April 17, 1962 L. C. PAGENHARDT 3,030,499

SELECTIVE AUTOMATIC SWITCHING DEVICE FOR MODEL RAILROADS

Filed Nov. 8, 1957

2 Sheets-Sheet 1

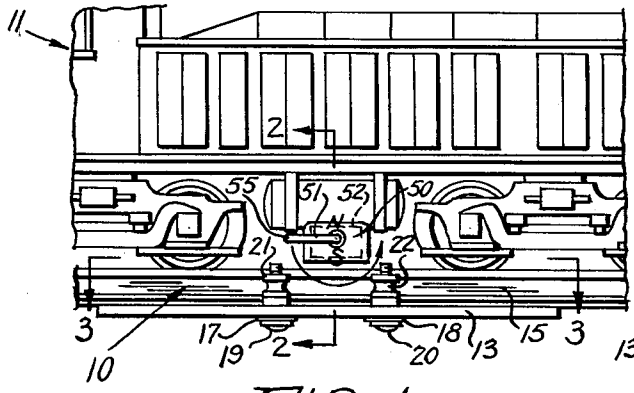


FIG. 1

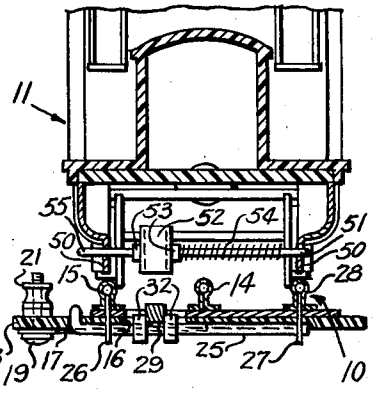


FIG. 2

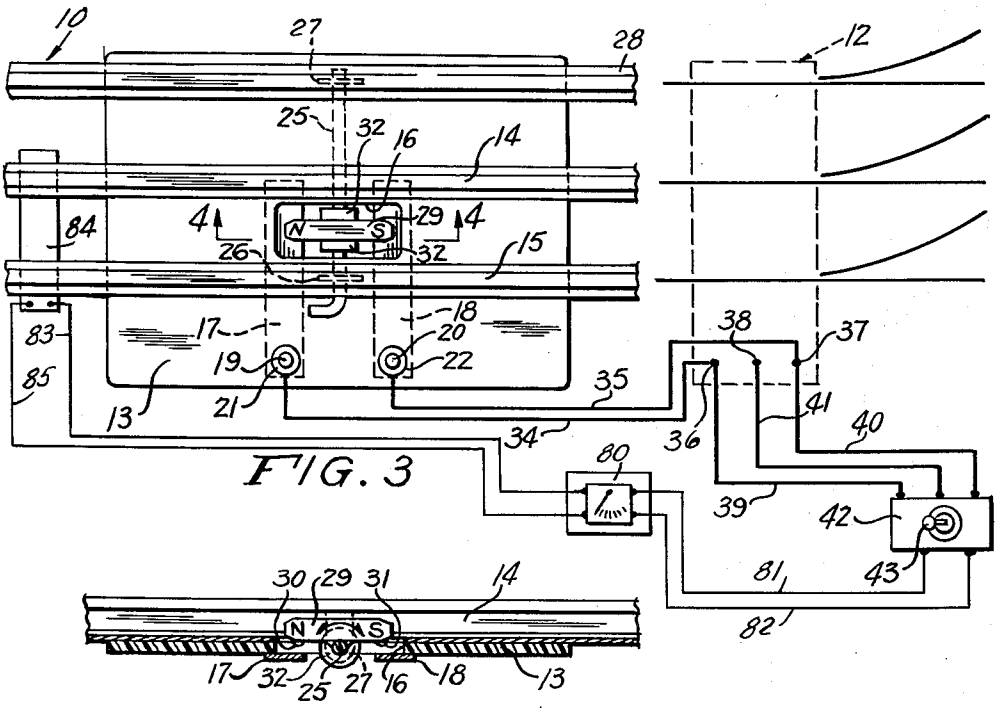


FIG. 3

FIG. 4

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SELECTIVE AUTOMATIC SWITCHING DEVICE FOR MODEL RAILROADS

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2 Sheets-Sheet 2

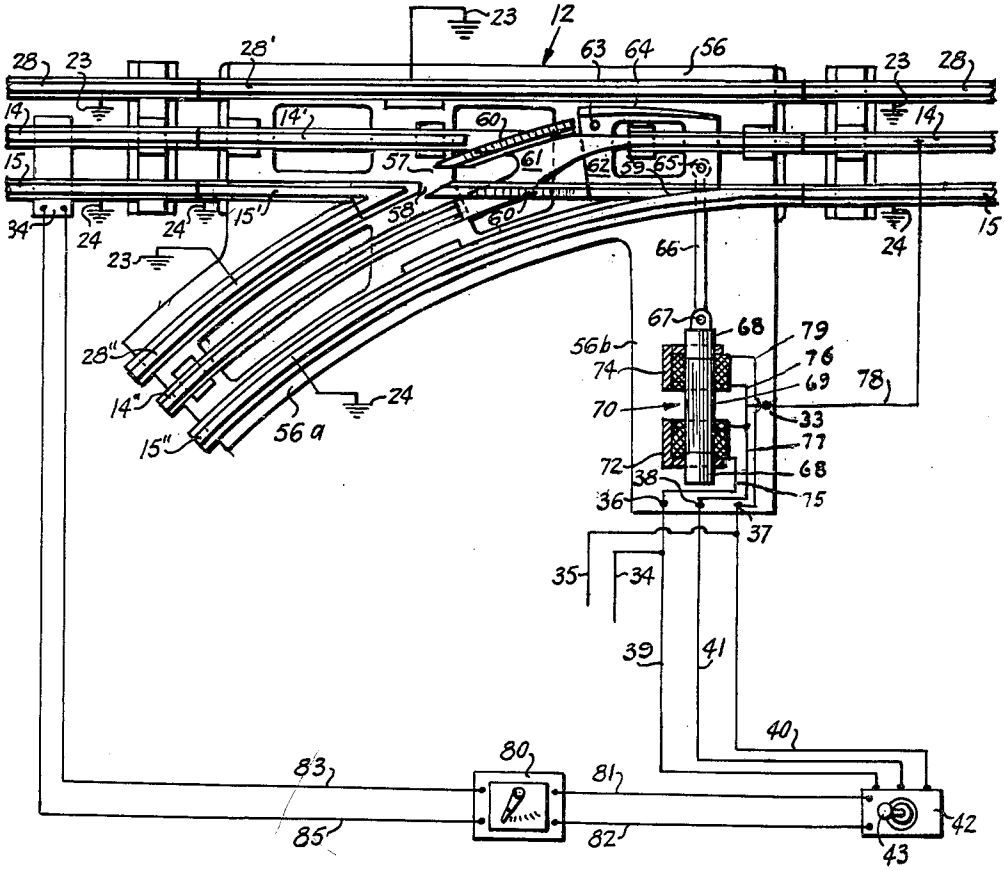


FIG. 5

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SELECTIVE AUTOMATIC SWITCHING DEVICE FOR MODEL RAILROADS

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4 Claims. (Cl. 246—231)

This invention relates to a selective automatic track switching device for model railroads, and has particular applicability to electromagnetic solenoid controlled track switches.

A primary object of this invention is the provision of a device whereby a track switch may be automatically thrown from one position to another by the passage of a locomotive thereover.

An additional object of the invention is the provision of such a device which includes a permanent magnet fixed between the rails adjacent the switch, and a corresponding permanent magnet fixed to the under side of the locomotive, the magnet carried by the locomotive being manually rotatable through 180° in order that the track switch may be thrown in either of two directions upon the passage of a locomotive thereover.

An additional object of the present invention is the provision of a normally balanced permanent magnet positioned between the center or power rail and an outside rail of a three rail model railroad track, so arranged that it will be tilted in one direction or the other, to close one of two selected circuits, in accordance with the position and polarity of the magnet carried by the locomotive.

An additional object of the invention is the provision of such a magnet which may be connected not only with the electro-magnetic track switch, but with any other model railroad accessory which it may be desired to actuate upon the passage of a locomotive or a train over same.

Still another object of the invention is the provision of an arrangement of a magnetic track switch of this character, which is completely automatic in operation, and after the initial setting of the magnet carried by the locomotive according to the desired polarity, needs no attention from the operator in order to automatically control the position of the switch, or other accessory to which it is connected.

A further object of this invention is the provision of an arrangement of this character which is sturdy and durable in construction, reliable and efficient in operation, and relatively simple and inexpensive to manufacture and install.

Still other objects reside in the combinations of elements, arrangements of parts, and features of construction, all as will be more fully pointed out hreinafter, and disclosed in the accompanying drawings, wherein there is shown a preferred embodiment of this inventive concept.

In the drawings:

FIGURE 1 is a side elevational view of a fragment of a miniature or model electrically operated locomotive, in association with a fragment of a track section;

FIGURE 2 is a sectional view taken substantially along the section line 2—2 of FIGURE 1, as viewed in the direction indicated by the arrows;

FIGURE 3 is a sectional view taken substantially along the section line 3—3 of FIGURE 1, as viewed in the direction indicated by the arrows;

FIGURE 4 is a sectional view taken substantially along the section line 4—4 of FIGURE 3, as viewed in the direction indicated by the arrows; and

FIGURE 5 is a layout of the track switch and the electro-magnet and associate circuit for operating same.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Referring now to the drawings in detail, there is generally indicated at **10** a fragment of a conventional track section such as is customarily employed in model railroads, while the reference numeral **11** indicates a fragment of a model locomotive embodying additional elements of the instant invention.

A remotely controlled and electro-magnetically operated track switch, as shown in Reissue Patent No. 21,488 to Haupt, is schematically indicated by the reference numeral **12** in FIGURE 3 and shown in detail in FIGURE 5.

In the illustrative embodiment of the instant invention, the device is shown in association with conventional "Lionel" model railroad equipment, although it is not necessarily limited to such equipment. It may be employed in any model railroad system wherever momentary closure of an electric circuit is desired in one of two directions, the closure being effected by a single pole double throw magnetic switch.

The device according to the instant invention includes a base plate **13** of insulating material, which is adapted to be secured, in any desirable manner, under the two outside rails **15** and **28** and the center or power rail **14** of a conventional section of three rail track. It will be understood that the locomotive **11** has a driving electric motor (not shown) therein and a shoe collector (also not shown) runs over the center or third rail **14** to form part of one side of the power circuit of the electric motor; the other side of the power circuit of the electric motor is, of course, through the wheels of the engine and to the outside rails **15** and **28**. These outside rails are grounded in the usual manner. To illustrate this feature, ground connections are shown on the rails **15**, **15'** and **15''**, at **23** and on the rails **28**, **28'** and **28''** at **24**.

The base plate **13** is provided with an opening **16** between the center or third rail **14** and the outside rail **15**. Positioned on the base plate **13** beneath the opposite ends of the opening **16** there is a pair of brass contact strips **17** and **18**, which are provided at their outer ends with contact terminals in the form of binding posts **19** and **20**, respectively. These binding posts have nuts **21** and **22**, respectively, thereon for holding conductors in place.

A shaft **25** extends transversely across the track and is journalled at one end and adjacent its other end in depending bearings **26** and **27** carried respectively by the outside rail **15** and the corresponding opposite outside rail **28**. The shaft **25** has mounted thereon a permanent magnet **29**, which is normally balanced centrally, and has north and south poles, as shown. The magnet may be of any desired type having opposite poles, but is preferably of "Alnico" bar construction. One pole of the magnet carries a contact **30**, which is adapted, when energized under predetermined conditions, to engage the contact strip **17**, while the other pole carries a contact **31**, which is adapted to engage, also under predetermined conditions, the opposite contact strip **18**. Insulating bushings **32** surround the shaft **25** on opposite sides of the magnet **29** to center the same with respect to the center or power rail **14** and the adjacent outside rail **15**. It will be noted that the shaft **25** may be in electrical connection with either or both of the outside rails **15** and **28** but, passing under the insulated base plate **13**, it is insulated from the center or power rail **14**.

Conductors **34** and **35** lead from the terminals **19** and **20**, respectively, to the outside terminals **36** and **37**, respectively, of a conventional "Lionel" remote control elec-

tro-magnetic track switch 12, which is illustrated in detail in FIG. 5 and later described. This electro-magnetic track switch has a center terminal 38 and conductors 39, 40, and 41 lead from the terminals 36, 37, and 38 to the usual controller 42, which has an operating handle 43. The controller 42 may be operated to shift the electro-magnetic track switch to either of two positions, in one of which it allows the train to travel straight through on the main line track and in the other of which it diverts the train onto the branch track, as will be later described.

It will thus be seen that when the magnet 29 is tilted, in a manner to be more fully described hereinafter, into engagement with the contact strip 17, a shunt circuit will be completed from ground to the terminal 36 while, when the magnet 29 is tilted in the opposite direction so that the contact 31 engages the contact strip 18, a shunt circuit will be completed from ground to the terminal 37. The first of these circuits is from either of the outside rails 15 or 28, which, as stated, are grounded, the wheels of the locomotive, the shaft 25, tiltable magnet 29, contact 30, contact strip 17, binding post 19, conductor 34, and to terminal 36 on the electro-magnet track switch 12. This provides a circuit in parallel with the circuit over the conductors 39 and 41 to the controller 42; the alternative circuit is from either of the outside rails 15 or 28, the shaft 25, tiltable magnet 29, contact 31, contact strip 18, binding post 20, conductor 35, and to terminal 37 on the electro-magnetic track switch 12. This likewise provides a circuit in parallel with the conductors 40 and 41 to the controller 42.

The engine illustrated in the drawing is a fragment of a conventional "Lionel" switching locomotive, and has as its only supplementary equipment a pair of side plates 50 mounted between the trucks, and forming journals for a transversely extending shaft 51. This shaft 51 carries a suitable permanent magnet 52, which is so positioned as to pass over the permanent magnet 29 and in vertical alignment with same. Suitable collars 53 are provided on the shaft 51 for securing the magnet 52 in position, and a compression spring 54 is positioned between one of the side plates 50 and one of the collars 53 and serves normally to bias the permanent magnet 52 into proper alignment.

The permanent magnet 52 is generally rectangular in shape and has north and south poles, as shown. A right angle arm or extension 55 on one end of the shaft 51 permits rotation of the magnet 52 to either of two positions, 180° relatively displaced, with proper alignment of the magnet being maintained, as stated.

By means of this arrangement, the permanent magnet 52 may be adjusted to either of two desired positions, with either its north or south pole, respectively, facing downwardly. Obviously, when the locomotive 11, with its associated permanent magnet 52, passes over the pivoted permanent magnet 29, one end or the other of magnet 29 will be depressed, due to the combined attraction of the dissimilar poles, and the repulsion of similar poles. Thus, in the position shown in the drawings, with the permanent magnet 52 having its south pole facing downwardly, the contact 31 will be moved downwardly into engagement with the contact strip 18 to establish a circuit through the terminal 37, as above described, to throw the electro-magnetic track switch 12 in one direction. Obviously, if the position of the permanent magnet 52 would be reversed, with the north pole positioned downwardly, the contact 30 would be moved downwardly into engagement with the contact strip 17, to thus establish a circuit through the terminal 36, as also above described, to throw the electro-magnetic track switch 12 in the opposite direction.

It is also the case that, if the switch is in the position indicated, with the permanent magnet 29 as shown, neither of the described circuits is completed. Correspondingly, the permanent magnet 29 is so balanced that, in the absence of a locomotive directly thereover, the electro-magnetic track switch 12 may be operated by the controller 42 in the usual manner.

The track switch 12 and the operating electro-magnet for same are shown in FIGURE 5. This switch is inserted in a gap in the center or third rail 14 and the outside rails 15 and 28 and includes rail sections 14', 15', and 28', which are continuations of the center or third rail 14 and the outside rails 15 and 28, respectively, as well as a diverging center or third rail 14'' and diverging outside rails 15'' and 28''. A base plate 56 of insulating material mounts the rail sections 14', 15', and 28' and has an acute angle extension 56*a* which mounts the rail sections 14'', 15'', and 28'', and also a right angle extension 56*b* on which the operating electro-magnets 72 and 74 are mounted. The section of the rail 28'' between the outside rails 15' and 28' is formed with a gap 57 inside the rail 15' to allow clearance for the wheel flanges on the engine and cars, when the latter are traveling over the main line track. At its end this section stops short of the outside rail 28.

A plate 62 is pivoted to the base 56 at 63 and has on one side a curved rail section 64. In the position of this plate 62 as shown, it allows the train to continue over the main line track. It may, however, be swung to another position in which the curved rail section 64 is aligned at one end with the rail section 28'' of the branch track and at the other end is against the outside rail 28 of the main line track. In this latter position it diverts the wheel flanges of the locomotive passing over the outside rail 28 of the main line track onto the rail 28'' of the branch track. The section of the outside rail 15 between the rails 15'' and 28'' of the branch track is formed with gaps 57 and 58, respectively, to allow clearance for the wheel flanges, when the locomotive and cars are being diverted onto the branch track. While the locomotive is being so diverted onto the branch track, the shoe collector (not shown) will be at least momentarily in contact with the section 15' of the inside rail of the main line track between the outside rails 15'' and 28'' of the branch track, the section of the outside rail 28'' of the branch track between the outside rails 15' and 28' of the main line track, and the center or third rail 14' of the main line track. To prevent short circuiting of the driving motor (not shown) on the locomotive at this time, the treads of these rail sections are covered with insulating material at 60. The center or power rail 14' of the main line track is reduced in height and flattened at 61, where it passes under the section of the outside rail 28'' of the branch track between the outside rails 15' and 28' of the main line track, and also where it passes under the section 15' of the outside rail of the main line track between the outside rails 15'' and 28'' of the branch track. This widened section 61 of the center or third rail allows the shoe collector (not shown) on the engine to remain in contact with the center or third rail, when the locomotive 11 is being diverted onto the branch track and the front wheels of same are on the outside rails 15'' and 28'' of the branch track, while the rear wheels are still on the outside rails 15' and 28' of the main line track.

For shifting the plate 62 from the position shown, in which it allows the train to continue over the main line track, to the stated position, in which it diverts the train onto the branch track, a pair of aligned electro-magnets 72 and 74 is provided and these are mounted on the right angle extension 56*b* of the base plate. A plunger 70 is slidable mounted within the electro-magnets 72 and 74, this plunger being comprised by brass ends 68—68 and a central iron armature section 69. The plunger 70 is connected by a pivot pin 67 to a link 66, which latter is in turn connected by a pivot pin 65 to the swingable plate 62.

It will be apparent that, when the inner electro-magnet 74 is energized, the plunger 70 will be centered with the central iron armature section 69 within the electro-magnet

and the link 66 will swing the pivoted plate 62 in the counter-clockwise direction to position the curved rail section 64 against the outside rail 28' of the main line track. The engine and cars approaching from the right (FIGURE 5) are diverted onto the branch track. Conversely, when the outer electro-magnet 72 is energized, the plunger 70 will be centered within the electro-magnet and the link 66 will swing the pivoted plate 62 in the clockwise direction to pull the curved rail section 64 away from the outside rail 28' of the main line track to the position shown in FIGURE 5. The engine and cars approaching from the right are now free to continue over the main line track.

The shunt circuits for energizing the electro-magnets 72 and 74 are as follows: For the electro-magnet 72 the shunt circuit on one side is comprised in part by a conductor 75, which is connected to one end of the winding of the electro-magnet and to one outside terminal 36 on the extension 56*b* of the base plate; the other side of this circuit is comprised in part by a conductor 76, which is connected to the other end of the winding of the electro-magnet 72, and also to one end of the winding of the electro-magnet 74, and to a terminal 33, and by a conductor 77 to the center terminal 38 on the extension 56*b* of the base plate. The terminal 33 is in turn connected by a conductor 78 to the center or third rail 14 of the track.

The other shunt circuit for energizing the electro-magnet 74 is as follows: for this electro-magnet the shunt circuit on one side is comprised in part by the conductor 79, which is connected to the other end of the winding of the electro-magnet, and to the outside terminal 37 on the extension 56*b* of the base plate. As before, the other side of this circuit is comprised in part by the conductor 76, which is also connected to one side of the winding of this electro-magnet, and the conductor 78, which is connected to the center or third rail 14 of the track.

It will thus be apparent that when the locomotive 11 is over the tiltable permanent magnet 29 on the track, with the permanent magnet 52 on the locomotive aligned with the permanent magnet 29 and the latter tilted with the contact 30 in engagement with the contact strip 17, the circuit will be completed as follows: from either of the outside rails 15 or 28, which, as stated, are grounded at 23 and 24, respectively, the wheels of the locomotive, the shaft 25, tiltable magnet 29, contact 30, contact strip 17, terminal 19, and over the conductor 34 to terminal 36 of the electro-magnetic track switch 12 and to one end of the electro-magnet 72; the other side of the circuit is from the other end of the winding of the electro-magnet over the conductors 77 and 78 to the center or third rail 14 of the track. The electro-magnet 72 is now energized and the plunger 70 centered with the central armature section 69 within the electro-magnet. As above described, this movement of the plunger 70 through the link 66 swings the plate 62 in the counter-clockwise direction to the position shown in FIG. 5, draws the curved rail section 64 therein away from the outside rail 28 of the main line track. As stated, the locomotive and cars approaching from the right (FIG. 5) are thus free to continue on the main line track.

Similarly, it will be apparent that when the locomotive 11 is over the tiltable permanent magnet 29 on the track, with the permanent magnet 52 on the locomotive aligned with the permanent magnet 29 and the latter tilted with the contact 31 in engagement with the contact strip 18, the circuit will be completed as follows: from either of the outside rails 15 or 28, and their ground connections 23 or 24, respectively, the wheels of the locomotive, the shaft 25, the tiltable magnet 29, contact 31, strip 18, terminal 20 and over the conductor 35 to the outside terminal 37 on the electro-magnetic track switch 12 and to one end of the winding of the electro-magnet 74; the other side of the circuit is, as before, from the other end of the winding of the electro-magnet over the conductors 77 and 78 to the center or third rail 14 of the track.

The electro-magnet 74 is now energized and the plunger 70 is centered with the central armature section 69 within the electro-magnet. As also above described, this movement of the plunger 70 through the link 66 swings the plate 62 in the clockwise direction and moves the curved rail section 64 thereon against the outside rail of the main line track. As stated, the locomotive and cars approaching from the right are now diverted to pass over the branch track.

As stated above, when the locomotive 11 is not over the magnetic switch on the track, or when the locomotive is passing over the magnetic switch with the permanent magnet 52 on the engine in horizontal position, the controller 42 may be used to operate the electro-magnetic track switch 12 in the usual manner. In the position of the handle 43 as shown, it closes the first described circuit across the conductors 39 and 41 and the outside and center terminals 36 and 38, respectively, of the electro-magnetic track switch 12; likewise, in the position of the handle 43 rotated through 180° from that shown, the controller closes the second described circuit across the conductors 40 and 41 and the outside and center terminals 37 and 38, respectively, of the electro-magnetic track switch.

A step down transformer 80, which may be connected to the usual 110 volts, 60 cycle, house lighting circuit, supplies power for the operation of the electro-magnetic track switch 12 and for energizing the driving electric motor (not shown) on the locomotive 12. The secondary winding of this transformer is connected by conductors 81 and 82 to the controller 42, and by conductors 83 and 85 to a connector 84, which latter underlies the center or third rail 14 and the outside rail 15.

Although in the foregoing the selective automatic switching device for model railroads has been described, and related in conjunction with a three rail track, it is to be understood that the basic principle of a balance magnetic switch on the track and a selectively adjustable permanent magnet carried by the locomotive may be equally advantageously employed in conjunction with a two rail track, in which instance, the opposite rails would be insulated from each other.

From the foregoing it will now be seen that there is herein provided an improved selective automatic switching device for model railroads, which renders the switching automatic, in accordance with predetermined conditions, effected by the positioning of the permanent magnet 52 on the locomotive 12 through its operating arm 55, which accomplishes all of the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiments hereinbefore shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative, and not in a limiting sense.

What I claim is:

1. In an automatic track shifting arrangement for model railroads having a first track comprised by at least two rails, a second track also comprised by at least two rails, a track switch between said tracks for directing railway vehicles travelling over one of said tracks onto the other, an electro-magnetic device connected to said track switch for operating same, and at least one railway vehicle adapted to travel over said tracks; the combination of a double acting switch comprised by a permanent bar magnet, mounting means positioned between the rails of said first track pivotally supporting said permanent bar magnet, movable contacts mounted on said permanent bar magnet adjacent to its respective ends, fixed contacts positioned on said mounting means respectively in alignment with said movable contacts, mounting means on said railway vehicle, a permanent magnet supported by said mounting means rotatable to one position with one pole positioned downwardly and to a second position with the other pole positioned downwardly and

disposed in vertical alignment with the permanent bar magnet between the rails of the first track, when the railway vehicle passes over the latter permanent magnet, a first circuit to said electro-magnetic device including one pair of contacts of the double acting switch for shifting the track switch to allow the railway vehicles to continue over the first track, and a second circuit including the other pair of contacts of the double acting switch for shifting the track switch to divert the railway vehicles from the first onto the second track.

2. In an automatic track switch shifting arrangement for model railroads having a first track comprised by at least two rails, a second track also comprised by at least two rails, a track switch between said tracks for diverting railway vehicles travelling over one of said tracks onto the other, an electro-magnetic device connected to said track switch for operating same, and at least one railway vehicle adapted to travel over said tracks; the combination of an operating circuit for said electro-magnetic device, a switch connected in said operating circuit comprised by a permanent bar magnet, a movable contact mounted on said pivoted bar magnet adjacent the end of the latter, mounting means positioned between the rails of said first track carrying said fixed contact and pivotally supporting said permanent bar magnet, a permanent magnet, and mounting means positioning said permanent magnet on said railway vehicle in vertical alignment with said permanent bar magnet between the rails of the first track, when the railway vehicle passes over the latter permanent bar magnet.

3. In an automatic track shifting arrangement for model railroads having a first track comprised by at least two rails, a second track also comprised by at least two rails, a track switch between said tracks for diverting railway vehicles travelling over one of said tracks onto the other, an electro-magnet device connected to said track switch for operating same, and at least one railway vehicle adapted to travel over said tracks; the combination of an operating circuit for said electro-magnetic device, a switch connected in said operating circuit comprised by a permanent bar magnet, movable contacts mounted on said permanent bar magnet adjacent the respective ends of the latter, fixed contacts respectively positioned in alignment with said movable contacts, mounting means positioned between the rails of said first track carrying said fixed contacts and pivotally supporting said permanent bar magnet, a permanent magnet, and mounting means positioning said permanent magnet on said railway vehicle in vertical alignment with the permanent bar magnet between the rails of the first track when the railway vehicle passes over the latter permanent bar magnet, said latter mounting means also pivotally supporting said permanent magnet for movement from one position in which one pole is positioned downwardly and repels the permanent bar magnet to close with one movable contact on one fixed contact, to another position 180 degrees displaced, in which the other pole is positioned downwardly and repels the permanent bar magnet to close with the other movable contact on the other fixed contact.

4. In an automatic track shifting arrangement for model railroads having a first track comprised by at least two rails, a second track also comprised by at least two rails, a track switch between said tracks for diverting railway vehicles travelling over one of said tracks onto the other, an electro-magnetic device connected to said track switch for operating same, at least one railway vehicle adapted to travel over said tracks; the combination of an operating circuit for said electro-magnetic device, a switch connected in said operating circuit comprised by a permanent bar magnet, movable contacts mounted on said permanent bar magnet adjacent the ends of the latter, fixed contacts respectively positioned in alignment with said movable contacts, mounting means positioned between the rails of said first track carrying said fixed contacts and pivotally supporting said permanent bar magnet, a permanent magnet and mounting means positioning said permanent magnet on said railway vehicle with either of its poles positioned downwardly, so that it will be in vertical alignment with said permanent bar magnet between the rails of the first track, when the railway vehicle passes over the permanent bar magnet, a first operating circuit for said electro-magnetic device including a conductor between one fixed contact cooperating with a movable contact on said permanent bar magnet and a ground return for moving the track switch to the first mentioned position, a second operating circuit for said electro-magnetic device including a second conductor between the other fixed contact cooperating with the other movable contact on said permanent bar magnet and the electro-magnetic device and the ground return for moving the track switch to the second mentioned position.

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