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(54) **SUPPORT BASE FOR A LADDER**

(57) Support base for an existing rung ladder (1), which base includes a support element (2) that can be fixed to the ladder (1) and a levelling member (3) mounted oscillating on the support element (2) by means of a hinge (5), wherein the levelling member (3) comprises a single central element (30) connected to the hinge (5) and two bearing legs (31) to the terrain, the central element (30) being provided with one or more removable housing seats (300) of the bearing legs (31).

The support element (2) can be fixed to the existing ladder (1), replacing the stabilizing bar used in many types of ladders, or using a horizontal adjustment device with insert (22) which allows efficient anchoring to ladders of different sizes without tampering with them.

The levelling member (3) and the ladder (1) can be locked at the desired angle by means of two new (alternative) locking systems with lapel (4) or with spacer (10) which can also be applied after the first use. The support element (2) can be a vertical column (21) to which the ladder (1) is anchored.

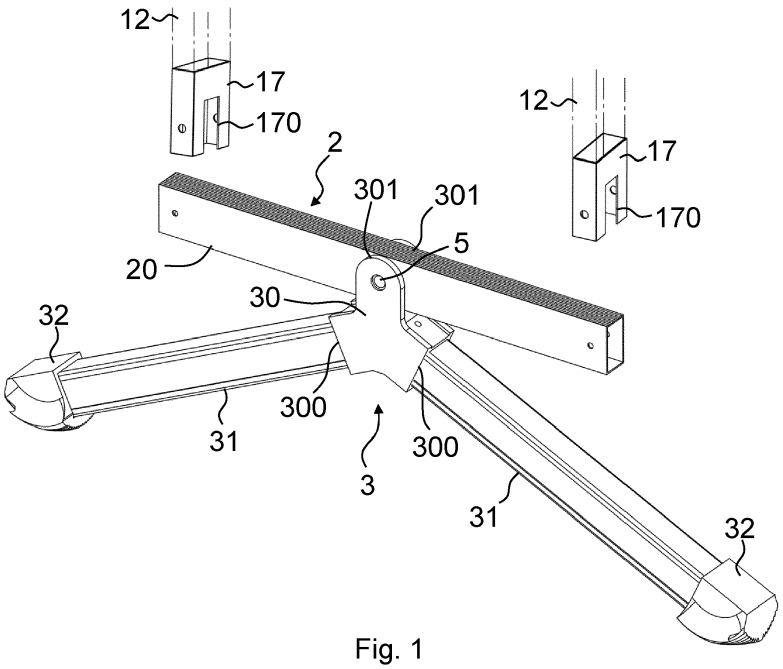

Fig. 1

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Description

[0001] The present invention relates to a support base for an existing rung ladder, which base comprises a support element which can be fixed to the ladder and a levelling member mounted oscillating on the support element through a hinge.

[0002] The present invention refers to a support base to be applied to any portable ladder, both simple, both with extension and with trestle, but also to stairs with central column. This tool makes them particularly suitable for slopes and uneven terrains, for pruning and fruit picking, but it can also be used in general for housework and by anyone who uses ladders in his profession, for example in the construction industry, for any maintenance work, in industry and the like.

[0003] Conventional rung ladders have many known drawbacks. First of all, they do not easily adapt to sloping or uneven terrain and it is difficult in such conditions to find a stable bearing position. The user must therefore climb and move very carefully on the ladder, since even small movements can place the ladder in an unbalanced condition and therefore in danger of falling. Secondly, the known ladders do not offer any guarantee of stability in the event that the support action by one of the two uprights ceases: also in this case the sudden displacement from the balanced position can cause the user to fall.

[0004] Bases are known on which the lower ends of the uprights can be mounted or fixed, which have a certainly greater width than that of the ladder. A base of this type increases the stability of the ladder on a flat and uniform terrain, but does not solve the above mentioned problems at all.

[0005] Ladders are known which aim to solve the problems described above for classic rung ladders by means of a levelling member mounted oscillating on the support element through a hinge.

[0006] The document US2205935A describes a levelling accessory suitable for being attached to the lower part of a ladder by which the ladder can be firmly supported in an upright position even by resting on an inclined surface.

[0007] The document US4243122A describes a levelling member suitable for being attached to a ladder and comprising a base, an upper part rotatably mounted on the levelling member and means for removably coupling the ladder to the upper part.

[0008] The document WO9731173A1, by the same applicant, describes a ladder rotatably connected to a support base so that the ladder can be tilted while maintaining its own axis of vertical symmetry regardless of the inclination angle of the plane wherein the support base is located.

[0009] In all the documents mentioned above, the levelling member is heavy, cumbersome, difficult to manufacture, expensive, inconvenient to install and the possible locking system is unreliable and does not have sufficient angular combinations.

[0010] The document US5507364A describes a base consisting of an articulated parallelepiped, comprising two crosspieces constrained by two hinges to a column that constitutes the support element of the ladder and two lateral uprights which house two bearing extendable legs to the terrain. This device is aimed at solving the problem of differences in height and constitutes an evolution of the extenders for columns, which are notoriously used. The parallelogram compensates for the differences in height while keeping the central column always vertical, thus preventing the ladder from tilting on the base. Finally, the described device comprises a friction lock in the desired final position, to lock the variation in height of the bearings. However, this friction proves insufficient if the base allows a free oscillation of the ladder.

[0011] The document US2641401A describes a ladder comprising an articulated base, which base is therefore not applicable to an existing ladder. The base is coupled to a column on which the ladder is fixed. The ladder is narrow, with thread-like uprights and closed at the top, so as to prevent any bearing different from the column described. This is rather limited to the use bearing on branches, while it becomes uncomfortable while using on a wall.

[0012] The present invention aims at overcoming the disadvantages set out heretofore of the rung ladders and of the support bases for ladders currently known. The invention achieves these purposes with a support base to be applied to an existing rung ladder as described at the beginning, wherein the levelling member comprises a central element connected to a single said hinge and two bearing legs to the terrain since the central element is provided with one or more removable housing seats of the bearing legs. The central element is variously shaped, capable of containing and anchoring two, preferably steel, straight legs or arches of preferred length, section and profiles. The base, through the hinge, creates new static dynamics, scientifically assessable, and allows you to bear the ladder on uneven terrains, to use it also inclined with respect to the vertical and to use it also with a single bearing point at the top.

[0013] This configuration has numerous advantages. First of all, the central element connected to the hinge can be small in size and easy to manufacture. The feet are designed to have maximum friction for any position on the terrain. It is also possible to easily remove the legs and replace them with legs of different length and form as needed.

[0014] The legs can be straight or arched and substantially identify a triangle between the two bearing points to the terrain and the hinge.

[0015] The support element can be enlarged if necessary with "sleeves" to meet almost all the different dimensions of the ladders at the base.

[0016] It is possible to keep the hinge free, so that the ladder can oscillate without any impediment with respect to the bearing legs. Thanks to the aforementioned trian-

gle configuration, the base adapts to any terrain, be it inclined, stepped, spongy, icy, etc., therefore it easily solves an atavistic technical problem that none of the devices known in the state of the art has ever concretely solved if not with expensive, cumbersome tools, difficult to apply in normal daily use. In the event of a sudden failure of a bearing, the hinge allows you to automatically reset the base and therefore all the ladder equipment. The ladder becomes self-levelling in this way.

[0017] In addition, the operator's weight goes down to the hinge which sends it back to the bearing feet without activating any destabilizing lever. In this way, the weight becomes only a burdening and stabilizing force, therefore if the feet of a ladder are pressed towards the ground by the operator's weight, the most suitable condition for safety occurs: if the feet are pressed they are obviously stable and consequently the whole ladder is stable.

[0018] The displacements of the operator on the ladder do not activate overturning moments so the ladder can also be used out of the vertical, which is not possible with classic ladders. Furthermore, thanks to the free hinge, the ladder can be rotated with respect to the legs and placed sideways; it is still safe even if it bears on a single point, such as for example bearing on a pole; it can also bears on relatively yielding fronds or branches, moving during use without any prejudice to stability.

[0019] Advantageously, with the free hinge it is possible to carry out small lateral displacements, for example bearing from one branch to another, without the need to go down the ladder. The same applies to the wall bearing, where you can move left and right for tens of centimetres without having to go down the ladder.

[0020] Alternatively, it is possible to create a rotation lock (for a stand or smooth wall bearing) after positioning the base on the ground, it is possible to activate a stop with a lapel element or with a sliding stick.

[0021] In an exemplary embodiment, in the assembled condition of the ladder the bearing legs lie substantially on the same plane as the ladder. This allows not to create bending moments on the base and in particular on the hinge even when an operator climbs the ladder.

[0022] In an embodiment, the hinge comprises a through hole made in the support element of the ladder, two wings fixed to the central element of the levelling member and a pin placed orthogonal to the plane where the ladder lies. The wings are spaced apart from each other so as to arrange themselves on opposite faces of the support element at the opposite openings of the hole of the said support element. The wings are provided with holes in such a way that said wing holes are overlapped on the opposite openings of the support element hole and the pin is placed in interpenetration in the support element hole and in the wing holes, preferably by means of a bushing, and constrains in a freely oscillating way the central element of the levelling member to the support element.

[0023] In a preferred exemplary embodiment, the support element of the ladder is a box-like element. Consequently, the through hole consists of two coaxial holes placed on opposite walls of the support element.

[0024] To improve the coupling described, a bushing is inserted in the drilled holes which has the function of absorbing and distributing the load and the pressures on a larger surface than the pin which, unloaded of the weight, only serves to tighten the wings of the central element towards the support element, preferably interposing also suitable washers.

[0025] In this way, only one hole made on the support element is needed to make the hinge. This solution gives a high construction simplicity, because it only requires a hole on the support element and a specific configuration with wings of the central element, easily obtainable during the manufacturing of the central element itself.

[0026] In an embodiment, the central element consists of two plates parallel to each other and at least one connecting wall of the two plates, which plates are shaped to form the said wings at a first end and the walls of two said seats at a second end, which seats are arranged to form an angle between them and are delimited by the two said plates and by the connecting wall, being the connecting wall placed at said second end. The central element is therefore easy to manufacture, light and compact.

[0027] In a further improvement, the central element comprises one or more further connecting walls between the two said plates which delimit the said seats. In this way the seats effectively hold the legs.

[0028] In a further improvement, the said further connecting walls consist of removably fixed elements between the two said plates.

[0029] This allows to have a first embodiment variant wherein a single fixed connecting wall is provided, at the end of the central element opposite to the hinge, that is, downwards in the bearing condition. Upwards the central element is thus open, with a U-shaped section. From above it is therefore possible to insert a single bearing element that forms the two bearing legs. This bearing element is preferably tubular, with a rectangular or circular or another type section, and can consist of an arch or two rectilinear portions angled to each other. Once the bearing element has been inserted, the further connecting walls can be inserted by carrying out the said removable fixing, to close the opening upwards of the legs housing seats, holding the bearing element in position.

[0030] In a second embodiment variant, the further connecting walls are fixed to the plates which constitute the central element, forming legs housing seats of substantially tubular shape of any section. In these seats the legs, made up of two separate elements, insert themselves by shape fit.

[0031] According to an optional exemplary embodiment, the bearing legs are extendable.

[0032] This allows to adjust the length of each single leg also independently of the other leg, to adapt the base to a use for different specific bearings on the ground.

[0033] In a first embodiment variant, the support ele-

ment of the ladder is a transverse rod.

[0034] This embodiment variant has the advantage that the support element on which it is possible to mount and fix the ladder also constitutes the lowest rung of the assembly that is created once the ladder is fixed to the support base.

[0035] According to an improvement, the transverse rod has the upper side provided with a non-slip finishing.

[0036] This allows the transverse rod to be used as the first rung already safe, without the need for further improvements once the ladder has been applied to the base.

[0037] The transverse rod can be extendable with sliding sleeves which, in addition to achieving the necessary width with a dovetail joint (if it is already present in the ladder), can be articulated with appropriate borders capable of effectively coupling with the various and different ladder columns.

[0038] In a second embodiment variant the support element of the ladder is a column.

[0039] This further embodiment variant has the advantage that the column is placed vertically and can be provided with an upper bearing terminal element, which therefore constitutes a stable support for the upper end of the ladder, especially on trees, and with a sufficiently small footprint for adapting to the space available between the branches and therefore do not cause the breaking of small branches or buds or the fall of fruit with its movement.

[0040] According to an improvement, the column is extendable.

[0041] The base, which can be freely arranged for any bearing, also has the possibility of being locked on the desired corner by locking devices that can be installed at will. In this exemplary embodiment, fixing means are therefore provided in position of the levelling member with respect to the support element of the ladder.

[0042] In an exemplary embodiment, the fixing means comprise a lapel element fixed to the support element of the ladder, which lapel element has an arched area provided with toothing on the intrados side, and a fixing element provided with toothing and mounted on the central element displaceably from a detached position from the lapel element to an engagement position with the lapel element, in which engagement position the toothing of the fixing element is engaged with the toothing of the lapel element and prevents rotation of the levelling member with respect to the support element of the ladder.

[0043] In a further exemplary embodiment, as an alternative or in combination, the fixing means comprise at least one spacer element fixed in an articulated way to the support element of the ladder and to one of the legs at two anchoring points, which spacer element is provided with variation and locking means of the distance between the anchoring points.

[0044] In a preferred embodiment the spacer element is a plate element provided on one face of a toothing and has a free end and a constrained end, comprising the means for varying and locking the distance between the anchoring points at least one fixing element provided with toothing corresponding to the toothing of the spacer element and fixed to the leg in an articulated way and in a displaceable way from a detached position from the spacer element to an engagement position with the spacer element.

[0045] 14. Base according to one or more of the preceding claims, which allows the anchoring to any ladder of different size without any tampering with the ladder itself and wherein all the components can be assembled.

[0046] The base described so far allows anchoring to any ladder of different size without any tampering with it. Furthermore, all the components can be assembled, making the ladder particularly useful for the DIY world. The prerogative of this invention is in fact the possibility that the whole base and even the individual components can be distributed, disassembled and even separated, leaving users the choice of what to buy, stimulating a very significant DIY especially in the agricultural field. For ladder manufacturers, this invention can be evaluated as a simple accessory replaceable to the stabilizing crossmember already present in various types of ladders.

[0047] The object of the present invention is also a ladder comprising a plurality of rungs parallel to each other and fixed to two lateral uprights, which ladder is fixed to a support base as described above.

[0048] These and other features and advantages of the present invention will become clearer from the following description of some non-limiting exemplary embodiments illustrated in the attached drawings in which:

fig. 1 illustrates an exemplary embodiment of the base;
fig. 2 shows a detail view of the central element;
fig. 3 shows a detail view of a terminal bearing element of a leg to the terrain;
figs. 4 and 5 show different exemplary embodiments of coupling elements of the ladder at the base;
fig. 6 shows the lapel element for fixing the levelling member in position with respect to the support element of the ladder;
fig. 7 shows a detail view of the lapel element;
fig. 8 shows an example of a fixing clamp of the lapel element to the transverse rod;
fig. 9 shows a further view of the base provided with a lapel element;
fig. 10 shows a section view of the lapel element and of the central element according to the section plane indicated in figure 9;
fig. 11 shows a detail view of the lapel element;
fig. 12 shows a detail view of the locking system of the lapel element in position;
fig. 13 illustrates the spacer element for fixing the levelling member in position with respect to the support element of the ladder;
fig. 14 shows an example of fixing clamps of the spacer element to the transverse rod and to one leg;

fig. 15 shows a further view of the base provided with a spacer element;
fig. 16 illustrates a section view of the spacer element;
fig 17 shows a detail view of the spacer element;
fig. 18 shows a detail view of the locking system of the spacer element in position,
fig. 19 illustrates a coupling system of an existing ladder to the support element;
fig. 20 shows a detail view of the coupling system of fig 19;
fig. 21 illustrates an elongation element of the transverse rod;
fig. 22 shows the bush and the pin to be inserted in the hinge hole;
figs. 23 and 24 illustrate different views of a further exemplary embodiment of a central element;
the fig. 25 and 26 show an exploded and assembled view respectively, of an exemplary embodiment wherein the support element is a column;
fig. 27 shows a detail view of the coupling of the column with the ladder;
figs. 28, 29 and 30 show overall and detail views of the central element with plates which can be removably fixed;
fig. 31 illustrates a single bearing element which forms the legs;
figs. 32, 33 and 34 show overall and detailed views of the fixing of a short column to the lower rungs of a ladder.

[0049] Figure 1 shows an exemplary embodiment of the support base for a rung ladder object of the present invention. The base comprises a support element 2 of the ladder 1 and a levelling member 3 mounted oscillating on the support element 2 by means of a hinge 5.

[0050] The ladder 1 is not illustrated in its entirety in figure 1, as is the case instead of figure 26, and comprises a plurality of rungs 11 parallel to each other and fixed to two lateral uprights 12. In figure 1 the lower terminal segments of the uprights 12 of the ladder 1 are only shown with dashed lines.

[0051] In the exemplary embodiments from figures 1 to 24, the support element 2 of the ladder is a transverse rod 20. The transverse rod 20 can be of any type, preferably it is a metal box-like profile. Preferably the transverse rod 20 has the upper side provided with a non-slip finishing. This non-slip finishing can be an appropriate surface knurling for example, visible in the figures, and/or consist of a plurality of prominences or ribs. Alternatively or in combination, the non-slip finishing can provide a surface layer of non-slip material.

[0052] In the example of figure 1, the lower terminals of the uprights 12 are provided with fixing elements 17 to the transverse rod 20, which fixing elements 17 have a dovetail conformation or have a recess 170 facing the transverse rod 20 of dimensions such as to house the transverse rod 20 inside it, as happens for the stabilizing rods in use on many ladders. In the engaged condition of the transverse rod 20 in the recesses 170 it is possible to couple the ladder 1 stably to the transverse rod 20 with the same screws used for the stabilizing rods. It is possible to provide more suitable coupling elements, illustrated in figures 2 and 3 and described below.

[0053] The levelling member 3 comprises a single central element 30 connected to the hinge 5 and two bearing legs 31 to the terrain.

[0054] The legs 31 can be of any type, preferably they are made up of metal box-like section profiles suitable for supporting the imposed weights.

[0055] The central element 30 is provided with two removable housing seats 300 of the bearing legs 31. In the example of the figures, the housing seats 300 are constituted by rectangular cross-section sleeves whose size is only slightly larger than the section of the legs 31, so that the legs 31 can be inserted in the housing seats and fixed there by shape fit, it is also possible to use two fixing pins using the upper opening of the central element 30. The housing seats 300 are angularly oriented spaced by an obtuse angle, so that the legs 31 in a coupled condition diverge and lie on the terrain in bearing points sufficiently distant to ensure stability, while keeping the hinge 5 close to the terrain.

[0056] The hinge 5 comprises a through hole made in the transverse rod 20, visible in figure 4, two wings 301 fixed to the central element 3 and a pin 50 placed orthogonal to the plane where the transverse rod 20 lies. The wings 301 are parallel and spaced apart from each other so as to arrange the transverse rod 20 on opposite faces at the opposite openings of the hole of the transverse rod 20. The wings 301 are provided with holes 302 such that they are overlapping the opposite openings of the hole of the transverse rod 20 and the pin 50 is placed in interpenetration in the hole of the transverse rod 20 and in the holes 302 of the wings 301 and constrains in a freely oscillating way the central element 30 and therefore the legs 31 to the transverse rod 20.

[0057] In the example in the figure, the transverse rod 20 is a box-like element and the through hole consists of two coaxial holes 200 placed on opposite walls of the transverse rod 20.

[0058] Two washers and a bushing 51 are interposed between the wings 301 and the transverse rod 20 to increase the bearing surface by releasing the pin 50 from any shear stress. The bushing 51 can be introduced through the holes 302 of the wings and the holes 200 of the transverse rod 20.

[0059] The length measurement of the bushing 51 will be slightly less than the width of the central element 3 to allow easy packing and creating a suitable rigidity for the whole system.

[0060] In an embodiment variant, the central element 3 is shaped only in part as described above: in fact, excluding the wings and moving the hinge 5 downwards, it can be engaged with a tilting cap capable of anchoring to the main cross-member 2, effectively obtaining an in-

strument equivalent to that described above. Alternatively, a column 21 or multiples thereof can be anchored to the cap 16 which are fixed centrally to an existing ladder 1 (2-4 meters long) which allow strengthening and multipurpose due to the self-levelling base.

[0061] The legs 31 are optionally extendable. It is possible to provide telescopic legs 31, consisting of coaxial tubular elements and places sliding one inside the other, or consisting of trellis, bellows or similar structures. Alternatively or in combination, the legs 31 can be fixed in the housing seats 300 in different positions from an extreme retracted position to an extreme extracted position.

[0062] The central element 30 is visible in detail in figure 2, wherein it is possible to appreciate the recess shape of the housing seats 300 for the legs 31.

[0063] Figure 3 illustrates a detailed view of a base bearing terminal 32 to the terrain. The terminal 32 is preferably made of polymeric material and has a fitting recess 320 on the lower end of the leg 31. The terminal 32 has a lower bearing surface 321 which is shaped convex both along a section plane parallel to the plane of the ladder and along a section plane perpendicular to the longitudinal axis of the leg 31. This always guarantees a good bearing regardless of the inclination of the ladder 1 and/or the inclination of the levelling member 3 with respect to the ladder 1. The lower bearing surface 321 is preferably knurled.

[0064] Figure 4 and figure 5 show two embodiment variants of coupling elements 18 of the fixing elements 17 to the transverse rod 20. The coupling elements 18 can be fixed by fitting to the ends of the transverse rod 20 or be shaped terminals of the transverse rod 20 itself. The coupling elements 18 are shaped so as to allow a shape fit with the fixing elements 17. In figure 2 the coupling element 18 has a lower thickness coupling end zone, while in figure 3 the coupling element 18 has two housing grooves of the fixing element 17.

[0065] Figures 6 to 18 show two execution examples in which fixing means are provided in position of the levelling member 3 with respect to the support element 2 of the ladder 1, in particular with respect to the transverse rod 20.

[0066] Both systems are removable and can also be mounted in different times to meet specific needs.

[0067] In the first exemplary embodiment illustrated in figures 6 to 12, the fixing means comprise a lapel element 40 fixed to the transverse rod 20. The lapel element 40 is preferably made of metal, and is shaped like an elongated curved element, which has fixing eyelets at the opposite ends. The use of particular clamps 44, illustrated in detail in figure 8, allows a simple assembly without drilling holes. Alternatively, it is possible to provide a fixing by means of screws, which screws engage in corresponding holes present on the transverse rod 20. The lapel element 4 has an arched area provided with toothing 400 on the intrados side and a fixing element 42 provided with toothing 420 corresponding to the toothing 400 and mounted on the central element 3 in a displaceable way from a detached position from the lapel element 4 to an engagement position with the lapel element 4. In the engagement position, the toothing 420 of the fixing element 42 is engaged with the toothing 400 of the lapel element 4 and prevents the levelling member 3 from rotating with respect to the transverse rod 20.

[0068] The arched area follows the circumference arc of a circle with the centre in the fulcrum of the hinge 5, so that the distance between the fixing element 42 and the toothing 400 remains unchanged as the levelling member rotates on the hinge 5 with respect to the transverse rod 20.

[0069] The engaging element 42 in the example illustrated in detail in figure 12 is a preferably metal block which slides for a predetermined excursion inside a seat 430 provided in a support element 43 of the fixing element 42. The support element 43 of the fixing element 42 is fixed to the body of the central element 30 in a lower position and interposed between the two housing seats 300 of the legs 31. Preferably the support element 43 of the fixing element 42 is metallic and is fixed to the central element 30 with the same screws that lock the legs. This configuration allows a little difficult manufacturing of the central element 30, to which the support element 43 of the fixing element 42 can optionally be fixed in addition in case it is desired to use the base with the lapel element 40. The support element 43 of the fixing element 42 is provided with a plate portion 431 cantilevered on a plane perpendicular to the longitudinal axis of the ladder and provided with a hole in which a threaded pin 45 engages, visible in the figure 9, manually operable by means of a knob or enlarged head 450. As an alternative to the knob, a jack wrench designed for use as a removable tool and to be used only when it is necessary to lock the ladder on a desired angle can be used. Said pin 45 also engages with the fixing element 42 and displaces it, by screwing and unscrewing, from the detached position to the engagement position with the lapel element 4 and vice versa. The fixing element 42 is provided with a safety clip 421 rotatable from an engagement position with the lapel element 40 to a disengagement position. When the fixing element is in the engagement position with the lapel element 4, the safety clip 421 can be displaced in the engagement condition with the lapel element. Its actual displacement indicates to the user that the fixing element 42 is in engagement condition with the lapel element 4 and that therefore the base is fixed and does not allow the rotation of the ladder.

[0070] In the second exemplary embodiment illustrated in figures 13 to 18, the fixing means comprise a spacer element 10 fixed in an articulated way to the transverse rod 20 and to one of the legs 31 in two anchoring points. The spacer element 10 is provided with varying and locking means of the distance between the anchoring points.

[0071] The spacer element 10 is a plate element provided on a face of a toothing 100, like a rack, and has a free end 101 and a constrained end 102. The constrained end 102 has an eyelet 103 which allows to fix in an ar-

ticulated way the constrained end 102 to the transverse rod 20 by means of an articulation pin engaged in a hole formed in a clamp 46 which tightens to the transverse rod 20. A three-hinge system that define a triangle with two fixed sides is created in this way. The third side can vary in length, so as to allow the opposite angle, corresponding to the inclination angle of the levelling member 3 with respect to the transverse rod 20, to vary in width. When the variable side is locked in length, the rotation of the levelling member 3 with respect to the transverse rod 20 is prevented and the entire base is stably fixed and prevents the ladder 1 from rotating on the bearing surface.

[0072] The varying and locking means of the distance between the anchoring points comprise a fixing element 13 provided with toothing 130 corresponding to the toothing 100 of the spacer element 10 and fixed to the leg 31 in an articulated way and in a displaceable way from a detached position from the spacer element 10 to an engagement position with the spacer element 10.

[0073] The coupling of the fixing element 13 to the leg 31 is guaranteed by a support element 14 of the fixing element 13 which has a fixing eyelet 142 by means of an articulation pin, engaged with a special strap 47 provided with a threaded hole constrained to one leg 31.

[0074] The fixing element 13 is preferably a metal block provided of the toothing 130 on one side. The support element 14 of the fixing element 13 is a box element made of two portions, of which a first portion provided with a first sliding housing seat 140 in a first direction of the spacer element 10 and a second portion provided with a second sliding housing seat 141 of the fixing element 13. The sliding of the fixing element 13 in the second housing seat 141 is allowed for a predetermined excursion and in a second direction perpendicular to the first direction of the spacer element 10. The spacer element 10 and the fixing element 13 are positioned so as to face the respective toothing 100 and 130 towards each other.

[0075] The support element 14 of the fixing element 13 is provided with an end wall 143 such that the fixing element 13 is interposed between said end wall and the spacer element 10. In the end wall there is a through hole in which a threaded pin 19, visible in figure 16, engages which is manually operable by means of a knob or enlarged head 190. Said pin 19 also engages with the fixing element 13 and displaces it, by screwing and unscrewing, from a detached position from the spacer element 10 to an engagement position with the spacer element 10 and vice versa. The fixing element 13 is provided with an engagement seat 131 for the pin. In the detached position of the fixing element 13, the spacer element 10 can freely slide inside the first seat 140 of the support element 14 of the fixing element 13, allowing the free rotation of the hinge 5 and therefore the inclination of the levelling member 3 with respect to the transverse rod 20. In the engagement position of the fixing element 13 with the spacer element 13, the toothing 130 of the fixing element 13 grip the toothing 100 of the spacer element 10, preventing their sliding inside the first seat 140 of the support element 14 of the fixing element 13 and therefore locking the relative rotation of the levelling member 3 with the transverse rod 20.

[0076] Alternatively, it is possible to constrain the spacer element 10 to the leg 102 in an articulated way and constrain the support element 14 of the fixing element 13 to the transverse rod 20 in an articulated way.

[0077] Alternatively or in combination, the variation and locking means can comprise cables or chains, flexible rods, hydraulic cylinders, and other known systems.

[0078] Figures 19 to 21 illustrate an exemplary embodiment in which the transverse rod 20 is extendable along its longitudinal axis to be able to adapt to ladders of different width. Preferably the transverse rod 20 is telescopic, being provided with inserts 22 which can be extracted from the opposite ends of the transverse rod 20 itself. The extractable inserts 22, illustrated in detail in figure 21, are provided at the external end with abutment tabs 220 which allow a plurality of uses: a) they can be the leaf outside the column of the ladder 1 in the case of dovetail joint: the joint takes place on the sleeve which has a rather large hole to allow the passage of the pin without making new holes; b) furthermore the tabs serve as a leaf for the "L" borders for the bearing of the ladder columns, described below.

[0079] In the left part of figure 19 a dovetail fixing element 10 is shown as previously described. In the right part of figure 19 an alternative system for fixing the upright 12 of the ladder 1 is illustrated, shown in detail in figure 20, in which a support element 15 with an L-section is provided. The vertical part 150 of the support element 15 is fixed to the end of the transverse rod 20, while the horizontal part 151 forms a bearing base for the upright 12. Once in the engagement position, the upright 12 can be fixed with removable fixing means. An exemplary embodiment of removable fixing means of the upright 12 to the support element is shown in figure 20 and comprises U-shaped elements 152 provided with holes wherein partially threaded L-shaped pins engage. The U-shaped elements 152 are positioned in a housing arranged on the vertical 150 of the support element 15 so as to expose the holes behind this part. The "L" threaded pins are tightened to the column with simple nuts 154 beyond the holes, by calibrating the tightness the locking is obtained on the vertical. The "L" shaped pins can be rubberised and somewhat arched.

[0080] Another example of fixing provides that two devices of the type used to tighten ski boots are fixed to the border 150.

[0081] Figure 22 illustrates an exemplary embodiment of the bushing 51 described above and of the pin 50.

[0082] Figure 23 shows a further exemplary embodiment of the hinge 5. In this case, as can be seen from figure 24 which shows a detail of the central element 30, the wings 301 of the central element 30 are not present and the fulcrum hole is not drilled on the transverse rod 20 but on the central element 30 itself. A connecting el-

ement 16 of the transverse rod 20 to the hinge 5 is provided, which connecting element 16 is provided with wings which are completely similar to the wings 301 and are suitable for arranging on the opposite sides of the central element 30 to form the hinge 5. In the configuration of figure 23 the lapel element cannot be used, while the spacer element system can be used.

[0083] In the configuration of figure 23 it is also possible to provide a levelling member consisting of a single piece and connected in an oscillating way to the support element by means of the hinge 5. This levelling member can consist of an arched element, for example, constrained to the hinge in its central point, or by a profile bent to form two bearing legs and constrained to the hinge in the folding point.

[0084] Figures 25 and 26 show an exploded and assembled view respectively of an exemplary embodiment in which the support element 2 is a column 21. The column 21 is provided with an enlarged terminal bearing head to a wall or a branch. The enlarged head can be provided on a terminal element suitable for being fitted on the top of the column 21.

[0085] The column 21 is preferably extendable, in particular it is telescopic consisting of three concentric sectors as illustrated in figure 17. The ladder 1 can be fixed to the column 21 by means of fixing elements consisting of a plate portion which can be coupled to a rung 11 of the ladder 1 and fixed to a box-like section open on two sides suitable for being fitted onto the column 21 and fixed in position, for example by means of clamping screws, as illustrated in detail in figure 27.

[0086] The rung 11 of the ladder can be fixed to the plate portion of the fixing element by means of removable fixing means, such as clamps, for example.

[0087] In the exemplary embodiment illustrated in figures 28 to 31, the central element consists of two plates 302 parallel to each other and at least one connecting wall 303 of the two plates 303. The two plates 302 are shaped to form the said wings at a first end facing upwards in the bearing condition of the base and the walls of two said seats 300 at a second end facing downwards. The seats 300 are arranged to form an angle between each other, preferably an obtuse angle, and are delimited by the two plates 302 and the connecting wall 303. In particular, only one fixed connecting wall 303 is provided, at the end of the central element opposite to the hinge, i.e. downwards in the bearing condition, so that the central element 30 is open upwards, with a U-shaped section.

[0088] From above it is therefore possible to insert in the central element 30 a single elongated bearing element 310 which forms the two bearing legs 31, illustrated in figure 31. Said bearing element 310 is preferably tubular, with a rectangular or circular or another type section, and can consist of an arch or two rectilinear portions angled to each other.

[0089] The central element 30 further comprises two further connecting walls 304 between the two plates 302. Said further connecting walls 304 are placed to delimit the said seats 300 and consist of fixedly removable elements between the two said plates 302.

[0090] The plates 302 are provided with grooves 305 for inserting the plate elements which constitute the further connecting walls 304 in the engagement position.

[0091] Once the bearing element 310 has been inserted inside the central element and brought in abutment on the connecting wall 303, the further connecting walls 304 are inserted in the said groove 305 carrying out the said removable fixing, to close the opening upwards the housing seats 300 of the legs 31, holding the bearing element 310 in position.

[0092] Figure 32 illustrates a support element of the ladder consisting of a short column, suitable for engaging with the lower rungs of the ladder, in particular with the first and third rungs starting from the bottom. The column can be coupled to the hinge by means of a special terminal shown in figure 33. The fixing to the rungs of the ladder is carried out by means of a plate-like element provided with a fixing collar to the column and with engagement grooves a pair of clamps suitable for holding the rung on the two opposite sides with respect to the column, illustrated in figure 34.

[0093] It is possible to provide a further short column that can be coupled, in a similar way as shown in figures 32 to 34, to the upper rungs of the ladder, so as to constitute an upper bearing end-piece.

Claims

1. Support base applicable to an existing rung ladder (1), which base includes a support element (2) that can be fixed to the ladder (1) and a levelling member (3) mounted oscillating on the support element (2) by means of a single hinge (5),
   characterized in that
   the levelling member (3) comprises a single central element (30) connected to the hinge (5) and two bearing legs (31) to the terrain, the central element (30) being provided with one or more removable housing seats (300) of the bearing legs (31).

2. Base according to claim 1, wherein, in the assembled condition of the ladder (1), the bearing legs (31) lie substantially on the same plane as the ladder (1).

3. Base according to claim 1 or 2, wherein the hinge (5) comprises a through hole made in the support element of the ladder (2), two wings (301) fixed to the central element (30) of the levelling member (3) and a pin (50) placed orthogonal to the plane where the ladder (1) lies, which wings (301) are spaced from each other so as to arrange themselves on opposite faces of the support element (2) at the opposite openings of the hole of the support element (2), the wings (301) being provided with holes (302) so that said holes (302) of the wings (301) are overlap-

ping the opposite openings of the hole of the support element (2) and in these holes (302) a bushing and a pin are inserted which constrain in a freely oscillating way the central element (30) of the levelling member (3) to the support element (2).

4. Base according to claim 3, wherein the central element consists of two plates parallel to each other and at least one connecting wall of the two plates, which plates are shaped to form the said wings at a first end and the walls of two said seats at a second end, which seats are arranged to form an angle between them and are delimited by the two said plates and by the connecting wall, being the connecting wall placed at the said second end.

5. Base according to claim 4, wherein the central element comprises one or more further connecting walls between the two said plates delimiting the said seats.

6. Base according to claim 5, wherein the said further connecting walls consist of removably fixed elements between the two said plates.

7. Base according to one or more of the preceding claims, wherein the bearing legs (31) are extendable.

8. Base according to one or more of the preceding claims, wherein the support element (2) of the ladder is a transverse rod (20).

9. Base according to one or more of the preceding claims wherein the support element is extendable with a sleeve (22).

10. Base according to one or more of the preceding claims wherein the support element is provided with a border (15) suitable for achieving a fixing suitable for various types of columns.

11. Base according to one or more of the preceding claims, wherein the support element (2) of the ladder is a column (21).

12. Base according to one or more of the preceding claims, wherein fixing means of the levelling member (3) are provided in position with respect to the support element (2) of the ladder (1), which fixing means comprise a lapel element (40) fixed to the support element (2) of the ladder (1), which lapel element (40) has an arched area provided with toothing (400) on the intrados side, and a fixing element (42) provided with toothing (420) and mounted on the central element (30) displaceably from a detached position from the lapel element (40) to an engagement position with the lapel element (40), in which engagement position the toothing (420) of the fixing element (42) is engaged with the toothing (400) of the lapel element (40) and prevents the levelling member (3) from rotating with respect to the support element (2) of the ladder (1).

13. Base according to one or more of the preceding claims, wherein fixing means of the levelling member (3) are provided in position with respect to the support element (2) of the ladder (1), which fixing means comprise at least one spacer element (10) fixed in an articulated way to the support element (2) of the ladder (1) and to one of the legs (31) in two anchoring points, which spacer element (10) is provided with varying and locking means of the distance between the anchoring points, wherein the spacer element (10) is a plate element provided on one face of a toothing (100) and has a free end (101) and a constrained end (102), comprising the varying and locking means of the distance between the anchoring points at least one fixing element (13) provided with toothing (130) corresponding to the toothing (100) of the spacer element (10) and fixed to the leg (31) in articulated and displaceable way from a detached position from the spacer element (10) to an engagement position with the spacer element (10).

14. Base according to one or more of the preceding claims, which allows the anchoring to any ladder of different size without any tampering with the ladder itself and wherein all the components can be assembled.

15. Ladder (1) comprising a plurality of rungs (11) parallel to each other and fixed to two lateral uprights (12), **characterized in that** it is fixed to a support base according to one or more of the preceding claims.

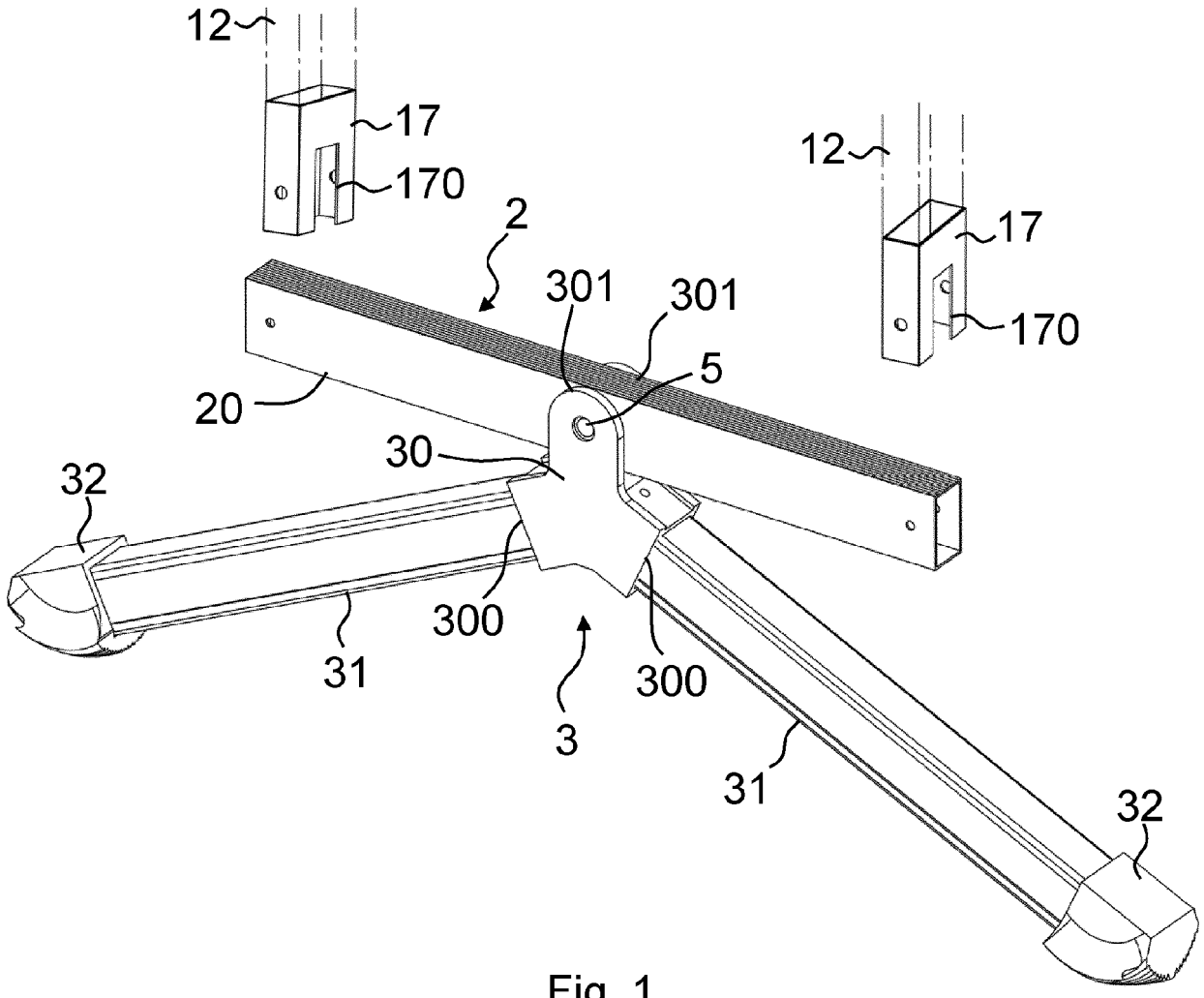


Fig. 1

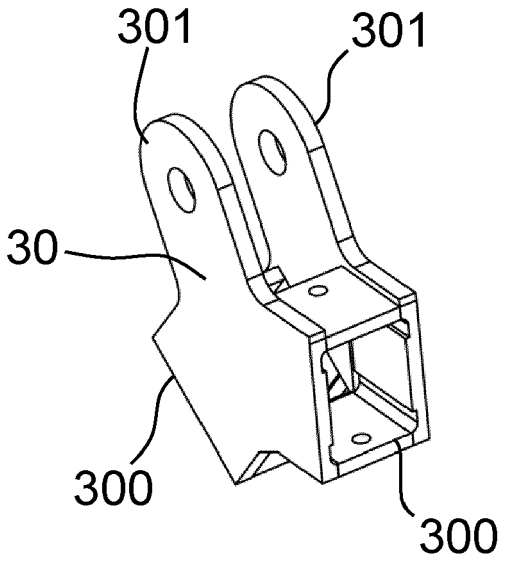


Fig. 2

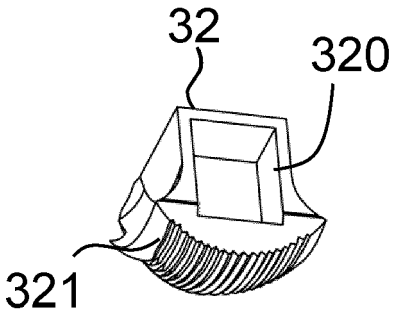


Fig. 3

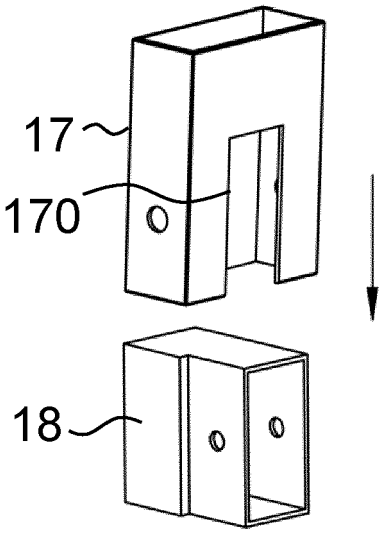


Fig. 4

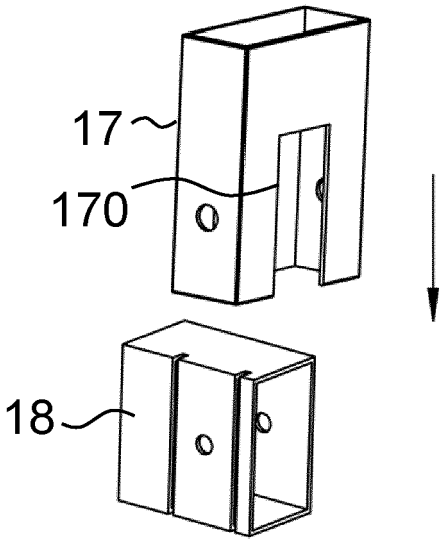


Fig. 5

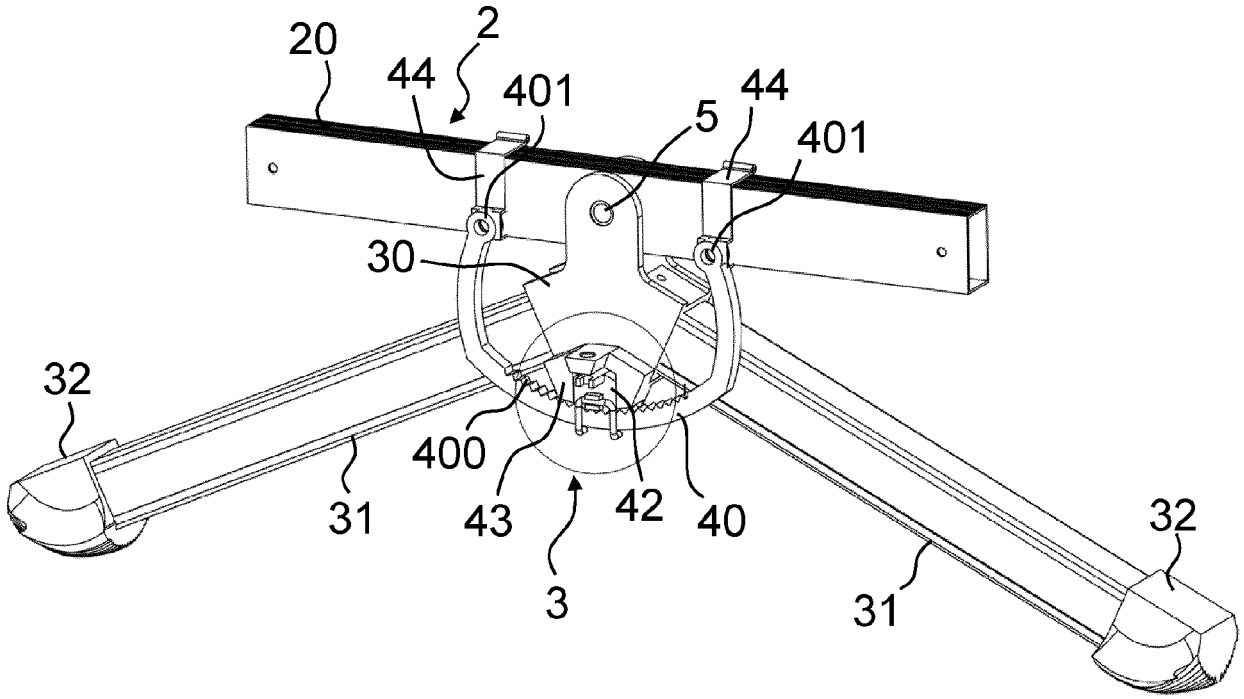
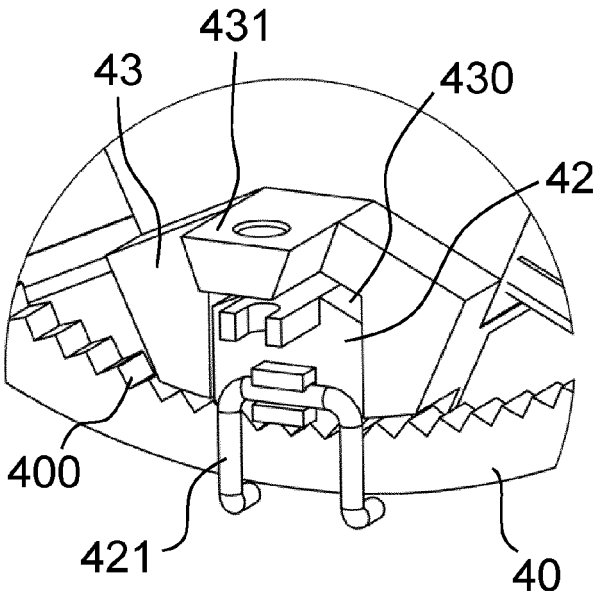


Fig. 6



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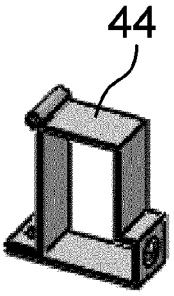

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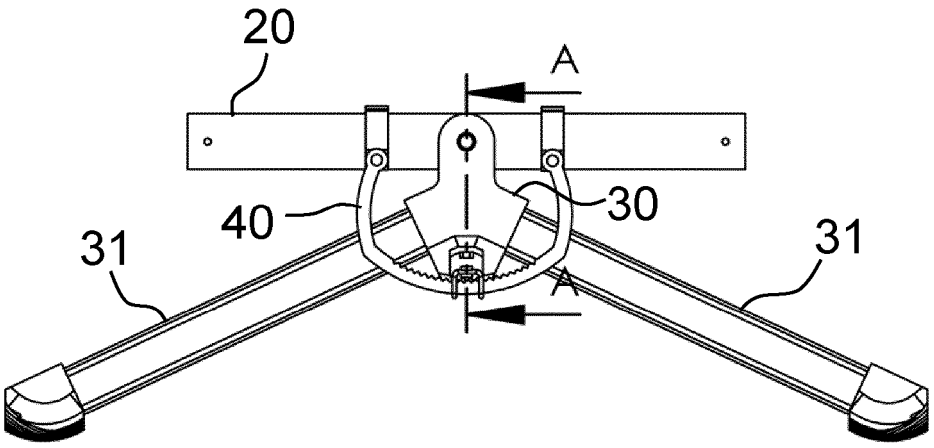
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Fig. 9

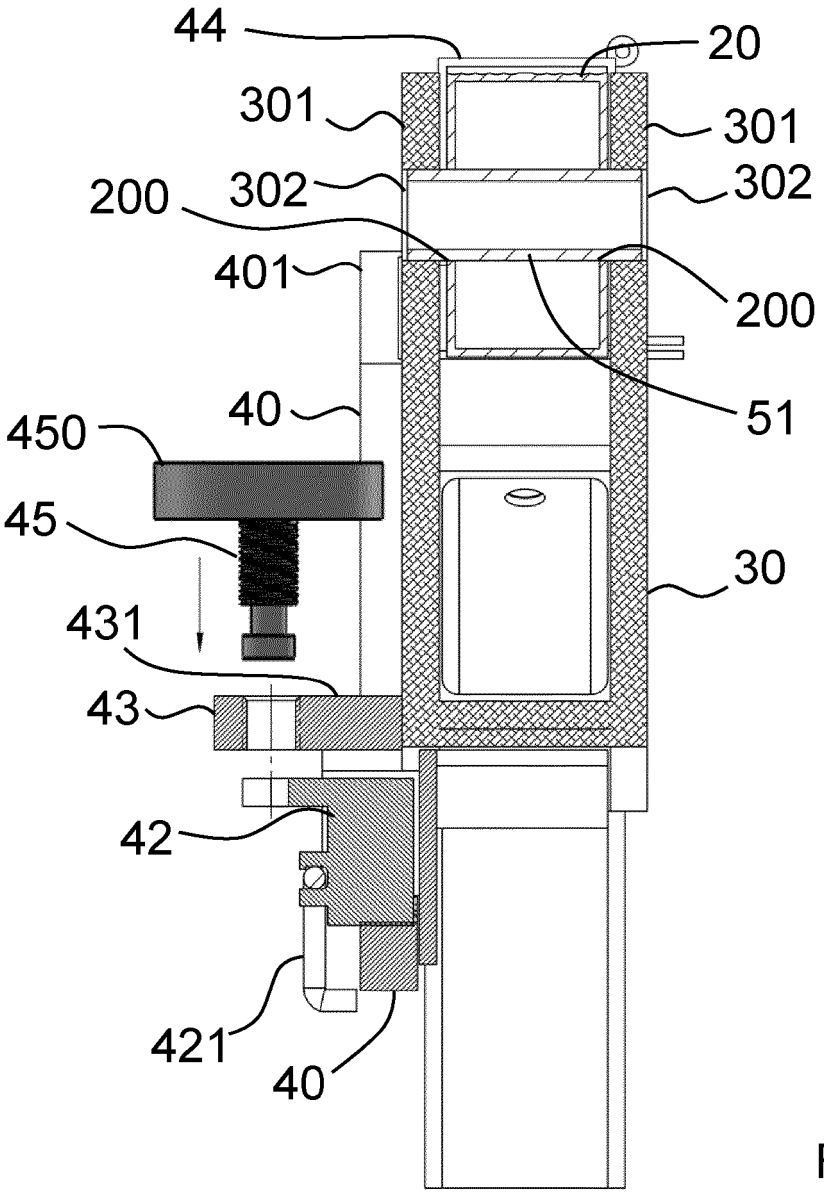
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Fig. 10

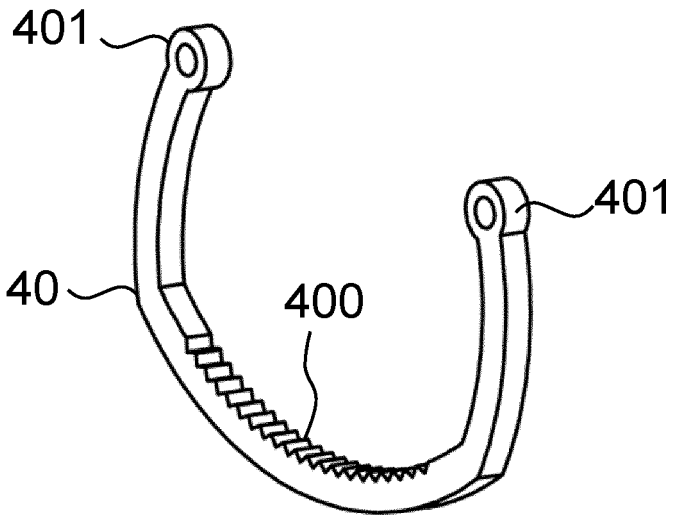


Fig. 11

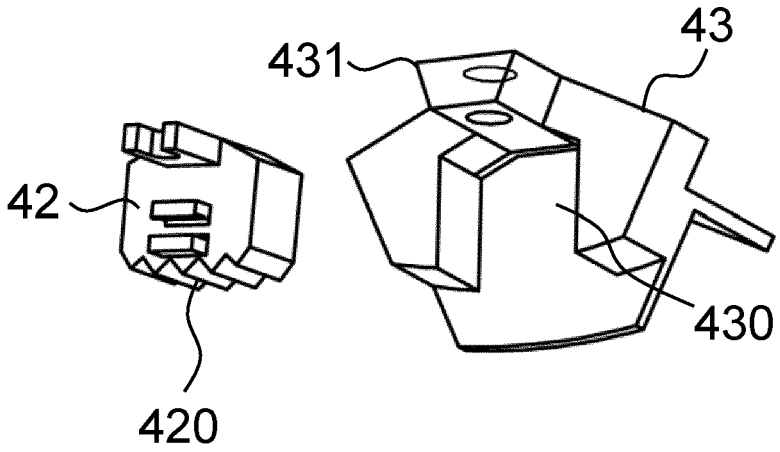


Fig. 12

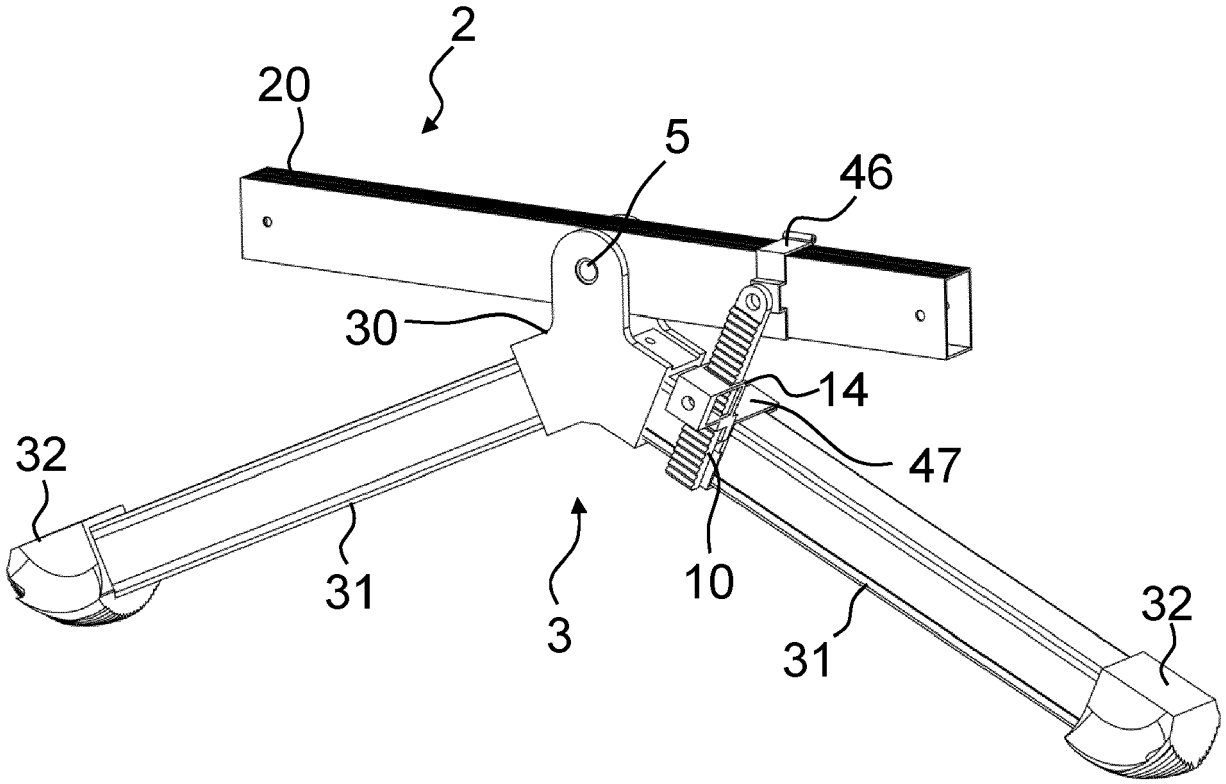
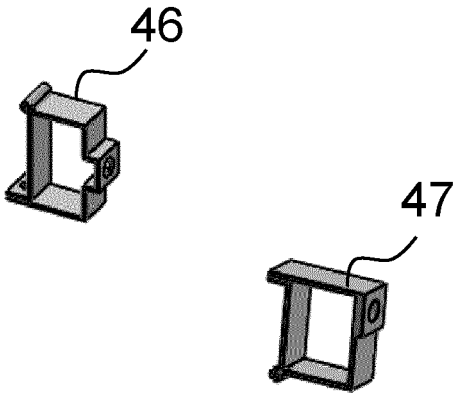


Fig. 13



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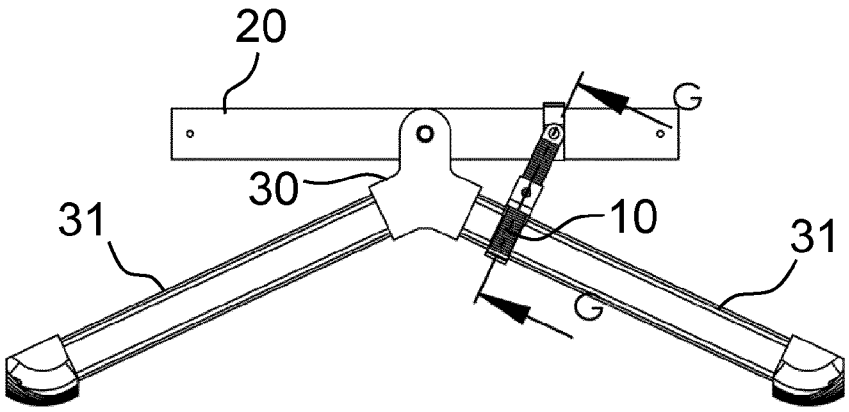

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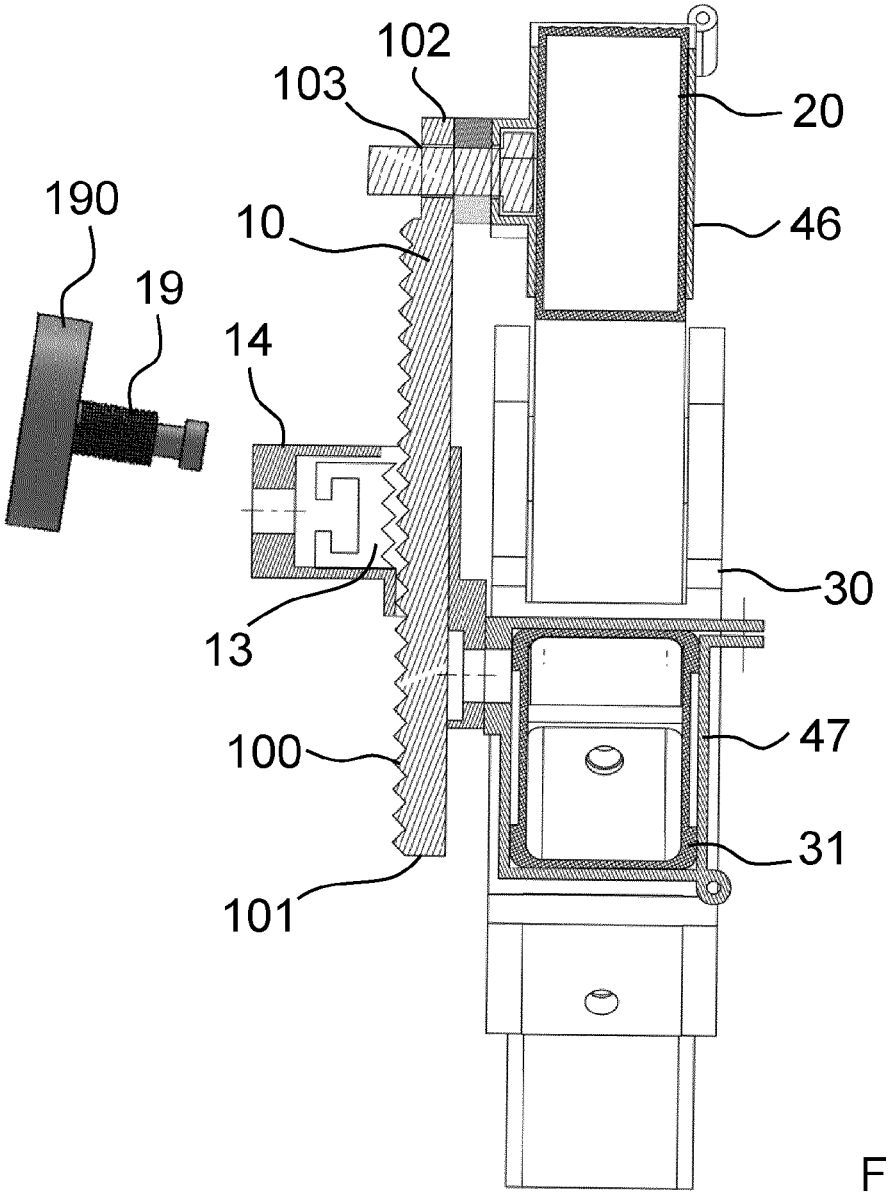

Fig. 16

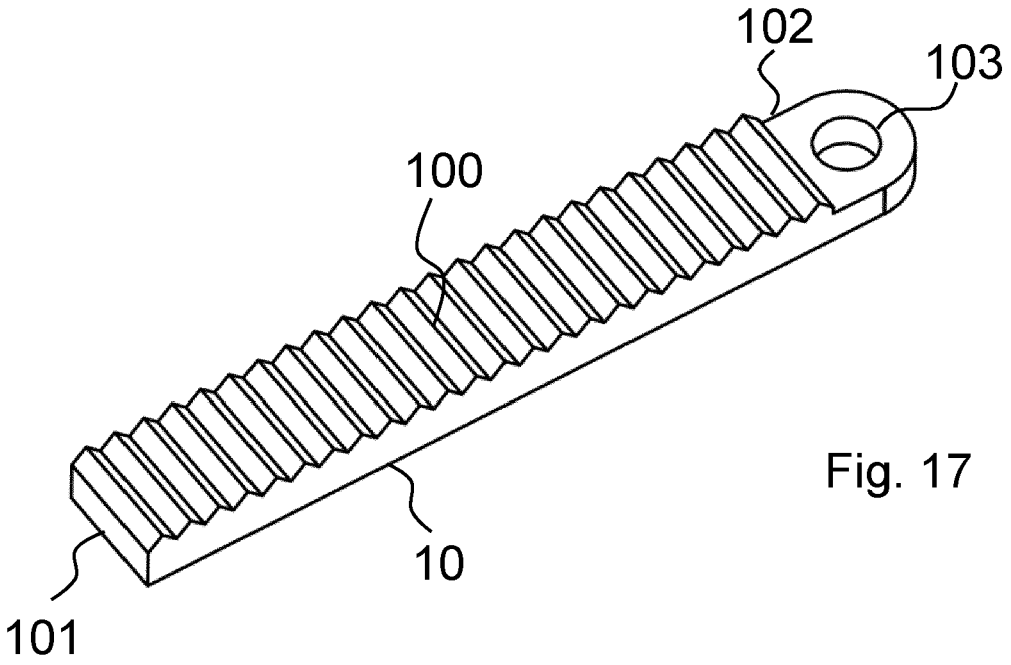

Fig. 17

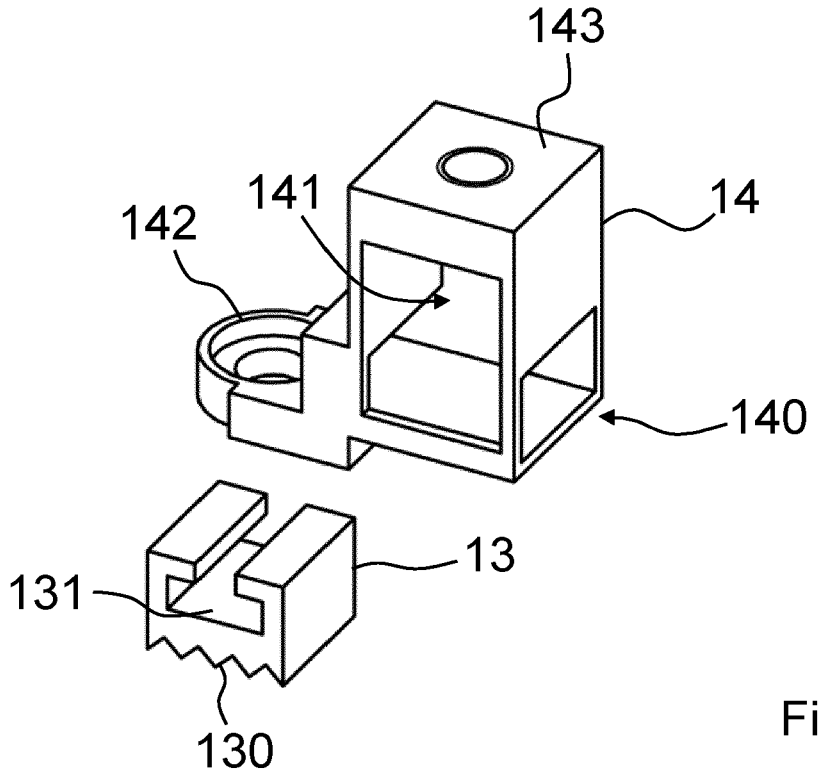

Fig. 18

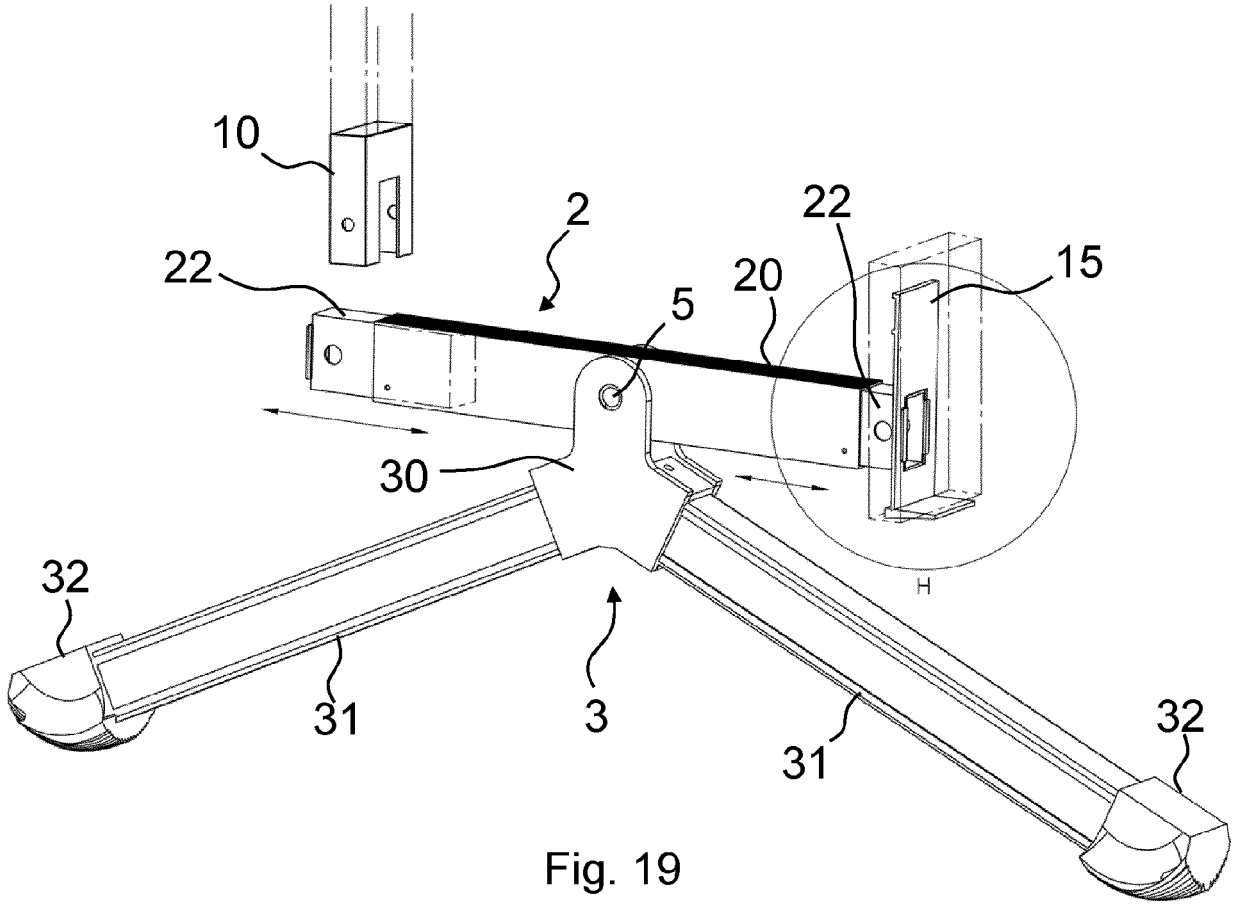

Fig. 19

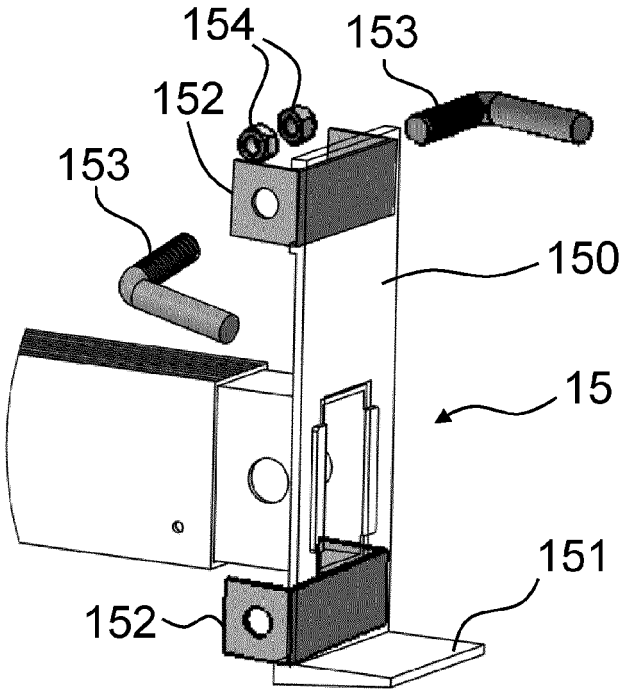

Fig. 20

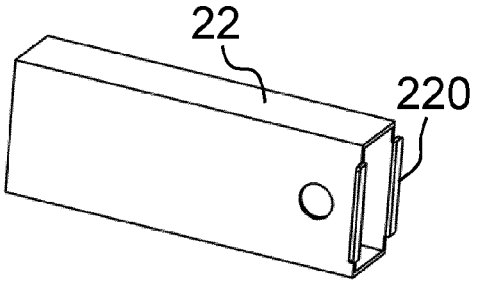

Fig. 21

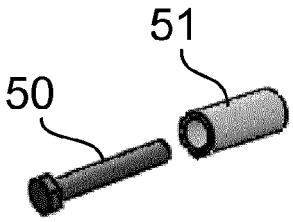

Fig. 22

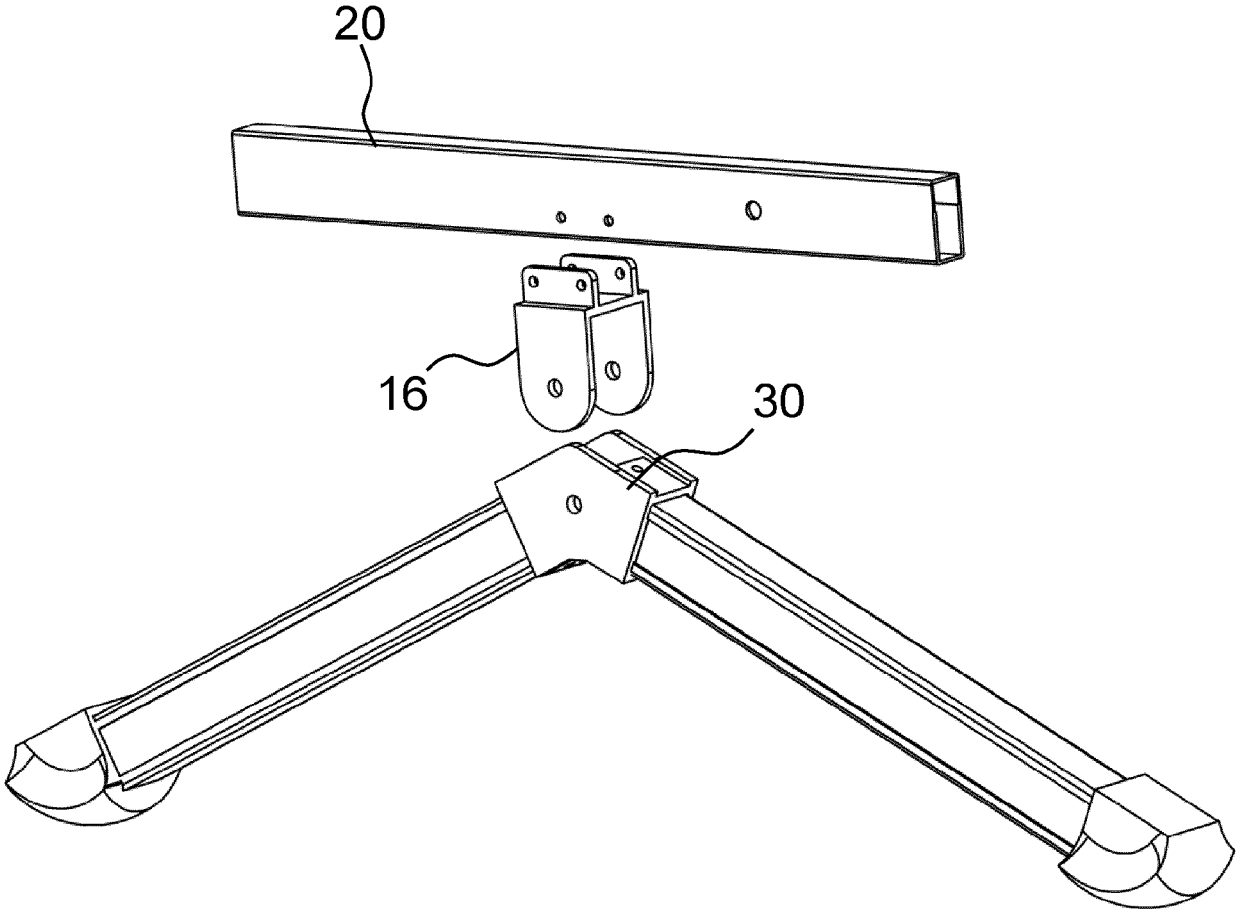

Fig. 23

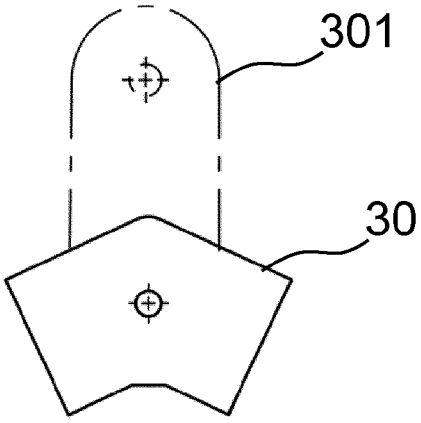

Fig. 24

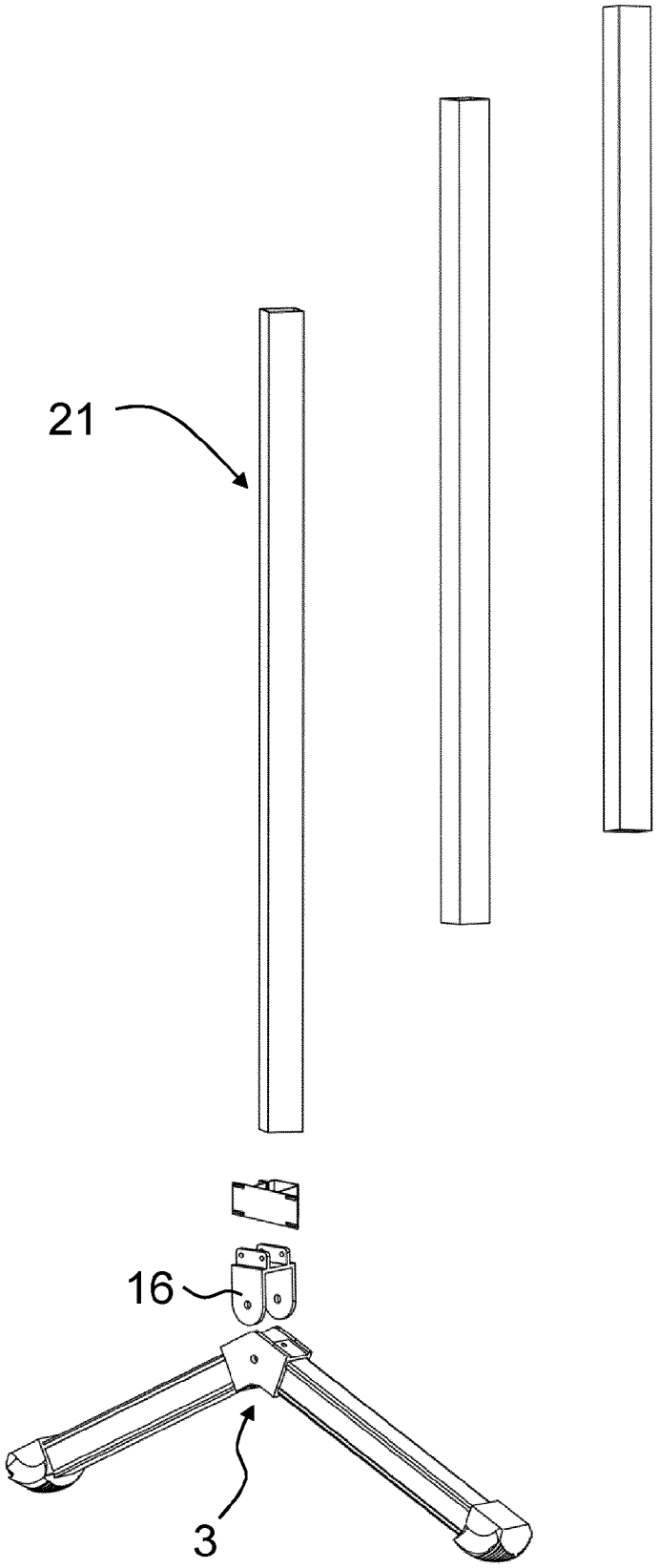

Fig. 25

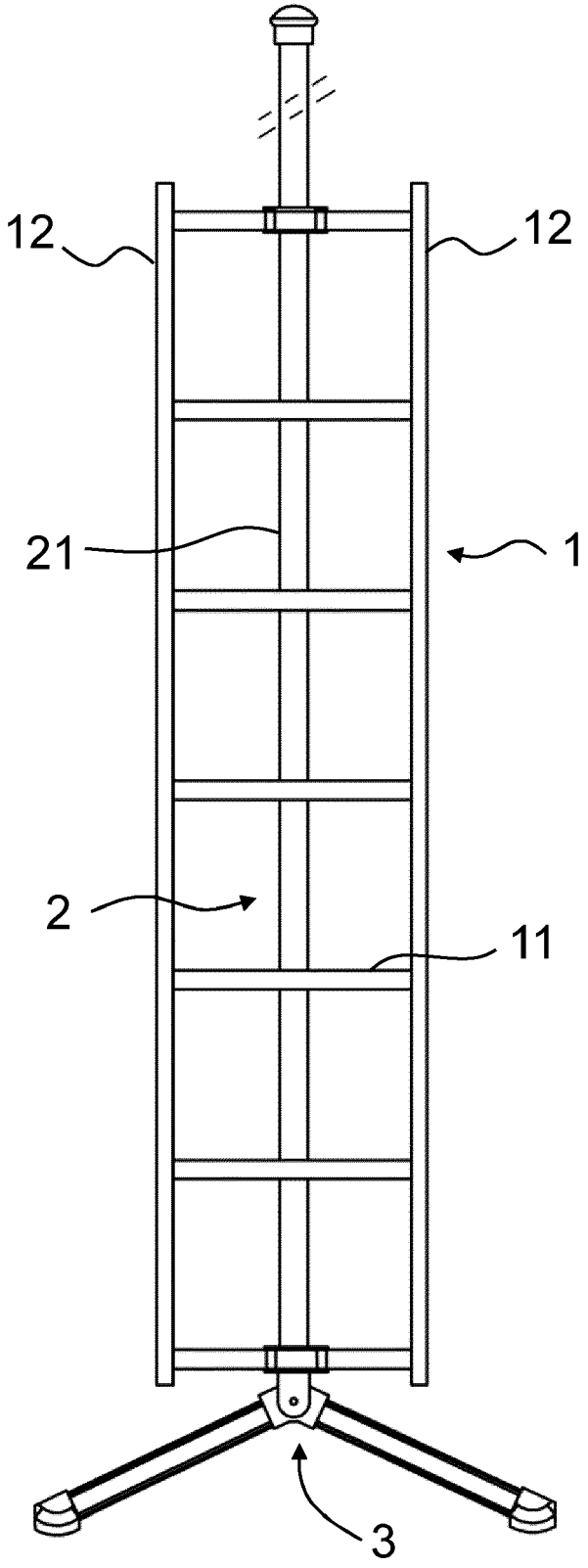

Fig. 26

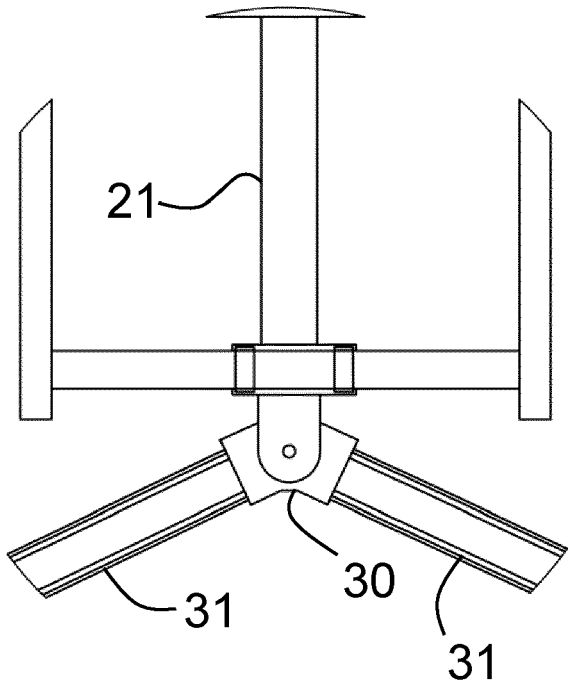

Fig. 27

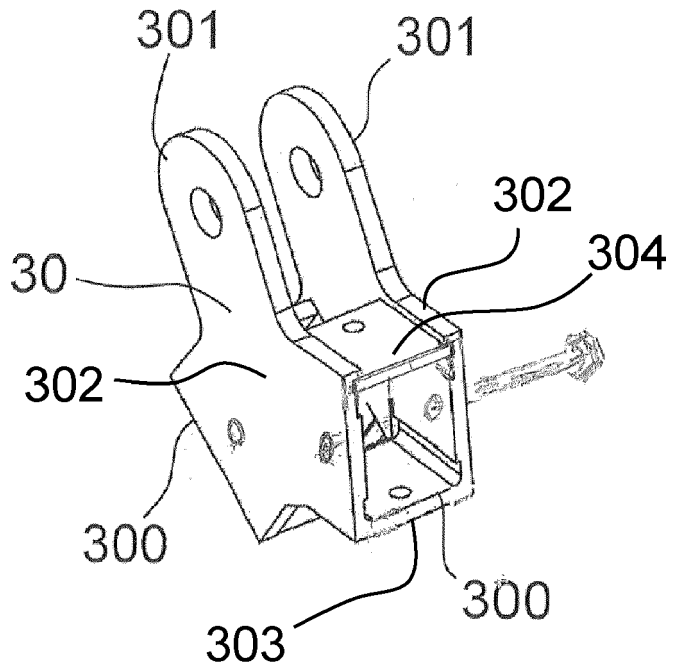

Fig. 28

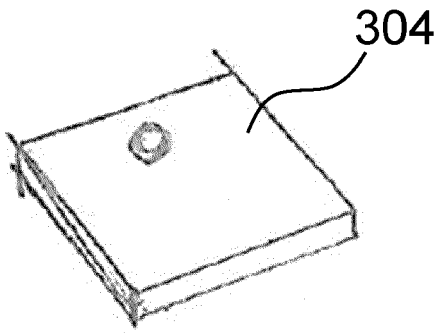

Fig. 29

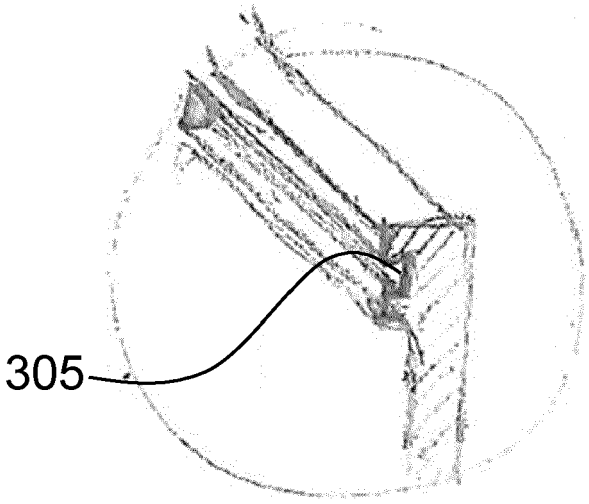

Fig. 30

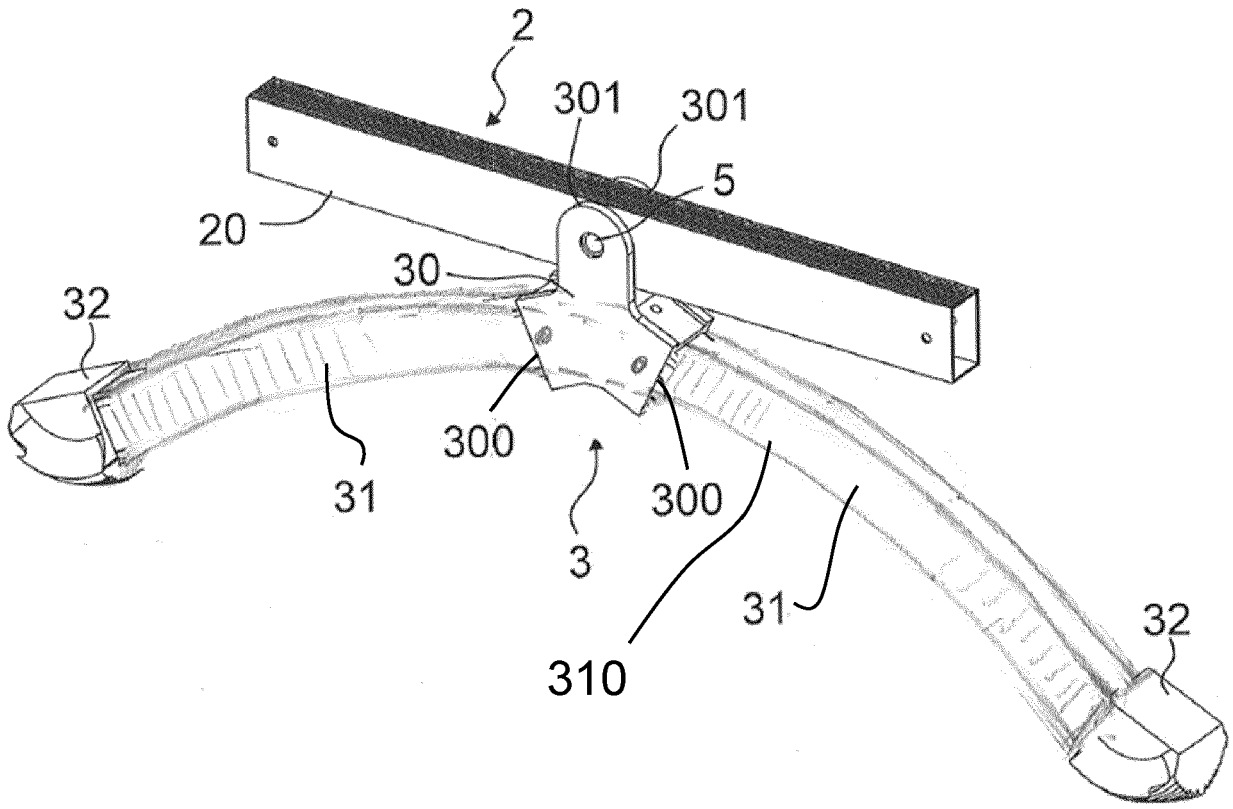

Fig. 31

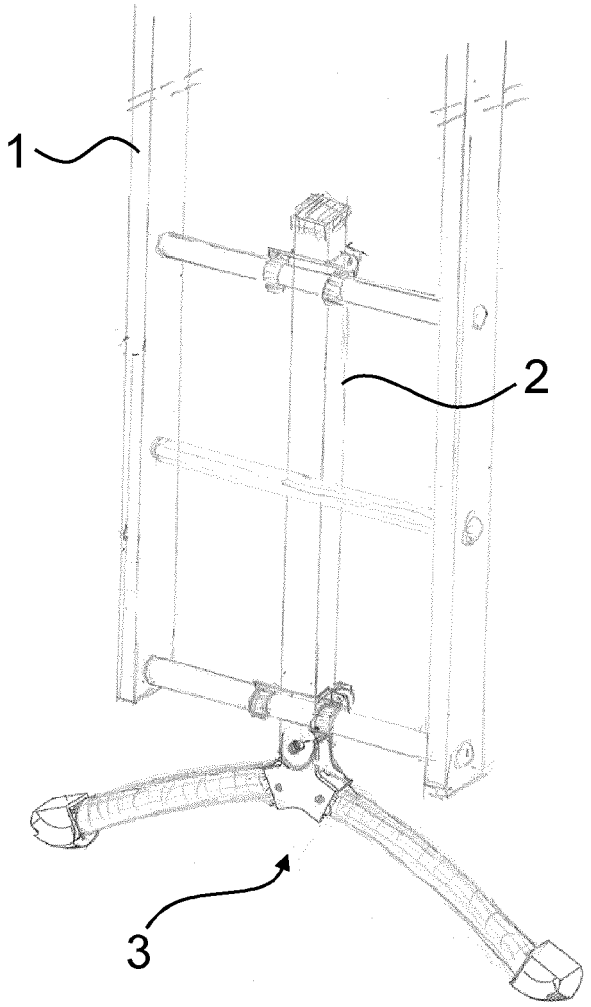

Fig. 32

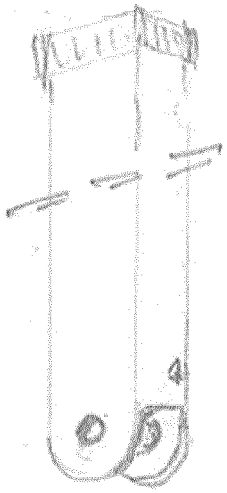

Fig. 33

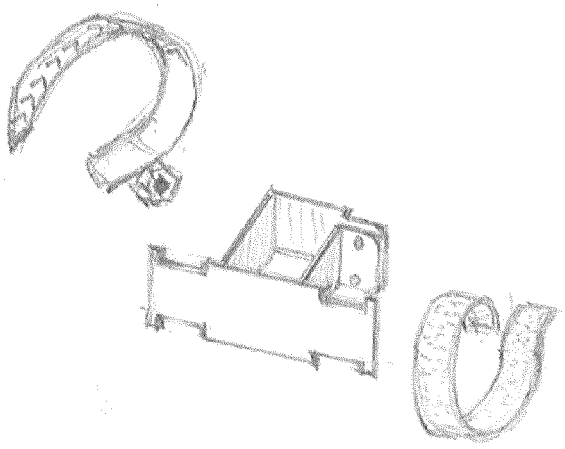

Fig. 34

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 20 15 7467

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	WO 00/60275 A1 (KIRK ALTON JULIAN WILLIAM [GB]) 12 October 2000 (2000-10-12) * figure 8 * -----	1-3,9, 14,15 4-6	INV. E06C7/44 E06C7/46
X A	US 2 641 401 A (HERSCHEL JAMES) 9 June 1953 (1953-06-09) * figures 11, 12 * -----	1,2,9, 11,14,15 3-6	
X Y	US 5 507 364 A (SPEVAK STEPHEN T [US]) 16 April 1996 (1996-04-16) * figure 1 * -----	1,2,7,8, 10,11, 14,15 12,13	
Y	JP H10 25982 A (FUJIMOTO YUKIHIRO; SAWA HIDENORI) 27 January 1998 (1998-01-27) * figures 1-6 * -----	12	
Y	WO 2017/061874 A1 (INVENTU AS [NO]) 13 April 2017 (2017-04-13) * figure 5 * -----	13	

TECHNICAL FIELDS SEARCHED (IPC)

E06C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 July 2020	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

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