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(54) Bogies for railway vehicles with variable gap between wheels.

(57) Bogies for railway vehicles with variable gap between wheels, consisting of a center frame (1), to which four oscillating arms are united by means of relative joints (2), at each of which ends bearing boxes for each rolling assemblies (3) are housed, which can be transversely moved, the wheel being located in each of two positions corresponding to two gauges, relying on the fact that the opposed portion of each arm rests on a helical spring (4), the lower end of which is resting on the center frame bottom, and at the end of this portion there is mounted a vertical shock absorber (5).

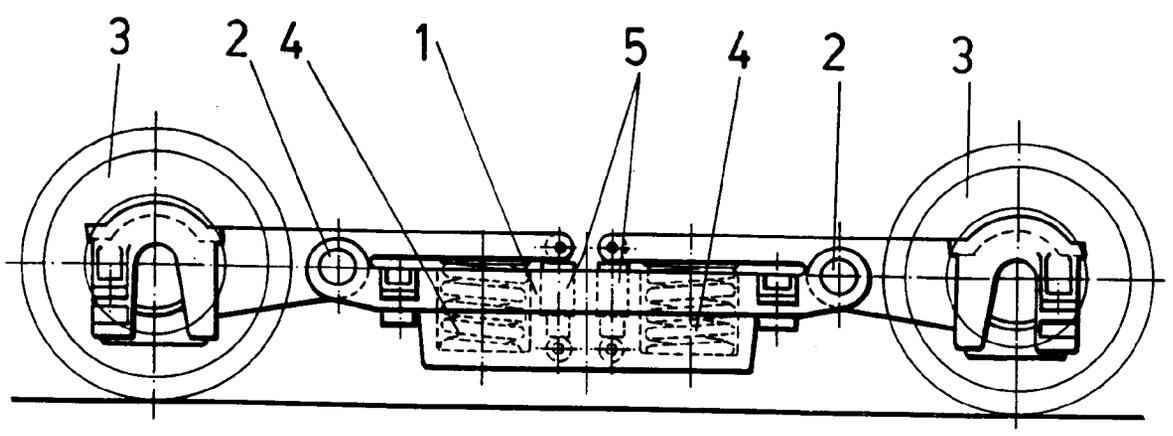

FIG.-1

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BACKGROUND OF THE INVENTION

The present specification relates to a Patent of Invention concerning bogies for railway vehicles with variable gap between wheels, the evident object of which is to allow a variable gap between the bogie wheels, the bogie being equiped with independent wheels, and checking that each rolling assembly is composed of a wheel fixed to an independent axle provided with bearings located at both ends, relying on the possibility of displacing each complete rolling assembly, the arrangement of the bearing boxes changing only and exclusively in relation to the bogie.

FIELD OF THE INVENTION

This invention applies to the industry engaged in the construction of railway vehicles, and its general application being also to the railway industry.

RELATED ART

It is well known the present problem posed by the different gauges existing in some railway networks affecting the transport of passengers and goods, this circumstance giving rise to carry out several studies and solutions in order to obviate the many drawbacks derived at present from the passenger and goods transport.

Nevertheless, no fully satisfactory solutions to this problem have been obtained up to date, specially concerning the adaptation of coaches or wagons equipped with bogies of conventional type.

One of the present solutions is to replace the whole bogies, for which it is totally necessary to raise the coach bodies, - disassembling previously the elements forming the brakes, as well as the electric mass braids, etc., these operations representing a substantial amount of lost time and which are considered as extremely laborious.

Also, it is known, at present, the realization of a series of devices to obtain an axle capable of carrying out a gap of variable wheels by a displacement on the axle body, but this potential solution does not represent a real practical solution owing to its great complexity and high cost, both in relation to acquisition and maintenance.

The main difficulty impeding to obtain an appropiate mechanism of this type is, mainly, the fastening of the wheel to the axle body so that it can give the same guarantees of safety, toughness, etc., etc., as the wheels fitted under pressure to an axle according to the typical procedure.

Besides, if it is necessary that the change is to be made - automatically in a short period of time and that sufficiently extensive distances can be travelled under perfect running conditions without the need for the mechanism to be overhauled in the maintenance workshop, it is very difficult to obtain a gear answering to all these requirements in a practical field.

It is known the existence of a Patent of Invention applied for in Spain under number 332.453, which was filed at the right moment in the name of the firm PATENTES TALGO, S.A., this firm being also the applicant for the present Patent. In said Patent the idea of using monoaxle bogies with variable gap between wheels is envisaged.

Nevertheless, in the general context of the invention, a series of requirements at present considered as strictly essential in order to obtain a good running of the railway unit are not anticipated

SUMMARY OF THE INVENTION

The bogies for railway vehicles with variable gap between - wheels as proposed by the invention constitutes, per se, a clear solution to the current problem on this matter, since in the invention it has been provided that each rolling assembly is formed by a wheel fixed to an independent axle fitted with bearings at both ends thereof, relying on the possibility of displacing each complete rolling assembly, the arrangement of the bearing boxes changing only functionally with regard the bogie.

In this way, the same features shown in a rolling assembly - envisaged for a change of gauge are practically obtained as - those existing in a conventional rolling assembly for a sole gauge.

In a more definite way, the bogies for railway vehicles with variable gap between wheels will allow a quick change of the gap between wheels when passing through a fixed installation carrying out the necessary operations for running via two networks having a different gauge.

The invention has the following advantages incorporated in - this new type of bogies.

- The rolling assemblies are the same type as the tested ones for long years in commercial service in the rolling gears used by the firm PATENTES TALGO, which is also the applicant for this Patent, composed of two wheels which are daily running on the European network and the two gauges of the Spanish network.
- The passing from one to another gauge would be effected at a gauge change installation similar to the existing ones at present to carry out the gauge change of the above-mentioned TALGO rolling assemblies.
- Both the steering and the brake conditioning is common for both gauges, not requiring any additional operation for being adapted to one or other gauge.

In general, the bogie which is the object of this invention is essentially composed of a center frame, to which four oscillating arms are united by means of corresponding joints , at one of which ends bearing

boxes for each of the rolling assemblies are housed.

Said rolling assemblies can move transversely, the wheels - being located in each of two positions corresponding to both - gauges.

The opposite part of each arms rests on the relative helical spring, the lower end of which rests on the center frame bottom.

At the end of this part, there is also mounted the relative vertical shock absorber.

Each of these assemblies, that is to say, oscillating arm - with joint, helical spring and shock absorber, constitutes the suspension of the relative rolling assembly

Apart from this primary suspension, the bogie is equipped with another secondary suspension.

In order to improve its coincidence in curves and to eliminate the dynamic effects inherent in being fitted with independent wheels, this type of bogie would be equipped with a guiding system, or the system could be adapted to an articulated bogie.

Each bogie is fitted with four rolling assemblies, each of which is composed of a semiaxle, wheel, brake discs, all them common each other, and the bearing boxes mounted at the ends of the semiaxle.

The bearing boxes have, at their upper side, a cylindrical surface on which the relative end of the oscillating arm of the bogie is resting, in the normal running position.

In order to distribute in a more even way the loads on the supporting surface, a resilient sheet can be interposed between the bearing box and the housing cradle, and said sheet must be securely fastened to one of these surfaces.

The vertical position bewteen bearing boxes and oscillating arm is, in this way, defined.

It must be born in mind, in order to obtain a good understanding of the invention, that longitudinal axles, efforts and displacements are designated those parallel to the track, and transverse ones to those perpendicular to the track, as per a horizontal plan.

Said surface being cylindrical, in a longitudinal sense, the axis of the bearing box is automatically centered on its theorical position.

The vertical flat faces, one at front and one at rear, are fitted on the relative vertical flat faces of inserts.

Between the outer casing of the bearing box and the pail - thereof, there is interposed a resilient bushing so the bearings will have a small degree of freedom to absorbe any small axial alignment error, this freedom being necessary in order that the transverse efforts caused in the running will be transmitted to the oscillating arm of the bogie through both bearing boxes of each semiaxle.

Lugs located on the front and rear vertical faces of each - bearing boxes, and which are common with it, constitute the - transverse fastening elements of the bearing boxes.

Adjusting these elements between the stop of the oscillating arm case and some latches, every transverse displacement of the bearing boxes is impeded.

The two vertical longitudinal faces of each of said lugs, wherein this contact is effected, are separated each other a distance which is similar to the half difference of gauges decreased of the latch thickness.

The latches, which are common with a bridge, are adjusted in longitudinal sense by their outer transverse faces between the two vertical faces of the oscillating arm case, their correct position being held because the latches are adjusted between the vertical longitudinal faces of the inserts which are common in the oscillating arm case.

in this manner, the latches only could be moved in vertical sense, their displacement being avoided in any other direction by means of stiff stops.

Vertically, they are fixed in their running position by means of springs, the pretension of which higher than the latching - device weight plus the dynamic force which may be produced, impedes these to descend.

Depending upon circumstances, the spring mechanism is complemented by an additional safety retaining device.

The bridge of the latching device is so designed that a "T" shaped part belonging to the fixed installation can be introduced into the lower part of said bridge. This "T" shaped part forces it to be vertically displaced, causing the latches to descend, overcoming the force opposed by springs, retainers and frictions.

Said bridge is designed in such a way that its inside adapts itself to the inclined planes existing on the dislatching guides of the fixed installation, so that they act on the central zone of the bridge.

By means of the inserts which are mounted in common on the - vertical faces of the oscillating arm case, besides to act as a transverse stop for the latches, the bridge has vertical transverse faces on which the faces of the bearing boxes are adjusted in a longitudinal sense.

A part presents a transverse guide which has an upper face inclined constituting the sliding surface of the bearing box during the transverse displacement of the rolling assembly.

The lower faces of the lugs have this same inclination and in normal running they are separated from the upper faces of the guides and parallel thereto.

When the bogie has been suspended, the bearing boxes descend until the lower faces of lugs rest on the guides, the transverse displacement being effected through this contact.

The inclination of the sliding faces of the guides impedes any particle which could hinder the side displacement of the wheel when changing the gauge

settle on them during the running.

By means of slides made of syntherized metallic material having a low coefficient of sliding friction and high compression resistance, located on the inclined planes of the lugs, the sliding of the rolling assemblies when transferring these to be positiones on each of both gauges is facilitated.

Through the vertical transverse face of the lugs, the steering of brakes accompanying the wheel in its displacement would be fastened.

BRIEF DESCRIPTION OF THE DRAWINGS

To complement the description being made here and in order to help to a better understanding of the features of this invention, the accompanying drawings, which are a part of this specification, show, in an illustrative and non limitative way, the following:

Figure 1 shows a side elevational view of the bogie for railway vehicles with variable gap between wheels which is the object of the invention.

Figure 2 shows a plan view of the object illustrated in Figure 1.

Figure 3 shows a perspective view of one of four rolling - assemblies incorporated in the bogie which is the object of the invention

Figure 4 shows a side elevational view of the cylindrical surface on which the relative end of the oscillating arm of the bogie is resting in a normal running position.

Figure 5 shows a plan view of the object illustrated in Figure 4.

Figure 6 shows a sectional detail along A-B of the object illustrated in Figures 4 and 5.

Figure 7 shows a perspective view of the vertical flat faces, one in front and one in rear, which are adjusted on the relative vertical flat faces of the inserts.

Figure 8 shows a sectional view of the object illustrated in Figure 7, corresponding to positioning and blocking elements of the bearing box in the oscillating arm case of suspension.

Figure 9 shows a detail of the object illustrated in Figures 7 and 8, along the line C-D.

Figure 10 shows a front elevational view duly sectioned from the rolling assembly and the housing cases of bearings.

Figure 11 shows a perspective view of the locking latch assembly.

Figure 12 shows a sectional view of the object illustrated in Figure 11.

Figure 13 shows a plan view of the fixed installation for - changing the gauges.

Figure 14 shows, finally, a sectional view of the centering and sliding runners resting on the sliding rail.

DETAILED DESCRIPTION OF THE PREFERRED EMBOBIMENTS

From these figures, it can be seen how the bogie for railway vehicles with variable gap between wheels, which is the object of this invention, configurates starting from a center frame 1, to which four oscillating arms are united by means of relative joints 2, at one of which ends the bearing boxes for each of the rolling assemblies 3 are housed.

These rolling assemblies 3 can transversely move, the wheels being placed in each of two position corresponding to both gauges.

The opposite side of each of the arms is resting on the relative helical spring 4, the lower end of which is resting on the center frame bottom 1.

At the end of the zone as mentioned in the above paragraph, there is mounted the relative vertical shock absorber 5.

Each of these assemblies, that is to say, oscillating arm - with joint, helical spring and shock absorber, constitutes the suspension of the corresponding rolling assembly, it being specifically understood that, apart from this primary suspension, the bogie will be equipped with another secondary suspension.

Although not shown the invention in the general figures of the bogie, in order to improve its coincidence in curves and to obviate the dynamic effects inherent in being fitted with independent wheels, this type of bogie will be equipped with a guiding system, or by means of a system which could be adapted to an articulated bogie.

Each bogie is fitted with four rolling assemblies as that shown in Figure 3, each of which is composed of a semiaxle 6, a wheel 7, brake discs 8, which are common each other, and the bearing - boxes 9 which are mounted at the semiaxle ends.

The bearing boxes 9, which can be seen in Figure 3, have, at their upper part, a cylindrical surface 10 on which there is resting, in the normal running position, the relative oscillating arm end of the bogie, such as it is shown at the sectioal view of Figure 4.

In order to distribute in a more even way the loads on the supporting surfaces, a resilient sheet can be interposed between the bearing box and the housing cradle, this sheet must be firmly adhered to one of these surfaces.

The vertical position between bearing box and oscillating arm is, in this manner, fully defined.

It must be born in mind that, for a good understanding of this description, longitudinal axles, efforts and displacements are - those are parallel to the track, and transverse ones are those elements being perpendicular to same, as per a horizontal plan.

Said surface being cylindrical, in a longitudinal sense, the axis of the bearing box is automatically centered in its theorical position.

The vertical flat faces 11, one at front and one at

rear, are fitted on the relative vertical flat faces of inserts 12 and 13.

Between the outer casing of the bearing box and the pail thereof, there is interposed a resilient bushing so that the bearings will have a small degree of freedom to absorbe any small axial - alignment error, this freedom being necessary in order that the transverse efforts caused in the running will be transmitted to the oscillating arm of the bogie through both bearing boxes of each semiaxle.

Lugs 14 located on the front and rear vertical faces of each bearing boxes, and which are common to it, constitute the transverse fastening elements of the bearing boxes.

Adjusted between the stop 15 or 15' of the oscillating arm case and the latches 16, they impede every transverse displacement of the bearing boxes.

The two vertical longitudinal faces of each of said lugs 12, wherein this contact is made, are separated each other a distance which is similar to the half difference of gauges decreased of the latch thickness 14.

The latches 16, which are common with a bridge 17, are adjusted in longitudinal sense by their outer transverse faces between the two vertical faces of the oscillating arm case, their correct position being held because the latches are adjusted between the vertical longitudinal faces of the inserts 12 and 13, which are common with the oscillating arm case.

In this way, the latches only can be displaced in vertical sense, their displacement being impeded in any other direction by means of rigid stops.

Vertically, they are fixed in their running position by means of springs 18, the pretension of which, higher than the latching device plus the dynamic forces which could be produced, impedes these to descend.

Eventually, the spring mechanism 18 is complemented with an additional safety retaining device 19.

The bridge 17 of the latching device is so designed that a "T"-shaped part belonging to the fixed installation can be introduced into the lower part of said bridge, The "T" shaped part forces it to be vertically displaced, causing the latches to - descend, overcoming the force opposed by the springs, retainers and frictions.

Said bridge is designed in such a way that its inside adapts itself to the inclined planes existing on the dislatching guides of the fixed installation, so that they act on the central zone of the bridge.

A design of this type is shown in perspective and in sectional view in Figures 11 and 12.

The inserts 12 and 13, which are mounted in common on the vertical faces of the oscillating arm case, in addition to act as a transverse stop for the latches, have vertical transverse faces on which the faces 11 of the bearing boxes are adjusted in longitudinal sense.

The part 13 has, moreover, a transverse guide 20, having its upper face inclined, which constitutes the sliding surface of - the relative bearing box during the transverse displacement of the rolling assembly.

The lower faces 21 of the lugs 14 have this same inclination and in normal running they are separated from the upper faces of guides 20 and parallel to it.

When the bogie has been suspended, the bearing boxes descend until the lower faces 21 of the lugs 14 rest on the guides 20, the transverse displacement being effected through this contact.

The inclination of the sliding faces of guides 20 impedes any particle which could hinder the lateral displacement of the wheel when changing the gauge settle on them during the running.

By means of slides made of a syntherized metallic material having a low coefficient of sliding friction and high compression resistance, located on the inclined planes 21 of lugs, the sliding of the rolling assemblies when transferring these to be positioned on each of both gauges is facilitated.

Although not shown, the common fastening of the brake steering accompanying the wheel on its displacement will be carried out on the vertical transversal face 22 of lugs 14.

In order to complement this description, to carry out the gap change between wheels for adapting them to each of two gauges, a brief description of the several operations to be carried out on the subject matter of the invention is given as follows:

The change of gap between wheels is to be always made with the aid of a fixed installation located in the changing station.

This change is made consecutively in each of the bogies when these pass at a reduced speed, which can attain up to a maximum of 20 km/h, through said fixed installation.

Figure 13 shows schematically the several elemnts forming part of the installation, which are as follows:

The end of the rails of the larger gauge is referenced 23, - while the end of the rails of the smaller gauge is referenced 24.

The sliding and centering guide rails are referenced 25; the unlocking and locking of latches are referenced 26, and the guides for moving the rolling assemblies, with regard to the resilient parts, are referenced 27, and the stiff parts, 28.

Assuming that a bogie accedes the fixed installation through the larger gauge, left hand side on Figure 13, the process for changing the gauge is as follows when the vehicle moves:

In order to carry out the moving operation of the rolling assemblies, it is necessary that the wheels do not support any load, this being obtained by the support of the bogie on the guiding rails, that is to say, by unloading the wheels.

This unloading of wheels is effected in a smooth way, by descending the rails 23 before they are dis-

continued, and at the right moment, according to the wheel diameter, the sliding and centering runners fitted in the oscillating arms of the bogie frame, reference 29 and 30 in Figure 2, will contact their corresponding sliding and centering rail.

In order to obtain the larger surface of support between the sliding runners 30 and the sliding rail 25, specially at the - initial contact, the runner 30.B leans on its support 30.A - through a spherical articulated joint.

The supporting runners, as well as the centering runners, are made of a plastic material and are lubricated with water, so obtaining a very low friction coefficient when they slide on the sliding rail.

The lubrication with water has a considerable advantage over other lubricants, since it does not cause, in any case, adherences or contamination.

Once the rolling assembly has been unloaded, it is necessary to unblock the rolling assemblies from the double locking of the latch stems, and for it the fixed installation has four unlocking -locking guides referenced 26, which are suitably located in relation to the longitudinal axis of the installation.

The section of the upper part of these guides adopts a "T" configuration, which allows the latch bridges to enter it, and owing to the configuration of its vertical profile 31, the latches descend and are held unlocked in the central part of guides, where its profile is fully horizontal.

Since the friction parts of the latch bridges 32 are made also of a plastic material, the lubrication is effected also with water in order to obtain the above-mentioned advantages.

During the process of unlocking the latches, the resilient portion of the guides for displacing the rolling assemblies corresponding to this gauge 27 contact the inner face of wheels.

The pressure exerted on them favours the unlocking operation of the latches.

Before the mentioned unlocking of the latches, once the wheels have been unloaded, the rolling assemblies descend lightly and do not support the upper part 10 of the bearing boxes on the seats of the oscillating arm cases, and then the inclined faces 21 of the mentioned lugs 14 lean on the inclined face of guide 20.

Later, as the rolling assemblies of the bogie, which is the object of this invention, advance through the fixed installation, the wheels lose contact with the resilient part of the moving guides on the side through which it has been entered, and, next, they contact the stiff part of the moving guides on the opposite side, that is to say, where the lesser gauge is located.

During the contact of the wheels with this stiff part, the - latches are unlocked and the wheels are transferred to the lesser gauge.

Later, the wheels still contact the resilient part of the moving guides and the latch guides press the latches upwards, that is to say, locking the latches.

The pressure exerted by the resilient part of the moving guides makes easy to lock the latches.

Once the process for moving the rolling assemblies has been completed, the rolling assemblies are locked in a position corresponding to the track having the smaller gauge.

Lastly, since the rolling assemblies are still advancing, there is a determinate moment in which the wheels contact the upward rails of the smaller gauge track, and the above-mentioned sliding and centering runners lose their contact with the sliding rails, the bogie is in a position to run over the track of this gauge.

The reverse process of passing from the track of smaller gauge to the track of larger gauge is carried out in a similar way.

It is not considered necessary to extend more this description for an expert in the art to understand the scope of the invention and the advantages derived from it.

The materials, shape, size and arrangement of its components are open to variation, provided that it does not imply any alteration to the essence of the invention.

The terms under which this specification has been described should be taken in an ample and non limitative sense.

Claims

1.- Bogies for railway vehicles with variable gap between wheels, characterized in that they are constituted starting from a center frame (1), to which four oscillating arms are united by means of corresponding joints (2), at one of which ends bearing boxes for each of the rolling assemblies (3) are housed, which can be transversely moved, the wheels being located in each of two positions corresponding to two gauges,and the opposite side of each of the arms rests on a helical spring (4), the lower end of which is resting on the center frame bottom, and at the end of this zone there is mounted a vertical - shock absorber (5), relying on the fact that each of these assemblies, composed of the oscillating arm with joint, helical spring, and shock absorber, constitute the suspension of the rolling assembly, relying, apart from this primary suspension, on the fact that the bogie will be equipped with a secondary suspension, the whole assembly being fitted with a guiding system, or with a possible adaptation to an articulated bogie.

2.- Bogies for railway vehicles with variable gap between wheels. according to claim 1, characterized in that each bogie is equipped with four rolling assemblies, each of these rolling assembly being composed of a semiaxle (6), a wheel (7), brake discs (8), which are common each other, and the relative bearing

boxes (9) mounted at the ends of the semiaxle, being so designed that the bearing boxes (9) have, at their upper part, a cylindrical surface on which the end of the oscillating arm of the bogie is leant in the normal running position, distributing the supporting surface loads, allowing to interpose a resilient sheet between the bearing box and the housing cradle, which is firmly fastened to one of these surfaces.

3.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that the vertical position between the bearing box and the oscillating arm is defined in the longitudinal sense of said cylindrical surface, and the bearing box shaft is automatically centered in its theoric position, the vertical flat faces (11) having a front and a rear one, which are adjusted on the vertical flat faces of the inserts (12) and (13), there being, between the outer casing of the bearing box and the pail thereof, a resilient bushing configuring certain degree of freedom for the bearings, in order to allow the absorption of axial alignment errors in the transverse efforts caused in the running, which are transmitted to the oscillating arm of the bogie through the two bearing boxes on - each semiaxle.

4.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that lugs (14), which are located on the front and rear vertical faces of each bearing boxes, and common with them, constitute transverse fastening elements for the bearing boxes which are fitted between a stop (15) or (15') of the oscillating arm case and latches (16), impeding the bearing boxes to transversely displace, and the two vertical longitudinal faces of each of said lugs (14) are separated each other a distance which is similar to the semi difference of gauges decreased in the latch thickness (14).

5.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that the latches (16), which are common with a bridge (17) are adjusted, in a - longitudinal sense, by their outer transverse faces, between the two vertical faces of the oscillating arm case, being transversely held in position when adjusting the vertical longitudinal faces of the inserts (12) and (13), which are common with the oscillating arm case, the latches displacing only in a vertical sense and impeding other displacements by means of stiff stops.

6.- Bogies for railway vehicles with variable gap between wheels, accordingto claim 1, characterized in the springs (18) hold f xed in their running position, due to their pretension, which is higher than the latching device weight plus the dynamic forces which could be produced, impeding the descent of same, the spring mechanism (18) being complemented by an additional safety retaining device (19).

7.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that the bridge (17) of the latching device is constituted so that its lower part allows a part configured in "T" to be introduced, this "T" shaped part belonging to the fixed installation, which impels the bridge to vertically displace and the latches descend, overcoming the force opposed by the retaining and friction springs, this bridge being designed in such a way that its inside adapts itself to inclined planes existing on the unlatching guides on the fixed installation so that they act on the central zone of the bridge, while the inserts (12) and (13), which are mounted in common on the vertical faces of the oscillating arm case, apart from being a transverse stop for the latches, present vertical transverse faces on which the faces (11) of the bearing boxes are adjusted in a longitudinal sense.

8.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that a part (13), configured as an insert, apart from having a transverse guide (20), with its upper face inclined, constitutes a sliding surface of the bearing box during the transverse sliding of the rolling assembly, and the lower faces (21) of lugs (14) have the same inclination, and in normal running, they are separated from the upper faces of guides (20) and parallel to it.

9.- Bogies for railway vehicles with variable gap between wheels, according to claim 1, characterized in that when the bogie has been suspended, the bearing boxes descend until resting, and the lower faces (21) of lugs (14), on the guides (20), obtaining through this contact a transverse displacement,and the inclination of the sliding faces of guides (20) impedes the deposition on them during the running of particles which could obstruct the lateral displacement of the wheel when changing the gauge.

10.- Bogies for railway vehicles with variable gap between wheels, according to any of the preceding claims, characterized in that they are fitted with slides made of syntherized metallic material of low coefficient of sliding friction and high compression resistance, which are located on the inclined planes (21) of lugs, making easy the displacement of the rolling assemblies when moving these for being positioned in each of the two gauges, the brake steering accompanying the wheel in its displacement being fastened on the vertical transverse faces of lugs (14).

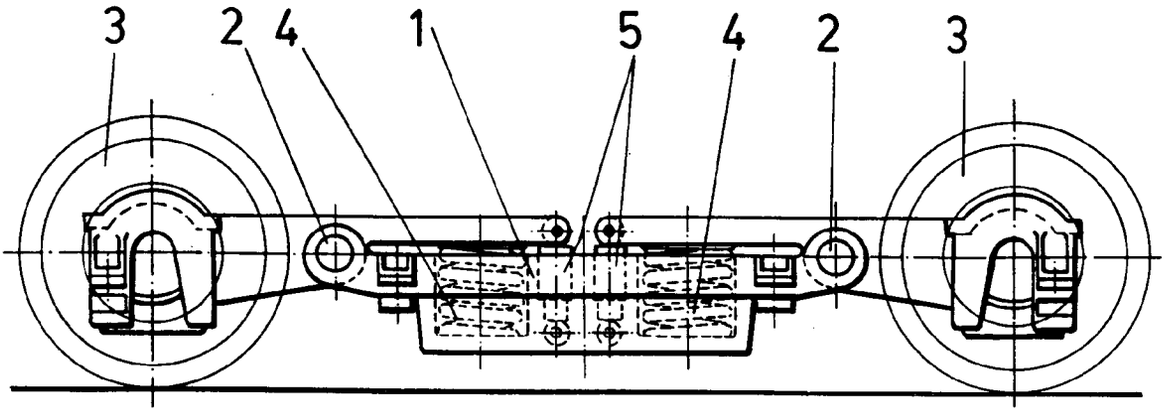

FIG.-1

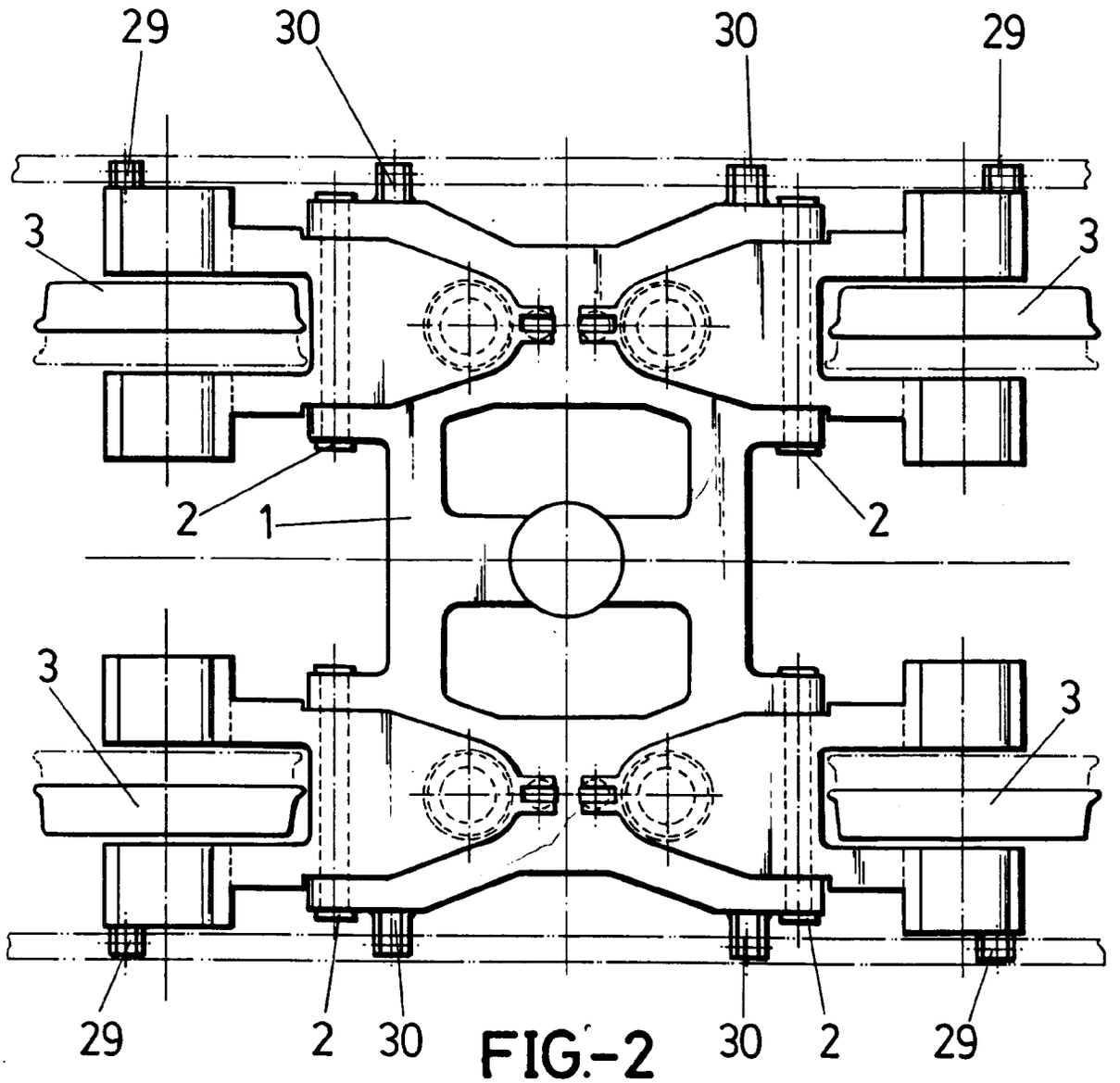

FIG.-2

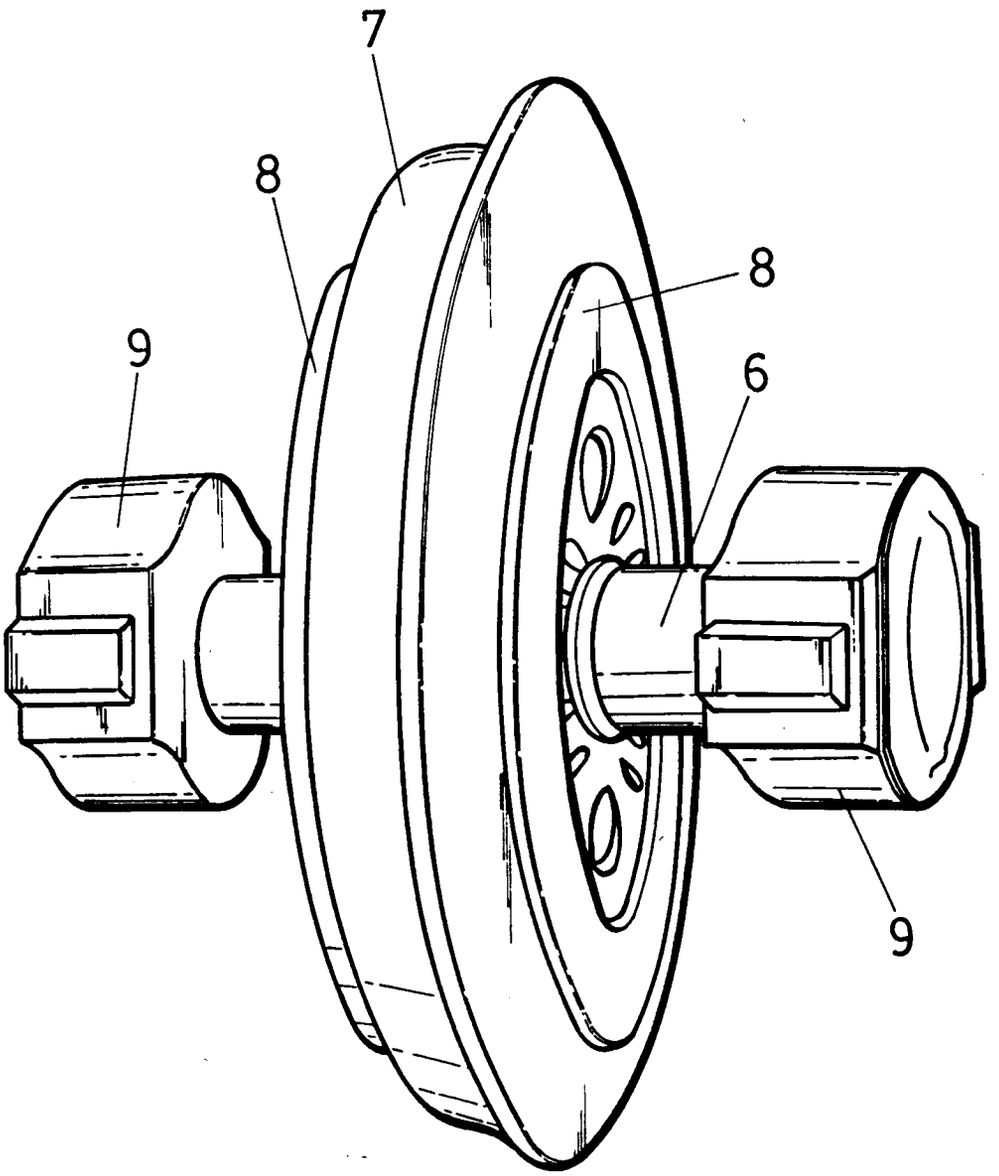

FIG.-3

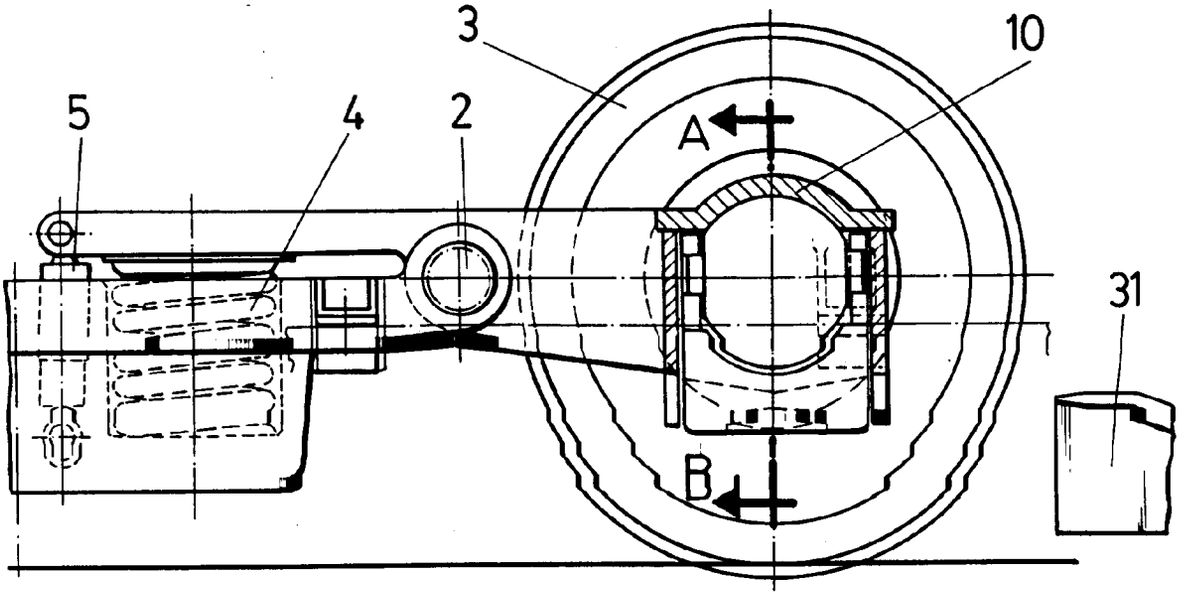

FIG.-4

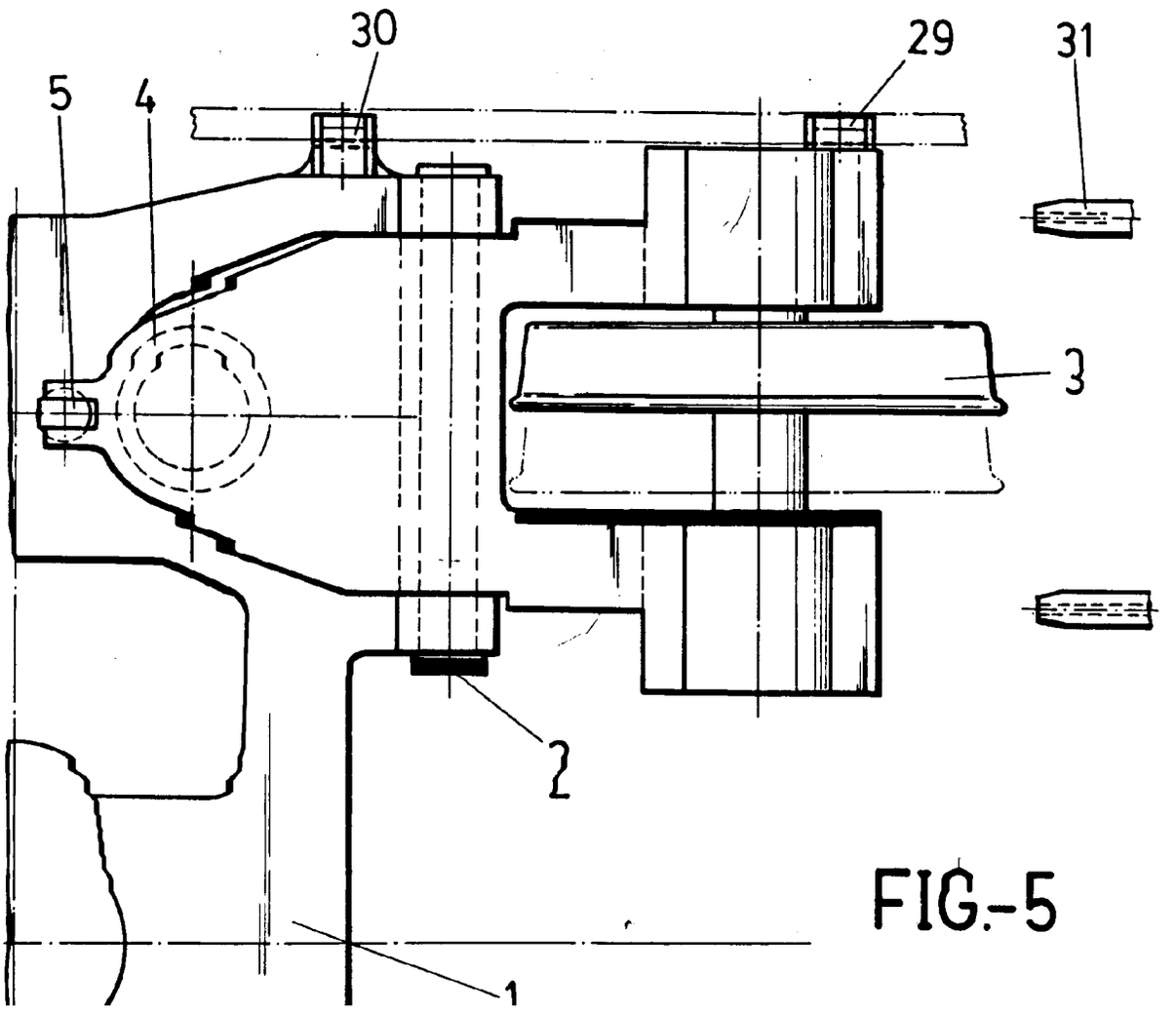

FIG.-5

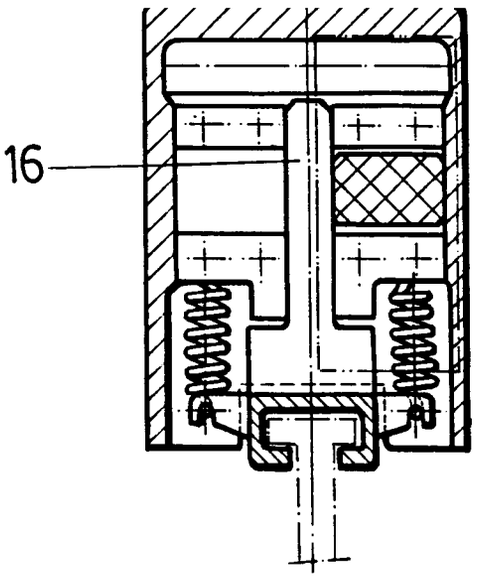

FIG.-6
A-B

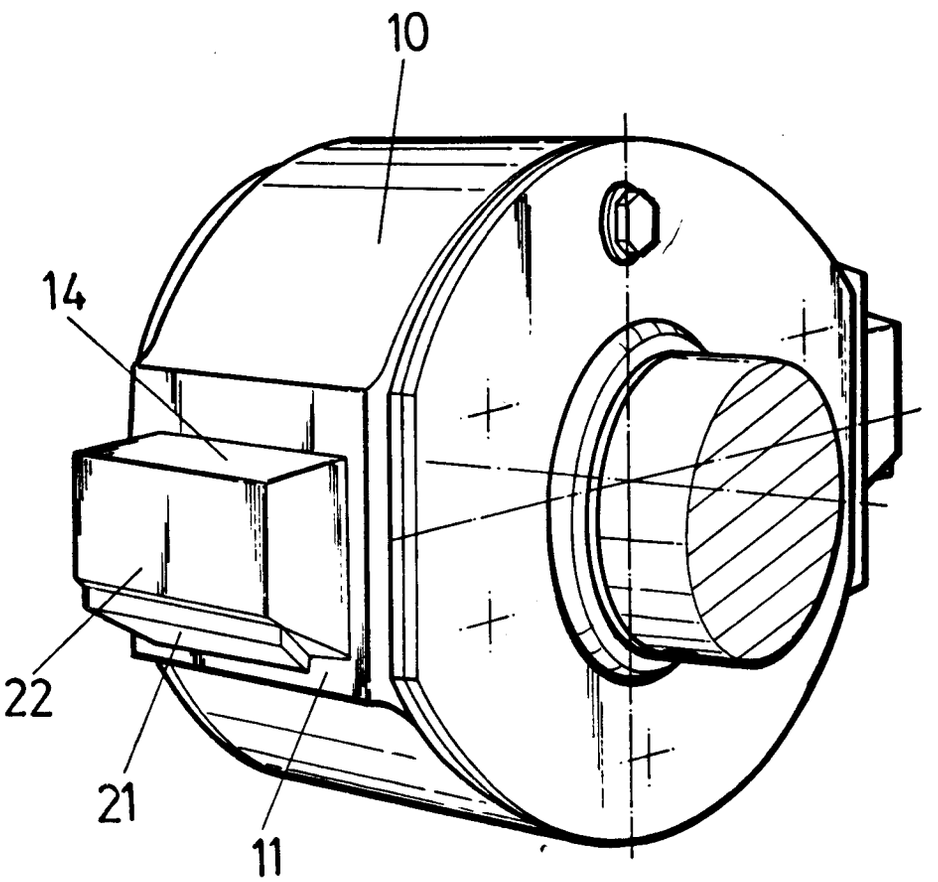

FIG.-7

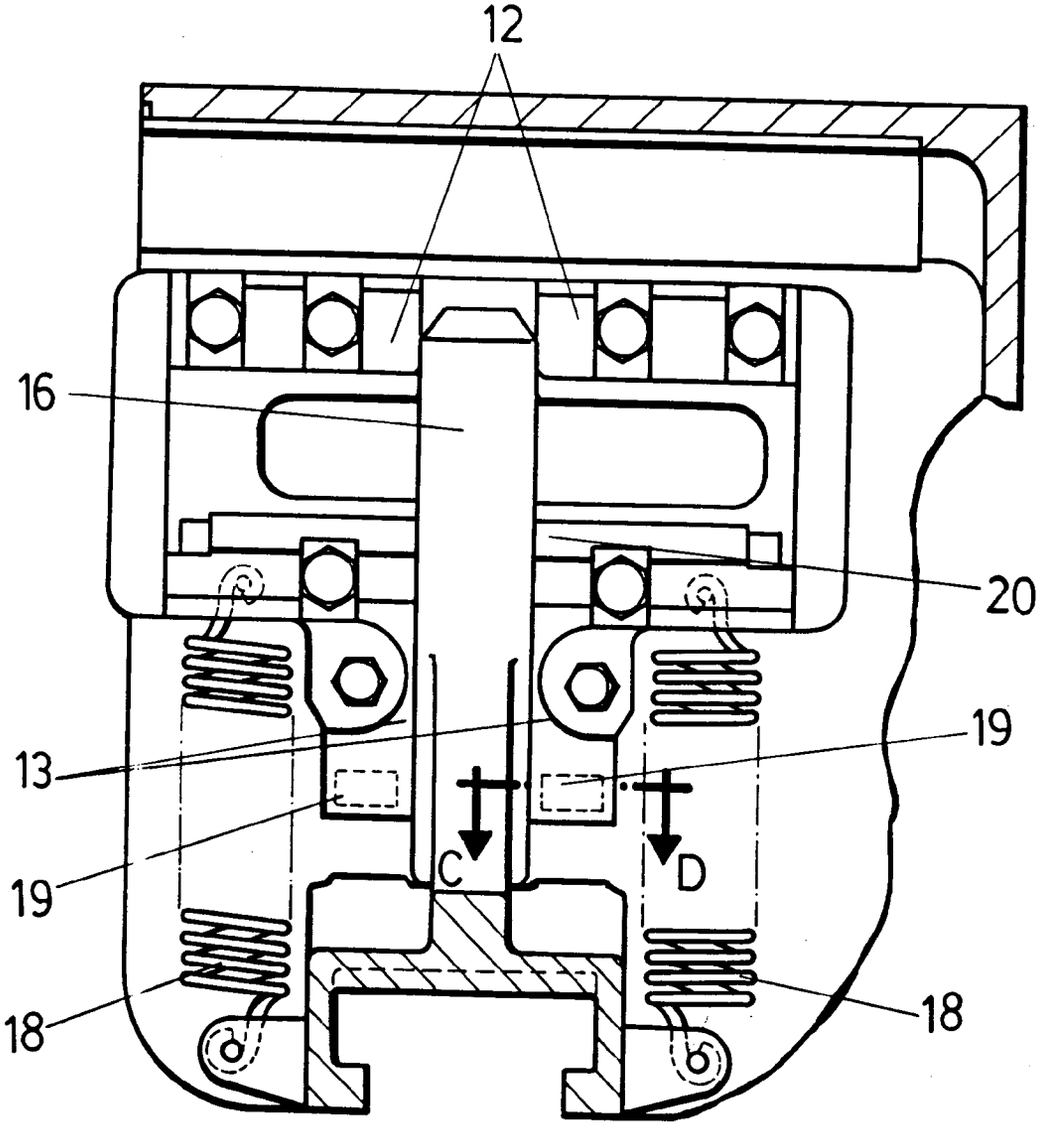

FIG.-8

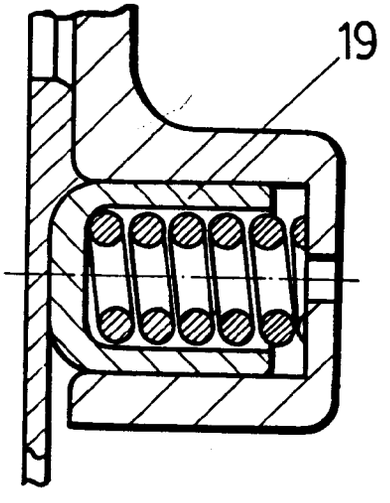

FIG.-9
C-D

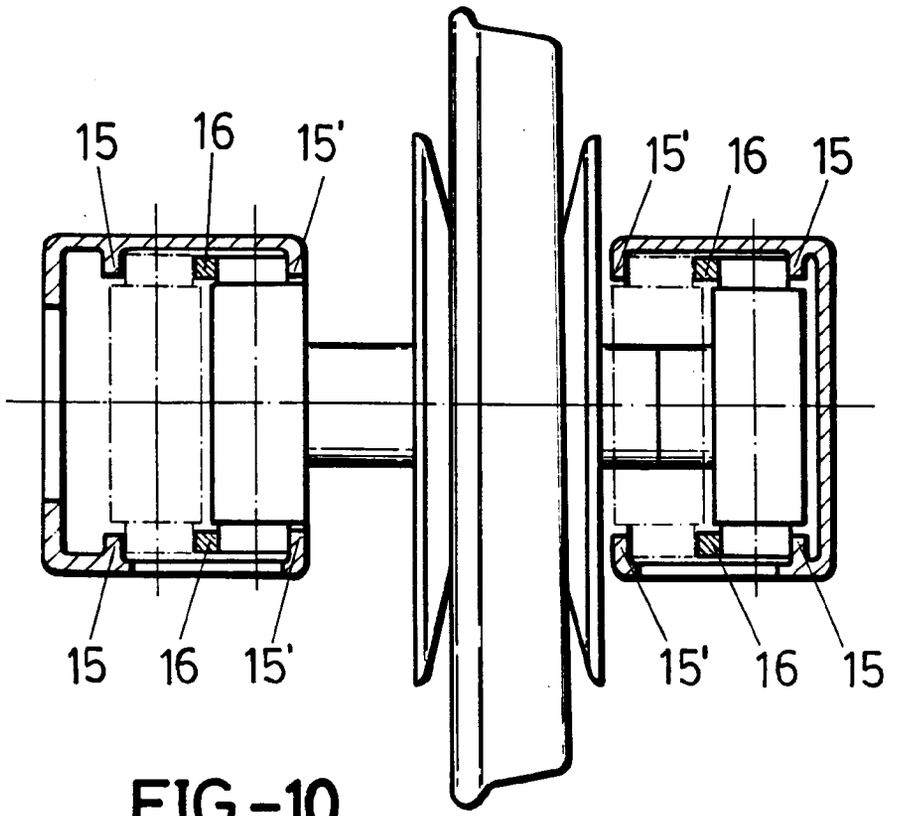

FIG.-10

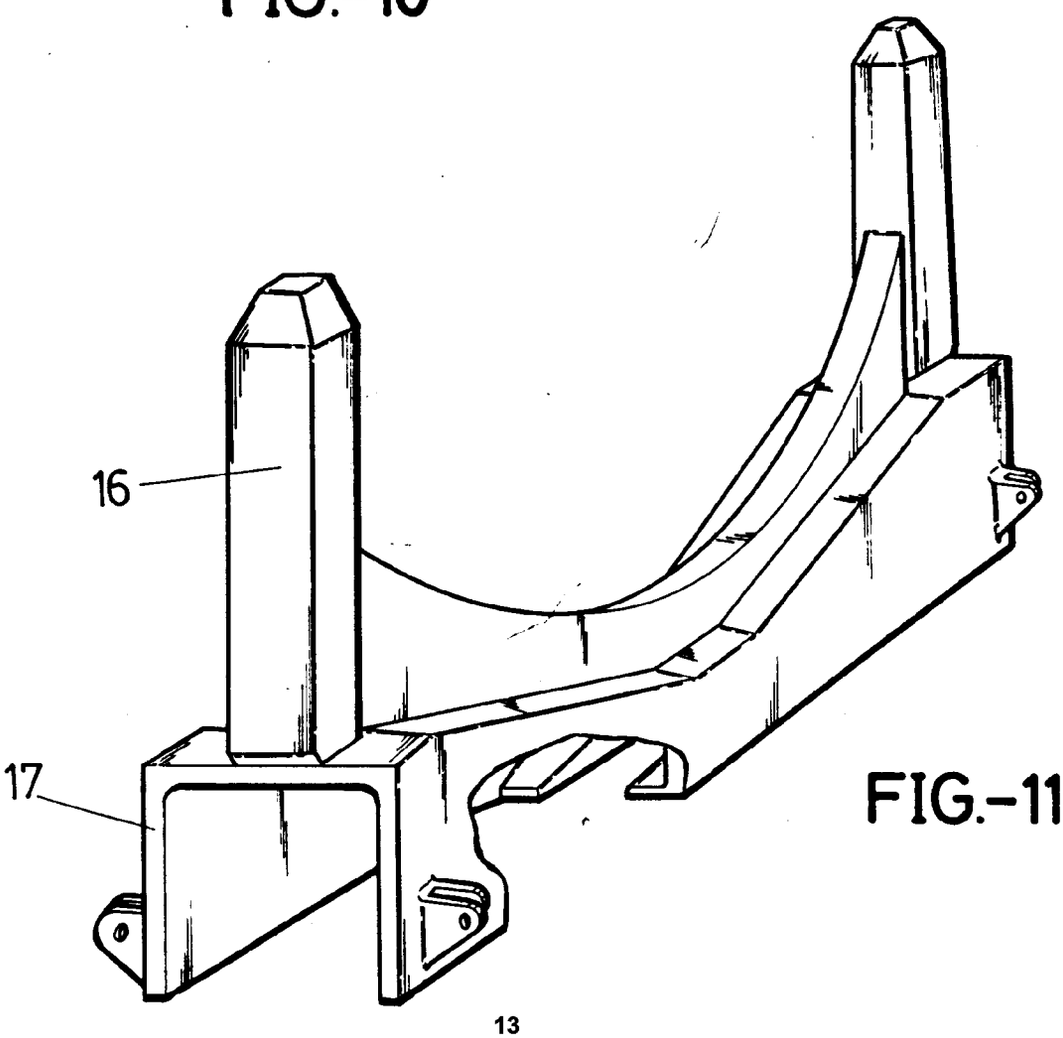

FIG.-11

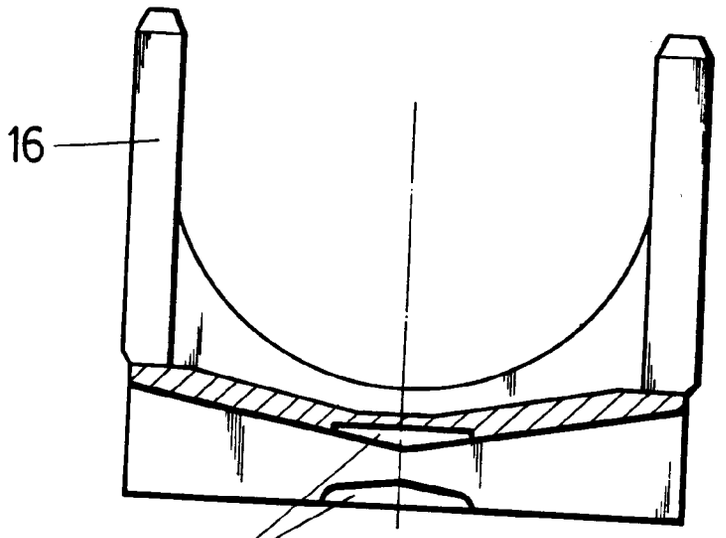

FIG.-12

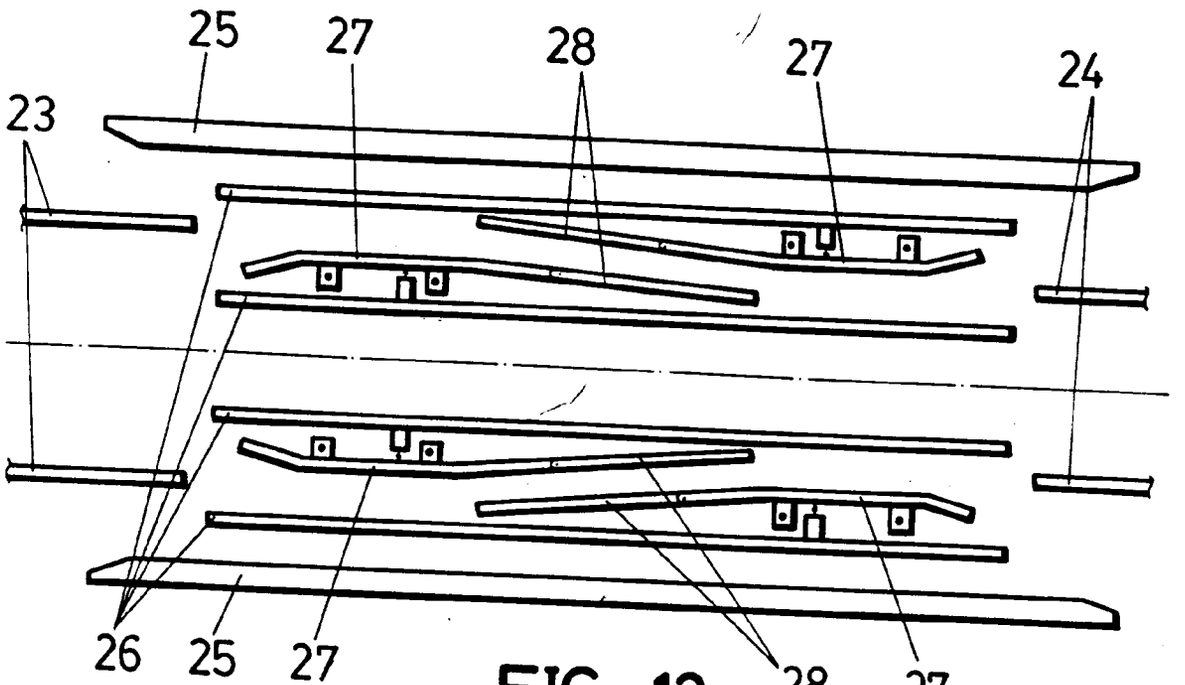

FIG.-13

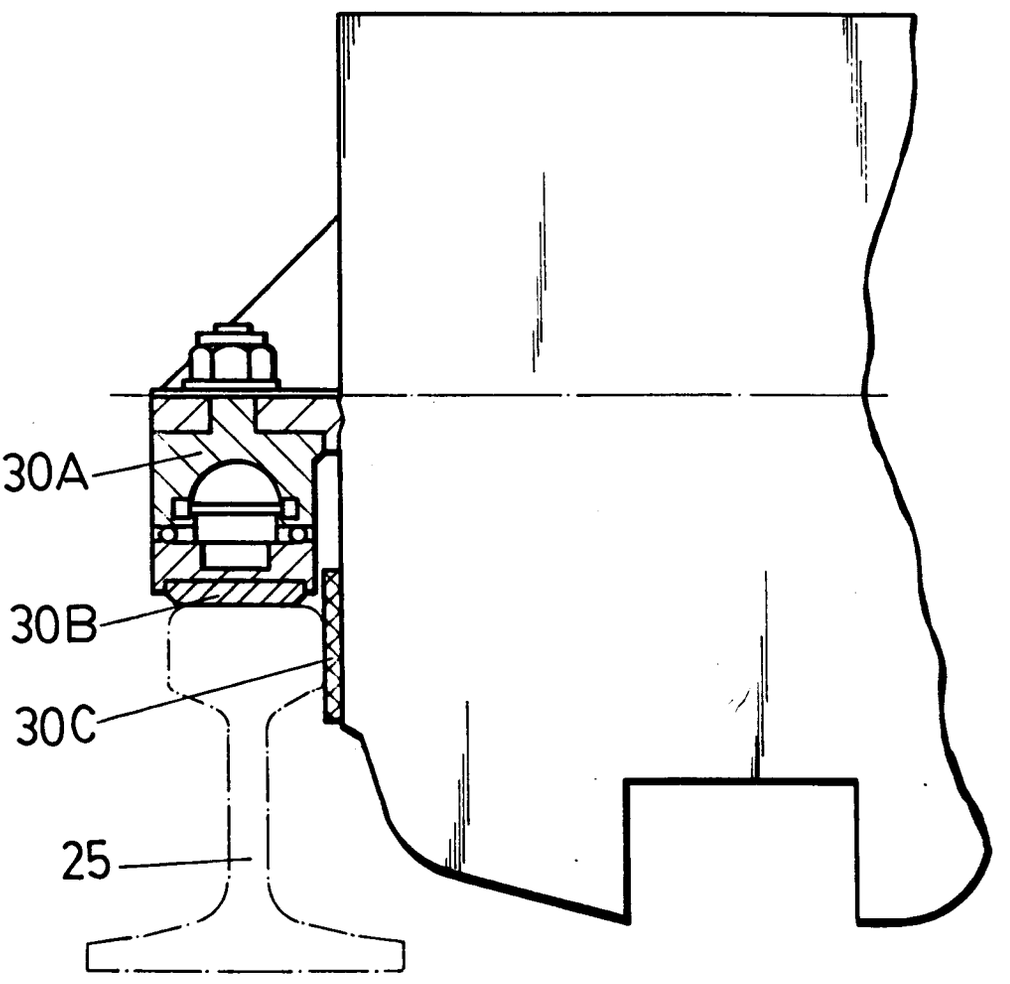

FIG.-14

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EUROPEAN SEARCH REPORT

Application Number
EP 93 50 0060

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A D	FR-A-1 558 329 (PATENTES TALGO S.A.) * page 2, left column, line 56 - right column, line 23; figure 1 * & ES-A-332 453 (PATENTES TALGO S.A.)	1	B61F3/16 B61F7/00
A	EP-A-0 050 727 (DUEWAG AG) * page 7, line 28 - page 8, line 7; figure 2 *	1	
A	EP-A-0 384 512 (SOCIETA COSTRUZIONI INDUSTRIALI MILANO S.P.A.) * column 2, line 19 - line 44; figures *	1	
A	EP-A-0 465 346 (GEC ALSTHOM SA)		
A	DE-B-10 09 220 (WAGGON- UND MASCHINENBAU G.M.B.H.)		
A	GLASERS ANNALEN ZEITSCHRIFT FÜR EISENBAHNWESEN UND VERKEHRSTECHNIK vol. 95, no. 4 , April 1971 , BERLIN pages 83 - 85 VON KLAUS KÄMPFE 'MÖGLICHKEITEN ZUR ÜBERWINDUNG DER VERSCHIEDENEN SPURWEITEN AFRIKANISCHER EISENBAHNEN ALS VORBEDINGUNG IHRER VEREINIGUNG'		TECHNICAL FIELDS SEARCHED (Int.Cl.5) B61F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 January 1994	MARANGONI, G

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