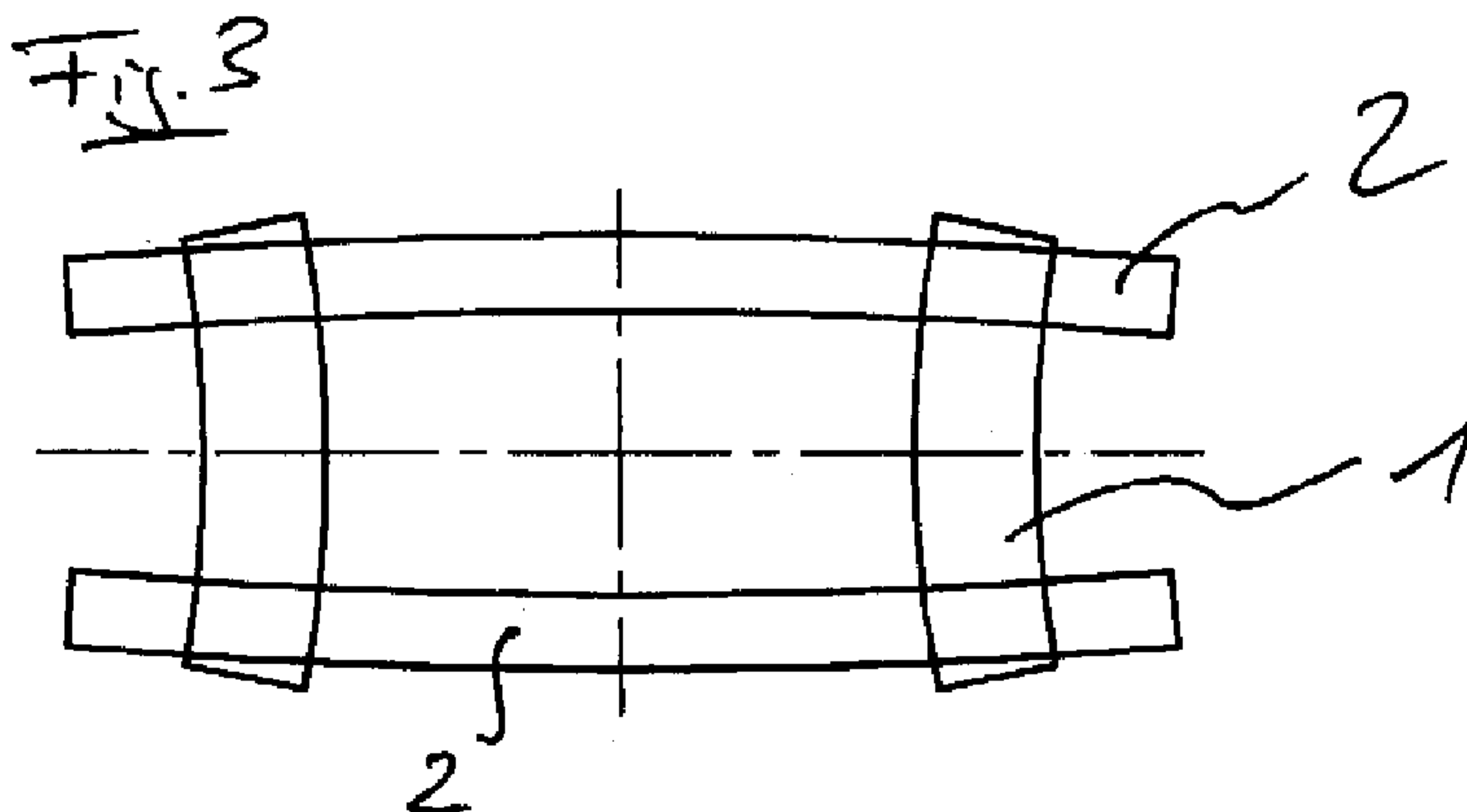




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(54) Titre : CHAINE ET PROCEDE DE FABRICATION D'UNE CHAINE
 (54) Title: CHAIN, AND METHOD FOR MANUFACTURING A CHAIN



(57) **Abrégé/Abstract:**

A chain, in particular a technical chain, preferably a unidimensionally movable chain (plate link chain), more preferably a bolt chain or roller chain, comprising at least one, preferably a number of chain links, wherein the at least one chain link is constructed with a preload, and a method for manufacturing a chain, characterized by at least the following method steps: assembling at least one chain link from at least two link plates (2) with link plate holes (3) and two bolts (1) or sleeves (4), wherein in the non-assembled state, the link plate (2) is not straight, in particular has a curved form, and/or the link plate (2) and the link plate holes have a hole axis (7), wherein the hole axis (7) is not right-angled, and/or, in the non-assembled state, the bolt (1) or the sleeve (4) is not straight, in particular has a curved form, and assembling the chain from at least two chain links, wherein at least one chain link manufactured in this way is used.

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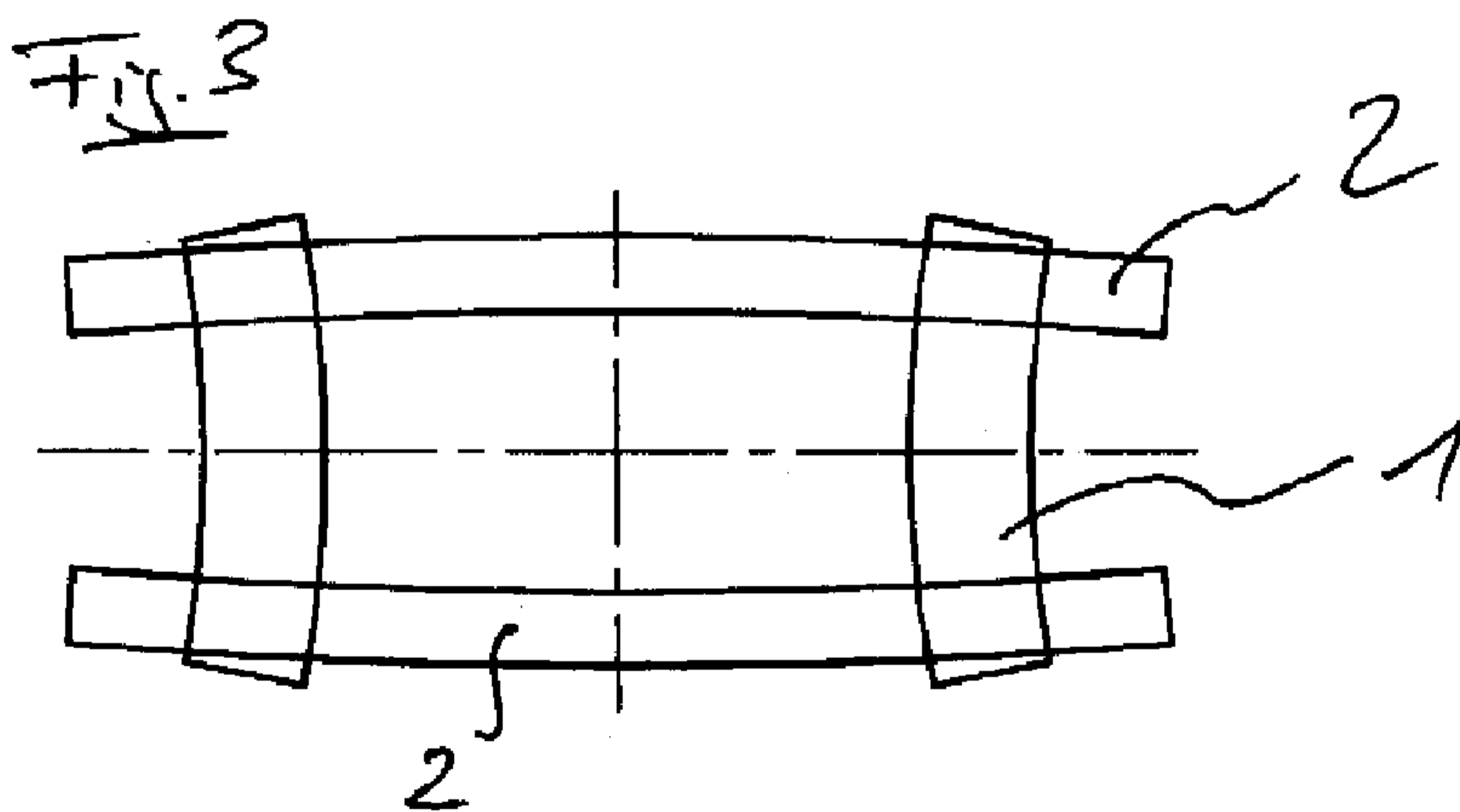
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(54) Title: CHAIN, AND METHOD FOR MANUFACTURING A CHAIN

(54) Bezeichnung : KETTE, SOWIE VERFAHREN ZUR HERSTELLUNG EINER KETTE



(57) Abstract: A chain, in particular a technical chain, preferably a unidimensionally movable chain (plate link chain), more preferably a bolt chain or roller chain, comprising at least one, preferably a number of chain links, wherein the at least one chain link is constructed with a preload, and a method for manufacturing a chain, characterized by at least the following method steps: assembling at least one chain link from at least two link plates (2) with link plate holes (3) and two bolts (1) or sleeves (4), wherein in the non-assembled state, the link plate (2) is not straight, in particular has a curved form, and/or the link plate (2) and the link plate holes have a hole axis (7), wherein the hole axis (7) is not right-angled, and/or, in the non-assembled state, the bolt (1) or the sleeve (4) is not straight, in particular has a curved form, and assembling the chain from at least two chain links, wherein at least one chain link manufactured in this way is used.

(57) Zusammenfassung:

[Fortsetzung auf der nächsten Seite]

WO 2012/001066 A1 

Kette, insbesondere eine technische Kette, vorzugsweise eine eindimensional bewegliche Kette (Gelenkkette), weiter vorzugsweise eine Bolzen- oder Rollenkette, umfassend mindestens ein, vorzugsweise eine Anzahl von Kettenelementen, wobei das mindestens ein Kettenelement mit einer Vorspannung verbaut ist, sowie Verfahren zu Herstellung einer Kette, gekennzeichnet durch mindestens nachfolgende Verfahrensschritte: Zusammenfügen mindestens eines Kettengliedes aus mindestens zwei Laschen (2) mit Laschenlöchern (3) und zwei Bolzen (1) oder Buchsen (4), wobei die Lasche (2) im unverbauten Zustand nicht gerade ist, insbesondere eine gekrümmte Form aufweist und/oder die Lasche (2) und die Laschenlöcher eine Lochachse (7) aufweisen, wobei die Lochachse (7) nicht rechtwinkelig ist und/oder der Bolzen (1) oder die Buchse (4) im unverbauten Zustand nicht gerade ist, insbesondere eine gekrümmte Form aufweist, Zusammenfügen der Kette aus mindestens zwei Kettengliedern, wobei mindestens ein derart hergestelltes Kettenglied verwendet wird.

CHAIN, AND METHOD FOR MANUFACTURING A CHAIN

The present invention relates to a chain, in particular a technical chain, preferably a one-dimensionally movable chain (plate link chain), more preferably a bolt chain or roller chain as claimed in the preamble of claim 1. The aforementioned chains can be used, for example, as conveyor chains. In addition, the invention relates to a method for manufacturing a chain as claimed in claim 10.

In the case of conveyor chains, considerable or significant bending stresses can occur in the link plates caused by the deformation of the bolt. Said high bending stresses have to be taken into consideration during construction and inevitably result in heavier link plates and consequently in higher chain weights. This, in turn, has a negative effect especially in the case of bucket conveyors. The aforementioned bolts and link plates, in addition also the hollow-cylindrical sleeves used instead of the bolts, are chain elements.

The object of the present invention is correspondingly to propose an improved chain, in particular to propose a chain which, with comparable loading capacity, in particular tensile loading capacity, is able to be manufactured using less material.

As claimed in the invention, said object is achieved by a chain with the characteristic features of claim 1. By the chain being manufactured already with at least one pretensioned, in particular negatively pretensioned chain element, in particular a negatively pretensioned bolt or link plate, the bending stress of the chain element, in particular of the link plate or also of the bolt, caused by the operating load can be reduced.

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The result is that the chain is able to be manufactured using less material than a chain as claimed in the state of the art with an identical anticipated tensile load, in particular it is possible to use thinner link
5 plates or bolts.

Further advantageous developments of the chain as claimed in the invention are produced in particular from the features of the sub-claims. In principle, the
10 features of the sub-claims are able to be combined together in an arbitrary manner.

In one preferred development of the chain as claimed in the invention, it can be provided, for example, that
15 the at least one chain element installed with pretensioning has a shape that deviates from the straight form in a non-loaded state of the chain. The chain element acts as a spring in this case, in particular a plate spring. Insofar as the chain is
20 loaded in a tensile manner, the chain element can pull straight against the pretensioning.

In one advantageous development of the invention, it can be provided that the chain element is a link plate,
25 wherein the link plate has a longitudinal axis and link plate holes with a hole axis for accommodating a bolt end or a sleeve end, wherein the hole axis is not aligned at right angles, in particular is aligned obliquely with respect to the longitudinal axis or to
30 the direction of pull of the chain. The "oblique" alignment of the link plate holes is an advantageous possibility to introduce the required pretensioning into the chain or into a chain link. It is particularly advantageous in the case of said variant that plate
35 links and bolts are able to be manufactured in each case with a straight extension and consequently in an economical manner and the pretensioning, in particular the negative pretensioning, is created by the oblique

link plate holes, which are to be introduced in an economical manner, when the chain link or the chain is assembled.

5 In a further advantageous development of the chain as claimed in the invention, it can be provided that at least two bolts or sleeves and two link plates form one chain link of the chain, wherein the bolts or sleeves, in a non-loaded state of the chain, have a curvature
10 which in each case faces the other bolt or sleeve, wherein the link plates, in a non-traction-loaded state of the chain, have a curvature which in each case faces away from the other link plate, wherein in particular the link plates, in a traction-loaded state of the
15 chain, in particular the longitudinal axes thereof, are aligned parallel to each other, wherein in particular the bolts or sleeves, in a traction-loaded state of the chain, in particular the longitudinal axes thereof, are aligned parallel to each other. The aforementioned
20 development of the chain or of the chain link can be achieved by just one or also a combination of measures to generate pretensioning. The form of the aforementioned chain elements in a non-tensile loaded state of the chain is presented in this respect by the
25 link plates being able to bend inward and the bolts or sleeves being able to bend outward. As a result, the chain link of a chain as claimed in the invention is pulled straight and is identical to a chain link as claimed in the state of the art in a non-tensile loaded
30 state. If the tensile load is removed, the chain link once again assumes its original non-straight state.

A further object of the invention is to propose a method for manufacturing an improved chain, in
35 particular to propose a method for manufacturing a chain which with comparable loading capacity, in particular tensile loading capacity, is able to be manufactured using less material.

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As claimed in the invention, said object is achieved by a method as claimed in claim 10. In principle, the development, as stated in claim 10, of the chain elements used is able to be combined in an arbitrary
5 manner. This essentially depends on at least one measure being taken for generating pretensioning in a chain element. The chain link assembled herefrom is then itself tensioned.

10 In practice, the negative pretensioning could be produced, for example,

- by a curved bolt and straight link plate holes (the curved bolts pretensioning the link plates and bolts)
- 15 - oblique link plate holes and straight bolts (link plates and bolts are pretensioned by the oblique bores in the link plates)
- curved link plates with straight link plate holes (link plates and bolts are pretensioned by
20 the curved link plates with the straight holes).

Further measures are conceivable. A number of chain elements are preferably pretensioned in the manner outlined above.

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The proposal/approach is basically also applicable to inside links. In this case, the negative pretensioning can be produced, for example,

- by curved sleeves and straight link plate holes
30 (the curved sleeves pretensioning the link plates and sleeves)
- oblique link plate holes and straight sleeves (the link plates and sleeves are pretensioned by the oblique bores in the link plates)
- 35 - curved link plates with straight link plate holes (the link plates and sleeves are pretensioned by the curved link plates with the straight holes).

Further features and advantages of the present invention become clear by way of the following description of preferred exemplary embodiments with reference to the accompanying figures, in which:

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figure 1 shows two bolts and two link plates of a chain as claimed in the prior art without tensile load (F);

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figure 2 shows two bolts and two link plates of a chain as claimed in the prior art with tensile load (F);

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figure 3 shows a chain as claimed in the invention, in particular two bolts and two link plates, without tensile load (F);

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figure 4 shows a chain as claimed in the invention, in particular two bolts and two link plates, with tensile load (F);

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figures 5-11 show exploded representations of chain elements prior to being assembled to form a chain link or to form a chain as claimed in the invention;

figure 10a shows a chain link assembled from the chain elements according to one of figures 5 to 11;

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figure 12 shows a chain as claimed in the invention;

figure 13 shows a chain as claimed in the invention;

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figure 14 shows a link plate to represent the side face and end face and a bolt.

The following references are used in the figures:

- B Bolt (prior art)
- L Link plate (prior art)
- 5 F Tensile force / possible running direction

- 1 Bolt
- 2 Link plate
- 3 Link plate hole
- 10 4 Sleeve
- 5 Longitudinal axis of the bolt or of the sleeve
in the non-installed state
- 6 Longitudinal axis of the link plate in the non-
installed state
- 15 7 Hole axis of the link plate hole
- 8 Side face
- 9 End face
- 5' Longitudinal axis of the bolt of the sleeve in
the installed state
- 20 6' Longitudinal axis of the link plate in the
installed state

- 7 -

Reference is made initially to figure 1. The representation of the deformation is shown to excess in all the figures for illustrative purposes.

5 Figure 1 shows several chain elements of a chain as claimed in the prior art, in particular two bolts B and two link plates L, in a non-loaded state, in particular without tensile force F. It can be seen that the chain elements, in particular the bolts and link plates, are
10 ideally typically straight in a non-loaded state of the chain.

Figure 2 shows several chain elements of a chain as claimed in the prior art, in particular two bolts B and
15 two link plates L, in a loaded state, in particular with a tensile force F. It can be seen that the chain elements, in particular the bolts and link plates, are deformed in a loaded state of the chain, in particular deviate from the ideally typically straight form. This
20 is essentially to be traced back to the tensions brought about as a result of the tensile force.

Figure 3 shows several chain elements of a chain as claimed in the invention, in particular two bolts 1 and
25 two link plates 2, in a non-loaded state, in particular without tensile force F. It can be seen that the chain elements, in particular the bolts and link plates, are not straight in a non-loaded state of the chain. The representation is shown in an exaggerated manner. The
30 chain elements, in particular the bolts and link plates, are installed with pretensioning.

Figure 4 shows several chain elements of a chain as claimed in the invention, in particular two bolts 1 and
35 two link plates 2, in a loaded state, in particular with a tensile force F. It can be seen that the chain elements, in particular the bolts and link plates, are ideally typically straight in a loaded state of the chain. This is essentially to be traced back to the

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fact that the tensions resulting from the tensile force
counteract the pretensioning. In the ideal case, the
aforementioned tensions cancel each other out. It could
be cited slightly loosely that the loaded chain as
5 claimed in the invention is similar to the non-loaded
chain as claimed in the prior art with reference to the
outer form thereof.

The effect of this is that the chain does not have
10 straight chain elements, in particular link plates,
bolts and/or sleeves, until it is under its regular
load. In other words: A chain provided with the
proposed chain elements is not pulled straight until
under load, that is to say under tensile load it has a
15 form which corresponds to that of a non-loaded chain as
claimed in the prior art. This means that a high level
of dimensional stability of the traction-loaded chain
is assured, as a result of which, for example, the
engagement of a gear wheel or the rotation of the
20 individual chain links, loosely said the running of the
chain, can be improved, this not being achieved,
however, by using more or more expensive material.

A further advantage of the invention is produced by the
25 bolt which is curved less under load or is not curved
at all under load. The support faces between the
sleeves and the bolts are increased and the so-called
edge pressure is reduced. Sleeves and bolts lie on top
of each other in an optimum manner. This means a
30 reduction in wear.

A chain as claimed in the invention essentially
comprises a number of chain links. A chain link
comprises a number of chain elements, in particular
35 link plates 2 with link plate holes 3, bolts 1 and/or
sleeves 4. The link plates 2 can be developed, for
example, as outer link plates. In this case, the chain
link preferably comprises link plates 2 and bolts 1.

The link plates can additionally be developed as inner link plates. In this case, the chain link preferably comprises link plates and sleeves 4. In a chain, in each case the bolts 1 are inserted through the sleeves 4 and consequently a number of chain links are arranged one behind another. The aforementioned embodiment forms a really simple chain. More than two link plates per chain link are also conceivable such that also intermediate link plates are conceivable.

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Figures 5 to 11 show chain elements prior to being joined together to form a chain link or a chain. In particular, figures 5 to 11 serve for the purpose of explaining in more detail the different possibilities for generating pretensioning inside the chain link. The individual non-installed chain elements have longitudinal axes, in particular the link plate 2 has a longitudinal axis 6, the bolt 1 has a longitudinal axis 5 and the sleeve 4 has a longitudinal axis 5. Insofar as it is assumed that a link plate has two side faces 8 and one end face 9, at least one side face 8 facing the bolt 1 or the sleeve 4, a longitudinal axis 6 should be assumed which is produced in a top view on the end face 9 of the link plate 2. Perspective views of a link plate, a bolt and a sleeve are shown as examples in figure 14.

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Each link plate hole 3 has a hole axis 7. Insofar as the link plate holes 3 are circular bores, instead of the hole axis, it is also possible to speak of a bore axis or center axis. In principle, arbitrary forms of the link plate holes are conceivable.

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The aforementioned chain elements can be installed to form a chain link. An installed state of the chain links is shown in figure 10a. To clarify the differences between a non-installed and an installed state of the aforementioned chain elements, in

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particular with reference to the longitudinal axes thereof, the respective longitudinal axes of the link plate, bolt and sleeve are characterized in the installed state by way of a line, accordingly as 5' and 6'. The representation of the curvatures is shown in an exaggerated manner and serves to visualize the respective curvatures. Materials, in particular steels, which enable corresponding reshaping and which have sufficient elastic characteristics, in particular in order to build up corresponding tension inside the chain link, are used for the individual chain elements. As already addressed above, the chain elements or the link plate holes can have different developments. The following table gives an overview of the possible developments which can lead to a desired pretensioning, in particular a negative pretensioning, inside the chain link or the chain.

Variants	Bolt / sleeve	Link plate	Link plate hole
1 (fig. 5)	straight	straight	oblique
2 (fig. 6)	straight	curved	vertical
3 (fig. 7)	straight	curved	oblique
4 (fig. 8)	curved	straight	vertical
5 (fig. 9)	curved	straight	oblique
6 (fig. 10)	curved	curved	vertical
7 (fig. 11)	curved	curved	oblique

A first variant of a chain link is shown in figure 5. In a non-installed state, the longitudinal axis 6 of the link plate 2 and also the longitudinal axis 5 of the bolt 1 are straight. The hole axis 7 of the link plate holes 3, in said variant, however, is not aligned at right angles to the longitudinal axis 6 of the link plate 2, that is to say oblique link plate holes are provided in the link plates. This could also be characterized in that the link plate holes are set obliquely with respect to the longitudinal running of

the chain. To produce the chain link, the bolt ends are introduced into the link plate holes 3. As the bolts 1 and the link plates 2 are straight, the link plate holes 3 however oblique, both the link plates 2 and the bolts 1 are curved by the tension created such that the shape of the resulting chain link is approximately as that indicated in figure 10a. The oblique link plate holes can be realized in production in a particularly advantageous manner and make it possible to produce a pretensioned chain link or a chain with negative pretensioning in a cost-effective manner. The longitudinal axis 5' of the bolts and also the longitudinal axis 6' of the link plates inside the chain link is not straight, in particular is curved. The hole axis is also designated in the installed state by the reference 7 as it does not curve - at least to a technically relevant extent. In principle, in this case and also in the following variants, chain elements which do not actually match each other are therefore installed together. Particularly advantageous in the case of said variant is that link plates and bolts can be produced in each case with a straight extension and the pretensioning, in particular the negative pretensioning, is not created until the chain link or the chain is assembled. The chain link according to figure 10a is distinguished in particular in that the link plates 2 are curved outward and the bolts 1 or sleeves 4 are curved inward.

In order to avoid repetition, it should be pointed out that all chain links produced according to the variants, in principle, can assume a shape as indicated in figure 10a. Slight deviations can be produced in particular by an oblique or non-oblique alignment of the link plate holes.

A second variant of a chain link is shown in figure 6. In a non-installed state, the longitudinal axis 6 of

the link plate 2 is curved and the longitudinal axis 5 of the bolts 1 is straight. Put simply, curved link plates 2 are installed with straight bolts 1 in said variant. The hole axis 7 of the link plate holes 3 is aligned in said variant at right angles to the respective portion of the longitudinal axis 6 of the link plate or to the running direction of the chain, that is to say straight link plate holes 3 are provided in the link plates 2 for the respective portion. To produce the chain link, the bolt ends are introduced into the link plate holes 3. As the bolts 1 are straight, the link plates 2 however curved, the bolts 1 are also curved by the tension created such that the shape of the resulting chain link is approximately as indicated in figure 10a. Overall, the chain link, in particular the chain elements thereof, is under a desired tension.

A third variant of a chain link is shown in figure 7. In a non-installed state, the longitudinal axis 6 of the link plate 2 is curved and the longitudinal axis 5 of the bolts 1 is straight. Put simply, curved link plates 2 are installed with straight bolts 1 in said variant. In this variant, the hole axis 7 of the link plate holes 3 is aligned obliquely with respect to the respective portion of the longitudinal axis 6 of the link plate or to the running direction of the chain, that is to say oblique link plate holes 3 are provided in the link plates 2 for the respective portion of the longitudinal axis. To produce the chain link, the bolt ends are introduced into the link plate holes 3. As the bolts 1 are straight, the link plates 2 however curved and the link plate holes 3 beveled, the bolts 1 too are curved by the tension created such that the shape of the resulting chain link is approximately as that indicated in figure 10a. Overall, the chain link, in particular the chain elements thereof, is under a desired tension. The production technique of the

aforementioned variant is particularly advantageous as the bolt ends and the respective link plate holes 3 can already be aligned with respect to each other to some extent in a non-installed state.

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A fourth variant of a chain link is shown in figure 8. In a non-installed state, the longitudinal axis 6 of the link plate 2 is straight and the longitudinal axis 5 of the bolts 1 is curved. Put simply, straight link plates are installed with curved bolts in said variant. The hole axis 7 of the link plate holes 3 is aligned in said variant at right angles to the respective longitudinal axis of the link plate or to the running direction of the chain, that is to say straight link plate holes 3 are provided in the link plates 2. To produce the chain link, the bolt ends are introduced into the link plate holes 3. As the bolts 1 are curved and the link plate holes 3 vertical or straight, the link plates 2 are also curved by the tension created such that the shape of the resulting chain link is approximately as indicated in figure 10a. Overall, the chain link, in particular the chain elements thereof, is under desired tension as a result of the chain elements which actually do not match.

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A fifth variant of a chain link is shown in figure 9. In a non-installed state, the longitudinal axis 6 of the link plate 2 is straight and the longitudinal axis 5 of the bolts 1 is curved. Put simply, straight link plates are installed with curved bolts in said variant. The hole axis 7 of the link plate holes 3 is aligned in said variant obliquely with respect to the longitudinal axis 6 of the link plate or to the running direction of the chain, that is to say oblique link plate holes 3 are provided in the link plates 2. To produce the chain link, the bolt ends are introduced into the link plate holes 3. As the bolts 1 are curved, the link plates 2 however straight and the link plate holes 3 are

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beveled, the link plates 2 are also curved by the tension created such that the shape of the resulting chain link is approximately as indicated in figure 10a. Overall, the chain link, in particular the chain element thereof, is under a desired tension. The manufacturing technique of the aforementioned variant is particularly advantageous as the bolt ends and the respective link plate holes can already be aligned to each other to some extent in a non-installed state.

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A sixth variant of a chain link is shown in figure 10. In a non-installed state, the longitudinal axis 6 of the link plate 2 is curved and the longitudinal axis 5 of the bolts 1 is curved. Put simply, curved link plates are installed with curved bolts in said variant. The hole axis 7 of the link plate holes 3 is aligned in said variant at right angles to the respective portion of the longitudinal axis of the link plate or to the running direction of the chain, that is to say straight link plate holes 3 are provided in the link plates. To produce the chain link, the bolt ends are introduced into the link plate holes 3. The curvature of bolt 1 and link plate 2 can be developed in such a manner that tension is nevertheless created in the chain link, in particular in the chain elements. The manufacturing technique of the aforementioned variant is particularly advantageous as the bolt ends and the respective plate link holes can already be aligned with one another to some extent in a non-installed manner.

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A seventh variant of a chain link is shown in figure 11. In a non-installed state, the longitudinal axis 6 of the link plate 2 is curved and the longitudinal axis 5 of the bolts 1 is curved. Put simply, curved link plates are installed with crooked bolts in said variant. The hole axis 7 of the link plate holes 3 is aligned in said variant obliquely with respect to the respective portion of the longitudinal axis of the link

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plate or to the running direction of the chain, that is to say oblique link plate holes are provided in the link plates. To produce the chain link, the bolt ends are introduced into the link plate holes 3. The curvature of bolt and link plate and also the alignment of the link plate holes can be developed in such a manner that tension is nevertheless created in the chain link, in particular in the chain elements. The manufacturing technique of the aforementioned variant is particularly advantageous as the bolt ends and the respective link plate holes are already aligned to one another to some extent in a non-installed state.

Representation of the variants which have sleeves 4 in place of bolts 1 has been omitted so as to avoid repetition. In the aforementioned variants, the solid bolt 1 can be replaced by a hollow-cylindrical sleeve 4. The development of the sleeve, that is to say a straight or curved sleeve, corresponds to the respective defaults of the bolt in the individual variants.

It can be seen that the result of the manufacture of a chain link using at least one above-outlined chain element, as a rule, is a chain link with a curved link plate and a curved bolt (cf. figure 10a). The bending of the link plate 2 and bolt 1 in an installed state, that is to say inside a chain link, can be predetermined as extensively as possible, for example by appropriate material selection and/or selection of the curvature prior to assembly. Thus, for example, it can also be provided that the curvature of the link plates is very slight or the link plate remains straight in the installed state. Nonetheless, the bolt 1 is curved and the chain link or the chain elements are under the required pretensioning. Said embodiment with link plates as straight as possible is particularly interesting technically as in this way

collisions with the link plates of adjacent chain links can be avoided in a simple manner.

Figure 12 shows a chain as claimed in the invention with two chain links. The left-hand chain link is a chain link which has been assembled from straight link plates 2, oblique link plate holes 3 and straight bolts 1 (cf. variant according to figure 5). Through corresponding manufacturing technology, care has been taken to ensure that the link plate 2, even in the installed state, that is to say in the chain link, has remained as straight as possible. The bolts 1, however, are curved. The second, right-hand chain link is a chain link as claimed in the prior art with link plates 2 and sleeves 4. A bolt 1 of the first chain link is guided through a sleeve 4 of the second chain link. The chain is shown in a non-loaded state, i.e. no tensile forces are acting on the chain links. It is comprehensible that the chain, in particular the bolt is "pulled straight" when a corresponding tensile force acts on the chain, in particular on the bolts. In the ideal case, the bolts 1 or sleeves 4 are then straight, that is to say the longitudinal axes 5 thereof are parallel, and the link plates 2 are straight, that is to say the longitudinal axes 6 thereof are parallel. The chain can obviously be extended more by further chain links, it being possible to use both chain links with pre-tensioned chain elements, also in the embodiment with sleeves, and chain links as claimed in the prior art, that is to say without pre-tensioned chain elements.

Figure 13 shows a chain as claimed in the invention with two chain links. The left-hand chain link is a chain link with pre-tensioned chain elements, which has been assembled from curved link plates 2, vertical link plate holes 3 and curved bolts 1 (cf. sixth variant according to figure 10). Once again, a chain link with

| sleeves 4 as claimed in the prior art is used as the second chain link, it obviously also being possible in this case too to use a chain link with pre-tensioned sleeves 4 or other pre-tensioned chain elements. 5 Otherwise, reference can be made to the designs in figure 12, the link plates also being "pulled straight" in the present embodiment.

Just two combinations of chain links in a chain as 10 claimed in the invention have been looked at in detail above. However, it is fundamentally possible to combine together each of the above-mentioned variants of the chain links in each case in the pairing with bolts or with sleeves. Thus, for example, the first variant with 15 bolts can be combined together with the second variant with sleeves. The variants with conventional chain links can also be combined to form a chain as claimed in the invention.

Claims:

1. A chain, in particular a technical chain,
5 preferably a one-dimensionally movable chain (plate
link chain), more preferably a bolt chain or roller
chain, said chain comprising a number of chain
elements, characterized in that at least one chain
element is installed with pretensioning.
- 10
2. The chain as claimed in claim 1, characterized in
that the at least one chain element installed with
pretensioning is installed with pretensioning which is
negative to the pulling direction occurring when the
15 chain is under tensile load (F).
3. The chain as claimed in at least one of the
preceding claims, characterized in that the chain
element is a bolt (1), a link plate (2) and/or a sleeve
20 (4).
4. The chain as claimed in at least one of the
preceding claims, characterized in that the at least
one chain element installed with pretensioning has a
25 form that deviates from the straight form in a non-
loaded state of the chain.
5. The chain as claimed in at least one of the
preceding claims, characterized in that the link plate
30 (2) has a longitudinal axis (6'), wherein the
longitudinal axis (6') is not straight in a non-
traction-loaded state of the chain, in particular has a
curved form.
- 35
6. The chain as claimed in at least one of the
preceding claims, characterized in that the bolt (1) or
the sleeve (4) has a longitudinal axis (5'), wherein
the longitudinal axis (5') is not straight in a non-

traction-loaded state of the chain, in particular has a curved form.

7. The chain as claimed in at least one of the preceding claims, characterized in that the link plate has a longitudinal axis (6') and link plate holes (3) with a hole axis (7) for accommodating a bolt end or a sleeve end, wherein the hole axis (7) is not aligned at right angles, in particular is aligned obliquely with respect to the longitudinal axis (6') or to the direction of pull (F) of the chain.

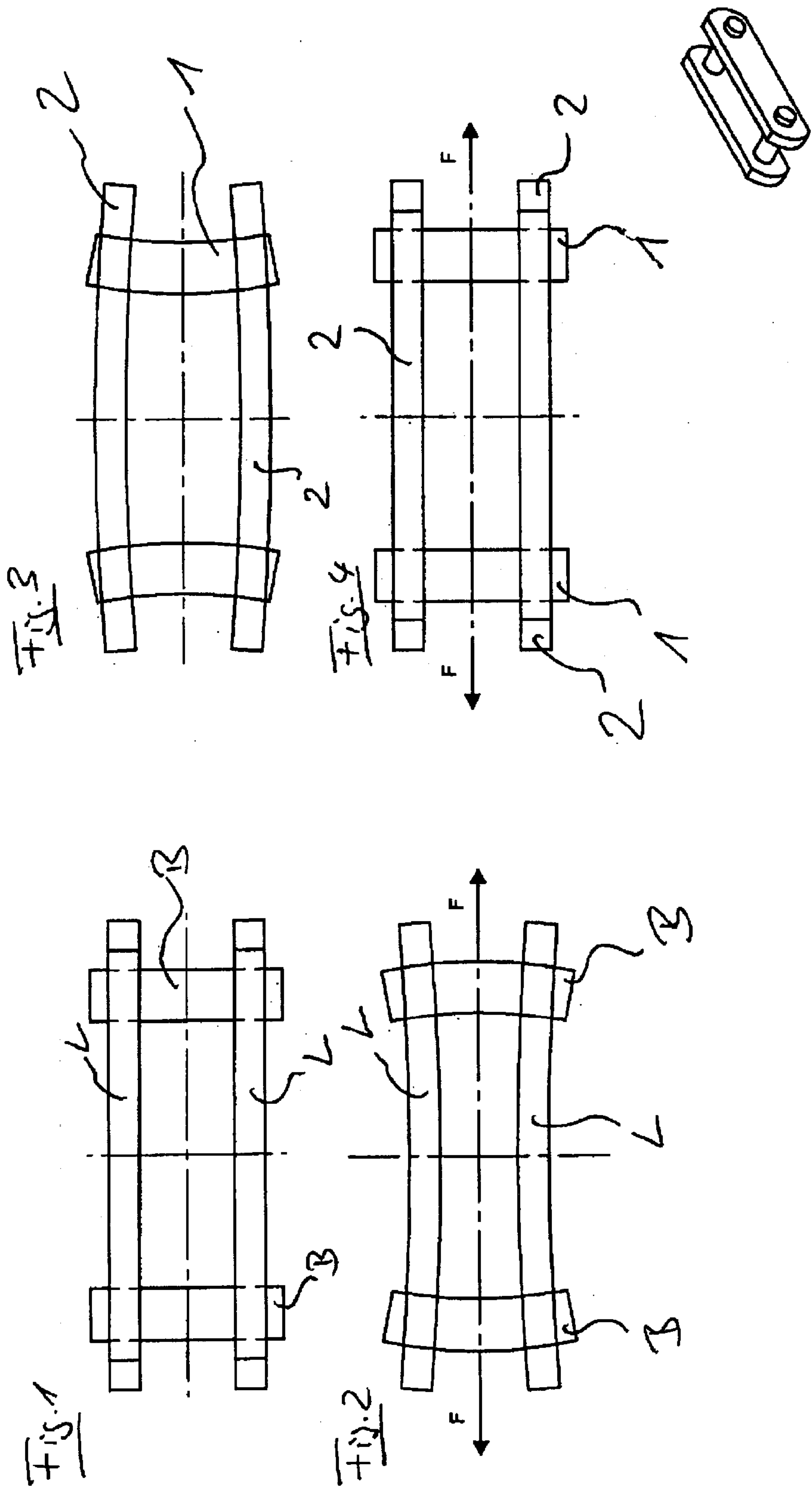
8. The chain as claimed in at least one of the preceding claims, characterized in that at least two bolts (1) or sleeves (4) and two link plates (2) form one chain link of the chain, wherein the bolts (1) or sleeves (4), in a non-loaded state of the chain, have a curvature which in each case faces the other bolt or sleeve, wherein the link plates (2), in a non-traction-loaded state of the chain, have a curvature which in each case faces away from the other link plate.

9. The chain as claimed in at least one of the preceding claims, characterized in that the link plates (2), in a traction-loaded state of the chain, in particular the longitudinal axes thereof, are aligned parallel to each other, wherein the bolts (1) or sleeves (4), in a traction-loaded state of the chain, in particular the longitudinal axes thereof, are aligned parallel to each other.

10. A method for manufacturing a chain as claimed in one of claims 1 to 9, characterized by at least the following method steps:

- joining at least one chain link from at least two link plates (2) with link plate holes (3) and two bolts (1) or sleeves (4), wherein

- 5 - the link plate (2) has a longitudinal axis (6), wherein the longitudinal axis (6) is not straight in the non-installed state of the link plate (2), in particular has a curved form and/or
- 10 - the link plate (2) has a longitudinal axis (6) and the link plate holes have a hole axis (7), wherein the hole axis (7) is not aligned at right angles, in particular is aligned obliquely with respect to the longitudinal axis (6) or to a direction of pull (F) of the chain and/or
- 15 - the bolt (1) and/or the sleeve (4) has a longitudinal axis (5), wherein in the non-installed state of the bolt (1) or of the sleeve (4) the longitudinal axis (5) is not straight, in particular has a curved form,
- 20 - joining the chain from at least two chain links, wherein at least one chain link manufactured in this manner is used.



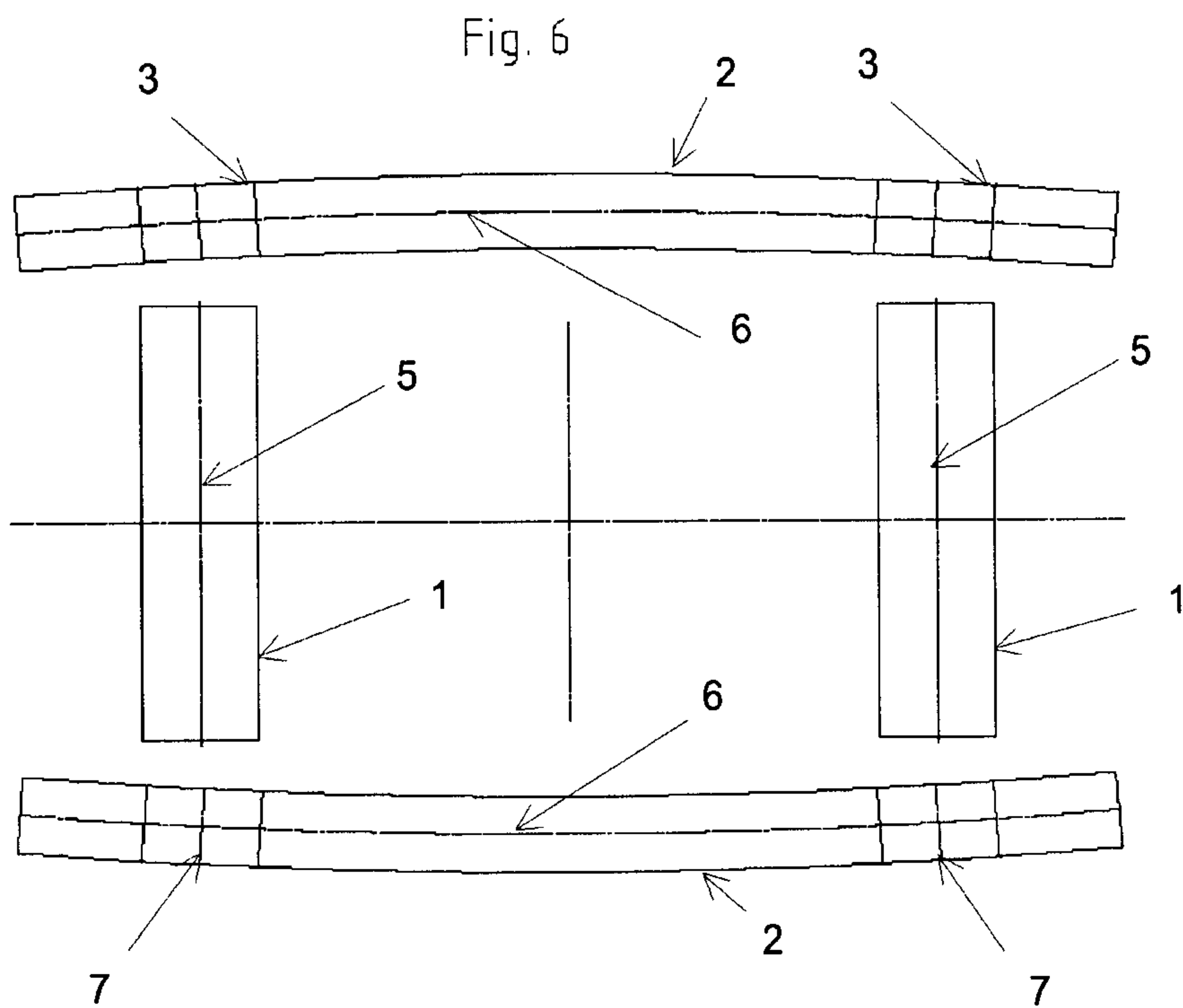
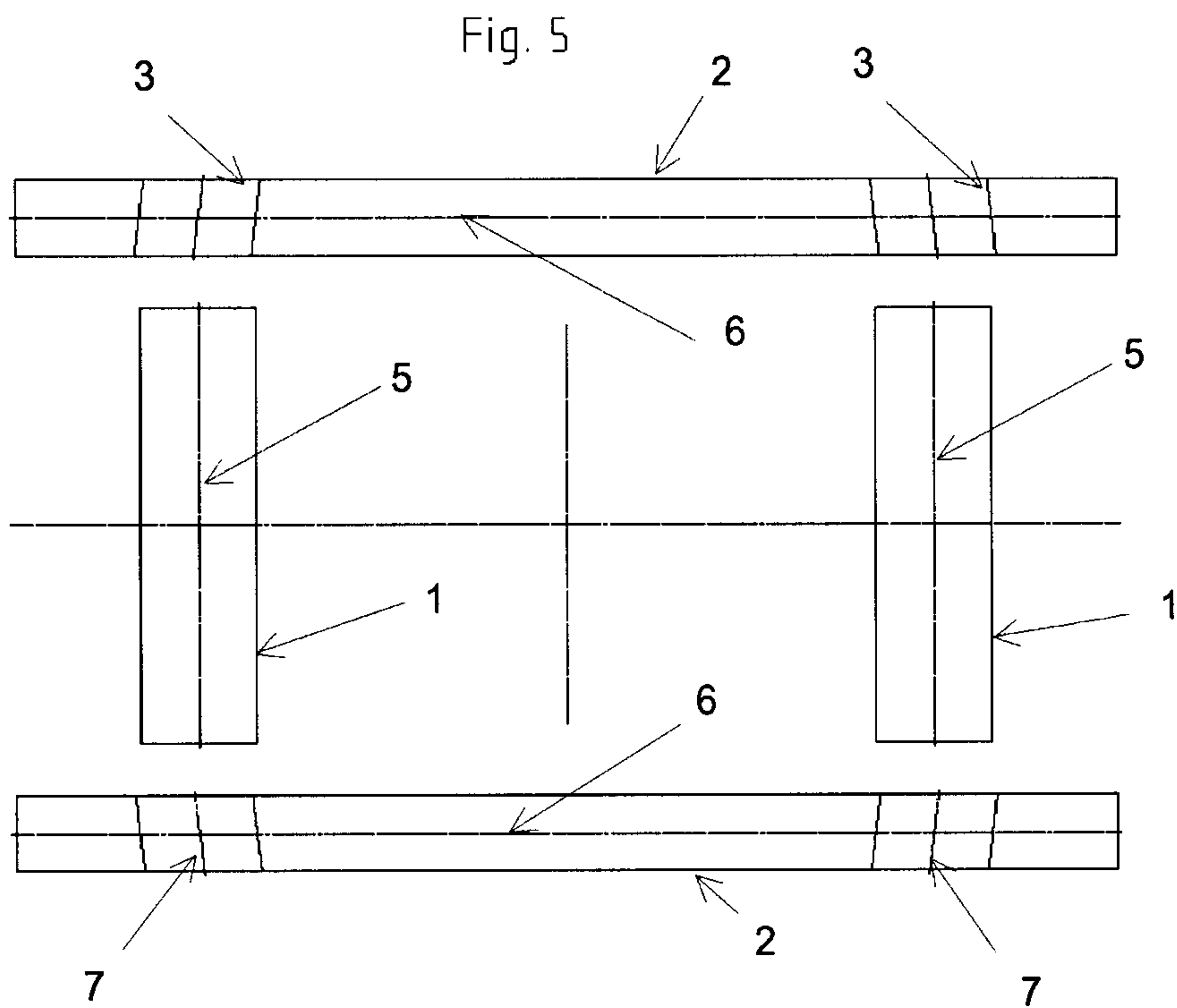


Fig. 7

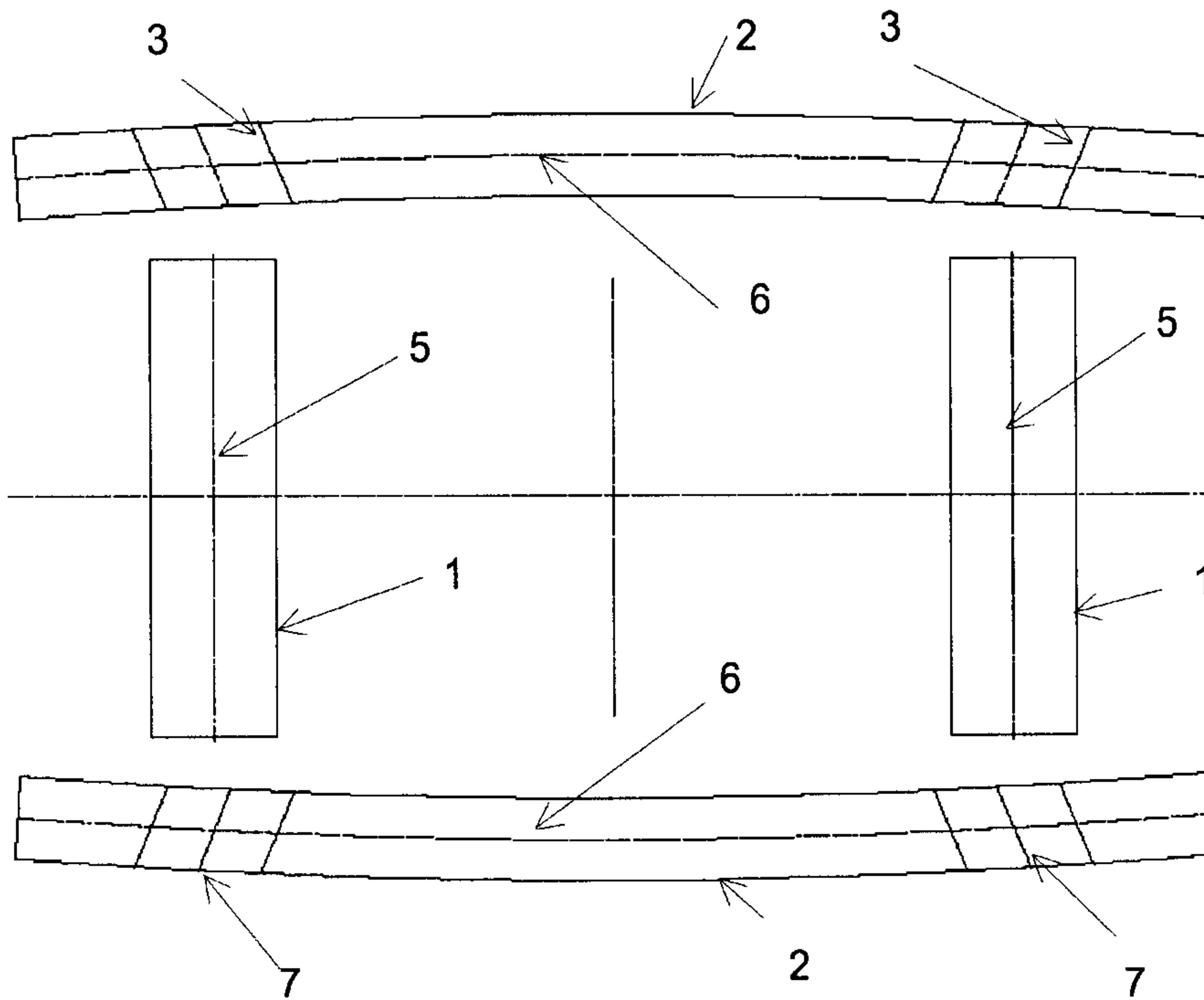


Fig. 8

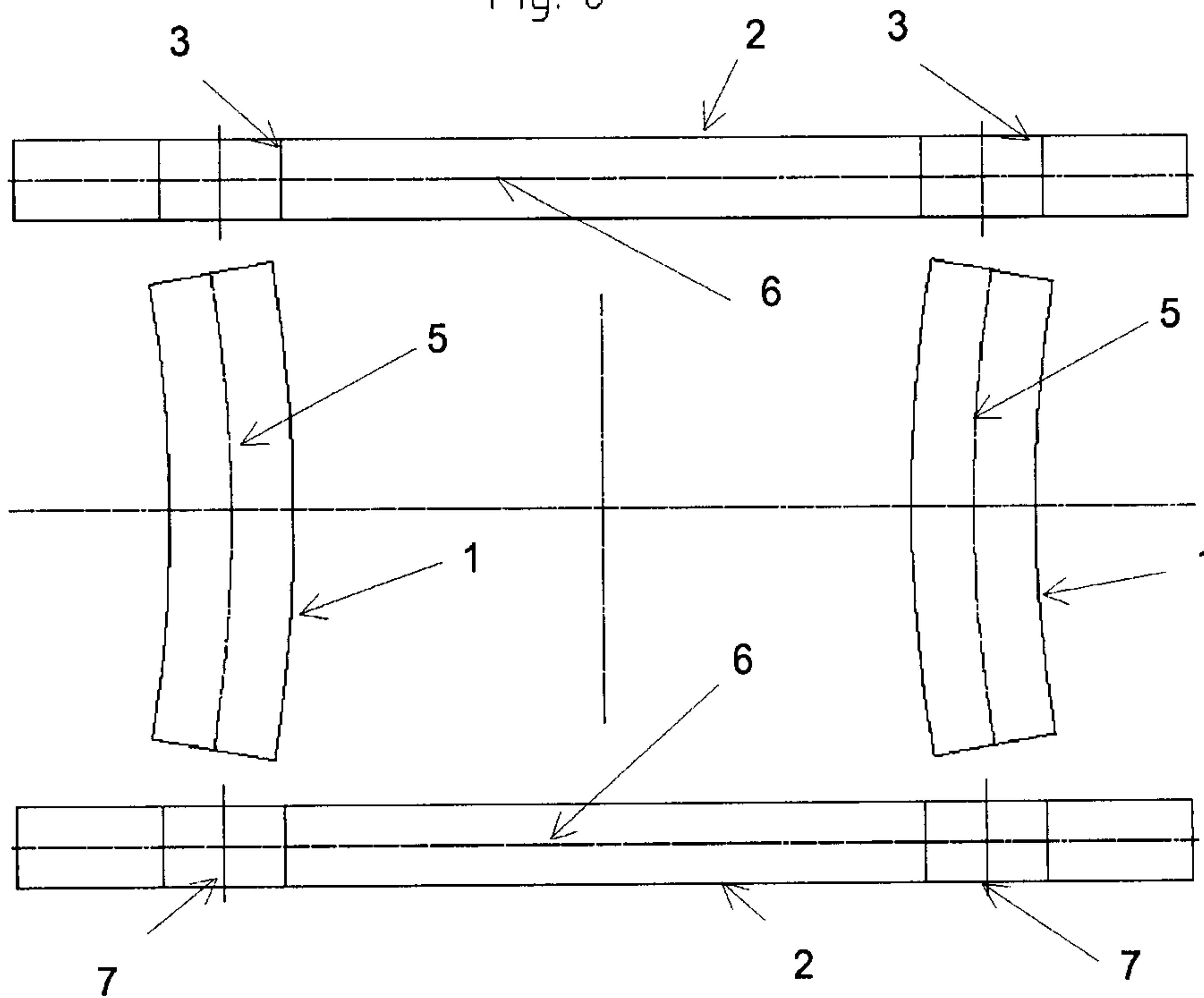


Fig. 9

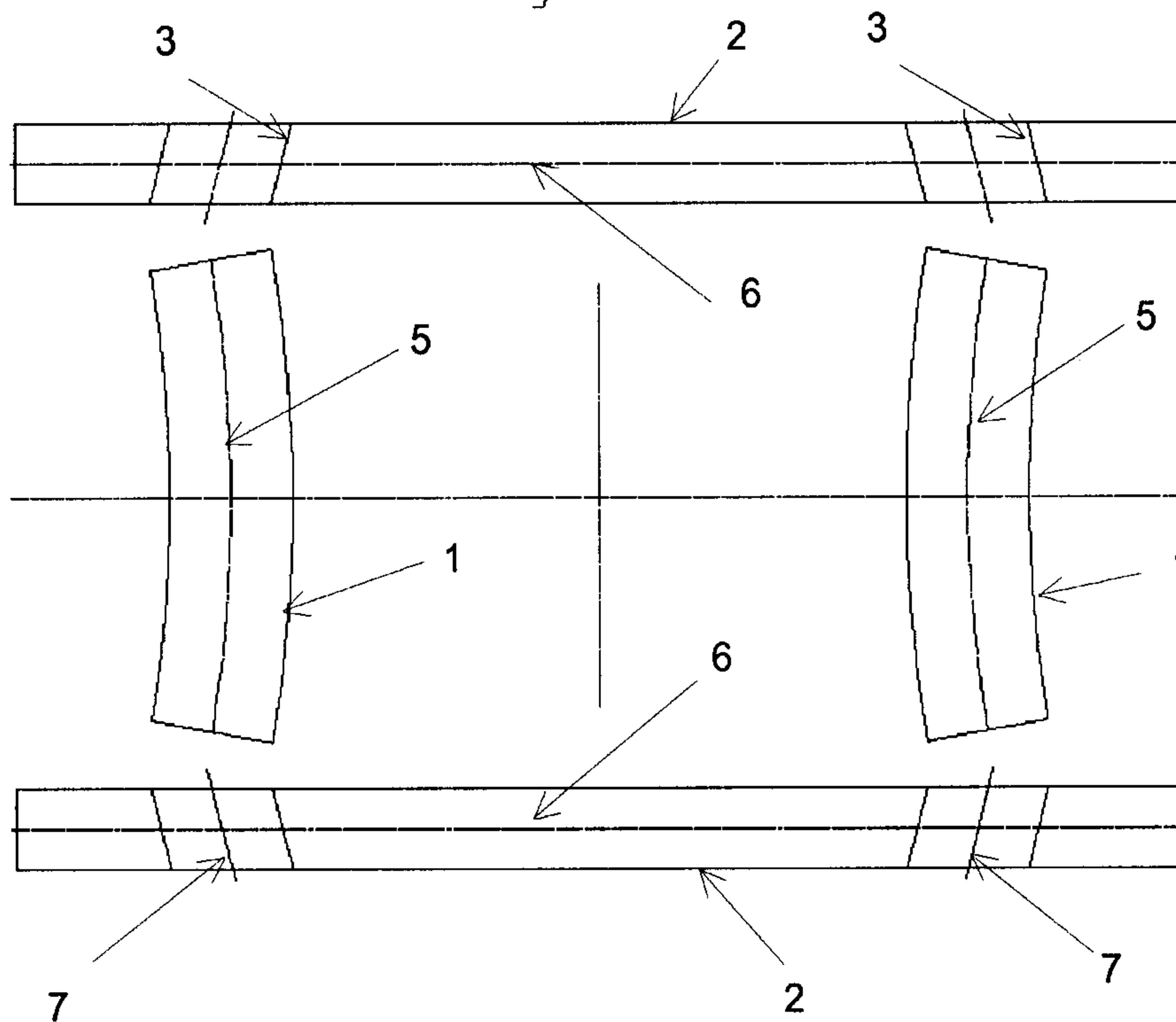


Fig. 10

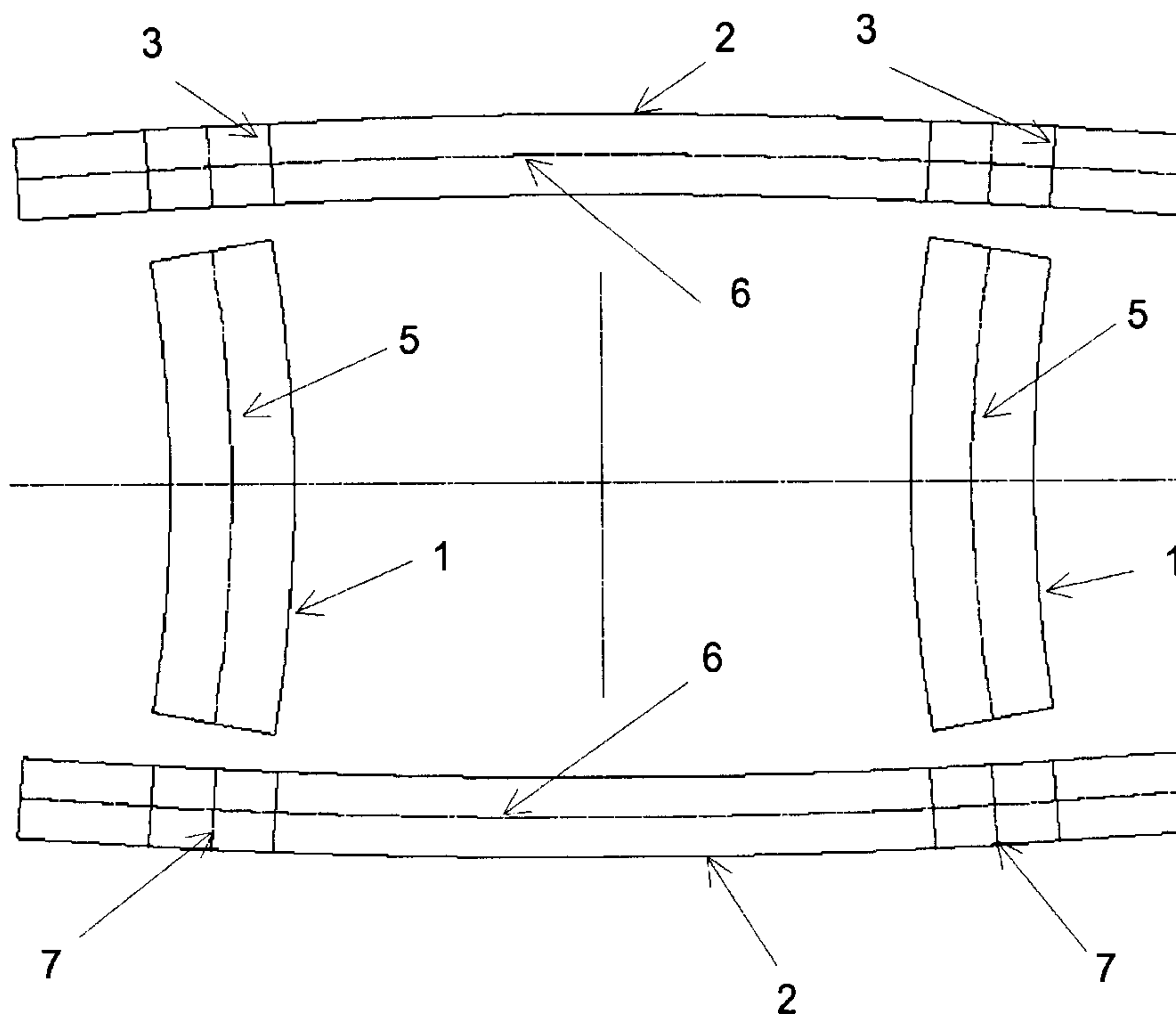


Fig. 10a

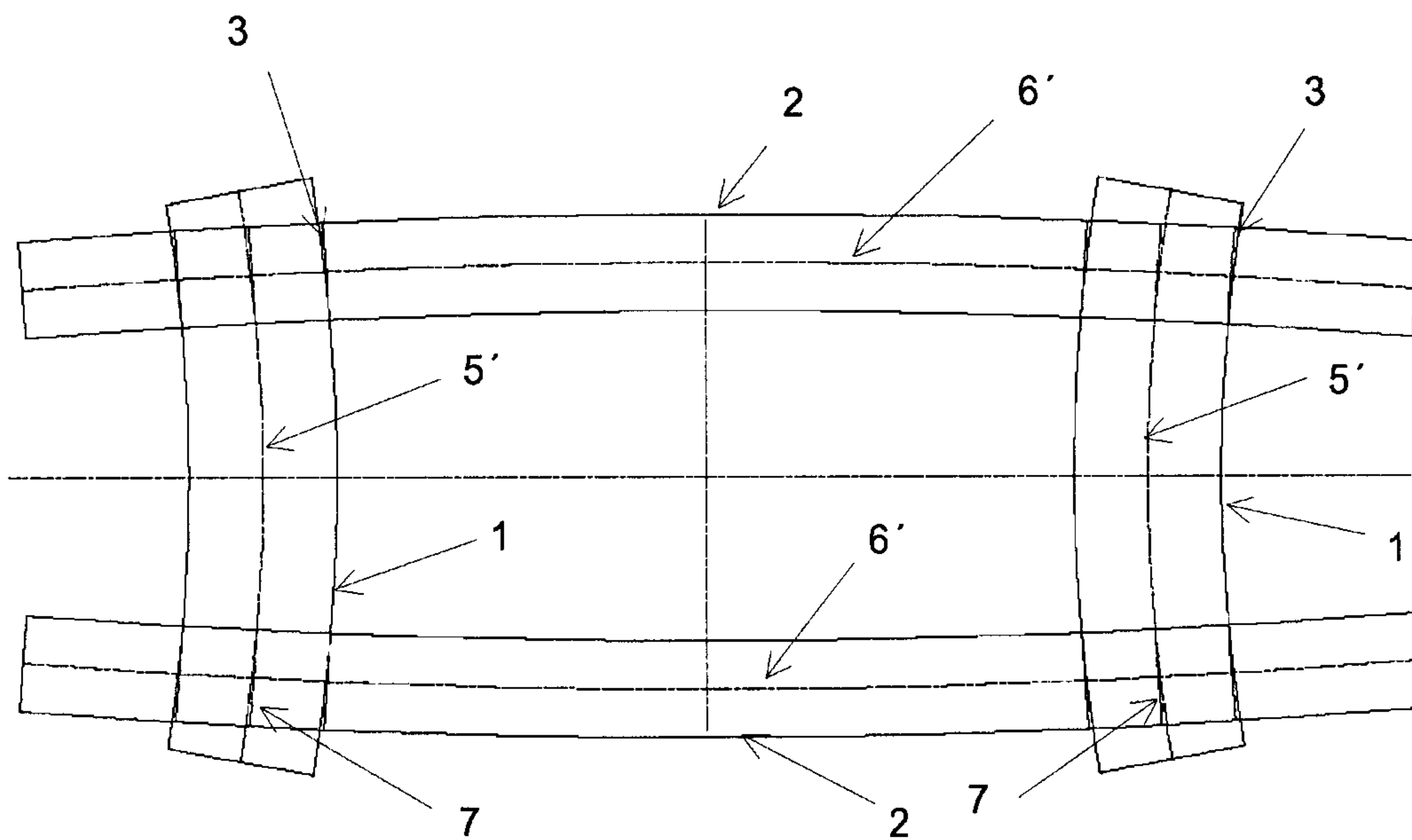
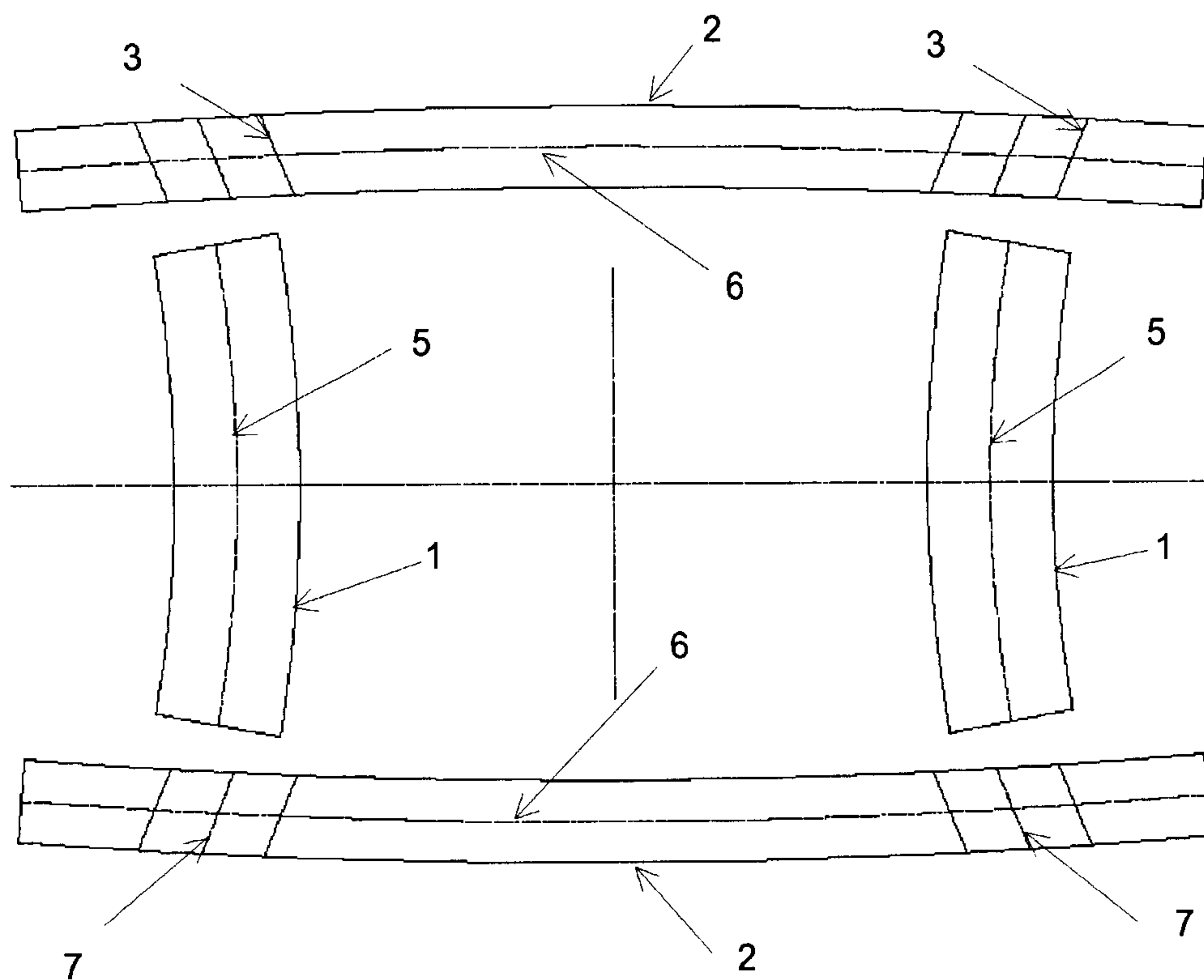
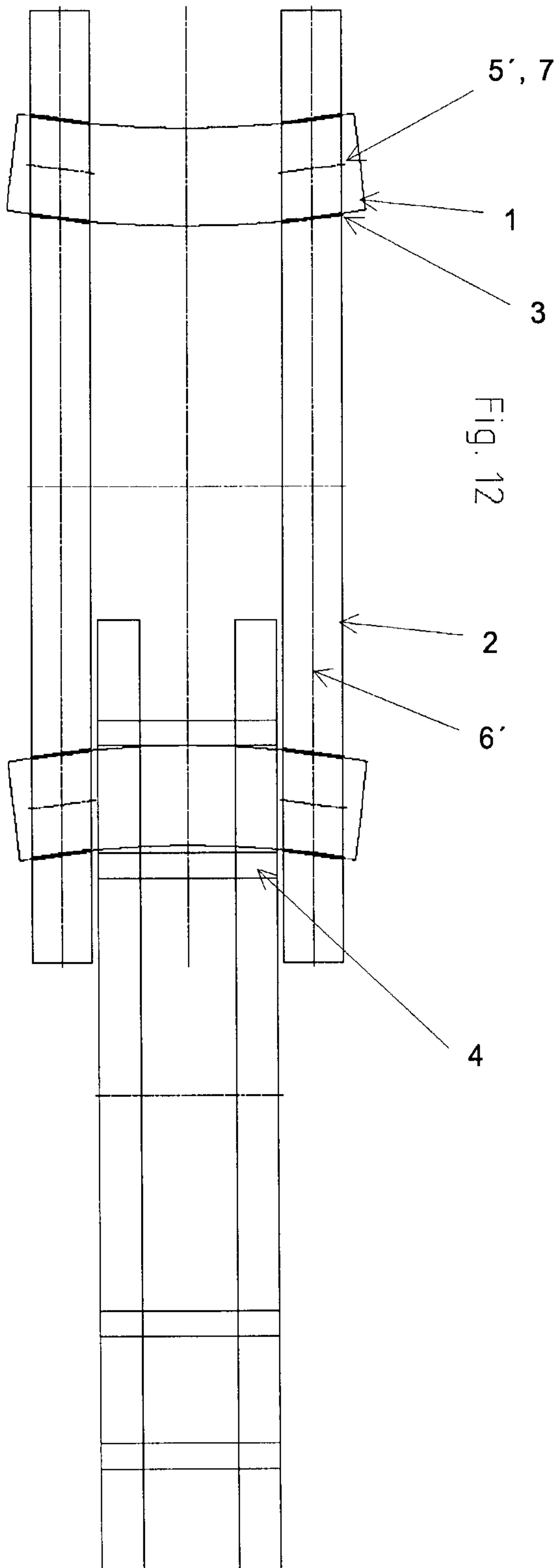


Fig. 11





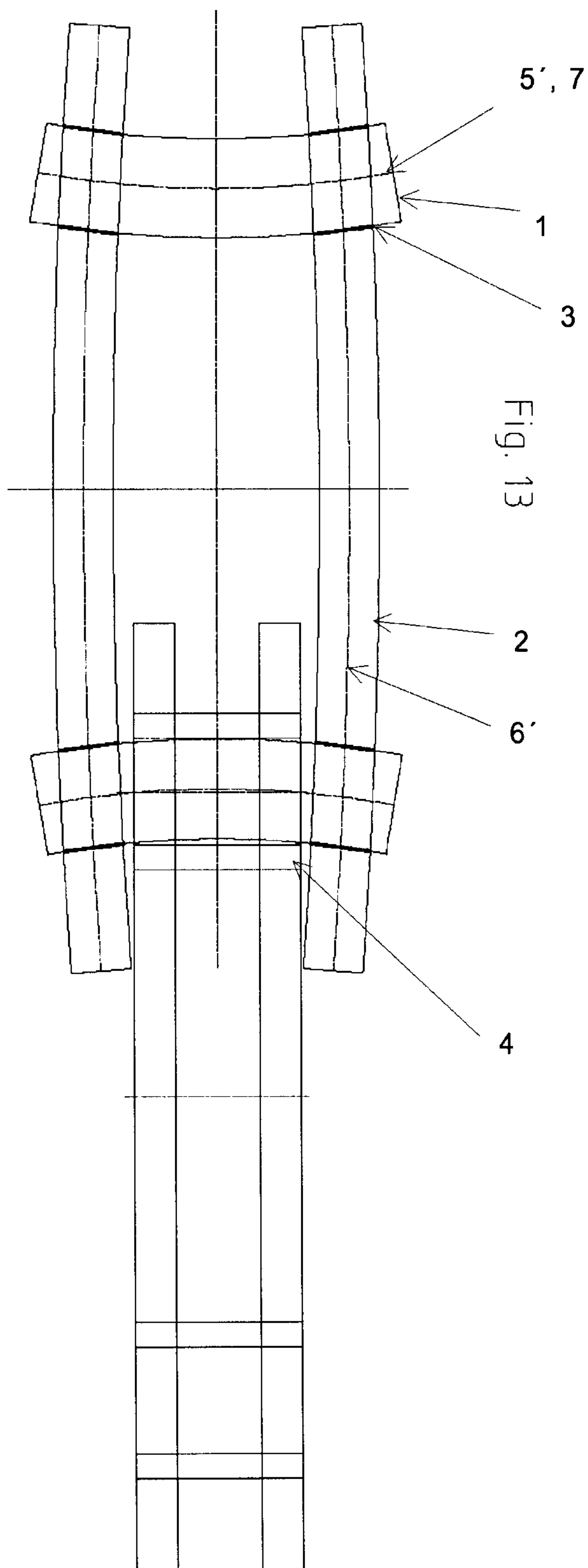


Fig. 14

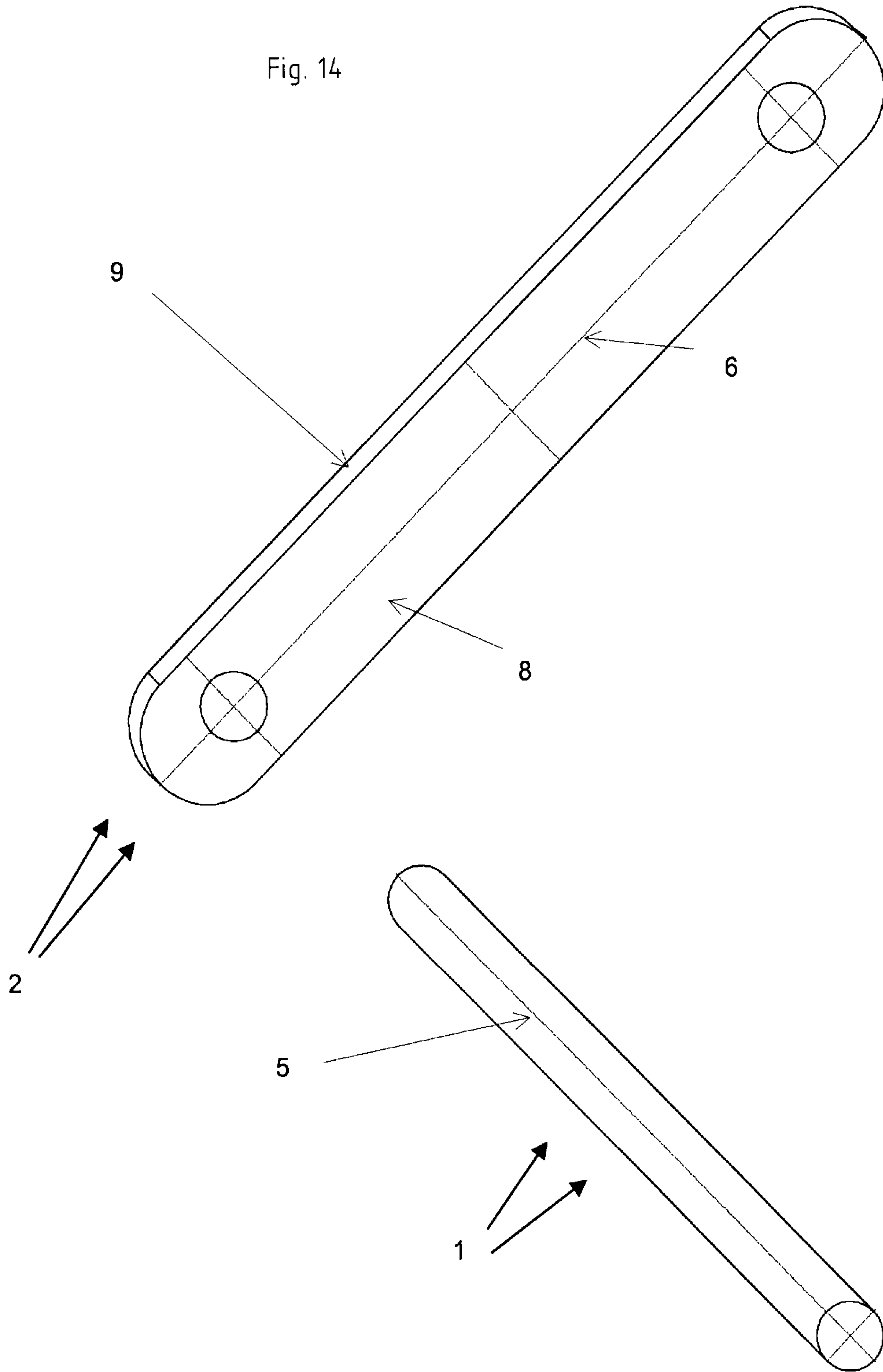


Fig. 3

