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(54) Primary suspension for railway vehicles and method for adjusting the same

(57) A primary suspension for railway vehicles is described in which blocks (3,3',4,4')of elastic material are positioned between the axle-box (1) that houses the end of the bogie axle and two brackets (10,10') integral with the bogie frame, in order to elastically absorb the oscillations that occur during motion. The adjustment of the position of the suspension in relation to the bogie frame can take place by simply loosening the connecting screws and does not require complete dismantling of the suspension from the frame.
A method for adjusting the position of the suspension is also described.

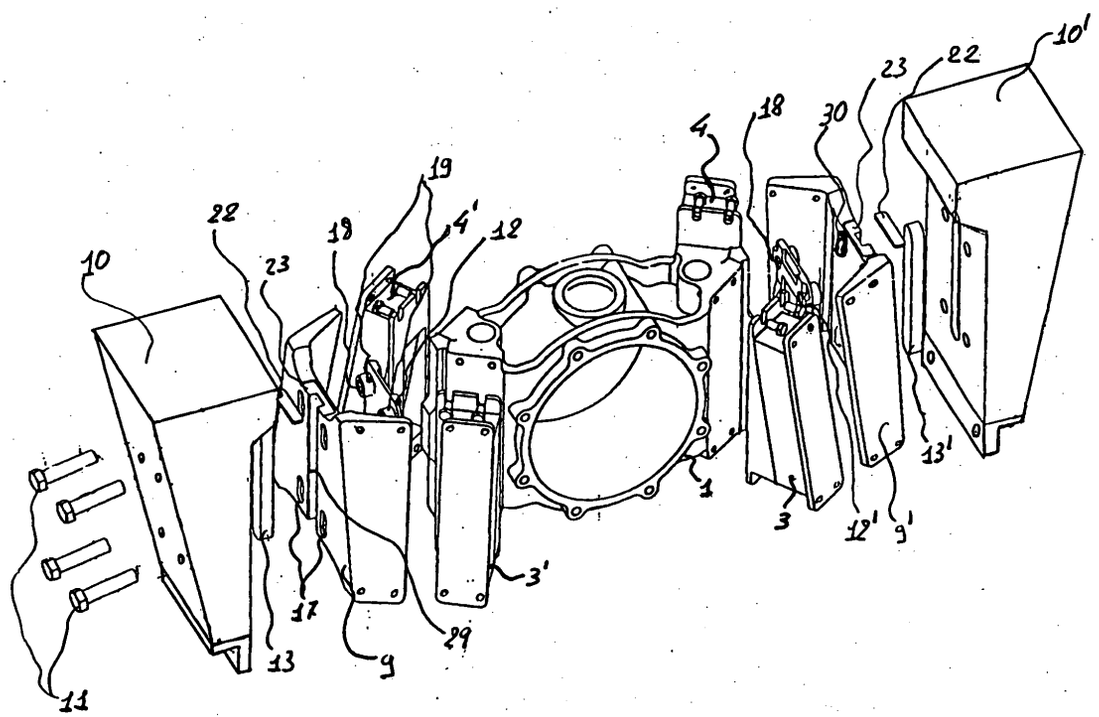

Fig. 4

EP 1 346 897 A1

Description

Technical field

[0001] The present invention relates to a primary suspension for railway vehicles, in particular a primary suspension device whose position in relation to the bogie can be adjusted without complete dismantling.

Background art

[0002] Suspensions in which the connection between the wheel arrangement (commonly intended as the axle, wheel and axle sleeve complex where the end of the axles are housed and can rotate) and the bogie frame takes place by means of blocks of elastic material that are subject to shear stress and compression are commonly employed in railways and railway transport vehicles in general. The oscillations are therefore primarily dampened by the deformation of said blocks of elastic material.

[0003] The axle sleeve is connected, at its sides, by said blocks of elastic material to supports joined to the bogie frame, called brackets.

[0004] The suspensions positioned between wheel arrangement and bogie frame, such as those mentioned above, are commonly called "primary suspensions", whereas the term "secondary suspensions" refers to those positioned between the bogie frame and the frame of the railway vehicle.

[0005] Generally, the blocks of elastic material are placed in such an inclined position that the load of the vehicle causes a certain compression thereon.

[0006] In order to obtain a correct distribution of the loads on the bogie axles, it is necessary to accurately adjust the position of the axle sleeve in relation to the bogie frame. This adjustment, performed upon assembly, must generally be repeated after a certain number of travelled kilometres during overhaul operations, as due to the settling of the materials, including the blocks of elastic material, usage causes a progressive lowering of the vehicle in relation to the wheel arrangement, and therefore in relation to the plane of the tracks, with the consequential need to restore initial conditions.

[0007] This adjustment entails the dismantling of the wheel arrangement from the bogie, in order to permit the replacement of the blocks of elastic material with others of different dimensions, or the introduction of special shims, thus adjusting the position of the bogie frame over the track plane and/or the distribution of the loads on the vehicle's various primary suspensions.

[0008] The complete dismantling that is necessary for these operations is both time-consuming and costly. This calls for the need to be able to perform this adjustment without having to completely disconnect the wheel arrangement from the bogie frame. It is preferable that it is sufficient to loosen the connecting elements (generally a series of screws) in order to displace the unit containing the axle sleeve, the blocks of elastic material and the structures that connect them to the brackets into the desired position and to introduce suitable end of stroke elements that serve to hold said group in the new position under load.

Summary of the invention

[0009] The abovementioned drawbacks are solved by a primary suspension for railway vehicles and similar comprising:

an axle sleeve destined to house one end of a bogie axle;
one or more blocks of elastic material;
one or more boxes, each one fixed to one or more said blocks of elastic material,
each of said boxes being connectable to a bracket integral with a bogie frame of said vehicle, at different distances from said frame.

[0010] According to a particular aspect of the invention, there are four of said blocks of elastic material and two boxes, each of which is connected to two of said blocks.

[0011] Preferably, said boxes can be connected to said brackets by screws and present elongated slots through which said screws pass.

[0012] According to a further embodiment of the invention, the device comprises a fixing plate for each box, said plate having a number of threaded holes and being destined to tighten said box against the bracket, by said screws.

[0013] The invention also relates to a method of adjusting a primary suspension such as described above, connected to one or more brackets integral with the bogie frame of a railway vehicle, comprising:

loosening the screws;
moving the suspension into the desired position;
tightening said screws.

[0014] Preferably the method comprises the introduction of an element (known as a shim) in contact with the box, above it and in contact with the bracket in a position that makes it possible to fix the box (and therefore the suspension) in the new position. In fact, the weight of the vehicle, combined with the oscillations, would cause the box to slip with respect to the bracket, since the box has elongated slots and not circular holes where the screws pass, in order to allow it to be moved during the adjustment step.

[0015] Preferably, the bracket presents a special protuberance above the position occupied by the central part of the box.

[0016] The method according to the present invention is suitably performed after the suspension has been unloaded, for example by suitably raising the vehicle with

respect to the track plane with suitable means.

List of the Drawings

[0017]

Figure 1 schematically illustrates a primary suspension according to the present invention mounted on the bogie frame of a rail vehicle.

Figure 2 schematically illustrates a frontal view of a suspension according to the invention, connected to the brackets integral with the bogie frame.

Figure 3 schematically illustrates a sectional top view according to plane AA indicated in figure 2, of a suspension according the invention connected to the brackets integral with the bogie frame.

Figure 4 schematically illustrates an exploded view of a suspension according to the invention.

Detailed description of the preferred embodiments

[0018] A description will now be given, by way of example only, of a primary suspension for railway vehicles and similar, according to the invention.

[0019] Figure 1 shows a primary suspension fixed to the frame 14 of the bogie, with a bogie axle mounted thereon. It is possible to distinguish the axle sleeve 1 receiving the end of the bogie axle, said axle sleeve being closed at the front with a cover 15 by means of a set of screws. An oscillation viscous dampening system 24 is generally present, represented only partially in the drawing, which works in parallel to the primary suspension and can, for example, connect the cover 15 to the frame 14 of the bogie. The axle sleeve 1 with the blocks of elastic material 3 and 3' (there are two more, hidden in figure 1) and the boxes 9 and 9', is part of a primary suspension that is housed between two structures, commonly said brackets, 10 and 10' fixed (for example by welding) to the frame 14 of the bogie; the boxes 9 and 9' are connected by bolts to brackets 10 and 10'. The distance between brackets 10 and 10' is generally such that inserting the primary suspension as shown in figure 1 it is necessary to give a certain pre-compression to the blocks of elastic material. A structure 16 connects the two brackets in the lower part thus giving suitable rigidity to the system and constituting an end of stroke element for the axle sleeve 1, should its oscillations around its prefixed position, due to shakes that occur during motion (with the deformation of the blocks of elastic material) exceed a certain limit. Suitable end of stroke elements can also be advantageously provided above the axle sleeve.

[0020] With reference to figures 2 and 3, it is possible to see the axle sleeve 1, whose cavity 1' is destined to house the end of the bogie axle with the suitable anti-friction organs, in order to permit the relative rotation of the parts.

[0021] The axle sleeve 1 presents at its sides two bodies 2 and 2' to which the blocks of elastic material 3, 3', 4 and 4' are fixed. The latter are fixed to the wings 7, 7', 8, and 8' of the boxes 9 and 9'. According to an embodiment of the invention, the blocks of elastic material 3, 3', 4 and 4' present, on two opposite faces, metal plates and wedge-shaped elements 5, 5', 6 and 6', which present elements for fixing the plates to boxes 9 and 9' and the wedge-shaped elements 5, 5', 6 and 6' to the bodies 2 and 2' of the axle sleeve 1. The plates and the wedge-shaped elements are integral with the elastic material of the blocks. Said material can be advantageously rubber, which is cured with said wedge-shaped elements and the plates already positioned, in such a way as to form a single structure. There may also be other plates or metal elements within the thickness of the blocks, as it is known, in order to give the blocks the mechanical characteristics desired.

[0022] As shown in the drawings, and this constitutes a preferred embodiment of the invention, blocks 3, 3', 4 and 4' are in an inclined position in relation to the vertical direction, so that the weight of the vehicle, which is transmitted through boxes 9 and 9', causes a certain compression of the blocks. As a matter of fact they, also subject to shear stress, must never be subject to traction, as is well known.

[0023] It is evident how the wedge-shaped elements 5, 5', 6 and 6' and the inclination of the wings 7, 7', 8 and 8' of the boxes 9 and 9' give the correct inclination to blocks 3, 3', 4 and 4'. This inclination can also be obtained using other methods, for example bodies 2 and 2' can present inclined faces and the wedge-shaped elements 5, 5', 6 and 6' can be replaced by common metal plates.

[0024] The inclined position of the blocks is particularly advantageous in those cases, such as that of the suspension shown in the figures, in which there is no further elastic suspension system, such as a system of suspension springs, working in parallel with respect to the blocks.

[0025] With particular reference to figure 3, it is shown how the boxes 9 and 9' are fixed to the brackets 10 and 10' by the screws 11. According to a possible embodiment of the invention, there are at least four screws 11 per bracket. They are passed through adapted holes in the bracket.

[0026] Advantageously, plates 12 and 12' can be provided, which constitute the fixing element for the boxes 9 and 9' against the brackets. The screws 11 pass through the boxes 9 and 9' in slots made thereon and are screwed into threaded holes of the plates 12 and 12'.

[0027] Keys 13 and 13', aligned along a vertical direction, and fitted into the brackets in a special housing, are received in corresponding housings 29 and 29' made on the surfaces of the boxes 9 and 9', in such a way as to facilitate correct positioning along the parallel direction of the axis of the axle.

[0028] The bodies 2 and 2' of the axle sleeve 1 can present ends 25 and 25' of various shapes. They can

constitute an end of stroke element for the axle sleeve 1 in the longitudinal movements caused by the oscillations that occur during motion, thus touching, due to the oscillations that exceed a certain extent, the plates 12 and 12'.

[0029] As shown in figure 4, the boxes 9 and 9' present elongated slots 17 through which the screws 11 can pass. Their elongated shape makes it possible to position the boxes in different positions along the vertical axis. The screws 11 can be screwed into the threaded holes 18 in plates 12 and 12'; advantageously, the protuberances 19, coaxial with the holes 18 may be present, which are destined to be lodged in special cavities 30 made in the box 9 in correspondence with the slots 17, as shown in figure 3.

[0030] This coupling enables easier assembly and is also useful during the position adjustment of the suspension in relation to the frame 14 of the bogie, which can be performed simply by loosening the screws 11 and shifting the suspension vertically. This operation is generally performed after having lifted the vehicle sufficiently to unload the weight that usually weighs on the suspension, in order to permit adjustment. The operation can suitably be completed by the introduction of shims, indicated with 22 in figure 4, preferably of a rigid material such as a metal material above the boxes and below the protuberances 21 of the brackets, as shown in figure 1, protuberances that are specifically provided above the position in which the central upper part of the box is located, preferably above the housing of the keys 13 and 13'; preferably each box will have one housing (23 in figure 4) for receiving said shim; this allows to maintain the suspension in position even when the vehicle is loaded on the suspensions again. The tightening of the screws completes the adjustment operation. The housing 23 is preferably positioned in the upper part of the box.

[0031] The shims 22 may have any suitable shape, and can be simple parallelepipeds with a rectangular section with a suitable height. As said, they can be inserted above boxes 9 and 9'. Instead of between the boxes and the brackets, or the protuberances 21 thereof, they may also be inserted between the boxes and the frame 14 of the bogie or between the protuberances integral with the latter and the boxes.

[0032] The advantage of the present invention is evident over state of the art suspensions, in which the position of the boxes in relation to the brackets and therefore the bogie frame cannot be adjusted. Adjustment operations are very swift because they do not entail complete dismantling with the introduction or replacement of shims between the blocks of elastic material and the axle sleeve or the replacement of the blocks with others of a different thickness. In alternative, the possibility of adjusting the position of the suspension, irrespective of the thickness or rigidity of the blocks, permits, by acting also on these parameters, to have a wider possibility to vary the overall characteristics of the suspension and, therefore, its behaviour during operation, if desired.

Claims

1. A primary suspension for railway vehicles and similar comprising:

   an axle sleeve (1) destined to receive one end of a bogie axle;
   one or more blocks (3, 3', 4, 4') of elastic material
   one or more boxes (9, 9'), each one fixed to one or more of said blocks (3, 3', 4, 4') of elastic material
   each of said boxes (9, 9') being connectable to a bracket (10, 10') integral with a frame (14) of a bogie of said vehicle, at different distances from said frame (14).

2. The suspension according to claim 1 wherein said boxes (9, 9') are two and said blocks (3, 3', 4, 4') of elastic material are four.

3. The suspension according to any of the previous claims wherein said boxes (9, 9') can be connected to said brackets (10, 10') by screws (11) and have elongated slots (17) through which said screws (11) can pass.

4. The suspension according to claim 3 comprising a fixing plate (12, 12') for each of said boxes (9, 9'), said plate having threaded holes (18) in which said screws can be tightened (11).

5. The suspension according to claim 4, wherein said plates (12, 12') present protuberances (19) coaxial to said holes (18) and said boxes (9, 9') present cavities (30) in correspondence with said slots (17) destined to house said protuberances (19).

6. The suspension according to any of the previous claims wherein said boxes (9, 9') present a key notch (29, 29').

7. The suspension according to any of the previous claims wherein said boxes (9, 9') present a housing (23) destined to receive a shim.

8. A method for adjusting a primary suspension comprising:

   an axle sleeve receiving the end of a bogie axle;
   one or more blocks of elastic material
   one or more boxes, each one fixed to one or more of said blocks of elastic material
   each of said boxes being connected by screws to a bracket integral with a bogie of a frame of

said vehicle,
said method comprising:

loosening the connection between each box and the bracket; moving the box to a distance from the bogie frame different from the original distance;
tightening the connection between the box and the bracket.

9. The method according to claim 8 comprising the introduction of a shim between the box and the bracket.

10. The method according to claim 9 wherein the bracket presents a protuberance above the position in which the box is mounted and comprising the introduction of said shim between said protuberance and the box.

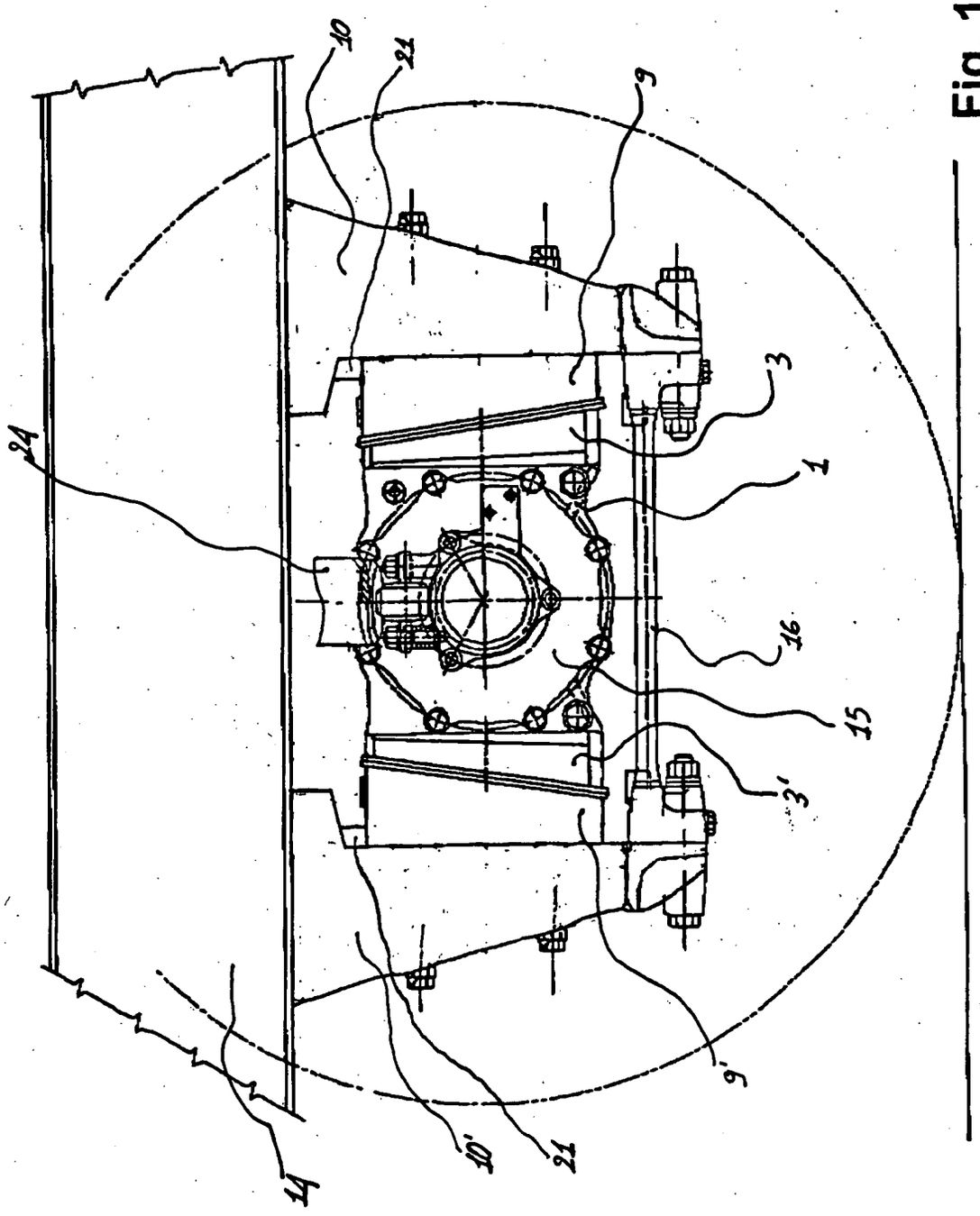

Fig. 1

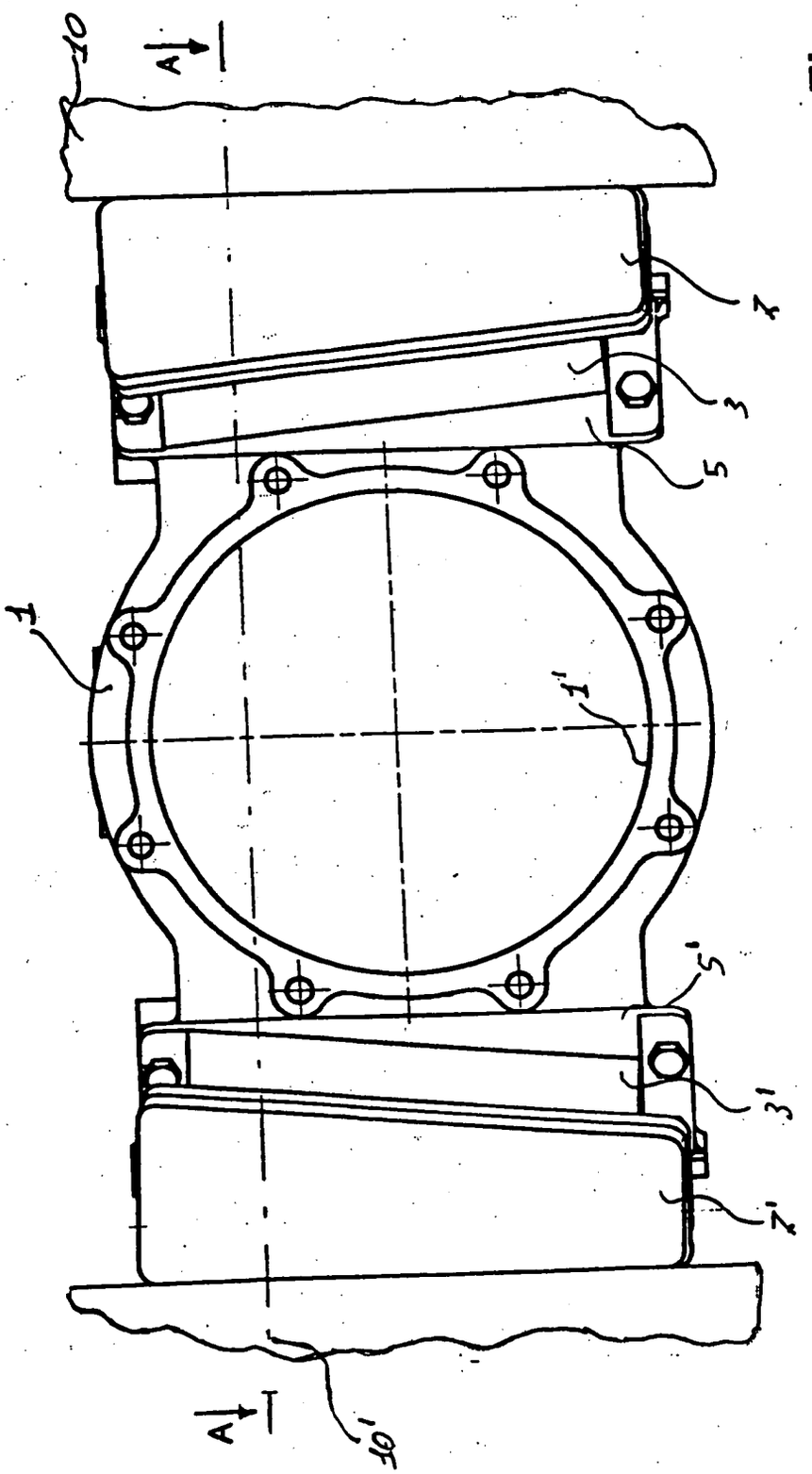

Fig. 2

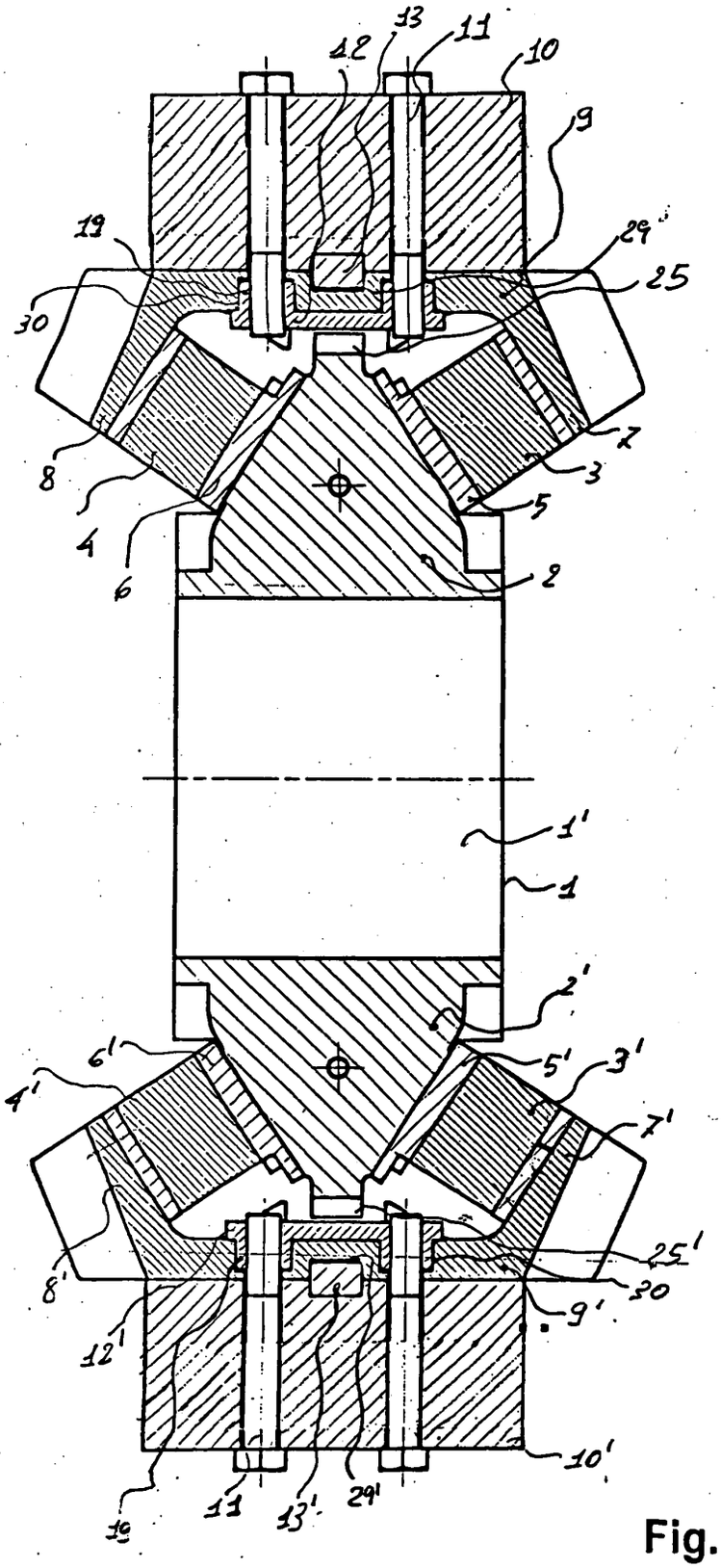
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Fig. 3

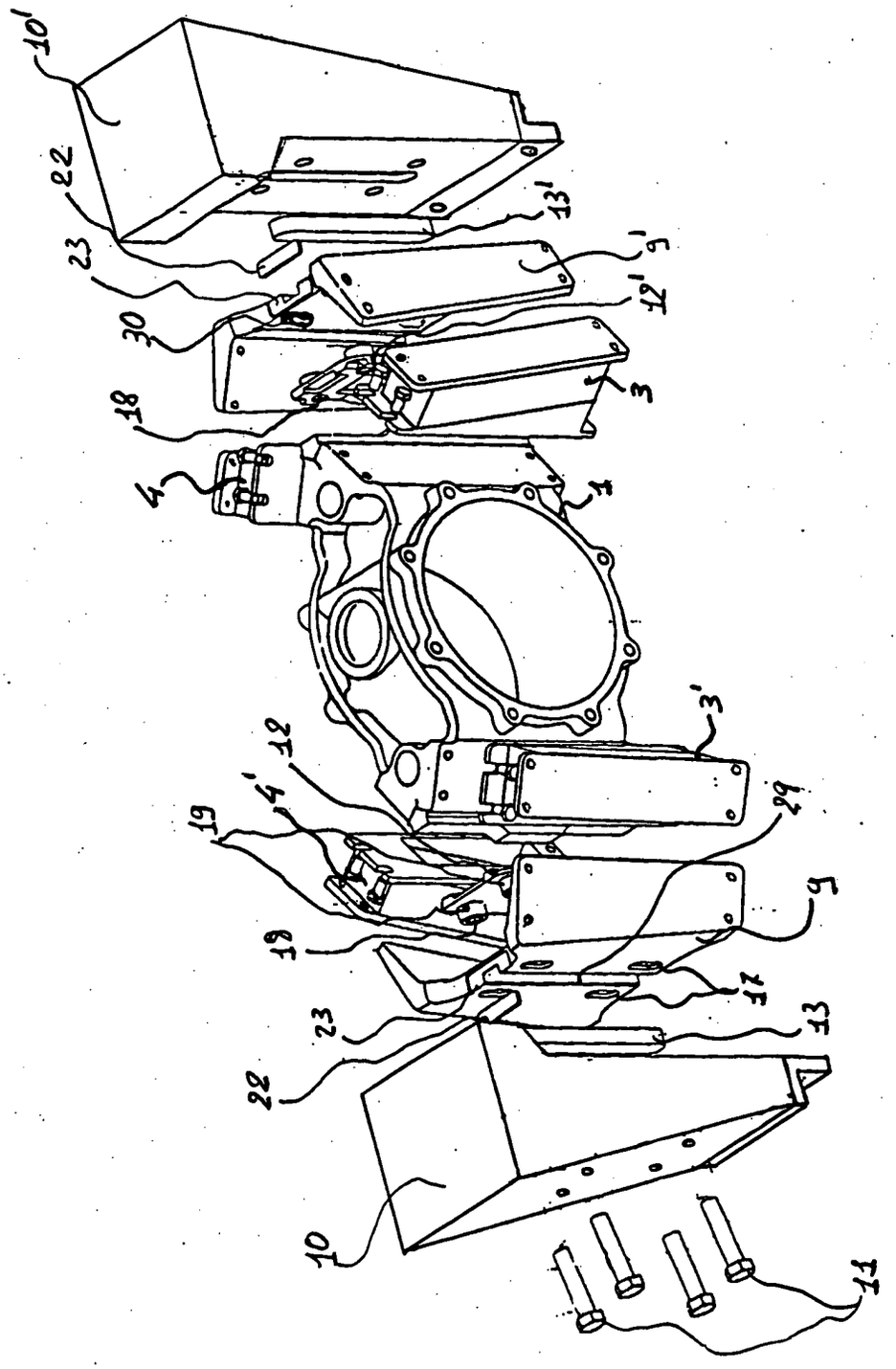

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 03 00 5977

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	22 May 2003	Ferranti, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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