United States Patent

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[31] E34589

[54] **SWITCH, ESPECIALLY DOUBLE CROSS SWITCH FOR ELECTRIC TOY AND MODEL RAILROAD INSTALLATIONS**
29 Claims, 9 Drawing Figs.

[52] U.S. Cl. 246/415, 46/1
[51] Int. Cl. E01b 7/00; A63h 19/32
[50] Field of Search .... 238/10, 10D; 104/60; 46/1; 246/415, 415 (A); 246/415

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ABSTRACT: A switch, especially narrow gauge double cross switch, for electric toy and model railroads, with current supply through both rails, in which in the vicinity of the central portion of the switch, the outer rails of the switch which are connected to the insulated switch bed, are provided with conductive plates which extend closely to the central portion of the switch and which within the switch form electric current conductive surfaces for contact with the wheel rims of rail vehicles passing over the switch and with guiding rails for the wheel rims as well as for the bearings of the switch tongues.

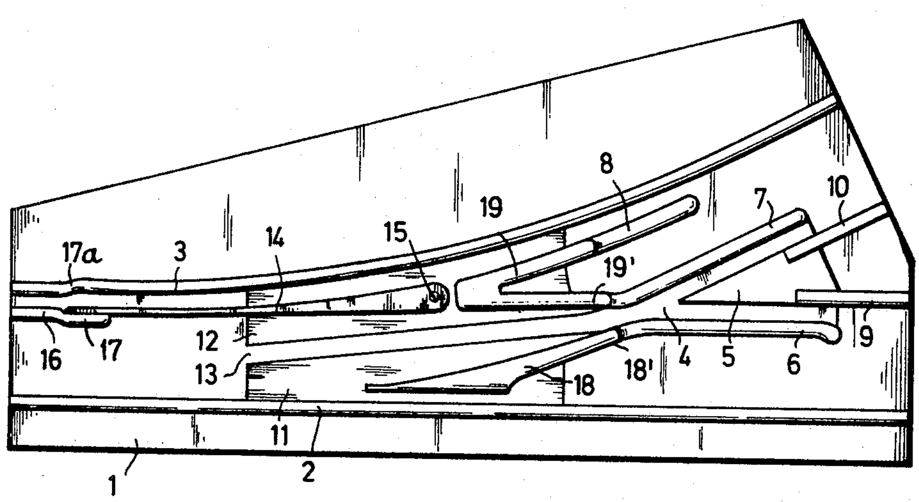
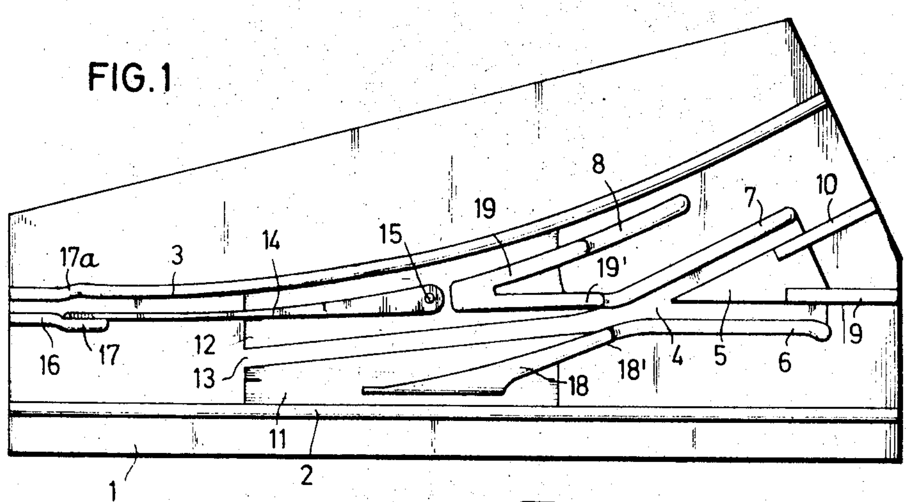


FIG.1



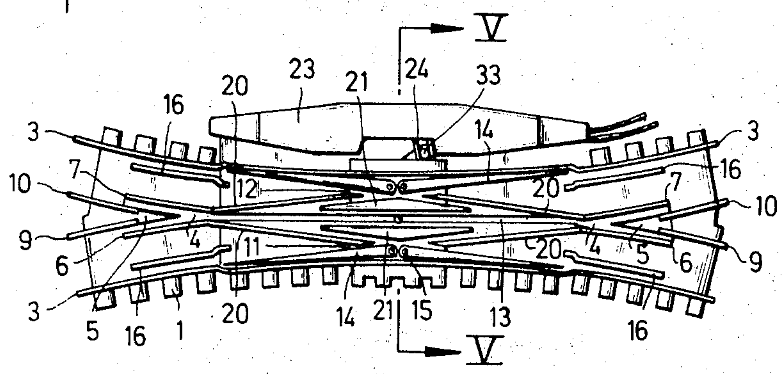


FIG.2

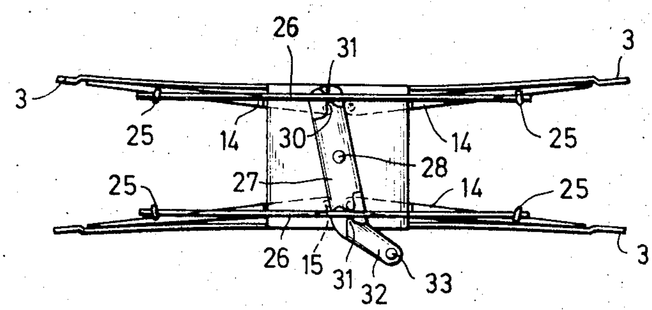


FIG.3

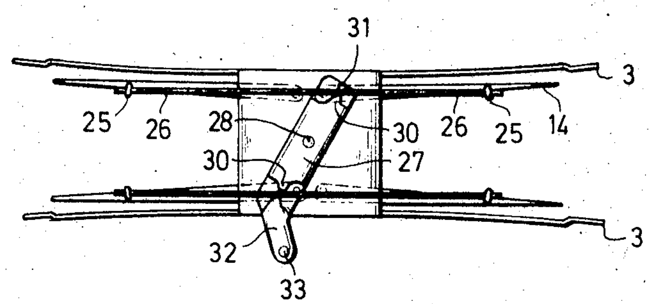


FIG. 4

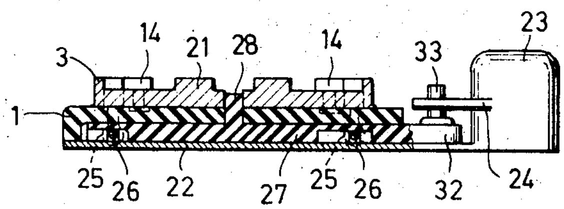


FIG. 5

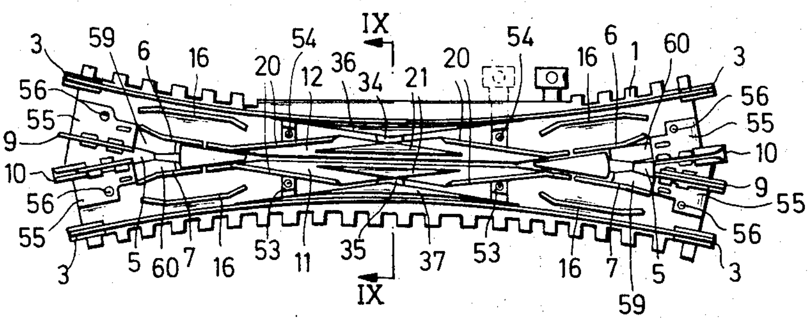


FIG. 6

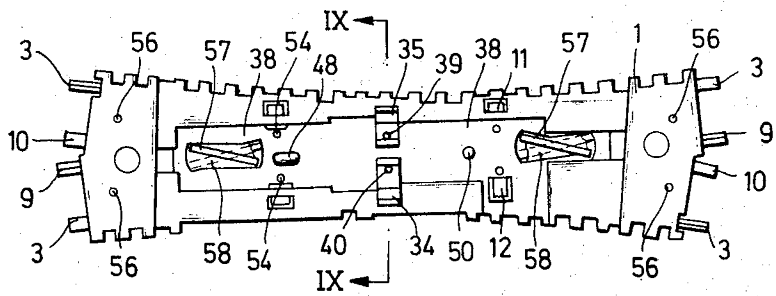


FIG. 7

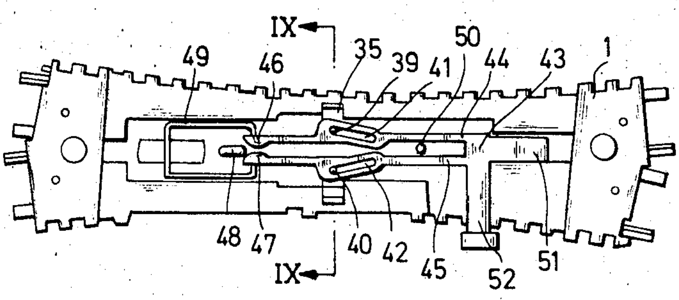


FIG. 8

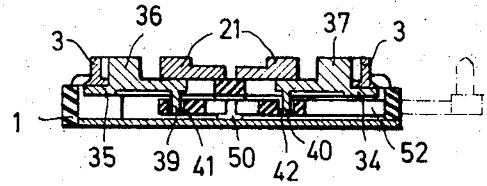


FIG. 9

SWITCH, ESPECIALLY DOUBLE CROSS SWITCH FOR ELECTRIC TOY AND MODEL RAILROAD INSTALLATIONS

The present invention relates to switches, especially double cross switches, for electric toy and model railroad installations, in particular those having a small gauge, in which the current supply is effected via both rails.

The nowadays miniaturizing of electric toy and model railroad installations which has been accomplished with great success brings about that these toys have to be produced at high precision in order to meet the requirements from a mechanical as well as an electrical viewpoint. The difficulties encountered in this connection occur in particular with movable elements such as the switch installations.

It is an object of the present invention so to design a switch of the above-mentioned type that it will not only function safely, but will also assure a safe passage thereover of the electric locomotive and the train pulled thereby while it will be assured that the wheels of the locomotive and/or train will not produce any short circuits.

It is another object of this invention to provide a switch, as set forth in the preceding paragraph, which will assure that in case the locomotive accidentally stops at any place within the switch, the locomotive will remain connected to the current supply so that it can start again.

It is a still further object of this invention to provide a switch as outlined above which will be relatively inexpensive in production.

These and other objects and advantages of the invention will appear more clearly from the following specification, in connection with the accompanying drawings, in which:

FIG. 1 diagrammatically illustrates a top view of a simple branching-off switch according to the invention.

FIG. 2 is a top view of a double cross switch according to the invention.

FIGS. 3 and 4 respectively illustrate the switch of FIG. 2, and more specifically, the adjusting device at the bottom side thereof in two different positions.

FIG. 5 is a cross section along the line V–V of FIG. 2.

FIG. 6 is a top view of a double cross switch according to the invention with double switch tongues displaceable in a direction transverse to the longitudinal direction of the switch.

FIG. 7 is a bottom view of the double cross switch of FIG. 6.

FIG. 8 shows the switch of FIG. 6 as seen from the bottom and provided with a control member.

FIG. 9 is a section along the line IX–IX of the switch of FIG. 6.

The switch according to the present invention is based on the finding that it is possible to build switches, especially double cross switches, for toy and model railroad installations which are not only very simple in their mechanical construction and reliable in their operation, but which also will assure an uninterrupted current supply when the train passes over the switch while avoiding the danger of short circuits. Merely at the entrance into the switch, it is necessary, in view of the inner conductors of the two rails crossing each other as to their polarity, to provide a short distance which must be passed through without current supply. This distance, however, can be made considerably shorter than the distance between two wheel pairs of the electric locomotive. In this way, with a simple switch and also with a double cross switch it will be avoided that a locomotive will be disconnected from the current supply, if at least two pairs of wheels are forming current conductors.

The switch, especially double cross switch, according to the present invention is characterized primarily by the following features: The outer switch rails which are anchored in the insulated switch bed are in the vicinity of the switch center provided with conductor plates which extend closely to the switch center. These conductor plates form within the switch, current conducting surfaces to be engaged by the rims of the wheels, rails, conducting webs for the wheel rims and, if desired, the supports for the switch tongues.

The rail sections approach each other at the central portion of the switch to a minimum distance from each other and overlap each other in the central portion of the switch in such a way that in a larger central portion of the switch the wheel moving on the outer curved rail section will have its rim move on a current conducting guiding web.

The metallic guiding webs provided in the core of the double cross switch are preferably so arranged that they are located opposite to each other with straight flanks while the conductor plates for purposes of forming surfaces upon which the wheel rims move will slightly protrude beyond said flanks toward the central portion of the switch.

The radius of curvature or the crossing angle of the switch is to be so selected that the distance between the outer crossing points is greater, especially a multiple of the distance between the inner crossing points.

The conductor plates of each switch or current side, which conductor plates are formed by surfaces onto which the wheels move or by rail webs or guiding webs, should extend closely to the crossing point of the switch or closely to the outer crossing points of the double cross switch.

The guiding plates connected to the curved rails should be provided with guiding webs for driving straight forward or for passing the crossing in a cross traffic. These guiding webs should with double cross switches extend from the central cross of the respective switch or current side to one of the outer crosses.

In order to design the switch mechanically in as simple a manner as possible, it is according to the present invention suggested to provide a switch tongue for each branch off. This tongue may, relative to the curved outer rail, be confined by an curved flat flank and may with regard to the straight outer rail or central portion of the switch be confined by a straight flank. According to a further feature of the invention it is suggested immediately adjacent to the relatively narrow head of the switch tongue or tongues to provide guiding webs or with a double cross switch to mount the heads of the switch tongues on the same rail side directly adjacent to the respective conductor plate.

According to a further feature of the invention, for purposes of adjusting the switch slide, there may be provided a control valve which is adjustable in the driving direction and preferably consists of synthetic material. This control valve has within the range of the valve slides two counter running slot arrangements which are engaged by studs of the switch slides.

Referring now to the drawings in detail, FIG. 1 shows the switch bed 1 made of insulating material. Mounted on said switch bed is a straight rail 2 and also an curved rail 3. FIG. 1 furthermore shows the outer crossing 4 which is formed by parts of the insulating switch bed and which is intended for passing the rims of the wheels. The crossing 4 comprises a triangular portion 5, and the guiding webs 6, 7, 8 made of the same material as the switch bed.

The reference numerals 9 and 10 designate conductive rail sections which are connected to the rail bed and which follow the triangle 5 of the crossing in outward direction.

From FIG. 1 it will also be seen that the two outer rails 2 and 3 are each provided with a conductor plate 11, 12 which advantageously are flush with the surface of the rail bed at the crossing point. At substantially the same level as the conductor plates 11 and arranged therebetween is the switch bed 13 which insulates the two current conductive parts from each other. The relatively slender switch tongue 14 is, by means of a pivot 15, journaled in the conductor plate 12. At the end of the switch tongue 14 there is provided a guiding web 16 with a slight crank 17. This guiding web serves as abutment for the switch tongue, the end of which engages the crank. At the oppositely located side a similar crank 17*a* is provided on rail 3. This last mentioned crank 17*a* serves for receiving the end of the switch tongue during straight forward drive. This crank permits a relatively strong design of the switch tongue even at its ends which is particularly advantageous with narrow gauges. The head of the switch tongues is selected so wide that it can receive a sufficiently strong pivot **15**. Provided on the conductor plate **11** is a guiding rail **18** which extends close to the crossing point **4** of the switch. A similar conductor web forms the extension of the switch tongue **14** and is located on the conductor plate **12** while being designed in the form of a two-arm guiding web **19, 19'**. One flank of web **19, 19'** forms a passage with the curved rail **3** while the other flank forms an oppositely located rail section with the rail **2** during straight forward drive. According to FIG. **1**, the switch tongue is adjusted for driving through an arc. From the drawing it will be evident that only for a very short outer range adjacent the crossing point **4** there will occur a current interruption. It is further evident that when passing through the switch by means of the guiding webs **18, 19** and the two guiding plates **11, 12**, both wheels will be supplied with current. When the switch tongue **14** of FIG. **1** is tilted clockwise the conductor plates **11, 12**, the switch tongue **14**, and the guiding web **19**, will be able to convey a current until shortly prior to reaching the crossing point **4** during passage from left to right. The critical area is located solely at the ends of the guiding webs **18, 19** at **18', 19'** while, however, it is not possible that the wheel rim which, for instance, with a 9 millimeter gauge has a thickness of approximately a few tenths of a millimeter will simultaneously contact the guiding webs **18, 19**. The necessary distance between the guiding parts **18, 19** or the necessary distance of the rail ends **9, 10** determine the track section which is to be driven over without current and after the crossing **4**. The thus obtained currentless track section may at any rate be shorter than the distance between two serially arranged pairs of wheels for conveying current to the driving motor.

In view of the fact that the switch tongue **14** consists of a single unitary movable element, the adjustment of said switch tongue **14** will cause no difficulties.

FIGS. **2—5** illustrate the application of the structural features shown in FIG. **1** to a double cross switch. All parts of FIGS. **2—5** corresponding to those of FIG. **1** are of the same design with the exception of the metallic guiding webs **18, 19** shown in FIG. **1**. Furthermore, the guiding web **8** of FIG. **1** has been replaced by the guiding web **16** in view of the symmetric arrangement in FIGS. **2—5**.

The double cross switch of FIGS. **2—5** is over the simple switch of FIG. **1** supplemented by the feature that adjacent each arced rail there are provided two switch tongues **14** having their head portions located adjacent each other. The guiding web **19, 19'** in FIG. **1** is, so to speak, cut open and replaced by the additional switch tongue **14** for the drive through the arced rail section and by a guiding rail **20** for straight drive.

The guiding web **18** of FIG. **1** has been replaced by two longitudinally extending drive and guiding webs **21** which are respectively located on the two conductor plates **11, 12** and which are located opposite to each other while being separated from each other solely by the insulating strip **13**. Merely a narrow margin of the conductor plates protrudes inwardly beyond these surfaces so that also the rims of the wheels of the railroad vehicle can engage said surfaces in a conductive manner between the webs **21**. Thus, from the two conductor plates **11, 12** are, so to speak, worked out webs **20** which act as rails, and guiding webs **21** likewise acting as rails, while conducting surfaces are provided which extend to the ends of the guiding webs **20**. The distance between the guiding webs **21** is on this switch only twice as great as the customarily provided driving groove for permitting the passage of the wheel rims. Inasmuch as with a 9 millimeter gauge the rims have a thickness of only 0.3 millimeters, insulating strip **13** having a width of approximately 1 millimeter will suffice to safely avoid a short circuit by the wheel rims.

The operation and the current supply to the wheels with a double cross switch according to the invention is effected in the following manner. During the cross drive, the switch tongues **14** and the oppositely located guiding webs **20** substantially take care of the current supply. As far as short interruptions occur, the wheel rims move onto the conductor plates **11, 12** so that in this way no current interruption occurs. When the switch is adjusted so that the rail vehicle or vehicles will pass through the switch along an arc, the ends of the switch tongues **14** engage the ends of the guiding webs **16**. When passing through the arced portion of the switch, the switch tongues will now, over a portion of their length, guide the inner wheels along the inner edge of the wheel rim, but will do so only until the wheel rim of the wheel moving along the outer arc has reached the guiding web **21**.

The respective wheel moving along the outer arc will, following the passage of the outer cross **4** move first off the guiding web **20**, subsequently is, by means of the switch tongue **14** moved away from said guiding web **20**, then moves over a short distance by means of the wheel rim on the likewise conductive conductor plate **11, 12**, and finally by means of its wheel rim moves onto the inner guiding web **21**. The two guiding webs **21** are spaced from each other to such an extent that the rim wheels can pass through the preferably straight gap therebetween in either direction. Thus, also when the vehicle moves through the arced portion of the switch, the current supply of the two wheels of a running axle will always be safely maintained when the vehicle passes through the relatively long central portion of the switch. Similar to the example of FIG. **1**, a relatively short interruption in the current supply is effected only when the vehicle crosses the two outer crosses.

FIGS. **3—5** additionally disclose a device for actuating a switch according to FIG. **2**. In conformity with FIG. **5**, a relatively thin metal plate **22** shown in cross section is screwed onto the switch bed **1** or may be connected thereto in any other convenient manner. From a housing **23** for a double electromagnet arrangement there protrudes a fork **24** toward the switch. As will be evident from FIGS. **3—5**, eyes **25** are provided on the switch tongues in recesses of the switch bed, said eyes **25** being located near the ends of said fork **24**. Spring wires **26** extend through the eyes of the two tongues of each switch side. Located on the bottom side of the switch bed is a two-arm control lever **27** which expediently is made of insulating material and which is pivotable about a pivot **28** of insulating material against abutments.

This lever **27** has its ends provided with recesses for forming cams **30, 31** located opposite to each other. Between said cams **30, 31** there is guided a spring wire **26** each. As will be seen from FIGS. **3** and **4**, when the lever **27** occupies its position shown in FIG. **3**, the switch tongues **14** are held outwardly against the arced rails **3** whereas, when the lever **27** occupies the position shown in FIG. **4**, the switch tongues are held inwardly in abutment with the guiding webs **16**. One end of lever **27** is continued by an outwardly extending arm section **32** which extends beyond the switch bed and at its end carries a pin **33**. Pin **33** engages a slot in fork **24**. A straight line adjustment of fork **24** thus brings about the adjustment of all four switch tongues so that they will occupy the position shown in FIGS. **3** and **4**.

According to the embodiment illustrated in FIGS. **6** and **9** and showing a double cross switch, the switch is of a still simpler construction which means comprises less parts whereby it is still more safe in operation and still less expensive in construction.

According to FIG. **6**, the switch bed **1** of synthetic material has connected thereto two arced or bent outer rails **3** having associated therewith guiding webs **16** of synthetic material which are substantially parallel to said outer rails **3**. Uniformly tapering inner rails **9, 10** lead into a triangle **5** of synthetic material which at both sides have associated therewith guiding webs **6, 7**. Metallic guiding rails **20** and guiding members **21** are provided in the switch bed **1**.

The switch bed **1** has furthermore mounted therein, switch slide members **34, 35** which are displaceable in a direction transverse to the driving direction and which preferably are displaceable in metallic conductor plates **11, 12** to which they are electrically conductively connected. Rigidly connected to the slides **34, 35** are double switch tongues **36, 37** which on the outside have a bend corresponding to the outer rail **3**, while on the inside they are straight and end at an obtuse angle. The two tapering tongues of such a double tongue **36, 37** are rigidly connected to each other and consist of one piece.

Mounted on the slides **34, 35** and extending through the switch bed **1** downwardly into a recess **38** are studs **39, 40** which extend into guiding slots **41, 42**. These guiding slots are mounted in a tuning fork-shaped control slide **43** or in the legs **44, 45** thereof. The free end of the legs **44, 45** are provided with a kind of crowned ends **46, 47** which by means of a spring wire **49** which closes the legs **44, 45**, engage a member **48**. Between the legs **44** and **45** there is also provided a guiding member **50** which registers with an extension **51** of the control slide **43**. Laterally, the control slide **43** is provided with an actuating lever **52**.

When the control slide **43** occupies the position shown in FIG. **8**, the double switch tongues **36, 37** are displaced outwardly which means that they are adjusted for a straight drive. If, however, the actuating lever **52** is moved toward the left, the crowned ends **46, 47** slide over the member **48**. The guiding slots **41, 42** move the studs **39, 40**, and the latter move the slides **34, 35** and the double switch tongues **36, 37** in a countercurrent manner inwardly (see FIG. **7**) until they engage the guiding webs **16**. The spring **49** engaging the legs **44, 45** sees to it that the double switch tongues **36, 37** will, in both control positions, engage their respective end position under resilient pressure.

For purposes of safely connecting the conductor plates **11** and **12** in the switch bed **1**, which plates are conductively connected to the outer rails **3**, each of said plates is provided with an extension **53** connected to the switch bed **1** by means of hollow rivets **54**. The inner rails **9** and **10** connected to an insulating base **55** are, together with said base **55**, riveted to the switch bed **1** by means of hollow rivets **56**. For safeguarding an electric connection of the conductor plates **11** and **12** with the corresponding inner rails **9, 10** held on the same potential, there are in conformity with FIG. **7** provided band-shaped conductors **57** and **58** which are located in the switch bed and which crcss each other while being insulated relative to each other. These conductors **57** and **58** are by means of the hollow rivets **54, 56** in good conductive connection with the conductor plates **11, 12** on one hand, and the inner rails **9, 10** on the other hand.

As shown in FIG. **6**, conductor plates **59** and **60** are conductively connected to the inner rails **9** and **10** and directed toward the switch center. It is these conductor plates **59, 60** on which the rims of the wheels can roll for reducing the currentless driving section until the conductor plates **11, 12** have been reached.

It is, of course, to be understood, that the present invention is by no means limited to the particular constructions shown in the drawings, but that also other modifications are possible, and that the invention is defined by the scope of the appended claims.

It is also to be understood that the present invention may be used for direct current operated as well as for alternating current operated toy and model railroad installations, in which the current supply is effected through both rails.

I claim:

1. A switch especially narrow gauge double cross switch, for electric toy and model railroads with current supply through both rails of one and the same track and with adjustable switch tongue means for controlling the switch, which includes: a switch base having a bed portion of insulating material, inner and outer rail means anchored in said bed portion, electric current conductive plate means arranged approximately in the central portion of said switch and associated with said outer rail means for electric communication with said switch tongue means and with the wheel rims of rail vehicles passing through said switch, curved rail means, and said switch tongue means including at least one switch tongue pivotally journaled near the adjacent curved rail means in the central portion of the switch, said switch also including guiding web means extending approximately parallel to and alongside the respective section of the adjacent curved rail means and having a cranked portion for engagement with the adjacent free end of the adjacent switch tongue, said guiding web means outside said cranked portion forming substantially the extension of the respective adjacent switch tongue when the latter engages said cranked portion.

2. A switch according to claim **14**, which includes guiding web means located in the central area of said switch and electrically conductively connected to said plate means, said guiding web means overlapping with portions of adjacent rail means so that over a central portion of said switch at least the wheel rim of a rail vehicle wheel passing over the respective outer rail of its track will pass over the respective current conductive guiding web means.

3. A switch according to claim **2**, in which said guiding web means have those sides thereof which face each other provided with straight flanks, and in which the electric current conductive plate means support said guiding web means and protrude beyond said flanks toward the central longitudinal plane of said switch.

4. A switch according to claim **14**, in which the radius of curvature of said rail means is so selected that the distance of the outer crossing points is a multiple of the distance of the inner crossing points.

5. A switch according to claim **14**, in which the electric current conductive plate means of each switch side extend close to the crossing point.

6. A switch according to claim **14**, in which the switch is a double cross switch, and in which the electric current conductive plate means of each switch side extend close to the outer crossing points of the double cross switch.

7. A switch according to claim **14**, in which said electrically conductive plate means are provided with and electrically connected to guiding plate means for a straight drive of a rail vehicle through said switch.

8. A double cross switch according to claim **14**, which includes a central crossing area of said outer and inner rail means and also includes outer crossing areas respectively located at the end portions of said switch and pertaining to said inner rail means, and in which said electrically conductive plate means are provided with and electrically connected to guiding webs extending from said central crossing area to the outer crossing areas.

9. A switch according to claim **14**, which has at least one branch-off section, and in which the switch tongue means comprise one single pivotable switch tongue for each branch-off section.

10. A switch according to claim **9**, in which said switch tongue has that longitudinal side thereof which is closest to the adjacent side of the switch curved and has the opposite longitudinal tongue side substantially straight.

11. A switch according to claim **9**, which includes guiding web means having one end adjacent the pivot axis of the respective adjacent tongue.

12. A switch according to claim **9**, in which four branch-off sections branch off from the central portion of the switch, and in which the pivot axes of two adjacent tongues are located in the immediate vicinity of each other near one side of the switch whereas the pivot axes of the other two tongues are located in the immediate vicinity of each other near the opposite side of the switch, said electric current conductive plate means comprising a first plate electrically connected to said first mentioned two tongues and a second plate electrically connected to said last mentioned two tongues.

13. A switch according to claim **8**, in which said tongue means are pivotable about pivot axes located in the central portion of the switch and extend in the direction toward the respective outer crossing areas pertaining thereto, the length of said switch tongue means equaling approximately the distance between the inner and outer crossing areas.

14. A switch according to claim **1**, in which said guiding web means forms a part of the bed portion of insulating material.

15. A switch according to claim 1, in which the curved rail means near the free end of the respective adjacent switch tongue is provided with a cranked portion for receiving said free switch tongue end when a straight drive through the switch is desired.

16. A double cross switch according to claim 1, with two oppositely curved rails spaced from each other in the transverse direction of the switch and with four branch-off sections branching off from the central area of said switch, in which the switch tongue means include four switch tongues arranged in pairs pivotally connected to said bed portion, one pair of said switch tongues being associated with one curved rail and the other pair of switch tongues being associated with the other curved rail, said switch also including actuating means extending within said bed portion in the longitudinal direction of said switch and being operatively connected to said tongues for adjusting the same.

17. A switch according to claim 16, in which said actuating means includes wire means connected to said tongues, and which includes a pivotable two-arm lever located at the bottom side and in the central portion of said bed portion and comprising cam means operatively engaging said wire means for actuating the same.

18. A switch according to claim 17, in which said cam equipped two-arm lever has an angled-off section provided with a pivot, and which includes double electromagnetic means operatively connected to said pivot for actuating said two-arm lever.

19. A switch according to claim 18, in which said two-arm lever is pivotable about a shaft of insulating material.

20. A switch, especially narrow gauge double cross switch, for electric toy and model railroads with current supply through both rails of one and the same track and with adjustable switch tongue means for controlling the switch, which includes; a switch base having a bed portion of insulating material, inner and outer rail means anchored in said bed portion, electric current conductive plate means arranged approximately in the central portion of said switch and associated with said outer rail means for electric communication with said switch tongue means and with the wheel rims of rail vehicles passing through said switch, two curved outer rails spaced from each other in the transverse direction f said switch for passing a rail vehicle through said switch along a curved path, and said switch tongue means including two one-piece double switch tongues movable selectively toward the respective adjacent curved outer rail for passing a rail vehicle through the switch along a substantially straight path and away from the respective adjacent curved rail for passing a rail vehicle through said switch along a curved path.

21. A switch according to claim 20, which for purposes of actuating said double switch tongues includes electrically conductive slide control means operatively connected to said double switch tongues and slidable in said electric current conductive plate means while being electrically connected thereto.

22. A switch according to claim 21, in which said slide control means are rigidly connected to said double switch tongues and are provided with pin means extending through said bed portion of said switch base, said switch including a control member operatively connected to said pin means for actuation of said double switch means.

23. A switch according to claim 22, in which said control member has slot means operatively receiving said pin means, said control member being displaceable in the longitudinal direction of said switch.

24. A switch according to claim 23, in which said control member has a U-shaped portion with the slot means respectively arranged in the legs of said U-shaped portion, and which includes locking means arranged adjacent the free ends of the legs of said U-shaped portion, the free ends of said U-shaped portion being operable in response to the displacement of the control member in one direction to lock said control member in said displaced position.

25. A switch according to claim 24, which includes spring means continuously urging the legs of said U-shaped portion toward each other.

26. A switch according to claim 22, in which said control member is movably arranged in the bottom of said bed portion and is provided with an extension, said bed portion comprising guiding means for reciprocably guiding said extension.

27. A switch according to claim 22, which includes a guiding member arranged in longitudinally spaced relationship to and in substantial alignment with said guiding means and located between the legs of said U-shaped portion of said control member for guiding the latter.

28. A switch according to claim 22, in which said control member has connected thereto an actuating member accessible from the outside of said switch for actuating said control member.

29. A switch, especially narrow gauge double cross switch, for electric toy and model railroads with current supply through both rails of one and the same track and with adjustable switch tongue means for controlling the switch, which includes; a switch base having a bed portion of insulating material, inner and outer rail means anchored in said bed portion, electric current conductive plate means arranged approximately in the central portion of said switch and associated with said outer rail means for electrical communication with said switch tongue means and with the wheel rims of rail vehicles passing through said switch, outer rails and inner rails, and insulated conductor means crossing each other and electrically conductively interconnecting said inner rails and the respective electric current conductive plate means of the same potential, additional electric current conductive plate means electrically connected to said inner rails and extending in the direction toward the central portion of the switch, said additional plate means having an electric current conductive surface for engagement with the wheel rim of a rail vehicle passing through said switch.