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Claus et al.

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[54] **SWITCH FOR RAIL VEHICLES**

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[73] Assignee: **Krupp Huttenwerke AG,** Alleestr., Germany

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[30] **Foreign Application Priority Data**

Mar. 27, 1971 Germany ..... P 21 14 926.8

[52] **U.S. Cl.** **246/446**

[51] **Int. Cl.** **E01b 7/00**

[58] **Field of Search** 238/150; 246/415, 246/416, 246, 445, 446, 430, 431, 333

[56] **References Cited**

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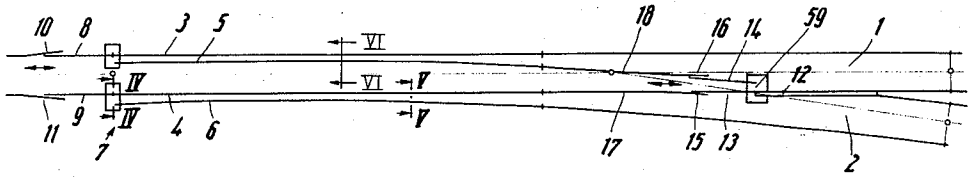
Assistant Examiner—Richard A. Bertsch
Attorney—Ralph D. Dinklage et al.

[57] **ABSTRACT**

An improvement in a switch for rail vehicles having a switch and pivoting frog in which the frog point can be joined to either of the rails which are disposed within the frog wherein there are longitudinally displaceable rails ahead of the switch which can be brought to contact a set of movable lateral deflectable rails. A system is disclosed wherein there are non-movable rails, i.e., non-pivoting rails ahead of the frog point of the switch. According to the disclosure branch track rails are provided which can be elevated or depressed with respect to the main track rails suitably at the beginning of the entrance of the switch. These rails can be canted.

17 Claims, 9 Drawing Figures



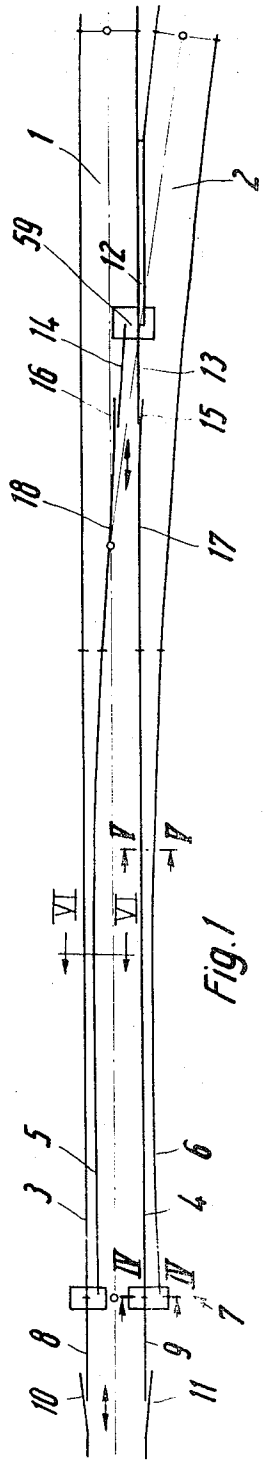


Fig. 1

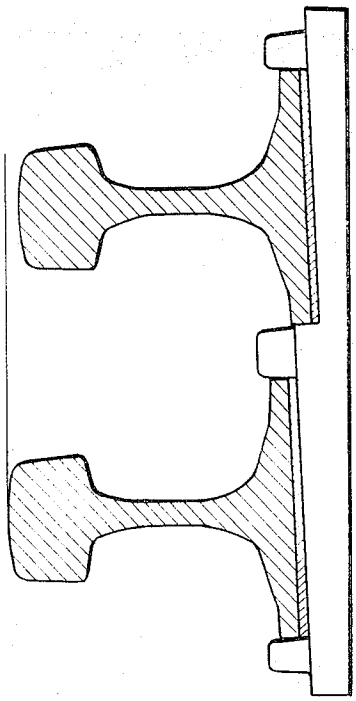


Fig. 9

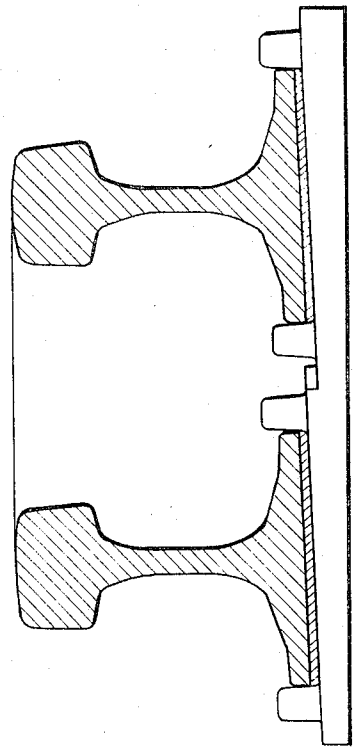


Fig. 8

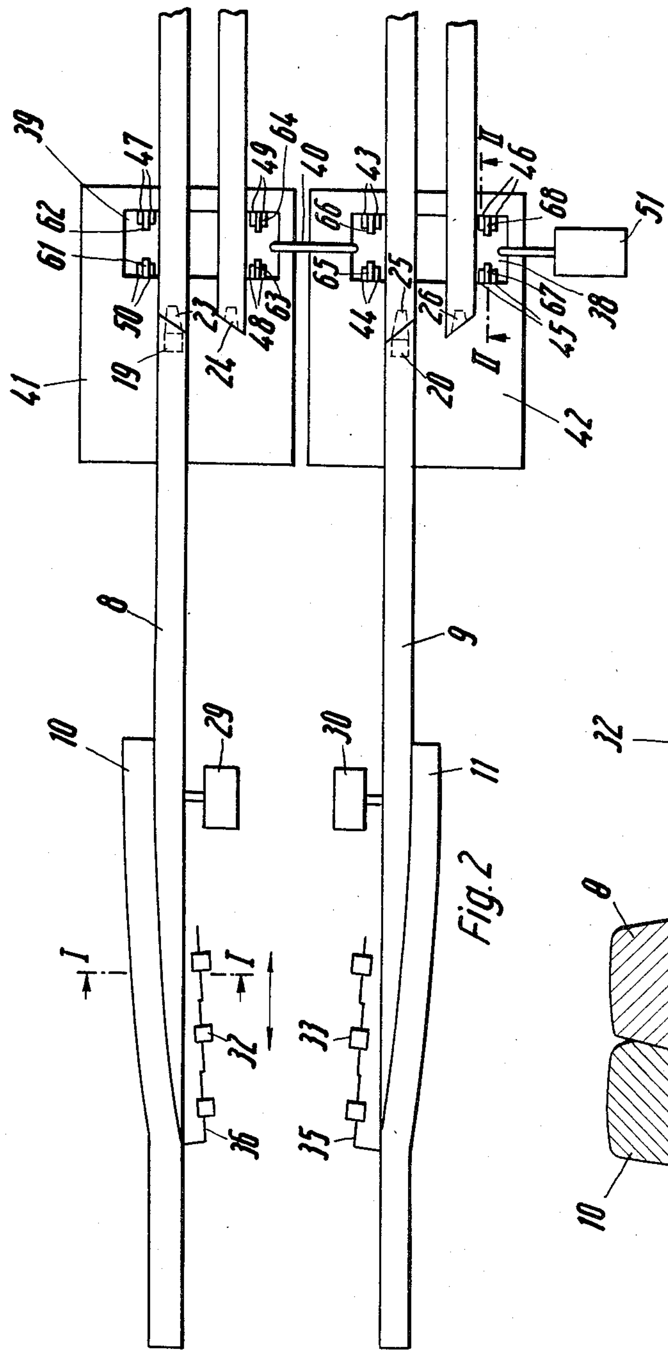

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Fig. 2

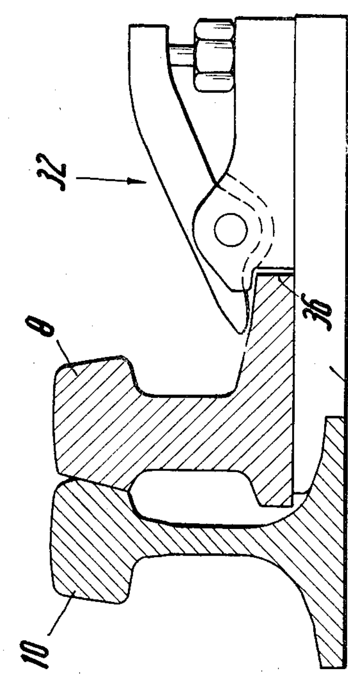
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Fig. 3

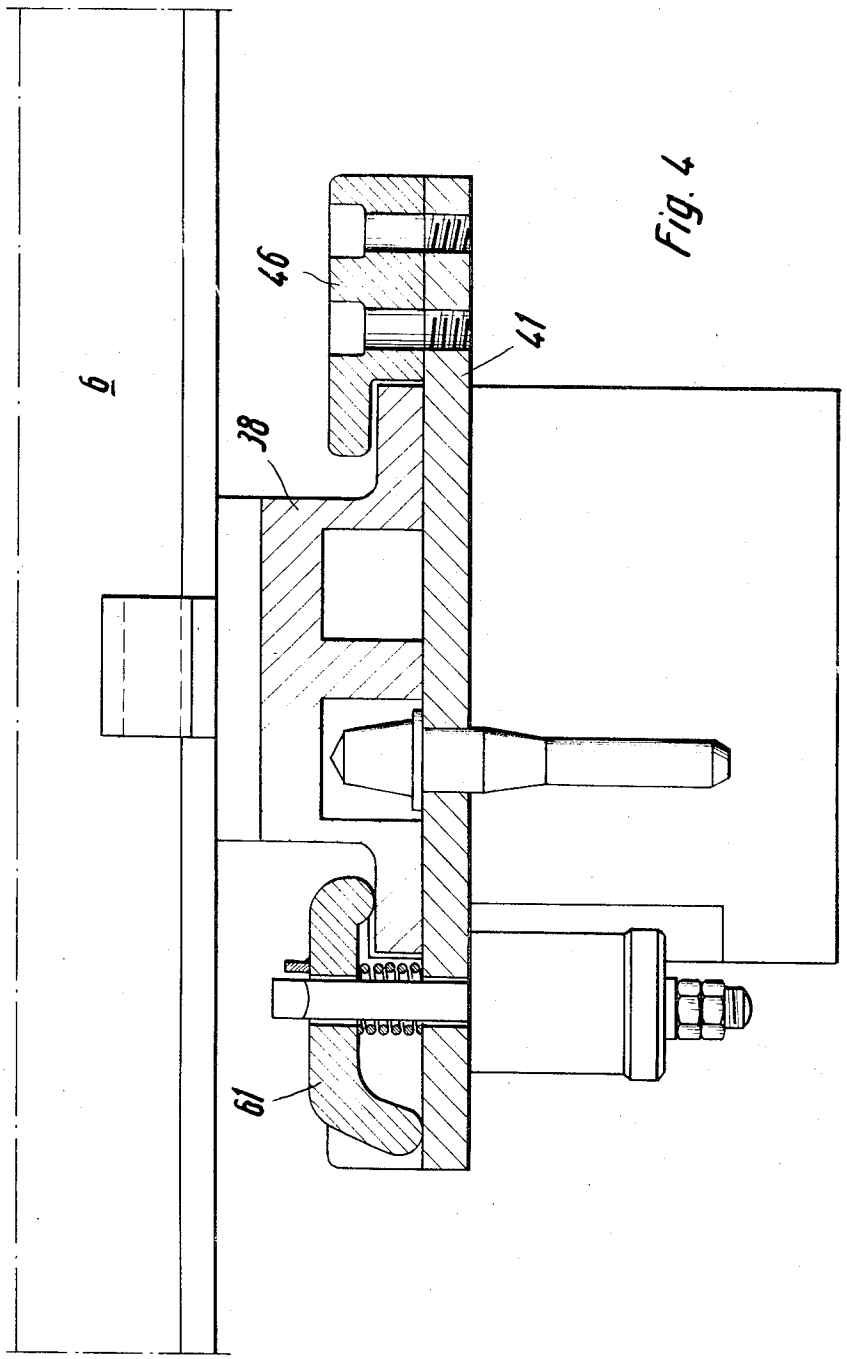

Fig. 4

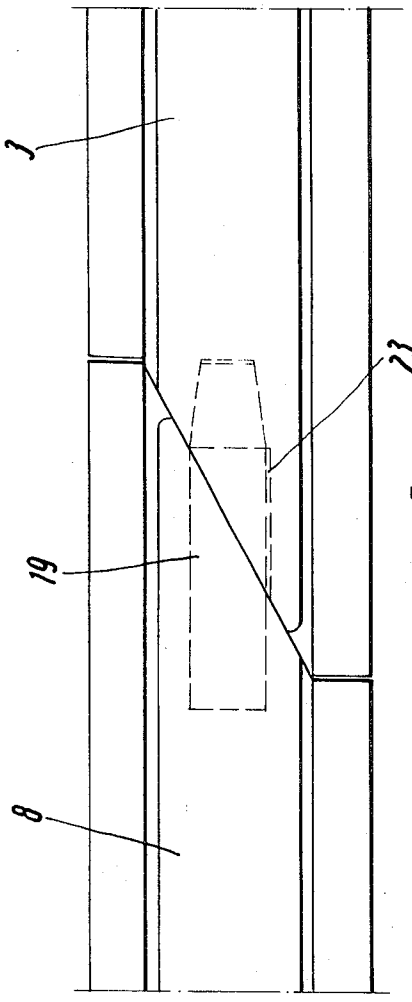

Fig. 5

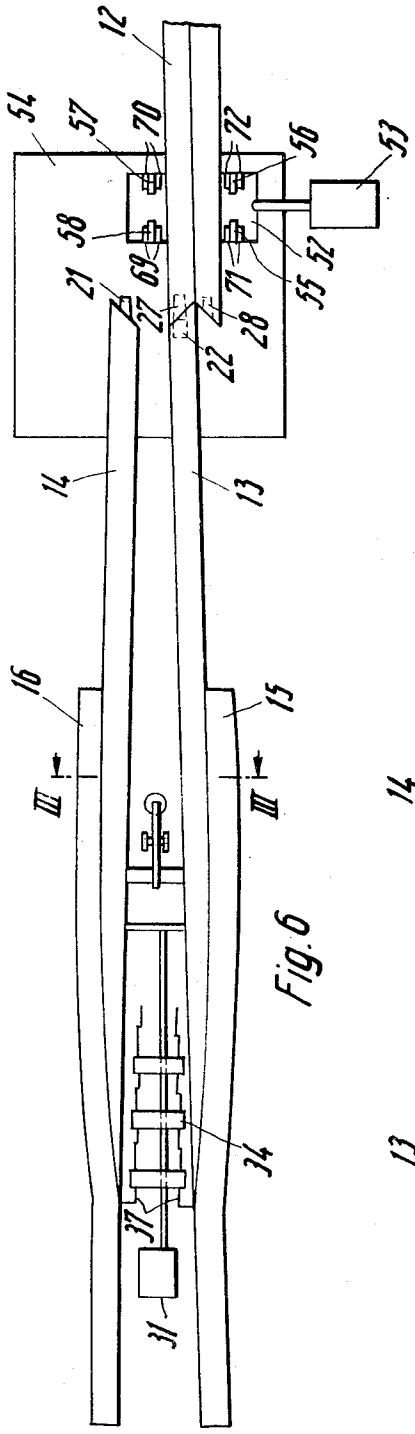
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Fig.6

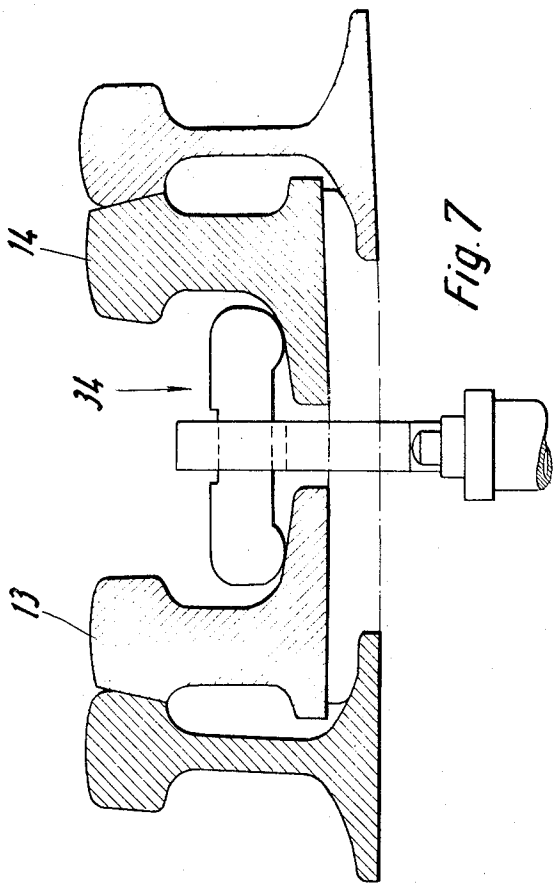
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Fig.7

SWITCH FOR RAIL VEHICLES

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a switch system utilizing a pivoting frog and laterally displaceable rails at the entrance to the switch wherein provision is made for longitudinally non-pivoting displaceable rails ahead of the entrance to the switch and ahead of the frog point. The rails ahead of the switch entrance abut the inside of the main track rails. The longitudinally displaceable rails ahead of the frog point abut, in one case the outside or perferably the inside of the inside rail of the branch track rails, and, in the other case, abut the outside or preferably the inside rail of the main track rails. More particularly, the invention relates to a switch for rail vehicles, which has a pivoting frog and in which the frog point can be joined in an end-to-end relationship to either of the two rails which are non-pivotally disposed within the frog and which have a flangeway between them, and wherein the main track rails and the branch track rails are separate from the main track rails ahead of the switch, are in the form of a laterally pivotable deflection unit, and can be joined in an end-to-end relationship to the rails lying ahead of the switch entrance.

DISCUSSION OF PRIOR ART

Switches with pivoting frogs are known. In a known switch of this kind the blunt-tipped, pivoting frog point can be joined in an end-to-end relationship with one of the two likewise blunt-tipped, non-pivoting main track and branch track middle rails having a flangeway between them. The non-pivoting middle rails are also incapable of movement in the direction of the rails, i.e., longitudinally. Between their blunt ends and the blunt frog point a gap is provided to permit lateral movement of the frog point. This gap causes a bump when the wheels roll over it and results in increased wear both on the rails and on the wheels of the rail vehicles. See German Pat. No. 467,798.

In another switch for rail vehicles the rails of the main and branch tracks are separate from the rails preceding the switch entrance. The ends of the rails are blunt. To enable the rails preceding the switch entrance to be joined in an end-to-end relationship with the main track or branch track rails located within the switch entrance, the rail sections preceding the switch entrance are pivotable laterally, but they are not movable longitudinally. In this switch, too, gaps are provided between the blunt ends of the rails to permit the rails to pivot. These gaps cause bumps and increased wear as the car wheels pass over them. See U.S. Pat. Nos. 2,641,690 and 3,317,725.

These rail vehicle switches with pivoting rails which can be blunt-endedly joined together have long been known, but they have not managed to win acceptance in practice, so that the switches most widely used today have pivoting, sharp-tipped frog points, stationary stock rails and sharp-tipped, pivoting switch tongues corresponding thereto. Nevertheless, this type of switch has disadvantages:

a. The point of the tongue is not located at the beginning of the arc, but is set back towards the end of the switch. This results in an abrupt angle of entrance which is perceived on the one hand as a jerk when it is struck and on the other hand through the increased wear which it causes.

b. In the case of switches of great radius, a long and consequently slender tongue is required that the tongue becomes unstable and, owing to its flexibility, tends to flutter.

c. For dynamic reasons the rails in the track are canted, at an inclination, for example, of 1:20 or 1:40. In a switch of conventional construction, a canting of the rails and tongues can be achieved only at an economically unfeasible cost.

d. In the case of stationary stock rails and movable tongues, the raising of the one rail and the lowering of the other rail of the branch track to reduce sidesway is not feasible.

e. As a rule, the frog of the switch has a stationary point. For certain applications, such as speeds in excess of 150 km/h, mixed traffic (wheels of varying tire widths), or axle loads exceeding 25 metric tons, frogs with movable points or movable guardrails are used.

In switches of very great radius, however, the frog point becomes geometrically so slender that the same disadvantages are created as in the case of slender switch tongues.

OBJECTS OF THE INVENTION

It is an object of this invention, therefore, to provide a switch system which does not have gaps at the rail entrance which cause wear on the wheels passing over the switch, as well as wear on the rails themselves.

It is another object of this invention to provide a switch system having longitudinally displaceable rails ahead of the switch entrance and ahead of the frog point which rails are non-pivotable.

It is another object of this invention to provide a switch system which does not have the above-mentioned disadvantages of prior art switch systems.

SUMMARY OF THE INVENTION

This invention is directed to an improvement in a switch for rail vehicles which switch comprises a pivoting frog in which the frog point is adaptable to be joined in an end-to-end relationship with either of the rails non-pivotingly disposed within the frog which rails form a flangeway wherein the main track rails and the branch track rails are separate from the main track rails ahead of the switch and means are provided for pivotingly effecting lateral deflection of the main track rails and branch track rails at the entrance to said switch, said improvement comprising longitudinally displaceable non-pivoting rails positioned ahead of the switch entrance, which rails are adaptable on one end thereof to abut in end-to-end relationship a pair of pivotingly laterally deflectable rails deflectable by said means for pivotingly effecting lateral deflection and on the other end to abut the inner edge of the main track rails; longitudinally displaceable non-pivotingly rails positioned ahead of the frog point, one rail of which on one end is adaptable to abut the inner edge of the inside rail of the branch track rails, the other rail of which on the same end is adaptable to abut the inner edge of the inside rail of the main track rails, each of said rails at different pivot positions of the frog point adaptable to abut a pivoting rail at said frog point in end-to-end relationship.

In a particularly desirable embodiment, means are provided ahead of the switch for lateral guidance of the longitudinally displaceable non-pivoting rails against the inner edge of the main track rails ahead of the

switch; the end of said main track rails is tapered outwardly to accommodate a disposition of the longitudinally displaceable rails against the inner edge or surface thereof. Similarly, the middle rail of the branch track rail and the middle rail of the main track rail are both tapered outwardly to receive against their inside surfaces the longitudinally displaceable rails ahead of the frog point, which rails are guided into position against the inner edge of these inside rails.

The invention utilizes longitudinally displaceable non-pivoting rails both ahead of the switch entrance and ahead of the frog point to engage pivoting rails on one side with stationary rails on the other. Such longitudinally displaceable rails avoid unnecessary gaps or the like at switch entrances and exits. The rails are moved by suitable servo motors which are coupled by means of spindles for racks and pinions to these longitudinally displaceable rails for rail extensions. They are suitably held in place against the inside ends of the non-pivoting rails by clamping means which can be actuated by hydraulic, pneumatic, mechanical or electrical means to secure the rail in its proper position. Movement of the rails is permitted by release of clamping means disposed against the flange of the rails. When the rail is set in its new position the clamping means are once again actuated to secure the rail against lateral movement.

In accordance with a preferred mode of the invention, securement of the ends of the longitudinally displaceable non-pivoting rails to the pivoting rails at the entrance to the switch and at the frog point is provided by an angle junction whereby the ends of the rails are caught at an angle to mesh with the corresponding rails to provide a junction which inhibits lateral displacement of the rails at said junction. Preferably, the longitudinally displaceable non-pivoting rails are provided with a tenon adaptable to enter a mating mortise or on the end of the pivoting rail to provide further securement against lateral displacement at the junction.

By use of longitudinally displaceable non-pivoting rails, the rails of the branch track, including the rails within the deflection area at the switch entrance, can be increasingly depressed or, on the other hand, can be increasingly elevated to provide against further side sway at the switch entrance. For the use of such a construction the rails in the switch can be disposed in an inclined position, as more fully discussed below.

The special advantages of the invention consist in the robust construction, which can be designed in accordance with the dynamic conditions involved. Such switch system readily permits canting of the rails and the elevation or depression of the branch track in respect of the main track rails. In the switch, except for the very short rail extensions, all of the rails within the switch and the frog point can consist of standard, unthinned rail cross-sections and the rails, while being tightly held on the saddles, can be clamped in the desired end position. This is especially desirable in the case of switches with great radii of curvature for high speeds.

BRIEF DESCRIPTION OF DRAWINGS

The invention will be further explained with the aid of a drawing representing a preferred embodiment thereof.

FIG. 1 is a schematic plan view of a switch.

FIG. 2 shows the deflection unit at the switch entrance and the rail extensions leading to the switch entrance, in a plan view.

FIG. 3 shows the rail extension in a cross section taken along line I—I of FIG. 2. The clamping means 32, however, are shown as if the view, in that respect, were an end view.

FIG. 4 shows the deflection unit at the switch entrance in a cross section along the line II—II of FIG. 2.

FIG. 5 is an enlarged plan view of an angled rail junction at the switch entrance.

FIG. 6 shows the frog of the switch with the rail extensions facing the frog point and one of said extensions 13 engaged with a pivoted rail.

FIG. 7 shows a cross-section taken along line III—III of FIG. 6 through the rail extensions ahead of the frog.

FIG. 8 is a sectional elevation taken along line IV—IV of FIG. 1, illustrating the canting of the rails at line IV—IV of FIG. 1 and

FIG. 9 is a sectional elevation taken along line V—V of FIG. 1, illustrating the lowering or raising of the branch rails in respect of the main track rails. FIG. 9 is also a sectional view taken along the line VI—VI of FIG. 1 illustrating the lowering or raising of the branch rails in respect of the main track rails. For instance, if FIG. 9 is a sectional view of V—V, then the main track rails are elevated with respect to the branch rails. If FIG. 9 is a sectional view along the line VI—VI, then the main track rails are depressed with respect to the branch rails. Thus FIG. 9 can show both embodiments, i.e., when the branch rails are lowered or when the branch rails are raised with respect to the main track rails.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The switch represented in FIG. 1 consists of the straight-running main track 1 and the branch track 2 departing from the main track 1. The rails 3 and 4 of the main track 1 and the rails 5 and 6 of the branch track 2 are invariable in their spacing from one another and are locked together in a laterally pivotable deflection unit 7. Ahead of the switch entrance lie two tongue-shaped rail extensions 8 and 9 which are longitudinally displaceable on slide plates 60 and which lie against the inner sides of the outwardly bent or tapered rail ends 10 and 11 of the main track 1 located ahead of the switch entrance. These rail extensions 8 and 9 are non-pivotable. In like manner, two rail extensions 13 and 14 disposed ahead of the frog point 12, which are joined together at an invariable distance from one another forming a flangeway 59 between them, and which are displaceable longitudinally on slide plates, lie against the inner sides of outwardly bent ends 15 and 16 of the middle rails 17 and 18 of main rail 1 and branch rail 2. These rail extensions 13 and 14 are also non-pivotable.

The ends of rails 3 to 6 at the switch entrance and the tip of the frog point 12 and the ends of the rail extensions 8, 9, 13 and 14 facing them are designed in the form of angled junctions, the longitudinally engageable coupling means being in the form of tapered tenons 19, 20, 21 and 22 and matching mortise bores 23, 24, 25, 26, 27 and 28. Such is seen in FIGS. 2 and 6 and in the enlargement of FIG. 5.

Servo motors 29, 30 and 31 are coupled, by means of spindles or racks and pinions, to the rail extensions

8, 9, 13 and 14 for the longitudinal displacement thereof. During the displacement the rail extensions 8, 9, 13 and 14 are laterally guided by the rail end portions 10, 11, 15 and 16 engaging them and by the dogs of clamping means 32, 33, 34 which are affixed to the corresponding slide plates 60 and engage the rail flanges. To prevent the rail flanges on rail extensions 8, 9, 13 and 14 from jamming during displacement, the rail flanges have step-like guiding edges 35, 36, 37, running parallel to the rail end portions 10, 11, 15 and 16. To lock the rail extensions 8, 9, 13 and 14 against longitudinal displacement, the clamping means 32, 33 and 34 have hydraulically actuated dogs engaging the rail flanges, as shown in detail in FIGS. 3 and 7.

In the deflection unit, as seen in FIG. 2, the rails 3 to 6 are mounted with invariable spacing on a plurality of saddles 38, 39, arranged in series, only one pair of saddles being represented in the drawing. Two adjacent saddles 38, 39, are joined together with the invariable spacing by a connecting bar 40, with provision for adjustment. The saddles 38 and 39 are mounted for lateral displacement on slide plates 41 and 42 which remain stationary. In the rail junction area, plates 41 and 42 are widened to provide better suport for the rail junctions. The saddles 38 and 39 are guided in the guiding means 43, 44, 45, 46, 47, 48, 49 and 50 affixed to slide plates 41 and 42 and can be locked in place by means of the hydraulically actuated clamping means 61, 62, 63, 64, 65, 66, 67 and 68. Details of the deflection unit 7 are shown in FIG. 4. A servo motor 51, which can be coupled to saddles 38 and 39 through a threaded shaft or rack-and-pinion drive, for example, serves for the shifting of the deflection unit 7. Suitably, the clamping means can be pneumatically, mechanically or electrically actuated.

The frog point 12 is, like the deflection unit 7, mounted on a plurality of saddles 52 arranged in series, which are guided by guiding means 69, 70, 71 and 72 and are laterally displaceable on stationary slide plates 54 by means of a servo motor 53, and which can be locked in place by hydraulically actuated clamping means 55, 56, 57, and 58 engaging the saddle. In the rail junction area the saddle 52 is widened for better support of the rail junction.

The switch is operated in the following manner.

First let it be assumed that the switch is set to let traffic pass through on main track 1. This setting is shown in the drawing. To switch traffic into branch track 2, first all of the hydraulic clamping means 32 to 34, 61 to 68 and 69 to 72 are released. Then the servo motors 29 to 31 of track extensions 8, 9, 13 and 14 are energized and the rail extensions 8, 9, 13 and 14 are disengaged from rails 3 to 6 and from frog point 12. Then the servo motor 51 of deflection unit 7 and servo motor 53 of frog point 12 are energized, so that the deflection unit 7 and the frog point 12 are pivoted in the plane of the drawing upwardly, i.e., clockwise away from the positions shown in the drawing. By means of suitable abutments (not shown in the drawing) provision is made to limit the switching movement so that rails 3 to 6 of deflection unit 7 and the two connections of the frog point 12 lie in alignment for coupling with the rail extensions 8, 9, 13 and 14. After the pivoting action, the servo motors 29 to 31 controlling the rail extensions 8, 9, 13 and 14 are re-energized so that the rail extensions 8, 9, 13 and 14 are displaced longitudinally and the rail extensions 8 and 9 are coupled to rails 5 and 6, and rail extension 14 is coupled to the end of frog point 12 that is associated with bore 28, with tenon 21 inserted within the mating mortise bore 28.

After the coupling action, the rail extensions 8, 9, 13, 14 and rails 3 to 6 as well as frog point 12 are again locked in place by the actuating of the clamping means 32 to 34, 61 to 68, and 69 to 72, hydraulically. The switch is then ready to guide traffic into the branch track 2.

What is claimed is:

1. In a switch for rail vehicles which switch comprises a pivoting frog in which the frog point is adaptable to be joined in end-to-end relationship with either of the rails non-pivotally disposed within the frog, which rails form a flangeway, wherein the main track rails and the branch track rails are separated from the main track rails ahead of the switch, and means for pivotally effecting lateral deflection of the main track rails and branch track rails in the switch, the improvement which comprises longitudinally displaceable rails positioned ahead of the switch entrance which rails are adaptable on one end thereof to abut in end-to-end relationship a pair of pivotally, laterally deflectable rails deflectable by said means for pivotally effecting lateral deflection and on the other end to abut one of the inner edges of the main track rails; longitudinally displaceable non-pivoting rails positioned ahead of the frog point, one rail of which on one end is adaptable to abut one of the inner edges of the inside rail of the branch track rails, the other rail of which on the same end is adaptable to abut one of the inner edges of the inside rail of the main track rails, each of said rails at different pivot positions of the frog point adaptable to abut a pivoting rail at said frog point.

2. An improvement according to claim 1 wherein said branch track rails have an increasingly elevated position with respect to said main track rails, beginning at the entrance of said switch.

3. An improvement according to claim 1 wherein all rails are disposed in an inclined position.

4. An improvement according to claim 1 wherein said branch track rails have an increasingly depressed position with respect to said main track rails, beginning at the entrance of said rails.

5. An improvement according to claim 1 wherein means are provided ahead of the switch for lateral guidance of the longitudinally displaceable, non-pivoting rails against the inner edge of the main track rails ahead of the switch.

6. An improvement according to claim 5, wherein the ends of the main track rails ahead of said switch are tapered outwardly and said rails are adaptable to accommodate the ends of said longitudinally displaceable rails against the inner edge thereof and the middle rail os the branch track rail and the middle rail of the main track rail in said switch are tapered outwardly to accommodate said longitudinally displaceable rails ahead of the frog point against their inner surfaces.

7. An improvement according to claim 6 wherein said longitudinally displaceable rails are displaceable through the action of servo motors coupled therewith.

8. An improvement according to claim 6 wherein the ends of said longitudinally displaceable non-pivoting rails and the facing ends of the laterally displaceable pivoting rails jone one another in end-to-end relationship in the form of an angle junction when said rails abut.

9. An improvement according to claim 8 wherein the ends of said longitudinally displaceable, non-pivoting rails facing said pivoting rails are provided with a tenon and the ends of said pivoting rails facing said longitudinally displaceable, non-pivoting rails are provided with a mating mortise bore wherein said tenon is adaptable to engage said mating mortise bore.

10. An improvement according to claim 6 wherein said means for effecting lateral displacement and said frog point are mounted on saddles which are displaceably borne on fixedly disposed slide plates and are provided with guide means to facilitate the said slide plates in gripping said saddles, said deflection unit and said frog point held in position by a releasable clamping means.

11. An improvement according to claim 10 wherein said clamping means can be actuated hydraulically.

12. An improvement according to claim 11 wherein

said clamping means can be actuated pneumatically.

13. An improvement according to claim 11 wherein said clamping means can be actuated mechanically.

14. An improvement according to claim 11 wherein said clamping means can be actuated electrically.

15. An improvement according to claim 6 wherein separate actuating mechanisms are provided for said means for effecting lateral deflection and said pivoting frog.

16. An improvement according to claim 5 wherein said means for lateral guidance comprises a plurality of releasable clamps adapted to engage the flange of a rail, said clamping means disposed along the inside edge of the main track rails ahead of the switch.

17. An improvement according to claim 16 wherein said clamps are pneumatically actuated.

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