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(54) **Lifting clamp, in particular for lifting elements with portions of "T" beams**

(57) The invention relates to a lifting clamp, in particular for lifting elements with portions of "T" beams, comprising a lifting element 2, a contact base 3, which defines a support surface 4 destined to come into contact with the element to be lifted, and two jaws 10 and 20, Each of which is provided with a grip portion 11, 21 and is hinged to the contact base 3 to pivot around a hinging axis X1, X2 between an open position, in which the respective grip portion is distanced from the support sur-

face, and a closed position, in which the grip portion is close to the support surface to press said element to be lifted against the base 3. Each jaw is moved between the two positions by means of a respective operating portion which is connected to the lifting element by roto-translatory coupling means 31, 32 so that a pivoting movement of the jaws corresponds to a translatory movement of the lifting element in relation to the base. The two jaws are hinged to the base on opposite sides to the lifting element.

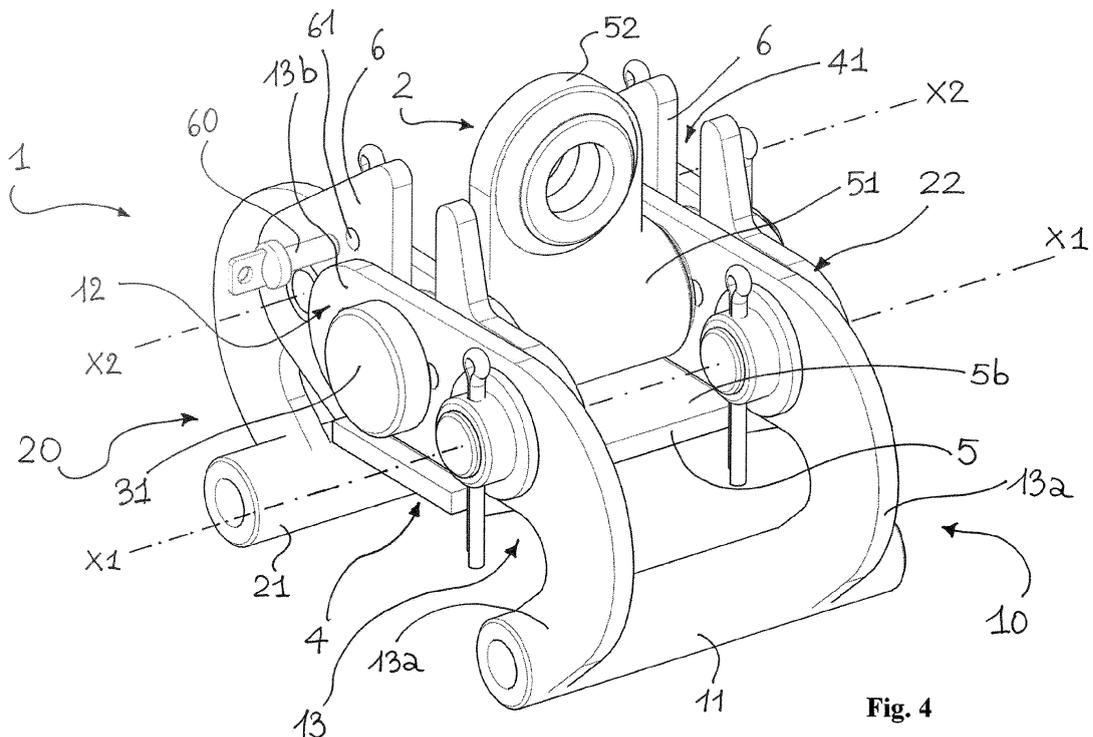


Fig. 4

Description

Field of application

[0001] The present invention relates to a lifting clamp, in particular for lifting elements with portions of "T" beams.

[0002] The clamp according to the invention is used in particular for lifting flat open blocks in the shipbuilding sector.

State of the art

[0003] As is known, in shipbuilding and, in general, in steel structural work, clamps with a mobile coupling tooth are widely used to lift elements of large dimensions. One clamp of such type is shown in the appended Figure 3. The clamp A is provided with two fixed jaws G between which a mobile coupling tooth D acts. The clamp A further comprises a mechanism of tightening the tooth D by gravity such as to automatically ensure blocking of the tooth in the gripping position under the weight of the load during lifting.

[0004] One of the limitations of this type of clamp lies in the reduced gripping surface and in the consequent localised concentration of the stresses which in some cases may generate highly significant deformations of the element lifted. Another limit lies in the asymmetric positioning of the tooth in relation to the jaws of the clamp. This further accentuates the problems deriving from an uneven distribution of the stresses on the element lifted.

[0005] Typically these problems arise when lifting the flat open blocks used to make sectors of ship decks (an example of which is shown in Figures 1 and 2). These structures are generally composed of a framework of "T" beams, comprising transversal (in relation to the main axis of the ship) beams (T1; in jargon, beams) and longitudinal beams (T2; in jargon, carlings), to which flat panels or plate are welded. The lifting of such structures envisages use of a plurality of lifting clamps with mobile coupling tooth, suitably distributed throughout the structure. The clamps are coupled to the flanges P of the beams T1 and/or T2.

[0006] The limited gripping surfaces of the clamps used and the asymmetric position of the tooth in relation to the flange causes a deformation of the flange such as to require subsequent restoration of the longitudinal axiality and the reduction of the impression left by the grip force of the clamp. As is known, the non-planarity of the flanges would increase the assembly times of the superstructures of the deck.

[0007] The tendency to process panels of increasingly large size, composed of increasingly thin plate and ever lighter reinforcement beams, has aggravated the problems related to deformation.

[0008] Alternatively, instead of clamps the open flat blocks can be lifted using steel cables which are made to pass through the holes F lightening the webs A of the

beams T and then fed back in a "noose" onto the shackle of the crane or on the loop slings. This lifting method substantially avoids the problems of deformation of the flanges but poses serious safety problems. The through cables are in fact subject to extensive stresses on the outer fibres and to wear in their inner parts in contact with the beam. This leads to regular maintenance having to be anticipated compared to when using clamps.

10 Presentation of the invention

[0009] Consequently, the purpose of the present invention is to overcome the drawbacks of the prior art described above, by providing a lifting clamp, in particular for lifting elements with portions of "T" beams, which enables a better distribution of the stresses on the object being lifted in compliance with safety conditions.

[0010] A further purpose of the present invention is to provide a lifting clamp, in particular for lifting elements with portions of "T" beams, which can be used in the shipbuilding sector to grip the flanges of the beams or carlings which compose the main structure of a flat open block without deforming it.

[0011] A further purpose of the present invention is to provide a lifting clamp, in particular for lifting elements with portions of "T" beams, which is easy to use and manage.

[0012] A further purpose of the present invention is to provide a lifting clamp, in particular for lifting elements with portions of "T" beams, which is easy and economical to make.

Brief description of the drawings

[0013] The technical characteristics of the invention, according to the aforesaid purposes, can be seen clearly from the contents of the following claims and the advantages of the same will be more clearly comprehensible from the detailed description which follows, made with reference to the attached drawings, showing one or more embodiments by way of non-limiting examples, wherein:

[0014] - Figure 1 show an example of a flat open block for making a portion of a deck of a ship.

[0015] - Figure 2 shows a detail of Figure 1 relative to the framework of beams and carlings.

[0016] - Figure 3 show an example of a lifting clamp with a mobile coupling tooth;

[0017] - Figure 4 shows a perspective view of a lifting clamp according to a preferred embodiment of the present invention, illustrated in the closed position;

[0018] - Figure 5 shows an exploded view of the clamp in Figure 4;

[0019] - Figure 6 shows the clamp in figure 4 illustrated in an open condition, lying on the flange of a T beam;

[0020] - Figure 7 shows the clamp in Figure 6 illustrated in a closed condition, resting on and gripping the flange of a T beam; and

[0021] - Figure 8 shows a side view of the clamp shown

in figure 7.

Detailed description

[0022] With reference to the appended drawings a lifting clamp according to the invention has been globally denoted by reference numeral 1, destined in particular for lifting elements with portions of "T" beams.

[0023] According to a general embodiment of the invention, the lifting clamp 1 comprises a lifting element 2, at which the clamp 1 is lifted, a contact base 3, which defines a support surface 4 destined to come into contact with the element to be lifted by means of said clamp, and two jaws 10 and 20.

[0024] Each jaw 10, 20 is provided with a grip portion 11, 21 which is destined to come into contact with the element to be lifted in opposition to the contact base 3.

[0025] Each jaw 10, 20 is hinged to the contact base 3 to pivot around a hinging axis X1, X2, between an open position, in which the respective grip portion 11, 21 is distanced from the support surface 4 (see figure 6 for example), and a closed position, in which the grip portion 11, 21 is close to the support surface 4 to press said element to be lifted against the base 3 (see for example Figures 7 and 8).

[0026] Operatively, each jaw 10, 20 is moved between the aforesaid two positions by means of a respective operating portion 12, 22 positioned on the opposite side to the grip portion 11, 21 in relation to the hinging axis X1, X2. Such operating portion 12, 22 being connected to said lifting element 2 by roto-translatory coupling means 31, 32 so that a pivoting movement of the jaws 10, 20 corresponds to a translatory movement of the lifting element 2 in relation to the base 3 in a direction Y incident to the support surface 4.

[0027] The two jaws 10, 20 are hinged to the base 3 on opposite sides to said lifting element 2.

[0028] Thanks to the present invention, the portion of the element to be lifted to which the clamp is attached is substantially not subject to deformation. Such portion is in fact pressed between the support surface 4 of the base 3 and the grip portions 11, 21 of the jaws. From a mechanical point of view, the contact base 3 absorbs the stresses transmitted by the grip portions 11, 21 to the element to be lifted.

[0029] Advantageously, the movement mechanism (which enables the element to be lifted to be pressed against the contact base) is, moreover, structured so that the jaws are kept in the closed position, and therefore pushed against the contact base, by gravity.

[0030] In fact, as already pointed out, thanks to the roto-translatory coupling means the lifting element 2 is free to translate (within the limits permitted by the length and shape of the two jaws 10, 20) in relation to the contact base 3 in a direction Y incident (preferably orthogonal) to the support surface 4 of the base 3. When the jaws 10, 20 are in the open position, the lifting element 2 is close to the contact base 3; when the jaws 10, 20 are in

the closed position, the lifting element 2 is distant from the contact base 3.

[0031] Operatively, when the clamp 1 is under stress, that is when a force is applied to the lifting element having at least one component orthogonal to the support surface 4 opposed to the weight force, the lifting element 2 is distanced from the contact base 3. Thanks to the roto-translatory coupling means a rotatory movement of the two jaws corresponds to such translatory movement of the lifting element, the two jaws thus passing from the open position to the closed position.

[0032] Preferably the roto-translatory coupling means comprise at least one pin 31 and at least one slotted aperture 32 for each jaw, respectively made on the lifting element 2 and on the operating portion 12, 22 or vice versa. Such coupling means 30 are dimensioned so as to associate the pivoting movement of the two jaws 10, 20 to a translatory movement of the lifting element 2.

[0033] Preferably, as may be observed in particular in Figures 4, 5 and 6, the contact base 3 comprises a flat element 5 provided with a first face 5a, which defines the aforesaid support surface 4, and a second face 5b, opposite the first and facing the lifting element 2.

[0034] Operatively, the planarity of the support surface 4 permits an even distribution of the stresses especially in the case in which the portion of the element to be lifted which the clamp is attached to is flat. This arises in particular in the case in which the element to be lifted has portions of T beam, such as for example in the flat open blocks in the shipbuilding sector.

[0035] According to the preferred embodiment illustrated in the appended Figures, the two jaws 10, 20 are hinged to the contact base 3 symmetrically in relation to a plane of symmetry S orthogonal to the support surface 4 and parallel to the hinging axes X1, X2 of the jaws.

[0036] The translation axis Y of the lifting element 2 lies on such plane of symmetry S and is preferably orthogonal to the support surface 4.

[0037] Even more preferably, the two jaws 10, 20 are symmetrical both in shape and dimension, and in the hinging to the base 3 in relation to the aforesaid plane of symmetry S. In this case the translation axis Y of the lifting element 2 lies on such plane of symmetry S and is necessarily orthogonal to the support surface 4.

[0038] As may be observed in particular in Figures 4 and 7, the contact base 3 comprises at least one hinging portion 6 for the jaws 10, 20. Such portion 6 preferably extends in a direction orthogonal to the second face 5b of the flat element 5 and is composed, for example of a flat tab.

[0039] Preferably the contact base 3 comprises means 41 for guiding the translatory movement of the lifting element 2 in relation to the base 3.

[0040] According to the embodiment illustrated in the appended Figures, such guide means comprise at least one groove 41 along which the pin 31 of the roto-translatory coupling means is engaged in a sliding manner. In particular, such groove 41 is made in the aforesaid hing-

ing portion 6.

[0041] Preferably each grip portion 11, 21 is composed of an elongated element such as a tubular body, positioned parallel to the hinging axis (X1, X2). This makes it possible to increase the gripping surface and thereby improve the distribution of the stresses. Similarly, it is preferable for the hinging axis X1, X2 and therefore the longitudinal orientation axis of the elongated elements to be parallel to the support surface 4.

[0042] Advantageously, each jaw 10, 20 comprises at least one lever 13, 23 which bears said grip portion 11, 21 associated to a first extremity 13a, 23a (composed in particular of an elongated element) and which defines said operating portion 12, 22 with a second extremity 13b, 23b. The jaw is hinged to the contact base 3 at an intermediate point of the lever 13, 23 between the aforesaid two extremities.

[0043] According to the preferred embodiment illustrated in the appended Figures, each jaw 10, 20 comprises two levers 13 or 23, joined to each other in their pivoting movement between the open and closed positions. The two levers 13 or 23 are both hinged to the contact base 3 and associated to said lifting element 2 by means of the aforesaid roto-translatory coupling means. Preferably the two levers are connected to opposite extremities of the elongated element which defines the grip portion 11 or 21 so as to ensure a better distribution of the stresses.

[0044] Preferably the roto-translatory coupling means comprise a single pin 31 which is mechanically associated to the operating portions 12, 22 of each jaw 10, 20 at respective slotted apertures 32. Said single pin 31 being parallel to the hinging axes X1, X2 of the jaws and to the support surface 4 of the contact base 3.

[0045] More in details, as illustrated in particular in Figures 5 and 8, the lifting element 2 comprises a bushing 51 inside which the aforesaid single pin 31 is rotationally inserted. At least one eyebolt 52 is associated to the outside of said bushing 51 to be used for the insertion of cables or chains.

[0046] Preferably, the clamp 1 comprises means 60 for blocking the movement of the jaws 10, 20 either in the closed position or in the open position. In particular, such blocking means may consist of one or more pegs 60 to be inserted in suitable through holes 61 made in the levers and in the hinging portions.

[0047] More in details, the blocking of the jaws in the closed position (i.e. with the jaws close to the support surface) is preferable for reasons of safety, in particular, to prevent accidental opening of the jaws during the lifting step on account for example of oblique pulling of the load.

[0048] The blocking of the jaws in the open position (i.e. with the jaws distanced from the support surface) is functional to the positioning and removal of the clamp. Without such blocking the jaws would tend to close on account of gravity thereby forcing the operator to intervene.

[0049] According to a particularly preferred embodi-

ment of the present invention, illustrated in the appended Figures the contact base 3 comprises a flat plate 5. Near the two opposite rims of the plate 5 two tabs 6 extend orthogonally, parallel to each other. At the centreline of the plate 5 each tab 6 is provided with an orthogonal groove 41 which defines the translation axis Y of the lifting element 2. This latter is composed of a bushing (provided externally with an eyebolt 52) which internally supports a pin 31 the extremities of which are inserted so as to slide in the aforesaid two grooves.

[0050] Each tab 6 defines a hinging portion for the two jaws 10 and 20. The two jaws are symmetrical both in shape, and in the hinging to the base 3 in relation to a plane of symmetry S which is orthogonal to the support surface 4 and passes through the longitudinal centreline of the plate 5. The translation axis Y of the lifting element 2 lies on such plane of symmetry S and is orthogonal to the support surface 4.

[0051] More in details, each jaw 10, 20 comprises two levers 13 or 23 which bear a tubular body 11, 21 (i.e. the grip portion) at one of their first extremities 13a, 23a. At the second extremity of each lever 13 or 23 a slotted aperture 32 is made inside which an extremity of the pin 31 is inserted. Each lever is hinged to one of the two flat tabs 6 at an intermediate point between the two extremities. The hinging axes X1, X2 of the two jaws are parallel to each other and to the plane of symmetry S.

[0052] Two levers are hinged to each tab 6, one for each jaw. The two levers are positioned on opposite faces of the tab. Advantageously, to eliminate possible rubbing and friction between the tab and the levers spacers may be used, for example in Teflon. Similarly, spacer elements may also be provided between the parts in contact along the pin axis 31, for example between the levers and the tabs and between the levers and the bushing.

[0053] As already mentioned above, the clamp 1 described above is particularly suitable for lifting elements with portions of T beams, on which a flange and a web orthogonal to it may be identified.

[0054] Operatively, the support surface 4 of the contact base 3 is laid on the flange with the two jaws blocked open by the safety pegs 60. The pegs 60 are then extracted to permit closing of the jaws (or at least their movement closer to the support surface). Once the pegs have been extracted, the operator raises the lifting element causing the approach of the jaws to the support surface by gravity. At this point the pegs are inserted again and the lifting operation can proceed safely. The lifting element 2 is distanced from the base 3 (for example by pulling the cable connected to the eyebolt) until the two jaws 10 and 20 are completely closed. The same operations are performed in reverse order to free the clamp. As soon as the pegs are extracted, the weight of the lifting element opens the jaws. At this point the pegs are inserted again to block the jaws in the open position.

[0055] The contact base absorbs all the stresses exerted on the flange by the grip portions.

[0056] The extensive gripping surface offered by the

tubular bodies permits the distribution of the stresses over a greater area.

[0057] The symmetrical structure of the two symmetrical jaws ensures an even and equilibrated distribution of the stresses on both the tabs of the flange. The plane of symmetry S of the clamp 1 is in fact substantially aligned with the web of the T beam.

[0058] Advantageously, the levers of the jaws can be dimensioned so that in the closed position the gripping portions do not just press against the flange, but also against the web of the T beam. This enables some of the stresses to be transmitted to the web.

[0059] The invention makes it possible to achieve numerous advantages some of which already described.

[0060] The clamp 1 according to the invention makes it possible to avoid the problem of deformation which typically occurs in the flanges using clamps with a mobile coupling tooth.

[0061] The compression effect exerted by the clamp on the clamped portion makes it possible to avoid deformations of the element to be lifted even in the presence of loads which are not perfectly perpendicular.

[0062] The clamp according to the invention 1 ensures a greater gripping surface compared to a traditional lifting clamp. This makes it possible to increase the load per clamp and therefore, for the same weight of element to be lifted, to reduce the number of clamps.

[0063] The clamp according to the invention offers a greater number of solutions in lifting operations, in particular of panels of greater dimension, thinner plate thicknesses and smaller sized sections.

[0064] The clamp according to the invention also permits an improvement of safety conditions in equipping manoeuvres of the clamp. The clamp is laid on the flange and the operator needs only to place the safety peg of the jaws in the open or closed positions.

[0065] The invention thus conceived thereby achieves the purposes set out.

[0066] Obviously, it may assume, in its practical embodiments, forms and configurations different from those illustrated above while remaining within the present sphere of protection.

[0067] Furthermore, all the parts may be replaced with technically equivalent parts and the dimensions, shapes and materials used may be varied as required.

Claims

1. Lifting clamp, in particular for lifting elements with portions of "T" beams, comprising a lifting element (2), at which the clamp (1) is lifted, a contact base (3), defining a support surface (4) destined to come into contact with the element to be lifted by means of said clamp (1), and two jaws (10,20), each of which is provided with a grip portion (11,21) and is hinged to the contact base (3) to pivot around a hinging axis (X1, X2) between an open position, in which the re-

spective grip portion (11, 21) is distanced from the support surface (4), and a closed position, in which the grip portion (11, 21) is close to the support surface (4) to press said element to be lifted against the base (3), each jaw (10, 20) being moved between said two positions by means of a respective operating portion (12, 22) positioned on the opposite side to the grip portion (11, 21) in relation to the hinging axis (X1, X2), said operating portion (12, 22) being connected to said lifting element (2) by roto-translatory coupling means (31, 32) so that a pivoting movement of the jaws (10, 20) corresponds to a translatory movement of the lifting element (2) in relation to the base (3) in a direction (Y) incident to the support surface (4), the two jaws (10,20) being hinged to said base (3) on opposite sides to said lifting element (2).

2. Clamp according to claim 1, wherein said roto-translatory coupling means comprise for each jaw at least one pin (31) and at least one slotted aperture (32), respectively made on said lifting element (2) and on said operating portion (12, 22) or vice versa, said coupling means (30) being dimensioned so as to associate the pivoting movement of the two jaws (10, 20) to a translatory movement of the lifting element (2).

3. Clamp according to claim 1 or 2, wherein said contact base (3) comprises a flat element (5) provided with a first face (5a), which defines said support surface (4), and a second face (5b), opposite the first and facing the lifting element (2).

4. Clamp according to one or more of the previous claims, wherein said two jaws (10, 20) are hinged to said contact base (3) symmetrically in relation to a plane of symmetry (S) orthogonal to said support surface (4) and parallel to the hinging axes (X1, X2) of the jaws, the translation axis (Y) of the lifting element (2) lying on said plane of symmetry (S) and being preferably orthogonal to the support surface (4).

5. Clamp according to claim 3 or 4, wherein said contact base (3) comprises at least one hinging portion (6) for said jaws (10, 20), which extends from the second face (5b) of said flat element (5).

6. Clamp according to one or more of the previous claims, wherein said contact base (3) comprises means (41) for guiding the translatory movement of the lifting element (2).

7. Clamp according to claims 2 and 6, wherein said guide means comprise at least one groove (41) along which the pin (31) of the roto-translatory coupling means is engaged in a sliding manner.

8. Clamp according to claims 5 and 7, wherein said groove (41) is made on said hinging portion (6).
9. Clamp according to one or more of the previous claims, wherein each grip portion (11, 21) is composed of an elongated element positioned parallel to the hinging axis (X1, X2), said hinging axis (X1, X2) being preferably parallel to said support surface (4).
10. Clamp according to claim 9, wherein each jaw (10, 20) comprises at least one lever (13, 23) which bears said grip portion (11, 21) associated to a first extremity (13a, 23a) and which defines said operating portion (12, 22) with a second extremity (13b, 23b), the jaw being hinged to said base (3) in an intermediate point of said lever (13, 23) between said two extremities.
11. Clamp according to claim 10, wherein each jaw (10,20) comprises two levers (13, 23), joined to each other in their pivoting movement, both hinged to said contact base (3) and associated to said lifting element (2), preferably said two levers being connected to opposite extremities of the elongated element which defines the grip portion (11, 21).
12. Clamp according to one or more of the previous claims, wherein said roto-translatory coupling means comprise a single pin (31) which is mechanically associated to the operating portions (12, 22) of each jaw (10, 20) at respective slotted apertures (32), said single pin (31) being parallel to the hinging axes (X1, X2) of the jaws.
13. Clamp according to claim 12, wherein said lifting element (2) comprises a bushing (51) inside which said single pin (31) is rotationally inserted, at least one eyebolt (52) being associated to the outside of said bushing (51).
14. Clamp according to one or more of the previous claims, comprising means (60) for blocking the movement of the jaws (10, 20) in the closed position or in the open position.

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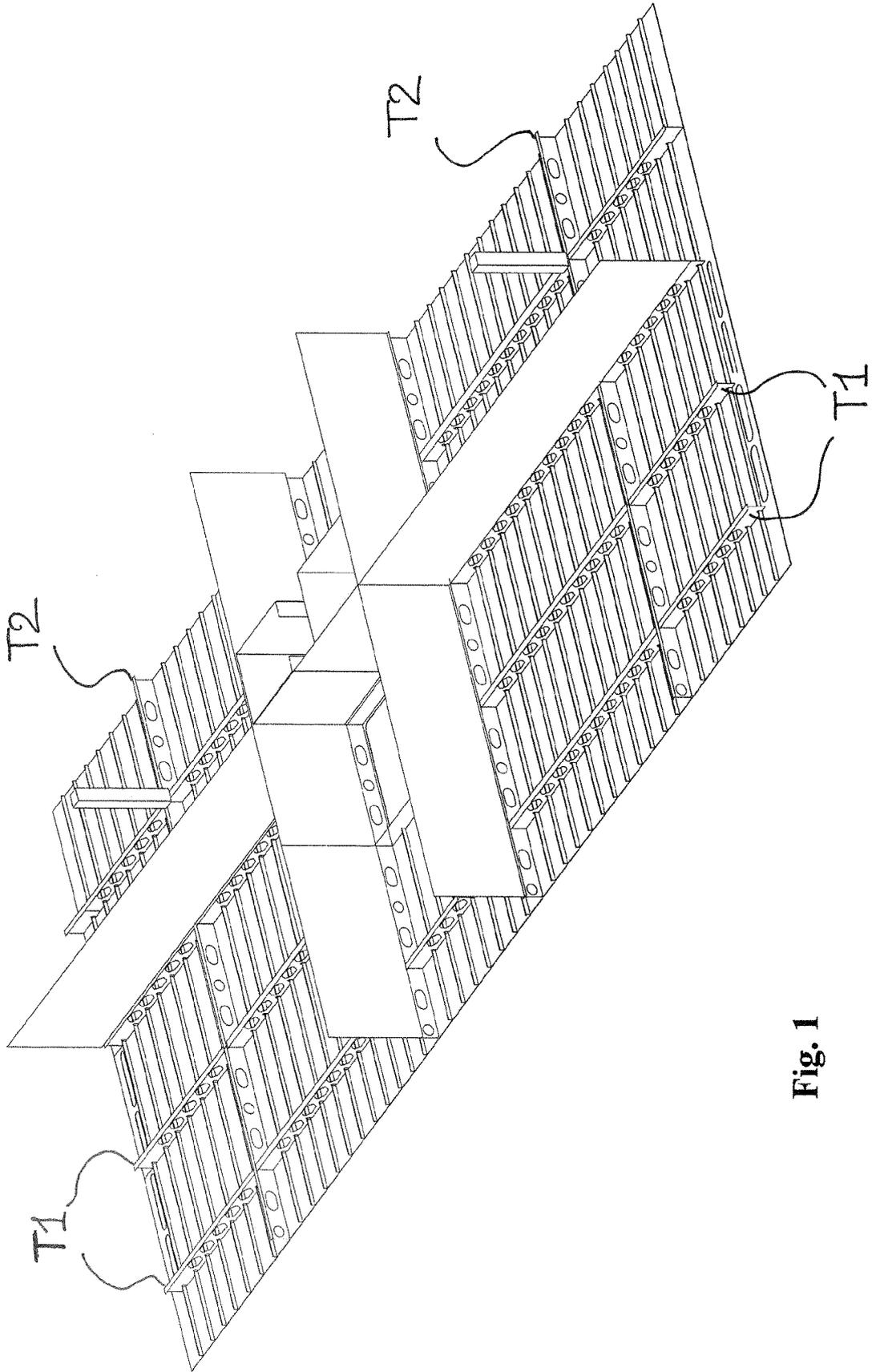


Fig. 1

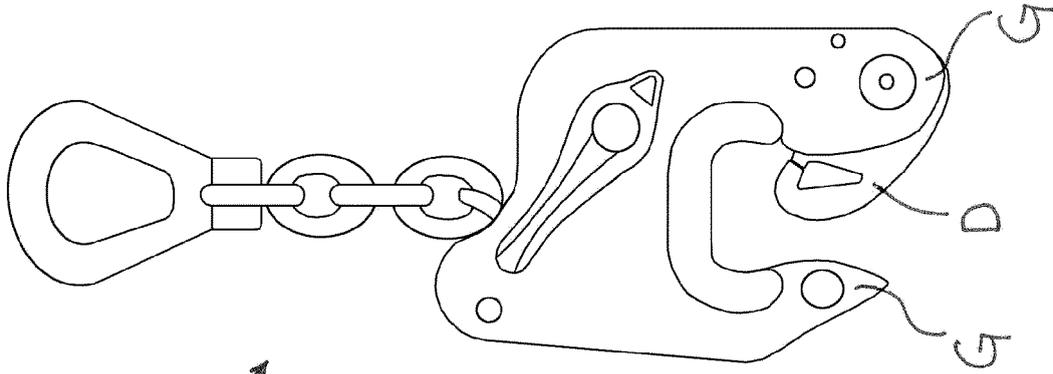


Fig. 3

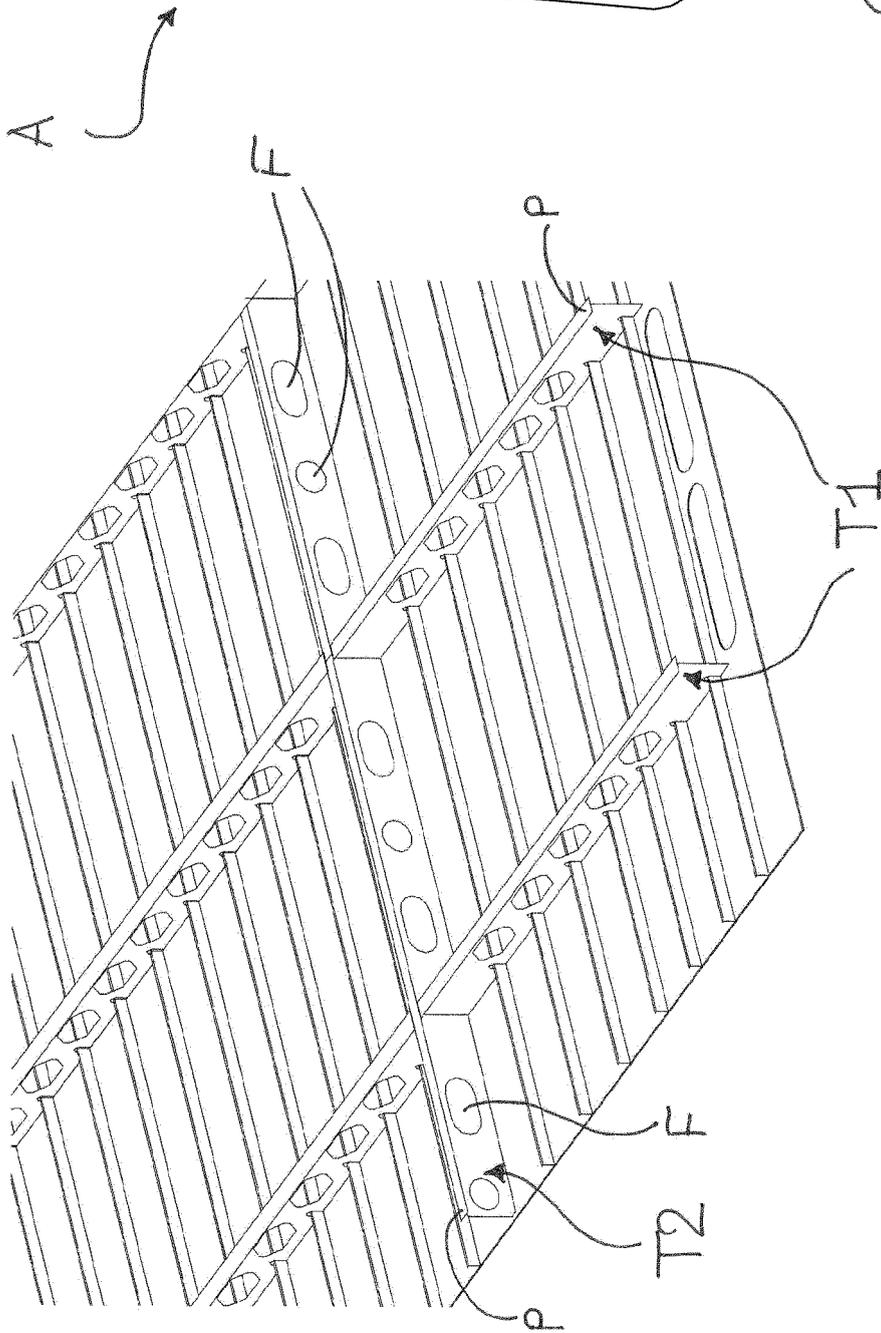


Fig. 2

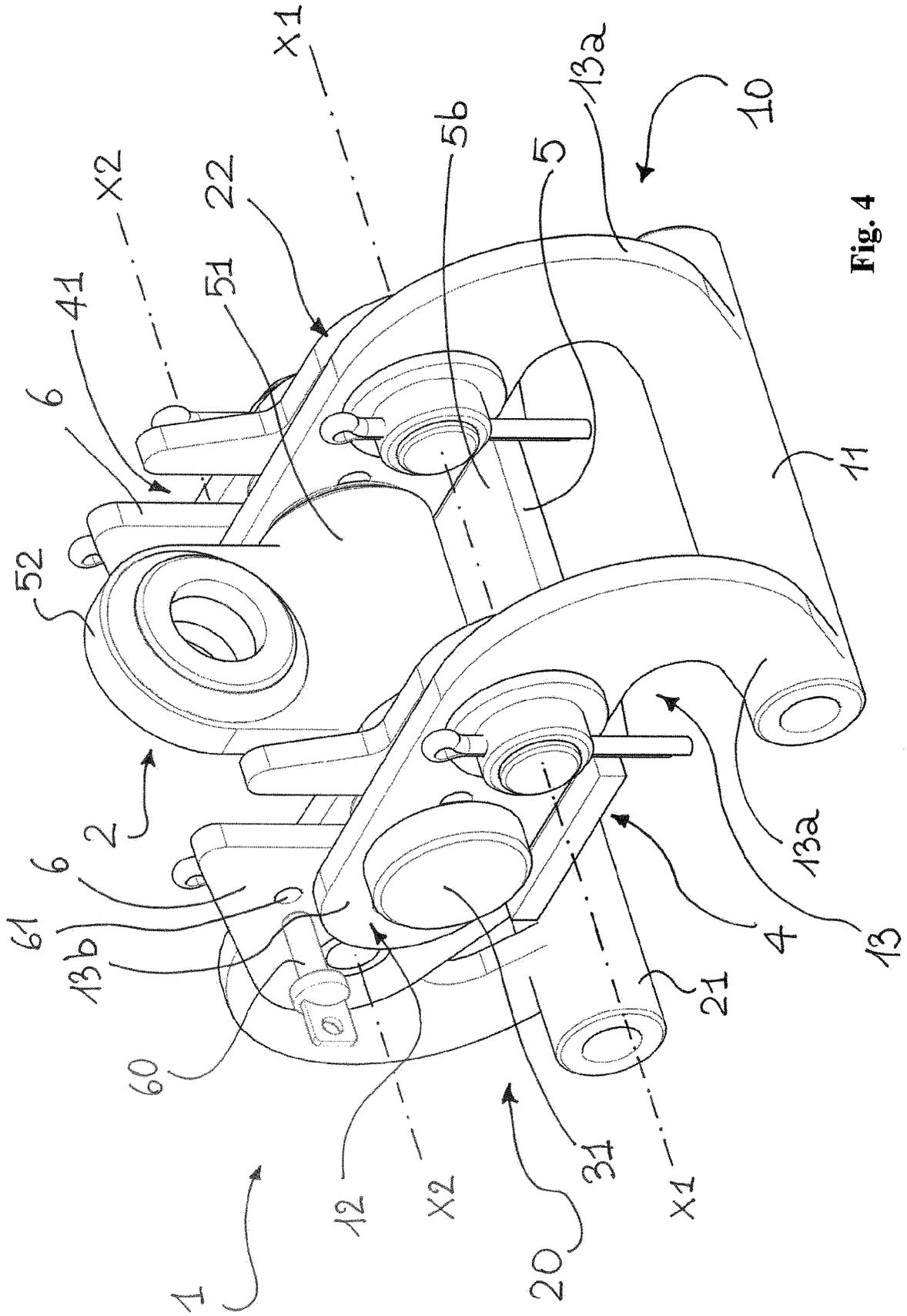


Fig. 4

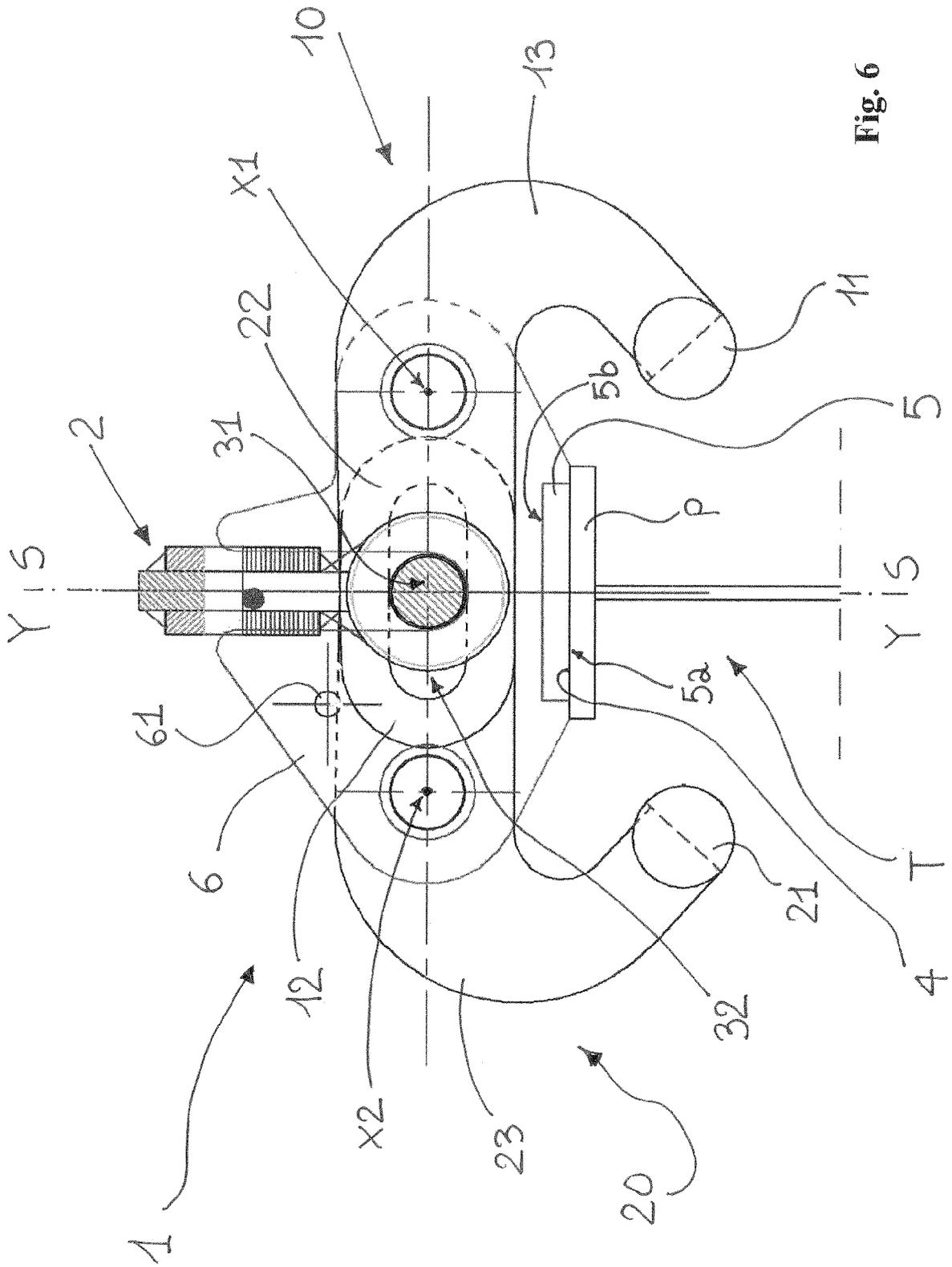


Fig. 6

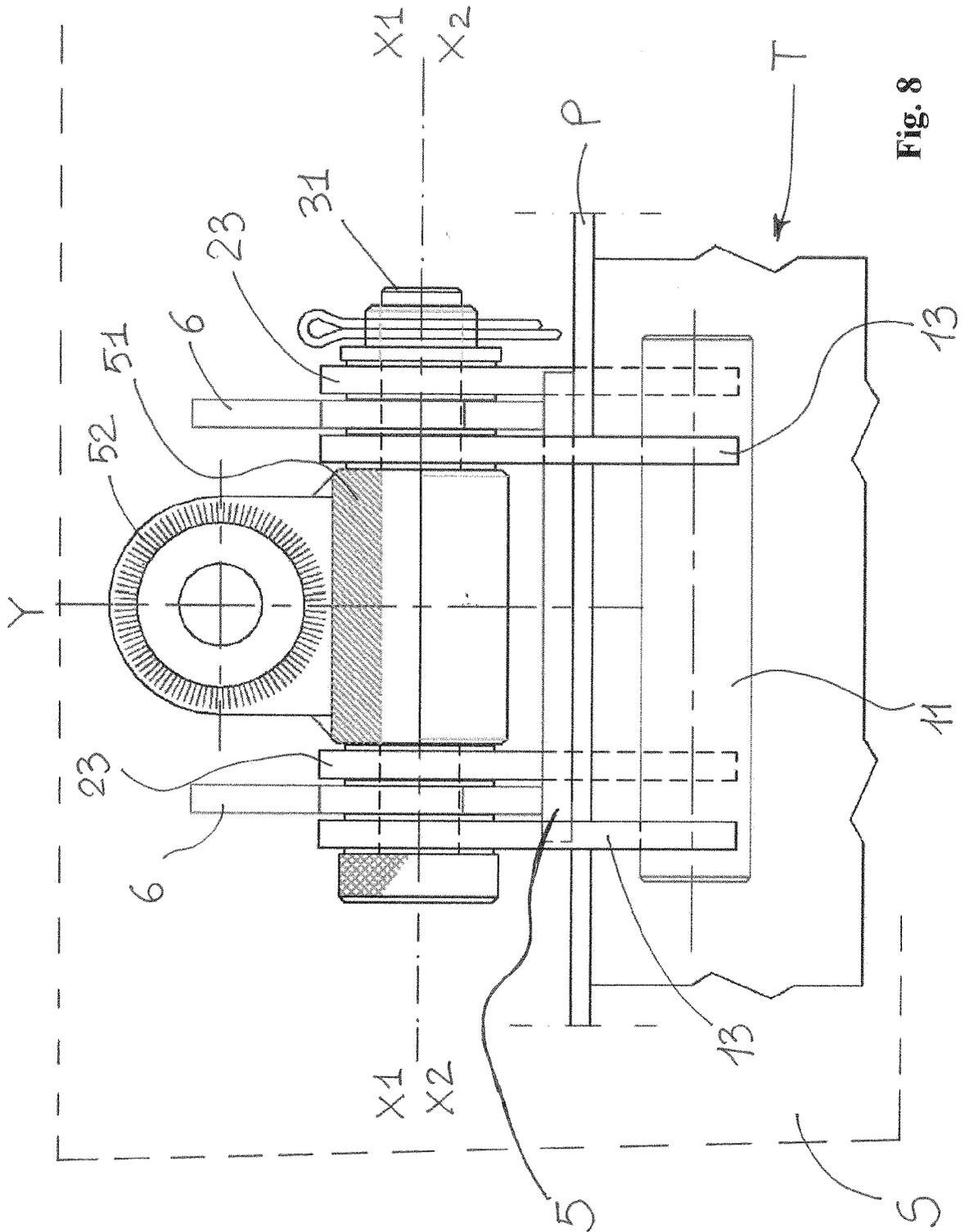


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 11 18 3306

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			B66C
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		6 January 2012	Rupcic, Zoran
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 11 18 3306

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06-01-2012

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