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DESCRIPTION

The present invention relates to the field of railway points and crossings and more specifically to the particular geometry of said points and crossings

5 The application of the present invention relates to all points and crossings for railway vehicles. The points and crossings ensure the support and guidance of vehicles at junctions and enable the division of a railway line by splitting a main track into two diverging tracks. Generally, said points and crossings are divided into three portions:

- a first portion which forms the switch portion and comprises the mobile switches
- 10 and the switch rails,
- a second intermediate portion, formed by the plain track, and
- a third portion which comprises the frog and the guard rails.

At the division of the railway line, at least one of the diverging tracks deviates having a curved geometry so as to separate its own line from that of the second diverging track. The

15 formation of the curvature of this curve imposes quite a few technical constraints, particularly due to the centrifugal force exerted on the moving vehicle guided by the diverging track.

Furthermore, when a vehicle traverses the railway points and takes the diverging track, it is subjected, due to the curvature of the track, to impact at the entry point of the switches, the force of which has an adverse effect on the vehicle but also on the structure of

20 the railway points. This causes the switches of the railway points to be subjected to greater wear at their respective ends positioned at the entry to the railways points. Document DE 1083843 thus proposes a geometric arrangement of the tip of the switch to enable the reduction of wear at the end of the structure of this element.

An optimal solution for managing the impact between the wheels of the vehicle and

25 the railways points consists of using a switch, the curvature of which has a geometric layout tangential to the joint of point JP of the switch; this joint of point JP is a theoretical point, where the switch joins the switch rail, which extends the switch beyond the real tip of the switch PRA. However, if such a solution, represented in figure 1, is ideal in terms of managing the forces exerted on the faces of the switch at the entry to the railway points, it also has the

30 disadvantage of imposing a wide curvature with a change of direction that only comes into effect after a long distance. The long distance of this tangential curvature thus requires sufficient space for the railways points to be positioned correctly and does not allow the mechanism to be set up in areas where there are space restrictions. Furthermore, the long distance of the curvature is carried forward to each of the elements of the railway points. The

different elements of the railways points are then longer and require machining which makes them even more expensive.

To overcome these various constraints, a solution has been proposed by document FR 2 608 647. According to this solution the point of departure in the switch of the cycloidal arc of the curvature precedes the point of departure of the blades of the railway switch with an arc of the circle geometry of the curvature which is oriented tangentially to the deviating axis of the diverging track. However, a vehicle moving on a railway line has a natural rocking movement which can shift the impact between the wheels of the vehicle and the railway points more deeply into the switches. Also, in the arrangement of the mechanism of the document FR 2 608 647, despite the shift of the geometry in the arc of the circle of the curvature, this solution does not take into account the shift of a point of impact attributable to the rocking movement of the vehicle.

The aim of the present invention is to overcome these disadvantages.

For this purpose the subject-matter is a switch for railway points characterised in that it comprises a geometric layout arranged to form over the whole of its length at least one angle with the main axis of displacement of a vehicle wheel impacting the switch at a considered point, the angle formed having a discontinuous variation over the length of the switch, such that this angle generates a force of impact which is inversely proportional to the probability of impact between a vehicle wheel and the switch at the considered point.

The subject-matter of the invention is also a deviating branch for railway points formed by one or more support and/or guiding elements of at least one vehicle wheel, characterised in that it integrates at least one switch according to the invention.

The subject-matter of the invention is also a railway points system characterised in that it integrates at least one switch and/or a deviating branch according to the invention.

The invention explained in more detail in the following description, which relates to preferred embodiments, given by way of a non-restrictive examples, and explained with reference to the attached schematic drawings in which:

- figure 1 is the schematic representation of the geometry of a switch of the railway points according to the prior art relative to the straight axis of a switch rail, the switch having a tangential geometry relative to the joint of the tip,

- figure 2 is the schematic representation of the geometry of a switch of the invention according to a first embodiment relative to the straight axis of a switch rail, the intermediate portion of the switch being straight,

- figure 3 is the schematic representation of the geometry of a switch of the invention according to a second embodiment relative to the straight axis of a switch rail, the intermediate portion of the switch forming a curve,

- figures 4a and 4b which are respective schematic representations, according to a section perpendicular to the axis of the rails of a railway points system, of a torque of perfect wheels and a torque of non-perfect wheels positioned on a railway points system where the torque of the wheel has been subjected to a lateral displacement imposed by the switch.

The invention relates to a railway points system, or a switch device, and particularly to the geometry of at least one deviating branch integrated by the system and more particularly to the switch which forms the guiding end of this deviating branch.

The switch of the invention has a geometric layout arranged to form over all of its length at least one angle with the main axis of displacement of a vehicle wheel impacting the switch at a set point, the angle formed having a discontinuous variation over the length of the switch, such that this angle generates a force of impact which is inversely proportional to the probability of impact between a vehicle wheel and the switch at the set point. This geometric layout enables the switch to have on the one hand an angle of impact which is smallest at the entry to the railway points and on the other hand an angle of impact that is greater in depth of the railway points. Thus, the angle of impact is on the one hand smaller at the end of the switch where the probability of impact between a vehicle wheel and one of the lateral faces of the switch is the greatest and on the other hand on the contrary greater when this probability of impact decreases. The geometric layout of the switch of the invention thus makes it possible to limit the wear caused by the impact of vehicle wheels on one of its lateral faces.

In a general manner the switch of the invention has a geometric layout such that in a direction oriented from the entry to the exit of the railway points, this layout has:

- a first straight portion 1 forming a first angle with the main axis of displacement of a vehicle wheel,

- a second portion 2a, 2b, or intermediate portion, forming at least a second angle with the main axis of displacement of a vehicle wheel, such that this second angle is at least greater than the first angle,

- a third portion 3 extending the second portion 2a, 2b and forming a defined curve R1.

The main axis of displacement of a vehicle wheel, which enters the railway points at the end of the switch, corresponds essentially to an axis parallel to the axis of the switch rail

of the railway points. The first angle, which the first portion 1 of the switch forms, has an angle of impact 6, preferably in the order of 0.05° to 0.5° and ideally in the order of 0.1° to 0.3° , which is defined as a function of the speed and the radius selected. This first angle of impact 6, borne by the first portion 1 of the switch, is positioned at the end of the switch at the entry to the railway points, at the portion 1 of the switch where the probability of impact between a vehicle wheel and one of the lateral faces of the switch is the greatest.

According to a preferred embodiment, this first angle of impact 6 has an angle which is sufficiently small to limit the force of impact between a vehicle wheel and one of the lateral faces of the switch. According to a non-limiting feature of the invention, the first angle 6, borne by the first portion 1, is formed by a variation in width of the switch. Thus the switch, from its tip, which forms a fine end towards the body which widens until it reaches the standard width of a rail, has a variation in width which defines the first angle of impact 6. The length of the switch, which bears this increase in width of the switch, then forms the first portion 1 of the switch.

The second angle 7, that the second portion 2a, 2b of the switch or intermediate portion forms, itself has an angle of impact greater than the first angle of impact 6, i.e. preferably in the order of 0.2° to 0.8° and ideally in the order of 0.3° to 0.7° , and which is defined as a function of the speed and the selected radius. This second angle of impact 7 borne by the second portion 2a, 2b of the switch is positioned following the first portion 1 of the switch, at a greater depth relative to the end located at the entry of the railway points. This second angle of impact 7, which has a greater angle than that of the first angle of impact 6, is then located along the portion 2 of the switch, where the probability of impact between a vehicle wheel and one of the lateral faces of the switch is smaller.

The third portion 3 of the switch is positioned following the second portion 2a, 2b of the switch and forms a curve R1, the curvature of which corresponds to the curvature defined by the deviating branch and is followed by the frog of the railway points.

It should be noted that in order that a vehicle can move along two parallel rails, the wheels of the vehicle are conical, such that the width which separates two opposite wheels of a vehicle is shorter than the width which separates the two parallel rails of a railway network. This difference in width prevents the wheels getting stuck between the rails, but also creates a natural rocking movement exerted by the whole vehicle when moving on a railway track. This natural rocking movement then acts on the point of impact of the wheel of the vehicle against the switch by shifting the point of impact to a greater or lesser depth along the switch relative to the end located at the entry of the railway points.

When the wheel of the vehicle is in perfect shape it has a mode of functioning and behaviour which is essentially identical, or at least very close, to that of a new wheel or a theoretical model of functioning.

According to the invention, the first portion 1 corresponds to the length of the switch
5 which bears all of the potential points of impact between a perfect vehicle wheel and the switch. This first portion 1 is then formed by the length of the switch located between the end of the switch and the point of the switch at which the lateral displacement imposed by the switch on this perfect wheel corresponds to the difference 11 which exists between the width 10 separating two perfect opposite wheels of a vehicle and the width 9 separating the two
10 parallel rails of a railway network, as represented in figure 4a. Thus, the switch of the invention is characterised in that the first straight portion 1 is positioned over the distance of the switch which bears at least all of the points of impact likely to occur between the switch and a perfect wheel of the vehicle.

When the wheel of the vehicle is in a non-perfect condition, it has a mode of
15 functioning and/or behaviour which differs from that of a new wheel or a theoretical model of functioning. Non-perfect wheels correspond currently to worn wheels. As a result of wear the conical form of the wheels deepens and the width which separates two opposite non-perfect wheels of a vehicle is smaller than that which would separate two perfect opposite wheels of the same vehicle. Consequently, the natural rocking movement of a vehicle equipped with
20 non-perfect wheels becomes greater than when the same vehicle is equipped with perfect wheels. Due to this smaller separation between two opposite wheels of the vehicle and the greater rocking movement, the non-perfect wheels of the vehicle are more likely to have an impact on the switch, located more deeply in the railway points mechanism.

According to the invention, the second portion 2a, 2b corresponds to the length of the
25 switch which bears all of the potential points of impact between the switch and a non-perfect wheel of the vehicle and which are not positioned on the first portion 1 of the switch. This second portion 2a, 2b is then formed by the length of the switch located between the first portion 1 and the tip of the switch at which the lateral displacement imposed by the switch on this non-perfect wheel corresponds to the difference 13 between the width 12 which
30 separates two opposite non-perfect wheels of a vehicle and the width 9 which separates the two parallel rails of a railway network, as illustrated in figure 4b. Thus, the switch of the invention is characterised in that the second portion 2a, 2b is positioned over the distance of the switch which bears at least all of the points of impact which may exist between the switch

and a non-perfect wheel of the vehicle and which are not positioned on the first portion 1 of the switch.

According to a first particular embodiment of this second portion 2a, presented in figure 2, this second portion 2a is straight. The difference between the first angle of impact 6 of the first straight portion 1 and the second angle of impact 7 of the second straight portion 2a forms a break in continuity in the geometric profile of the switch at a junction point 4. This break in continuity thus forms a kink between the first portion 1 and the second portion 2a of the switch. Likewise, the junction 5 between the second portion 2a and the curve R1 of the third portion 3 of the switch may have break in continuity when the angle 8, that the end of the curve R1 of the third portion 3 forms, is different from and/or greater than the second angle of impact 7 of the second straight portion 2a.

According to a second particular embodiment of this second portion 2b, presented in figure 3, this second portion 2b is formed by a curve R2, the radius of the curvature of which is lower than the radius of curvature of the curve R1 of the third portion 3 or of the exit of the railway points and/or the length of which is shorter than the length of the curvature of the curve R1 of the third portion 3 or of the exit of the railway points. In this second embodiment the junction points 4, 5 between respectively on the one hand the first 1 and second 2b portions and on the other hand the second 2b and third 3 portions, cannot form a break in a kink of the geometric layout but on the contrary a progressive modification of the angle of impact. Thus the curve R1 of the second portion 2b has an angle of impact at its end at the junction point 4 with the first portion 1, which is at least equal to the angle of impact 6 of the first portion 1. Likewise, the angle of impact of this curve at its end at the junction point 5 with the third portion 3 is at most equal to the angle of impact of the third portion 3 at this junction point 5.

According to a particular embodiment, the second portion 2b is formed by a curve R2, the length of which is shorter than the length of the first portion 1 of the switch.

These different variants of the switch make it possible to limit the impact of vehicle wheels on the lateral face of the switch, which causes the deviation of these wheels, at the same time allowing constraints of length and curvature. Furthermore, this reduction of the length imposed by the geometry of the switch also enables a reduction of the amount of machining and indirectly a reduction of at least a portion of the manufacturing costs.

The switch of the invention, in all its variants, is adapted to be integrated into a deviating branch for railway points, said deviating branch also being able to be formed by one or more support and/or guide elements of at least one vehicle wheel. The deviating branch,

by integrating a switch having the particular geometric layout of the invention, has itself a geometric layout making it possible to limit the impact of vehicle wheels on one of the lateral faces of the rail which causes the deviation.

The switch and the deviating branch of the invention are adapted to integrate a
5 railway points system, in particular of the switch type.

Of course, the invention is not limited to the embodiments described and represented in the attached drawings. Modifications are still possible, in particular with regard to the formation of the various elements or by substituting equivalent techniques, without departing as such from the scope of protection of the invention as defined by the attached claims.

PATENTKRAV

1. Tungeskinne til en sporskifteindretning, med en geometrisk trace, som over hele sin længde i det mindste danner en vinkel med hovedaksen for forskydning af et køretøjshjul, som samvirker med tungeskinnen i et betragtet punkt, idet den dannede vinkel har en diskontinuerlig ændring over længden af tungeskinnen, således, at denne vinkel genererer en stødskraft, som er omvendt proportional med sandsynligheden for sammenstød imellem et køretøjs hjul og tungeskinnen ved det betragtede punkt, hvor stødvinklen således er mindre ved den ende af tungeskinnen, hvor sandsynligheden for sammenstød er størst, og større langs tungeskinnen, når sandsynligheden for sammenstød reduceres, **kendetegnet ved, at** den geometriske trace langs en retning orienteret fra indgangen til udgangen for sporskiftet omfatter
- en første lige del (1), som danner en første vinkel (6) med hovedaksen for forskydning af et køretøjs hjul og placeret over den længde af tungeskinnen, som omfatter i det mindste alle de stødsteder, som kan optræde imellem tungeskinnen og en perfekt hjulmodel for køretøjet, som har en teoretisk driftsmodel, hvilken første del (1) er dannet af den længde af tungeskinnen som er beliggende mellem enden af tungeskinnen og det punkt ved hvilket den laterale forskydning, som påføres af tungeskinnen på denne perfekte hjulmodel svarer til den forskel (11), som foreligger imellem på den ene side den bredde (10), som adskiller to perfekt overfor hinanden liggende køretøjshjulmodeller, som svarer til de teoretiske driftsmodeller og på den anden side den bredde (9), som adskiller de to parallelle skinner i et jernbanenetværk,
 - en anden del (2a, 2b), som danner i det mindste en anden vinkel (7) med hovedaksen for forskydning af et køretøjs hjul, således at denne anden vinkel er i det mindste større end den første vinkel (6) og er placeret over den længde af tungeskinnen, som i det mindste omfatter alle de stødsteder, som kan optræde imellem tungeskinnen og en ikke perfekt køretøjshjulmodel, hvis driftsmodel ligger fjernest fra den teoretiske perfekte hjuldriftsmodel, og som ikke er anbragt på det første afsnit (1) af tungeskinnen, idet dette andet afsnit (2a, 2b) så er dannet af den længde af tungeskinnen, som er anbragt imellem den første del (1) og i det mindste det sted på tungeskinnen, på højde med hvilket sidebevægelsen, som denne ikke perfekte hjulmodel af tungeskinnen påtvinges, svarer til forskellen (13) imellem på den ene side bredden (12), som adskiller to ikke perfekte overfor hinanden anbragte hjul på et køretøj, som har driftsmodeller, som er længst fra den teoretiske model

for det perfekte hjul, og på den anden side bredden (9), som adskiller de to parallelle skinner i et jernbanenetværk,

- en tredie del (3), som forlænger den anden del og danner en kurve (R1) med defineret krumning.

5

2. Tungeskinne til en indretning ifølge krav 1, **kendetegnet ved, at** den første lige del (1) tilvejebringer den første vinkel (6), som dannes ved en breddeændring af tungeskinnen.

10 3. Tungeskinne til en indretning ifølge ethvert af kravene 1 eller 2, **kendetegnet ved, at** den anden del (2a) er lige.

4. Tungeskinne til en indretning ifølge ethvert af kravene 1 eller 2, **kendetegnet ved, at** den anden del (2b) er dannet af en kurve, som har en krumning, hvis radius er mindre end radius for krumningen i kurven (R1) for den tredie del (3) eller for udgangen fra sporskiftet og/eller hvis længde er mindre end længden af kurven (R1) eller den tredie del (3) i udgangen fra sporskiftet.

15

5. Tungeskinne til en indretning ifølge ethvert af kravene 1 eller 2 og 4, **kendetegnet ved, at** den anden del (2b) er dannet af en kurve (R2), som har en krumning, hvis længde er mindre end længden af den første del (1) af tungeskinnen.

20

6. Devierende gren til et sporskifte, som er dannet af et eller flere støtte- og/eller føringselementer for i det mindste ét køretøjs hjul, **kendetegnet ved, at** i det mindste én tungeskinne ifølge ethvert af kravene 1 til 5 er integreret.

25

7. Sporskifteindretning, **kendetegnet ved, at** i det mindste én tungeskinne ifølge ethvert af kravene 1 til 5 og/eller en devierende gren ifølge krav 6 er integreret.

30

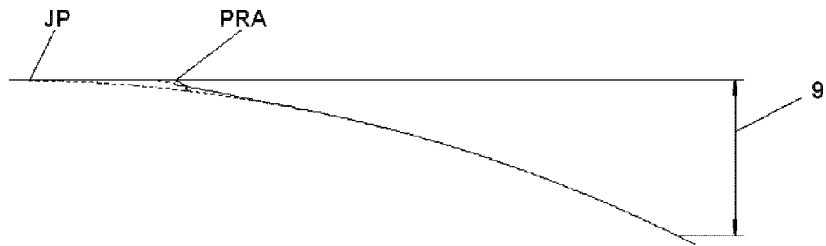


Fig. 1

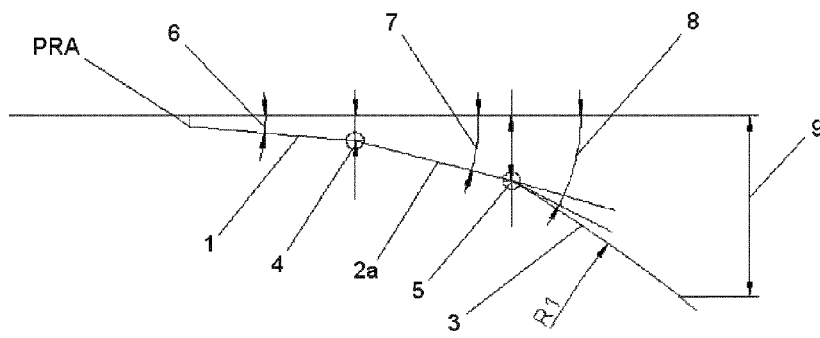


Fig. 2

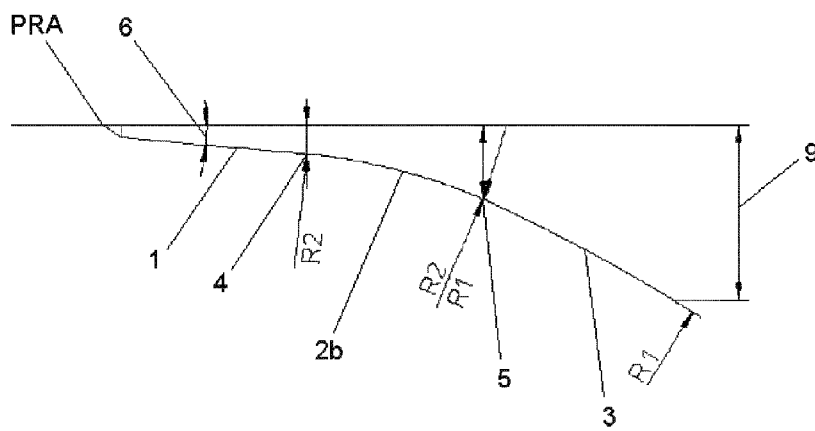


Fig. 3

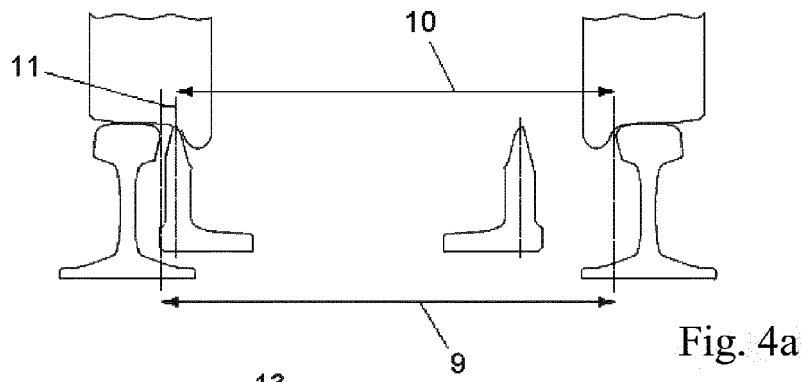


Fig. 4a

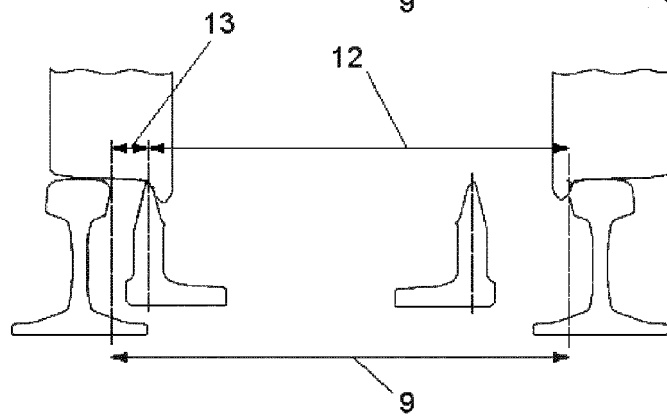


Fig. 4b