. **10** shows the individual components of the novel rail switching mechanism in a spaced orientation.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

FIG. **3** illustrates the interconnection between the track rails **1***a*, **1***b*, **1***c* and the support members **23** in one exemplary embodiment of the present invention. The support members **23** have thereon electrically conducting connecting plates **5** (see also FIG. **6**) which run perpendicular to the support members **23** in the direction of the track rails **1***a*, **1***b*, **1***c*. The connecting plates **5** co-act with the track rails **1***a*, **1***b*, **1***c* in a known manner (e.g., sliding fit) such that the track rails **1***a*, **1***b*, **1***c* are capable of being integrally coupled with the connecting plates **5** and thereby fixed to the support members **23**. Although three track rails **1***a*, **1***b*, **1***c* are shown, it should be appreciated that any number of track rails can be utilized corresponding to the particular model vehicle to be driven thereon. In addition, one of the track rails can function as an isolated power pick-up line which co-acts with a roller located underneath a model vehicle.

The features of the novel support member **23** of the present invention will now be discussed. In the illustrated embodiment, the support member **23** defines a generally rectangular box with two side surfaces and two end surfaces, and an open top (top as viewed from FIG. **3**). The bottom surface **7** of the support member **23** includes three openings **7***a*, **7***b*, **7***c*. It should be appreciated that any shape and configuration for the support members **23** can be used to effect the benefits of the present invention (e.g., circular, square, ellipse, triangular, etc.). Each of the end surfaces of the support member **23** defines a hole **8***a*, **8***b* thereon, respectively. In addition, at least one of the two side surfaces include cut-out portion(s) **9**. The functionality of the openings **7***a*, **7***b*, **7***c*, holes **8***a*, **8***b*, and cut-out portion(s) **9** will be discussed further below.

Turning to FIG. **4**, one exemplary embodiment of an electric power terminal **10** of the present invention will now be discussed. The electric power terminal **10** includes a non-conductor body **11**, "cave-in" ends **12***a*, **12***b*, connecting terminals **13***a*, **13***b*, **13***c* and lead wires **3***a*, **3***b*, **3***c*. The electric power terminal **10** is coupled to a power source (not shown) via lead wires **3***a*, **3***b*, **3***c*. The connecting terminals **13***a*, **13***b*, **13***c* correspond to the track rails **1***a*, **1***b*, **1***c*, respectively. The connecting terminals **13***a*, **13***b*, **13***c* function to couple the power supplied from the power source (not shown) into the body **11** (with appropriate electrical circuitry therein), and then to the respective track rails **1***a*, **1***b*, **1***c*.

As shown in FIG. **5**, an electric power terminal **10** is shaped to fit within one of the support members **23**. If more power sources (not shown) are desired to be coupled to the track layout, additional electric power terminals **10** can be positioned within respective support members **23**. Returning to FIG. **4**, the "cave-in" ends **12***a*, **12***b* each extend from a respective end surface of the body **11** and include a curved surface **122**, **122'** that extends from a bottom surface **124**, **124'**. The curved surface **122**, **122'** extends to a top surface **126**, **126'** of the "cave-in" ends **12***a*, **12***b*. The top surface **126**, **126'** is spaced from the end surface so as to define a step or groove **128**, **128'** between the top surface **126**, **126'** and the end surface.

Turning to FIG. **5**, the novel connection between the electric power terminal **10** and the support member **23** will now be discussed. In particular, one "cave-in" end **12***a*, **12***b* is placed through a respective hole **8***a*, **8***b* of the support member **23** such that the inner edge of hole **8***a*, **8***b* of the support member **23** is fitted within the step or groove **128**, **128'**. Thereafter, the other "cave-in" end **12***a*, **12***b* can be snap-fit into the other hole **8***a*, **8***b* by pushing the curved surface **122**, **122'**, which functions as a guide surface, against the top edge of the end surface (above the respective hole **8***a*, **8***b*) of the support member **23**, thereby guiding the "cave-in" end **12***a*, **12***b* into the hole **8***a*, **8***b*. Accordingly, the electric power terminal **10** is securely fixed to the support member **23**.

When the electric power terminal **10** is fitted within the support member **23**, the connecting terminals **13***a*, **13***b*, **13***c* (see FIG. **4**) extend through openings **7***a*, **7***b*, **7***c*, respectively, and are coupled to connecting plates **5** in order to electrically couple the connecting terminals **13***a*, **13***b*, **13***c* to the rails **1***a*, **1***b*, **1***c*. The openings **7***a*, **7***b*, **7***c* each define a groove sized to fit a connecting plate **5** therein, which plate **5** is held in place by any suitable clamp means **4***a*, **4***b*, **4***c* (see FIG. **6**). Thus, the track rails **1***a*, **1***b*, **1***c*, which are positioned on a connecting plate **5**, are electrically coupled to the power source. The lead wires **3***a*, **3***b*, **3***c* extending from the electrical terminal **10** are directed through cut-out portion(s) **9** to the power source (not shown).

In order to remove the electric power terminal **10** from the support member **23**, one need only push one of the "cave-in" ends **12***a*, **12***b* back through its respective hole **8***a*, **8***b*, at which point the internal pressure will force that end of the electrical power terminal **10** upward guided by the corresponding curved surface **122**, **122'**. The electrical power terminal **10** can thereafter be easily pulled out from the support member **23**.

Accordingly, the present invention provides a power supply mechanism for a model train layout that can be easily connected/reconnected to the model train layout independently of any messy wiring connections and dangerous soldering required in the prior art. That is, the power supply can be coupled or de-coupled from the track without the need to use adhesives (e.g., solder) and/or tools (e.g., soldering equipment) while providing a better aesthetic appearance.

Turning to FIG. **7**, a novel rail converting switch **10** of the present invention will now be discussed. As shown in FIG. **7**, a main rail **50** diverges into two distinct paths defined by rails **55** and **56**. The path that a train will take depends on the location of direction converting rails **51***a*, **51***b*. The converting rails **51***a*, **51***b* are coupled to a common rail coupler **52** extending across the track rails. The rail coupler **52** is attached to the rail converting switch **10** through a peg/hole arrangement. In the exemplary embodiment, the rail converting switch **10** moves the rail coupler **52** in a direction generally perpendicular to the track rails in order to effect the switching operation.

In the position shown in FIG. **7**, a train coming from the main rail **50** will be directed to the rail **56**. That is, the direction converting rail **51***a* is located on the rail **50** while the direction converting rail **51***b* is spaced away from rail **50**. Accordingly, the wheels located on the left side of the rail **50** as viewed in FIG. **7** will be directed into direction converting rail **51** a from rail **50** when entering the intersection, and the wheels on the right side of rail **50** will remain in rail **50**. As a result, the train will move onto rail **56**. If the direction converting rail **51***b* is moved onto the rail **50** (which would simultaneously move direction converting rail **51***a* off of rail **50**), the train would move onto rail **55** by virtue of the wheels located on the right side of rail **50** being directed into the direction converting rail **51***b* from rail **50** when entering the intersection, and the wheels on the left side of rail **50** remaining in rail **50** (direction converting rail **51***a* will be spaced away from rail **50** in similar fashion as direction converting rail **51***b* shown in FIG. **7**).

The rail converting switch **10** is coupled to the direction converting rails **51***a* and **51***b*, through rail coupler **52**, in order to effect the switching between the aforementioned positions. As shown generally in FIG. **7**, the rail converting switch **10** includes solenoids **30***a*, **30***b*, stroke axles **31***a*, **31***b*, a sliding part **20**, and a base **40**. The sliding part **20** includes a supporting axle **24** having a connecting portion **29**. The connecting portion **29** is illustrated as a peg that fits into a corresponding hole on the rail coupler **52**. Of course, any suitable connection between the supporting axle **24** and the rail coupler **52** can be used.

Turning to FIGS. **8–10**, the structural and functional interactions between the various elements of the rail converting switch **10** will be discussed. As shown in FIG. **8**, the base **40** includes a corridor **41** for housing and guiding movement of the sliding part **20**. Base **40** further includes corridors **42***a*, **42***b* for housing solenoids **30***a*, **30***b*, respectively, as well as for housing and guiding movement of corresponding stroke axles **31***a*, **31***b*. The front end face of base **40** includes an opening **49** for allowing supporting axle **24** movement therethrough. At the back end of base **40** is an electrical terminal **44** adapted to be connected to any suitable power source (e.g., battery, transformer, etc.). The terminal **44** is electrically coupled to the solenoids **30***a*, **30***b* to provide electric power thereto.

The solenoids **30***a*, **30***b* each have hollow interiors configured to slidably receive a respective stroke axle **31***a*, **31***b* in a manner that allows the stroke axle **31***a*, **31***b* to slide into and out of the hollow interior. The stroke axles **31***a*, **31***b* each have a groove **32***a*, **32***b* formed at one end of the stroke axle for coupling the stroke axle to a body part **21** (see FIG. **10**). Body part **21** includes two projecting parts **23***a*, **23***b* extending from opposing ends of the body part **21**, one projecting part **23***b* extending from the front end of body part **21** and the other projecting part **23***a* extending from the back end of body part **21**. Each projecting part **23***a*, **23***b* includes a hole **22***a*, **22***b* extending therethrough. The solenoids **30***a*, **30***b* are coupled to the body part **21** by fitting stroke axles **31***a*, **31***b* through openings **22***a*, **22***b* until the circumferential edge of openings **22***a*, **22***b* are snap fit into the respective grooves **32***a*, **32***b* of the stroke axles **31***a*, **31***b*. Coupling the solenoids **30***a*, **30***b* to opposing ends of the body part **21** will more efficiently distribute the power from the solenoids **30***a*, **30***b* to the body part **21** to thereby provide a more forceful movement of the supporting axle **24**. The movement of supporting axle **24** will therefore more closely correspond to the movement of the rail coupler **52** so that a more reliable switching operation can take place. In combination with the buffering action discussed below, the additional force of a second solenoid being placed on an opposing side of the body part will dramatically reduce the play between the main rail and the direction converting rails.

Looking at FIGS. **9** and **10**, formed integrally with the supporting axle **24** is a middle portion **25** with a middle-projecting part **25'**. Two pegs **100**, **102** extend from side faces of middle portion **25** for guiding springs **26***a*, **26***b* to be connected to the end surfaces of middle portion **25**. Body part **21** includes a hollow interior for housing the middle portion **25** and part of the supporting axle **24** therein. Body part **21** further includes an opening **21'** on an end face for allowing supporting axle **24** to extend out from the hollow interior.

As shown in FIG. **9**, when the supporting axle **24** and middle portion **25** are assembled into the hollow interior of the base part **21**, the middle-projecting part **25'** extends through an opening **27** on the top surface of body part **21**. Middle-projecting part **25'** is arranged to be movable within the gap defined by an opening **27** in order to provide a buffer when the rail converting switch **10** is in operation. On opposing sides of the opening **27** there are formed lock-removing projections **28***a*, **28***b*, whose functionality will be discussed below. The lock-removing projections **28***a*, **28***b* include tapered surfaces **28***a*', **28***b*'. As shown in FIG. **10**, a stopper spring **45** forms generally a U-shape with outward flange portions **45'**. The outward flange portions **45'** are fixedly coupled to the base **40** (e.g., by soldering, or being fitted into holes on a surface of the base, etc.). The stopper spring **45** extends around tapered surfaces **28***a*', **28***b*' and middle-projecting part **25'** so as to lock sliding part **20** in a retracted position (see FIG. **8**).

FIG. **9** illustrates a cross-sectional view of the body part **21** and the interconnection of the middle portion **25** within the hollow interior of the body part **21**. As previously mentioned, one end of springs **26***a*, **26***b* is connected to a surface of the middle portion **25**. Similarly, the opposing end of springs **26***a*, **26***b* is fixedly connected to an inner surface of body part **21** (can be independently connected, or soldered to add strength in the connection; any suitable connection can be used, e.g., placing spring wire into corresponding hole in body part **21**/middle portion **25** surfaces). As is apparent from viewing FIG. **9**, middle portion **25** is provided with a buffering clearance within opening **27** so that there is buffered relative-movement between the middle portion **25** and the body part **21**.

The connecting projection **29** is adapted to fit within a connecting hole of the coupler **52** (see FIG. **7**) so that movement of the supporting axle **24** is transmitted to corresponding movement of the coupler **52** to effect the switching operation. In operation, the solenoids **30***a*, **30***b* will be energized via terminal **44** with voltage so that, from the positions shown in FIG. **8**, stroke axle **31** a is moved into the hollow interior of should be appreciated that one solenoid can also be used to drive the body part **21**, but providing two in the unique configuration laid out by the present inventors (e.g., coupling the solenoids **30***a*, **30***b* to opposing ends of body part **21**, with the solenoids **30***a*, **30***b* facing opposite directions) provides a more reliable rail converting switch while minimizing space requirements. The solenoids **30***a*, **30***b* can also be arranged in the same direction; however as previously discussed, arranging them in opposite directions to be coupled to opposing ends of body part **21** provides a more efficient and forceful drive of the body part **21** and supporting axle **24**. As a result, the direction converting rails **51***a*, **51***b* connected to the rail coupler **52** will be tightly held against the main rail **50** with minimal play therebetween, thereby providing a more reliable intersection for the trains (or other locomotives) to move across without being thrown off the track because of misalignment of the direction converting rails **51***a*, **51***b* and the rails **50** or **55**, **56**.

Through the interconnection of stroke axles **31***a*, **31***b* and body part **21**, movement of the stroke axles **31***a*, **31***b* forces body part **21** to slide within corridor **41** in a direction away from terminal **44**. During this movement, stopper spring **45** is forced to pivot upwardly about its outward flange portions **45**' via the tapered surfaces **28***a*', **28***b*' of lock-removing projections **28***a*, **28***b*. Specifically, tapered surfaces **28***a*', **28***b*' act as inclined cam surfaces which move with body part **21** into the stopper ring **45** so as to force stopper ring out of a locking position, thereby allowing the body part **21** to continue movement toward opening **49** as viewed in FIG. **8**. Thus, the lock mechanism of the present invention (i.e., stopper spring **45**) for preventing unintended movement of the body part **21** by locking it in place can be automatically removed through natural operation of the rail converting switch **10**. No manual manipulation is needed. Further, stopper spring **45** can slide back into its locking position when the body part **21** is returned to the position shown in FIG. **8**, whereby the stopper spring **45** will be guided into its locking position by lock-removing projections **28***a*, **28***b*. The lock-removing projections **28***a*, **28***b* should extend beyond opening **27** and higher than middle-projection part **25**' so as to prevent contact between the stopper ring **45** and the middle-projecting part **25**'.

Movement of body part **21** during operation is transmitted to corresponding movement of the stroke axle **24** through the interconnection of springs **26***a*, **26***b* between body part **21** and middle portion **25** so that supporting axle **24** is moved in the same direction as body part **21**. In this manner, supporting axle **24** and connecting portion **29** move in and out of opening **49**. When desired to connect converting rail **51***a* to rail **50**, solenoids **30***a*, **30***b* are energized to move body part **21** through stroke axles **31***a*, **31***b* such that the connection portion **29** forces rail coupler **52** towards the left as viewed in FIG. **7** to thereby firmly connect converting rail **51** a to main rail **50**. When desired to connect converting rail **51***b* to main rail **50**, the energy to solenoids **30***a*, **30***b* is shut-off via terminal **44** so that return springs (not shown; positioned in the interior of the respective solenoids) force the stroke axles **31***a*, **31***b* back to their previous positions. In lieu of return springs, a second reverse-polarity voltage can be applied to the solenoids **30***a*, **30***b* via terminal **44** to induce a return movement of the stroke axles **31***a*, **31***b*.

The novel dual spring **26***a*, **26***b* arrangement of the present invention provides a buffer for the sliding part **20** by allowing relative movement between the body part **21** and the supporting axle **24** during operation. Therefore, any bounce-back force resulting from the impact between the rails will not transmit to the body part **21**, but will be absorbed by the middle portion **25** through supporting axle **24**. As shown in FIG. **9**, the middle portion **25** which is integrally formed with the supporting axle **24** can move within opening **27** so that impact forces are effectively absorbed. Accordingly, when the direction converting rails **51***a*, **51***b* forcefully impact rail **50** during a switching operation, the resulting shock will be transmitted through supporting axle **24** to middle portion **25**, which will absorb the shock through reciprocating movement of middle portion **25** between springs **26***a*, **26***b* within opening **27**. After the shock is absorbed, the balanced springs **26***a*, **26***b* will operate the supporting axle **24** to force the direction converting rail **51***a*, **51***b* into a tight coupling with the main rail **50** to equate the forces across the middle portion in relation to the relative positioning of the body part **21** and middle portion **25**.

As shown in FIG. **9**, middle projecting part **25**' extends above opening **27** so as to limit movement of the middle portion **25**. The buffer provided by the dual springs **26***a*, **26***b* enables a close adherence between main rail **50** and the respective direction converting rail **51***a*, **51***b*, thereby providing a more reliable rail converting switch. Of course, a single spring can also be used for a more limited buffering action.

Accordingly, the present invention provide a rail converting switch that is advantageously compact, while providing a shock absorbing function whereby a tight fit between the main rail and converting rails can be maintained.

Although certain specific embodiments of the present invention have been disclosed, it is noted that the present invention may be embodied in other forms without departing from the spirit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims, and all changes that come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

We claim:

1. A rail converting switch for a model track layout, comprising:

a body part;

a supporting axle coupled to said body part, said supporting axle adapted to be connected to a rail coupler; and

a moving mechanism coupled to said body part, said moving mechanism for moving said body part,

wherein said supporting axle is configured to be movable relative to said body part,

further comprising a base, said base including a first corridor housing said body part, wherein said first corridor guides movement of said body part.

2. The rail converting switch of claim **1**, further comprising a stopper spring, said stopper spring configured to lock said body part in a first position when said body part is stationary and to automatically release said body part when said body part moves.

3. The rail converting switch of claim **1**, wherein said rail coupler is adapted to be slidably held on said model track layout.

4. The rail converting switch of claim **3**, wherein said model track layout includes a main rail, a first direction rail and a second direction rail, said rail coupler sliding between a first position where said first direction rail is aligned with said main rail and a second position where said second direction rail is aligned with said main rail.

5. The rail converting switch of claim **1**, wherein said base includes a second corridor separated from said first corridor by a wall portion, said moving mechanism including a moving member housed in said second corridor and coupled to said body part through an opening of said wall portion such that movement of said moving member forces a corresponding movement of said body part.

6. The rail converting switch of claim **5**, wherein said first corridor is arranged adjacent to said second corridor, said moving member and said body part move along a longitudinal axis of said base in the same direction.

7. The rail converting switch of claim **5**, wherein said moving mechanism further includes a solenoid for driving said moving member so that said moving member moves into or out of a hollow interior of said solenoid.

8. The rail converting switch of claim **5**, wherein said body part includes a flange extending from a first end of said body part with a hole extending therethrough, said moving member having an end portion fitted through said hole for coupling said body part to said moving mechanism.

9. The rail converting switch of claim **5**, wherein said base includes a third corridor separated from said first corridor by a wall portion, said moving mechanism including a second moving member housed in said third corridor and coupled to said body part through an opening of said wall portion such that movement of said second moving member forces a corresponding movement of said body part.

10. The rail converting switch of claim **9**, wherein said first corridor is arranged adjacent to said third corridor, said second moving member and said body part move along a longitudinal axis of said base in the same direction.

11. The rail converting switch of claim **9**, wherein said moving mechanism further includes a second solenoid for energizing said second moving member so that said second moving member moves into or out of a hollow interior of said second solenoid.

12. The rail converting switch of claim **9**, wherein said body part includes a first flange extending from a first end of said body part with a hole extending therethrough, said moving member having a first end portion fitted through said hole for coupling said body part to said moving mechanism, and

wherein said body part includes a second flange extending outward from a second end of said body part opposite said first end with a second hole extending therethrough, said second moving member having a second end portion fitted through said second hole for coupling said body part to said moving mechanism.

13. The rail converting switch of claim **9**, wherein said first corridor is positioned between said second and third corridor.

14. A rail converting switch for a model track layout, comprising:

a body part;

a supporting axle coupled to said body part, said supporting axle adapted to be connected to a rail coupler; and

a moving mechanism coupled to said body part, said moving mechanism for moving said body part,

wherein said supporting axle is configured to be movable relative to said body part, wherein said body part includes a hollow interior and said supporting axle includes a middle portion extending within said hollow interior.

15. The rail converting switch of claim **14**, further including a first spring, said first spring having one end coupled to an inner surface of said body part and another end coupled to said middle portion.

16. The rail converting switch of claim **15**, further including a second spring, said second spring having one end coupled to an inner surface of said body part and another end coupled to said middle portion such that said middle portion is positioned between said first and second spring.

17. The rail converting switch of claim **14**, wherein said body part includes a top surface with an opening therethrough, said middle portion including a projection extending through said opening.

18. A rail converting switch for a model track layout, comprising:

a body part;

a supporting axle coupled to said body part, said supporting axle adapted to be connected to a rail coupler; and

a moving mechanism coupled to said body part, said moving mechanism for moving said body part,

wherein said supporting axle is configured to be movable relative to said body part,

said rail converting switch further comprising a stopper spring, said stopper spring configured to lock said body part in a first position when said body part is stationary and to automatically release said body part when said body part moves,

said rail converting switch further comprising at least one projection extending from a top surface of said body part, said at least one projection configured to co-act with said stopper spring during movement of said body part from said first position to effect unlocking of said body part from said first position.

19. The rail converting switch of claim **18**, wherein said at least one projection includes a tapered surface for slidably engaging said stopper spring to effect pivoting of said stopper spring.

20. A rail converting switch for a model track layout, comprising:

a body part;

a supporting axle coupled to said body part, said supporting axle adapted to be connected to a rail coupler; and

a moving mechanism coupled to said body part, said moving mechanism for moving said body part,

wherein said supporting axle is configured to be movable relative to said body part,

wherein said supporting axle includes a peg extending from an end portion of said supporting axle, said peg adapted to fit within a hole of said rail coupler.

21. A rail converting switch for a model track layout, comprising:

a base;

a sliding part located on said base; and

a moving mechanism for moving said sliding part on said base, said moving mechanism including a first and second movable stroke axle coupled to said sliding part, wherein said first and second movable stroke axles move in a same direction,

wherein said base includes a peripheral side wall defining an enclosed space, said sliding part and moving mechanism being arranged at least partially within said enclosed space,

wherein said base further includes at least one partitioning wall within said enclosed space, said at least one partitioning wall arranged between said sliding part and one of said first and second movable stroke axles.

22. The rail converting switch of claim **21**, wherein said sliding part includes a first end and a second end arranged opposite said first end, said first movable stroke axle coupled to said first end and said second movable stroke axle coupled to said second end.

23. The rail converting switch of claim **22**, wherein a first flange portion extends outward from said first end and a second flange portion extends outward from said second end, said first movable stroke axle attached to said first flange portion and said second movable strobe axle attached to said second flange portion.

24. The rail converting switch of claim **21**, wherein said sliding part moves in said same direction.

25. The rail converting switch of claim **21**, wherein said moving mechanism further includes a first and second solenoid for moving said first and second movable stroke axle, respectively.

26. The rail converting switch of claim **25**, wherein said first solenoid is positioned in a first direction and said second solenoid is positioned in a second direction opposite to said first direction.

27. A rail converting switch for a model track layout, comprising:

a base;

a sliding part located on said base; and

a moving mechanism for moving said sliding part on said base, said moving mechanism including a first and second movable stroke axle coupled to said sliding part,

wherein said first and second movable stroke axles move in a same direction, wherein said moving mechanism further includes a first and second solenoid for moving said first and second movable stroke axle, respectively, wherein said first and second solenoid each include a hollow interior, said rail converting switch configured such that said first movable stroke axle moves into the hollow interior of said first solenoid as said second movable stroke axle moves out of said hollow interior of said second solenoid.

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