

(19)



(11)

EP 3 029 215 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.06.2016 Bulletin 2016/23

(51) Int Cl.:
E04F 21/18^(2006.01) B66C 1/24^(2006.01)

(21) Application number: **15194953.4**

(22) Date of filing: **17.11.2015**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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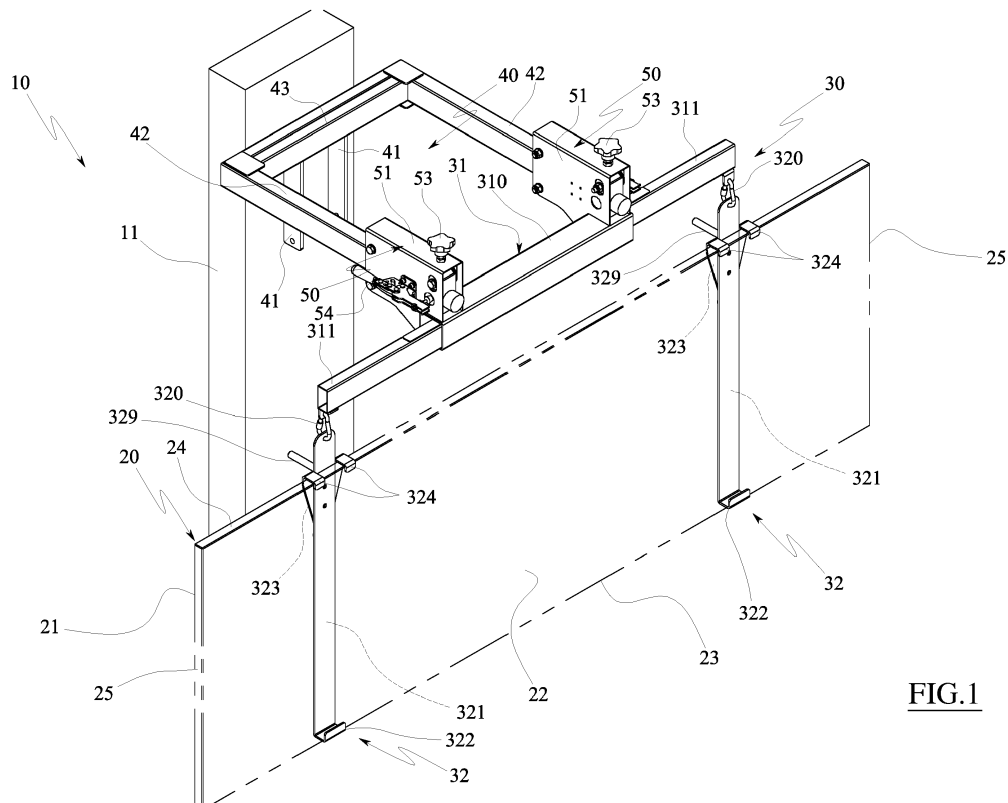
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(30) Priority: **02.12.2014 IT RE20140100**

(54) A GRIPPING AND LIFTING DEVICE OF SLABS

(57) A gripping and lifting device (30) of slabs (20) comprises a support cross member (31) able to support at least a gripping organ (32) of a slab (20), in which the gripping organ (32) of the slab (20) comprises at least a bearing body (321) inferiorly hung on the support cross member (31) and provided with a support shelf (322) de-

fining a rest plane for a lower edge (23) of the slab (20), and a gripping body (323) provided with a gripping hook (324) of an upper edge (24) of the slab (20) and slidably associated to the bearing body (321) from a neared position thereto to a distanced position therefrom, in opposition to pushing means (327).

**FIG.1****EP 3 029 215 A1**

Description

TECHNICAL FIELD

[0001] The present invention relates to a gripping and a lifting device of slabs.

[0002] In greater detail, the invention relates to a gripping and a lifting device of heavy slabs, such as for example marble or stone slabs, or slabs made of another material, for example for use in the stone laying sector.

PRIOR ART

[0003] As is known, to lift slabs such as for example marble or stone slabs, for example for stone cladding of burial places or the like, hoists are used for moving slabs which comprise a hoist that can rest on a ground surface, which comprises a gripping organ of a slab which can be translated vertically by the hoist, for example by rotating a crank or a motorized device, for example screw device, between a lowered position and at least a raised position.

[0004] The gripping organs generally comprise a pair of lower arms spaced from one another and defining a horizontal lower rest plane for the lower surface of the slab located by a side (i.e. with the lie plane substantially vertical) and a vertically mobile upper arm, along an upright solidly constrained to the pair of lower arms, distancingly and nearingly from and to the lower rest plane. The upper arm is constrainable to the upright, by means of threaded blocking organs, so that they can be rested on the upper surface of the slab (opposite the lower surface) and fixed in the rest position.

[0005] The lower arms are fixed to a common cross member, which is associated to a vertical slide of the hoist which enables vertical movement of the gripping organ.

[0006] In practice, the slab can be interposed between the lower arms and the upper arm and retained between them during the vertical movement imparted by the hoist to the gripping organ.

[0007] To perform the fixing of the slab to a vertical wall, for example the cladding of the closing wall of a burial place, it is sufficient to arrange fixing pins on the vertical wall, which pins project from the wall, for example at least two lower and at least one upper pins.

[0008] The slab must therefore be positioned, using the hoist, resting on the lower fixing pins, so that it is vertically interposed between the lower fixing pins and the upper fixing pin.

[0009] Once the slab has been placed in this position it is sufficient to block the slab by means of blocking organs, for example washers or stakes which engage on the pins so as to project radially therefrom.

[0010] The fixing operations of the slab on the vertical wall, though conceptually simple, are however considerably complicated from the practical point of view, especially when the slabs are heavy.

[0011] Further, the positioning operations of the slab,

the detachment of the slab from the gripping organ of the hoist and the receiving of the slab by the fixing pins with the relative blocking organs cannot always be carried out in total safety for the operatives installing the slab.

[0012] It has been found, in fact, that when the hoist has positioned the slab at the desired level, i.e. with the lower surface a little above the level of the lower fixing pins, that the passage of the slab from resting on the lower arms to resting on the lower fixing pins is not always easy and in any case leads to the necessary use of physical force on the part of the operatives in order to raise and position the slab close by the wall.

[0013] Among other risks, this operation involves those originating from the use of personnel in stressful situations and forced often to work in precarious situations of equilibrium, high-up in relation to the ground surface and in environments that are not comfortable, and the risk of the slab falling vertically in the passage thereof from resting on the lower arms to resting on the lower fixing pins, with all the drawbacks that entails.

[0014] Examples of gripping and lifting device of slabs are shown in documents D1: US 3,976,321 and D2: US2002/190533.

[0015] An aim of the present invention is to obviate the above-mentioned drawbacks in the prior art, with a solution that is simple, rational and, for example, relatively inexpensive.

[0016] These aims are attained by the characteristics of the invention reported in the independent claim. The dependent claims delineate preferred and/or particularly advantageous aspects of the invention.

DESCRIPTION OF THE INVENTION

[0017] In particular the invention relates to a gripping and lifting device of slabs which comprises a support cross member able to support at least a gripping organ of a slab, in which the gripping organ of the slab comprises at least a bearing body inferiorly hung on the support cross member and provided with a support shelf defining a rest plane for a lower edge of the slab, and a gripping body provided with a gripping hook of an upper edge of the slab and slidably associated to the bearing body from a neared position to the support shelf to a distanced position therefrom, in opposition to elastic pushing means.

[0018] With this solution, the slab can be manoeuvred and installed, even when it is a heavy and awkward slab that is to be installed in positions and locations that are not easy, in perfect safety while enabling the slab to be solidly constrained to the gripping organ during all the operations of movement thereof up to the secure fixing thereof to the wall.

[0019] In an aspect of the invention, the pushing means can comprise at least a spring.

[0020] With this solution, the gripping organ is safe and at the same time economical and fast to assemble.

[0021] In a further aspect of the invention, the support

shelf exhibits a substantially C-shaped conformation having a concavity facing upwards and is able to envelop a portion of the lower edge and at least a portion of a face adjacent to the lower edge of the slab.

[0022] In this way, the slab is solidly engaged in the rest shelf without any possibility of accidental freeing thereof during the movement thereof.

[0023] The gripping hook advantageously exhibits a substantially C-shaped conformation with a concavity facing downwards and is able to envelop a portion of the upper edge and at least a portion of a face adjacent to the upper edge of the slab.

[0024] In this way, the slab is solidly engaged between the support shelf and the gripping hook without any risk of accidental disengaging therefrom during the movement thereof.

[0025] The bearing body can advantageously be hung from the support cross member by means of at least a hooking element, for example a carabiner hook.

[0026] Owing to this, the bearing body is afforded several degrees of freedom which facilitate activation thereof by the operator, who in any case can manoeuvre the heavy slab from a raised position with respect thereto and therefore in conditions of complete safety.

[0027] In a further aspect of the invention, the gripping organ is movably associated along a longitudinal axis of the support cross member.

[0028] In this way, the slab can easily be gripped by the gripping organ and always in the most advantageous position in terms of leverage and equilibrium of the centre of gravity of the device.

[0029] The support shelf advantageously comprises at least a fixed portion and at least a mobile portion able to be moved along the longitudinal axis of the fixed portion and blockable with respect to the fixed portion by releasable fixing means, the gripping organ being inferiorly hung from the mobile portion such as to be mobile along the longitudinal axis of the cross member.

[0030] In a further aspect of the invention the support cross member is fixed to at least a carriage that is mobile on a longitudinal guide, i.e. a guide bar, that is substantially perpendicular to a longitudinal axis of the support cross member.

[0031] With this solution, the slab can be neared to and distanced, while maintaining the same height, to the wall to which it is to be fixed, while remaining solidly gripped by the gripping organ.

[0032] At least two of the gripping organs, distanced from one another, can advantageously be hung from the support cross member, along the longitudinal axis of the support shelf.

[0033] With this solution, even with activation of particularly long slabs, the gripping stability of the slab by the gripping organs is guaranteed, as well as the overall equilibrium of the gripping and raising device.

[0034] In a further aspect of the invention, a lifting group of slabs is provided which comprises a gripping and lifting device, according to any one of the preceding claims,

wherein the hoist is able to move the gripping and raising device in a vertical direction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0035] Further characteristics and advantages of the invention will emerge from a reading of the description that follows, provided by way of non-limiting example, with the aid of the figures of the accompanying tables.

Figure 1 is an axonometric view of a gripping and lifting device according to the invention.

Figure 2 is a frontal view of figure 1.

Figure 3 is a lateral view of figure 1.

Figure 4 is a larger-scale view of detail IV of figure 2.

Figure 5 is a larger-scale view of detail V of figure 3.

Figures 6a, 6b and 6c are lateral views of the device of figure 1 during respective work steps.

BEST WAY OF CARRYING OUT THE INVENTION

[0036] With particular reference to the figures, 10 denotes in its entirety a slab lifting group, the slabs being denoted in their entirety by reference numeral 20.

[0037] The slabs 20 are for example stone slabs, but could be any substantially slab-shaped bodies, such as tiles, glass sheets, photovoltaic panels or another product which must and/or can be associated for example to a vertical wall W.

[0038] In the example the wall W might be a closing wall of a tomb.

[0039] In the example the slab 20 is a substantially parallelepiped body which exhibits a slim thickness, for example from 1 to 5 cm, preferably about 2 cm. Further, the slab 20 exhibits a front face 21, for example rectangular, which can be provided with surface finishings of good quality or which in any case can be located in-view once supported on the wall W to which it is to be fixed. The slab 20 further comprises an opposite-facing rear face 22 (also rectangular), which for example can be faced to the wall W, preferably adheringly and substantially supported thereon.

[0040] The slab 20 further comprises a lower edge 23 and an upper edge 24, for example substantially planar over a whole longitudinal extension thereof. Lastly, the slab 20 comprises two opposite lateral edges 25, in the example exhibiting a smaller length with respect to the lower edge 23 and the upper edge 24.

[0041] The lifting group 10 in particular comprises a hoist 11 provided with ground rests (not illustrated), which can activate in substantially vertical motion a gripping and lifting device 30 of a slab 20.

[0042] The hoist 11 comprises command means (not shown as of known type), of a manual or motorised type (such as for example a winch or a reel activated by a drill and/or a screw) able to command the movement of the gripping and lifting device 30 alternatively between a lowered position and a raised position.

[0043] The gripping and lifting device 30 in particular comprises a support cross member 31, which is substantially rigid (rigid, for the purposes of the present description, meaning a substantially non-deformable body under the action of the loads to which it is normally subjected during operation, for example under the weight of the slab 20), and, for example, exhibits a substantially horizontal longitudinal axis.

[0044] The support cross member 31 comprises a fixed portion 310, for example defined by a substantially tubular longitudinal member (for example having a quadrangular section) which is internally hollow.

[0045] The support cross member 31 further comprises at least a mobile portion 311, which is associated to the fixed portion 310, slidably or in any case translatably along the longitudinal axis of the support cross member 31.

[0046] The mobile portion 311 is defined by a substantially rigid bar which, for example, is partly insertable in the internal cavity of the fixed portion 310, for example telescopically, so as to at least partly project from an open end of the cavity.

[0047] In practice, the part of the mobile portion 311 exhibiting the free end (external of the fixed portion 310) axially prolongs the fixed portion 310.

[0048] In the example, the support cross member 31 comprises two mobile portions 311, of which a left mobile portion and a right mobile portion, for example each projecting axially from a respective open end of the fixed portion 310 by at least an axial part of a variable length.

[0049] Each mobile portion 311 is axially releasably fixable to the fixed portion 310, for example in a determined desired extraction position, by fixing means, such as for example a threaded organ 312, for example a flat-head screw screwed into a through-hole and threaded, made in the fixed cross member 310.

[0050] The support cross member 31 can suspendingly support at least a gripping organ 32 which can grip at least a slab 20, for example one slab 20 at a time. In practice, the gripping organ 32 is hung below the support cross member 31, preferably so as to be able to oscillate under its own weight, as will be more fully described in the following.

[0051] In the example, the gripping and lifting device 30 comprises two gripping organs 32 which are axially spaced along the longitudinal axis of the support cross member 31.

[0052] For example, each gripping organ 32 is hung below a respective mobile portion 311, preferably in proximity of the free end thereof, for example by means of a respective hooking element, for example a carabiner hook 320. Each gripping organ 32 comprises a bearing body 321, for example a substantially plate-shaped rod (i.e. having a slim thickness, comprised between about 1/10 and 2/10 of the thickness of the slab 20, and preferably long and narrow) arranged with a substantially vertical longitudinal axis.

[0053] The bearing body 321 is substantially non-de-

formable and/or inextensible, i.e. non-deformable and/or inextensible on the action of the weight of the slab 20.

[0054] The bearing body 321 is provided, for example in proximity of the lower end thereof, with a support shelf 322, which preferably branches projectingly from one of the faces (for example the face turned towards the wall W during use) of the bearing body 321 (and is substantially at right angles thereto).

[0055] The support shelf 322 exhibits, together with the bearing body 321, a substantially C-shaped conformation (or L-shaped) with a concavity thereof facing upwards.

[0056] In the example, the support shelf 322 is defined by a (double) right-angled bend of the lower end of the bearing body 321, so that the free end of the support shelf 322 is bent substantially parallel to the bearing body 321 and at a distance therefrom by an intermediate part (lower) that is substantially horizontal.

[0057] In practice, the support shelf 322 is able to define a support plane for the slab 20, i.e. for the lower edge 23 thereof.

[0058] Owing to the substantial C-shape of the support shelf 322, with the concavity thereof facing upwards, the support shelf 322 can envelop an axial portion of the lower edge 23 (with the intermediate part on which the lower edge 23 rests) and a portion of the rear face 22 (with the free bent end of the support shelf).

[0059] The bearing body 321 defines a vertical rest surface for the front face 21 of the slab 20, for example over the whole height of the front wall, height in this case meaning the distance between the lower edge 23 and the upper edge 24.

[0060] In the illustrated example the bearing body 321 exhibits a greater length than the height of the slab 20.

[0061] The upper end of the bearing body 321 is hooked to the support cross member 31, in particular to one of the mobile portions 311 thereof, for example by means of the carabiner hook 320, which can be connected for example to a through-hole realised in proximity of the upper end of the bearing body 321.

[0062] Each gripping organ 32 further comprises a gripping body 323 provided with a gripping hook 324 able to receive the upper edge 24 of the slab 20.

[0063] The gripping body 323 is conformed for example as a profiled and vertically elongate plate (having a substantially triangular shape with a vertex facing downwards) having substantially a slim thickness, arranged with a substantially vertical longitudinal axis parallel to the longitudinal axis of the bearing body 321.

[0064] The gripping body 323 is substantially non-deformable and/or inextensible with respect to the usual work stresses.

[0065] The gripping hook 324 exhibits, together with the gripping body 323, a substantially C-shaped (or L-shaped) conformation, with a concavity facing downwards.

[0066] In the example, the gripping hook 324 is defined by a (double) right-angled bend of the upper end of the

gripping body 323, so that the free end of the gripping hook 324 is bent substantially parallel to the gripping body 323 at a distance therefrom with an intermediate portion (upper) that is substantially horizontal.

[0067] In practice, the free end of the gripping hook 324 defines an anti-tip rest surface for the slab 20, able to go into contact, in use, with a portion of the rear face 22 of the slab 20.

[0068] Owing to the C-shape thereof, with the concavity facing downwards, the gripping hook 324 can envelop an axial portion of the upper edge 24 (through the upper intermediate part which rests on the upper edge 24) and a portion of the rear face 22 (through the bent free end of the gripping hook).

[0069] In the example, the gripping body 323 is located substantially parallel to the bearing body 321, for example in such a way as to be substantially supported on the bearing body on the opposite side with respect to the surface thereof destined to define the rest surface for the front face 21 of the slab 20.

[0070] The gripping hook 324, which projectingly branches from one of the faces (i.e. the face turned towards the bearing body 321) of the gripping body (and substantially at right-angles thereto) can project beyond the plane defined by the bearing body 321, for example such as to be substantially superposed in plan view on the support shelf 322.

[0071] In the example, the upper end of the gripping body 323 exhibits a broadened portion, larger than the width of the bearing body 321; the gripping hook 324 branches from the upper end of the gripping body 323 in such a way as to flank the bearing body 321.

[0072] Also, in the illustrated example, the gripping body 323 comprises two parallel and spaced gripping hooks 324, for example by a distance that is substantially equal to or greater than the width of the bearing body 321, and arranged on opposite sides with respect to the bearing body.

[0073] The gripping body 323 is slidably associated to the bearing body 321, with respect to a sliding axis parallel to the longitudinal axis of the bearing body 321, i.e. substantially vertical.

[0074] In the example, a longitudinal guide 325 is defined on at least one from between the gripping body 323 and the bearing body 321, for example a through-slot (arranged with a longitudinal axis parallel to the longitudinal axis of the bearing body 321, i.e. substantially vertical), which can be engaged by at least a sliding pin 326 projecting (in a horizontal direction) from the other from between the bearing body 321 and the gripping body 323.

[0075] In the illustrated example the guide 325 is realised in the gripping body 323 and the sliding pin 326 (for example two in number, vertically aligned) in the bearing body 321.

[0076] With the guide 325 the gripping body 323 is mobile with respect to the bearing body 321 alternatively between a neared position, in which the gripping hook 324 is neared with respect to the support shelf 322, and

a distanced position, in which the gripping hook 324 is more distanced with respect to the support shelf 322.

[0077] The gripping organ 32 further comprises pushing means, for example elastic such as for example a spring 327, able to push the gripping hook 324 towards the neared position thereof to the support shelf 322.

[0078] In the example the spring 327 is a traction spring, and preferably a helical spring, the opposite ends of which are associated respectively to the gripping body 323, for example in proximity of the lower end thereof, and to the bearing body 321, for example in proximity of a halfway portion, interposed between the upper end and the lower end thereof.

[0079] The bearing body 321 in the example comprises a reinforcing rib 328, which rises substantially at a right angle from at least an axial portion of the face of the bearing body 321 opposite with respect to the face destined to rest on the front face 21 of the slab 20.

[0080] In the example the reinforcing rib 328 (exhibiting overall substantially an L-shape) projects from the intermediate part of the support shelf 322 up to the halfway portion of the bearing body 321, interposed between the upper end and the lower end.

[0081] The reinforcing rib 328 defines a T-shaped conformation of the bearing body 321, for example of the lower portion thereof.

[0082] The lower end of the spring 327 is constrained to the upper end of the reinforcing rib 328.

[0083] The gripping body 323 can comprise a grip 329, for example a stem projecting from the face of the gripping body 323 opposite with respect to the face proximal to the bearing body 321, which can be gripped for activating the gripping body 323 in translation with respect to the bearing body 321, for example in opposition to the action of the spring 327, i.e. from the neared position towards the distanced position of the gripping hook 324.

[0084] The support cross member 31 is for example associated to the liter 11 by means of at least a rigid support frame 40.

[0085] In the example, the support frame 40 is associated to the hoist 11, for example by means of fixing brackets 41, so as to be translatable substantially in a vertical direction, drawing with it the support cross member 31 and therefore the gripping organs 32 hung therefrom.

[0086] The support frame 40 comprises at least a guide bar 42, in the example two, spaced, substantially parallel and in practice defining a fork.

[0087] Each guide bar 42 is rigidly connected to a rigid bar 43 which bears the fixing brackets 41.

[0088] The rigid bar 43 is substantially horizontal and parallel to the support cross member 31.

[0089] Each guide bar 42 is horizontal and substantially perpendicular to the support cross member 31.

[0090] The support cross member 31 is associated to each guide bar 42 in such a way as to be able to slide along the longitudinal axis of the guide bar 42, for example by means of a carriage 50.

[0091] The cross member 31, in particular the fixed

portion 310 thereof, is preferably associated to each guide bar 42 so as to be able to slide along the longitudinal axis of the guide bar 42 by means of a respective pair of carriages 50.

[0092] Each carriage 50 is fixed in proximity of an end of the fixed portion 310 of the support cross member 31 and is slidably associated to one of the guide bars 42.

[0093] The carriage 50 comprises a box body 51 in which revolving means are contained, such as for example rollers 52 (shown in the larger-scale view of figure 4), which are rotatably associated to the box body 51 with respect to rotation axes substantially parallel to the longitudinal axis of the support cross member 31; the rollers 52 are able to roll on the guide bar 42.

[0094] In the example each carriage 50 comprises at least a pair of rollers 52 arranged superiorly of the guide bar 42 and rest revolvingly thereon and at least a roller 52 (or more) located inferiorly of the guide bar 42.

[0095] Each carriage 50 further comprises fixing means, for example a threaded knob 53 and/or lever means 54, which can fix the axial position of the carriage 50 along the guide bar 42.

[0096] The fixing means, i.e. the threaded knob 53 and/or the lever means 54, are (for example manually) operable selectively for blocking the carriage 50 in an axial position along the guide bar 41 and for unblocking the carriage 50.

[0097] In practice, with the fixing means in blocking position the carriage 50 is prevented from axial sliding along the guide bar 42, while with the fixing means in unblocked position the carriage 50 can axially slide along the guide bar 42, for example between two endrun positions (defined for example by anti-deinsertion bodies fixed to the guide bar), preferably located at opposite ends of the guide bar, i.e. at least at the free ends of the guide bars 42. Each slab 20 can be fixed to the wall W by means of a fixing group 60, which is more fully described in the following.

[0098] The fixing group 60 can comprise at least a plurality of pins 61 or pickets, which are fixed to the wall W in such a way as to project axially for at least an external axial part (perpendicular to the wall W) exhibiting a length a little, for example a few centimetres, greater than the width of the slab 20.

[0099] For example, the fixing group 60 comprises at least two pins 61 located inferiorly, i.e. substantially aligned along an imaginary horizontal line and at a level at which the lower edge 23 of the slab 20 is to be positioned, and at least a pin 61 located superiorly, i.e. at a higher level than a distance that is at least equal to the height of the slab 20 (substantially corresponding to the level of the upper edge 24 of the slab 20 when the slab 20 is resting with the lower edge 23 thereof on the lower pins 61).

[0100] The number of upper and lower pins 61 can however be greater than the number described above.

[0101] Further, the fixing of the slab 20 can be completed by further pins 61 able to surround the slab 20

also laterally.

[0102] A broadened head 62 is associable to the pins 61, mobile between an interference position with the slab 20 and a position of non-interference therewith.

[0103] For example the broadened head 62 might be (as illustrated) defined by a collar, for example threaded, removably screwable to the pin 61 which is externally threaded, in which in the non-interfering position the threaded collar is removed from the engagement with the pin 61 and in the position of interference is fixed at least partly on the pin 61.

[0104] Alternatively, the collar might be joint-associated to the pin 61 or the pin 61 could also exhibit a cam-shaped broadened head 62 rotatable between a position in which in the non-interfering position is dealigned horizontally with the area of the wall W which will be occupied by the slab 20 and a position in which in the interfering position it is aligned horizontally with the area of the wall W which will be occupied by the slab 20.

[0105] In the light of what is described above, the functioning of the lifting group 10 is the following.

[0106] First the hoist 11 is brought in proximity of the wall W to which the slab 20 is fixed by means of the fixing group 60.

[0107] The command means of the hoist 11 are used to bring the gripping and lifting device 30 (and therefore the support cross-member 31 and the gripping organs 32) into a lowered position, for example to a level a little higher than the height of a slab 20 to be lifted, or in any case with the support shelf 322 substantially at ground level and the bearing body 321 hung from the support cross member 31 and arranged in a vertical position.

[0108] For example, in the lowered position the carriages 50 can be in an intermediate position of the guide bars 42, i.e. at a determined distance from the free end thereof (an endrun position for the carriage 50), as can be seen in figure 6a.

[0109] With the gripping and lifting device 30 in this position the slab 20, i.e. the lower edge 23 thereof, is brought into a supported position on each support shelf 322, so that the lower edge 23 is accommodated internally of the upwards-facing concavity of the rest shelf 322.

[0110] Thereafter, for example by means of the grip 329, each gripping body 323 is activated towards a respective distanced position, in opposition to the spring 327, by an amount just enough to enable insertion of the upper edge 24 of the slab 20 in the downwards-facing concavity of the gripping hook 324. Then when releasing the gripping body 323, the spring 327 will push the gripping body 323 towards the neared position to the support shelf 322, exerting a pushing force (vertical downwards) such that the slab 20 is substantially clamp-retained between the gripping hook 324 and the support shelf 322.

[0111] In this configuration, the plate 20 is solidly retained by the gripping organs 32, and, for example, is (or can be) lifted from the ground in suspension, supported by the support cross member 31 which in practice is substantially superposed in plan view on the slab 20 posi-

tioned with a substantially vertical lie plane.

[0112] It is also possible for the gripping organs 32 to be hooked also by detaching them from the support cross member 31 and by rehooking them, for example by means of the carabiner hooks 320, once they have been attached to the slab as described above.

[0113] It is sufficient for the distance between the gripping organs 32, regulated by the sliding of the mobile portions 311 of the support cross member 31 on the fixed portion 310, to have been fixed in such a way as to be different with respect to the distance between the two lower pins 61 present in the wall W to which the slab 20 is to be fixed, so that the gripping organs are dealigned with respect to the pins 61.

[0114] By activating the command means of the hoist 11 the support crossbar 31 is raised, and with it the gripping organs 32 and the slab 20 retained thereby, up to a desired height.

[0115] In particular, the slab 20 must be lifted up to the height at which the lower edge 23 thereof is substantially coplanar (slightly higher) than the plane defined by the lower pins 61.

[0116] When the slab 20 has been brought to this height it is sufficient to translate the slab 20 horizontally towards the wall W, as shown in figure 6b.

[0117] To do this it is sufficient to bring the fixing means, for example the threaded knob 53 and/or the lever means 54, of each carriage 50 into the unblocking position, so that the carriage 50 can slide along the guide bars 42 towards the wall W, i.e. towards the free end of the guide bars.

[0118] With this horizontal translation, during which the gripping organs 32 keep the slab 20 solidly gripped, the slab 20 in the vertical position is brought substantially into a position superposed in plan view on the external axial part of the lower pins 61 (in which the lower edge 23 of the slab 20 is maintained at a minimum distance from the lower pins and the upper edge 24 is maintained, inferiorly of the upper pin 61, at a minimum distance therefrom, in this case minimum distance being taken to mean a distance not greater than the distance between the external jacket of the pin 61 and the most off-centre position of the broadened head 62).

[0119] At this point it is sufficient to maintain the slab 20 in this position (i.e. hung from the support cross member 31, solidly retained by the gripping organs 32, and vertically interposed between the lower pins 61 and the upper pin 61), for example by blocking the fixing means, i.e. activating the threaded knob 53 and/or the lever means 54, up to when the broadened head 62 of each pin 61 is located in an interfering position, i.e. so as to clamp-retain (at first with a small amount of play) the slab 20 between the wall W and the broadened heads 62.

[0120] Before completely securing the broadened head 62 (by blocking it) of each pin 61, the hoist 11 is activated so as to lower the slab 20, for example by an amount equal to the minimum distance mentioned above, down to when it rests on the lower pins 61, the plate 20

can be freed from the clamping action of the gripping organs 32.

[0121] For example, by activating the grip 329, the gripping body 323 is first brought into a distanced position from the support shelf 322, so as to free the upper edge 24 of the slab 20 from the gripping hook 24 and, thereafter, by pulling the bearing body 321 downwards the lower edge 23 of the slab 20 is freed from the support shelf 322, thus enabling distancing of the lifting group 10 and definitively securing the broadened heads 62 on the pins 61.

[0122] Obviously all the above-described operations can be repeated in reverse whenever a slab 20 is to be safely removed from a wall W.

[0123] The invention as it is conceived is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept.

[0124] Further, all the details can be replaced by other technically-equivalent elements.

[0125] In practice, the materials used, as well as the contingent shapes and dimensions, can be any according to requirements, without forsaking the scope of protection of the following claims.

Claims

1. A gripping and lifting device (30) of slabs (20) which comprises a support cross member (31) able to support at least a gripping organ (32) of a slab (20), in which the gripping organ (32) of the slab (20) comprises at least a bearing body (321) inferiorly hung on the support cross member (31) and provided with a support shelf (322) defining a rest plane for a lower edge (23) of the slab (20), and a gripping body (323) provided with a gripping hook (324) of an upper edge (24) of the slab (20) and slidably associated to the bearing body (321) from a neared position to the support shelf (322) to a distanced position therefrom, in opposition to elastic pushing means (327).
2. The gripping and lifting device (30) of claim 1, wherein the elastic pushing means comprise at least a spring (327).
3. The gripping and lifting device (30) of claim 1 or 2, wherein the support shelf (322) exhibits a substantially C-shaped conformation having a concavity facing upwards and is able to envelop a portion of the lower edge (23) and at least a portion of a face (22) adjacent to the lower edge (23) of the slab (20).
4. The gripping and lifting device (30) of any one of the preceding claims, wherein said gripping hook (324) exhibits a substantially C-shaped conformation with a concavity facing downwards and is able to envelop a portion of the upper edge (24) and at least a portion of a face (22) adjacent to the upper edge (24) of the

slab (20).

5. The gripping and lifting device (30) of any one of the preceding claims, wherein the bearing body (321) is hung from the support cross member (31) by means of at least a hooking element (320). 5
6. The gripping and lifting device (30) of claim 5, wherein the hooking element comprises a carabiner hook (320). 10
7. The gripping and lifting device (30) of any one of the preceding claims, wherein the gripping organ (32) is movably associated along a longitudinal axis of the support cross member (31). 15
8. The gripping and lifting device (30) of any one of the preceding claims, wherein the support cross member (31) comprises at least a fixed portion (310) and at least a mobile portion (311) able to be moved along the longitudinal axis of the fixed portion (310) and blockable with respect to the fixed portion (310) by releasable fixing means (312), the gripping organ (32) being inferiorly hung from the mobile portion (311). 20
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9. The gripping and lifting device (30) of any one of the preceding claims, wherein the support cross member (31) is fixed to at least a carriage (50) that is mobile on a longitudinal guide (42) that is substantially perpendicular to a longitudinal axis of the support cross member (31). 30
10. The gripping and lifting device (30) of any one of the preceding claims, wherein at least two of the gripping organs (32) are hung from the support cross member (31), which at least two gripping organs (32) are spaced from one another along the longitudinal axis of the support cross member (31). 35
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11. A lifting group (10) of slabs (20) which comprises a hoist (11) provided with a gripping and lifting device (30), according to any one of the preceding claims, wherein the hoist (11) is able to move the gripping and raising device (30) in a vertical direction. 45

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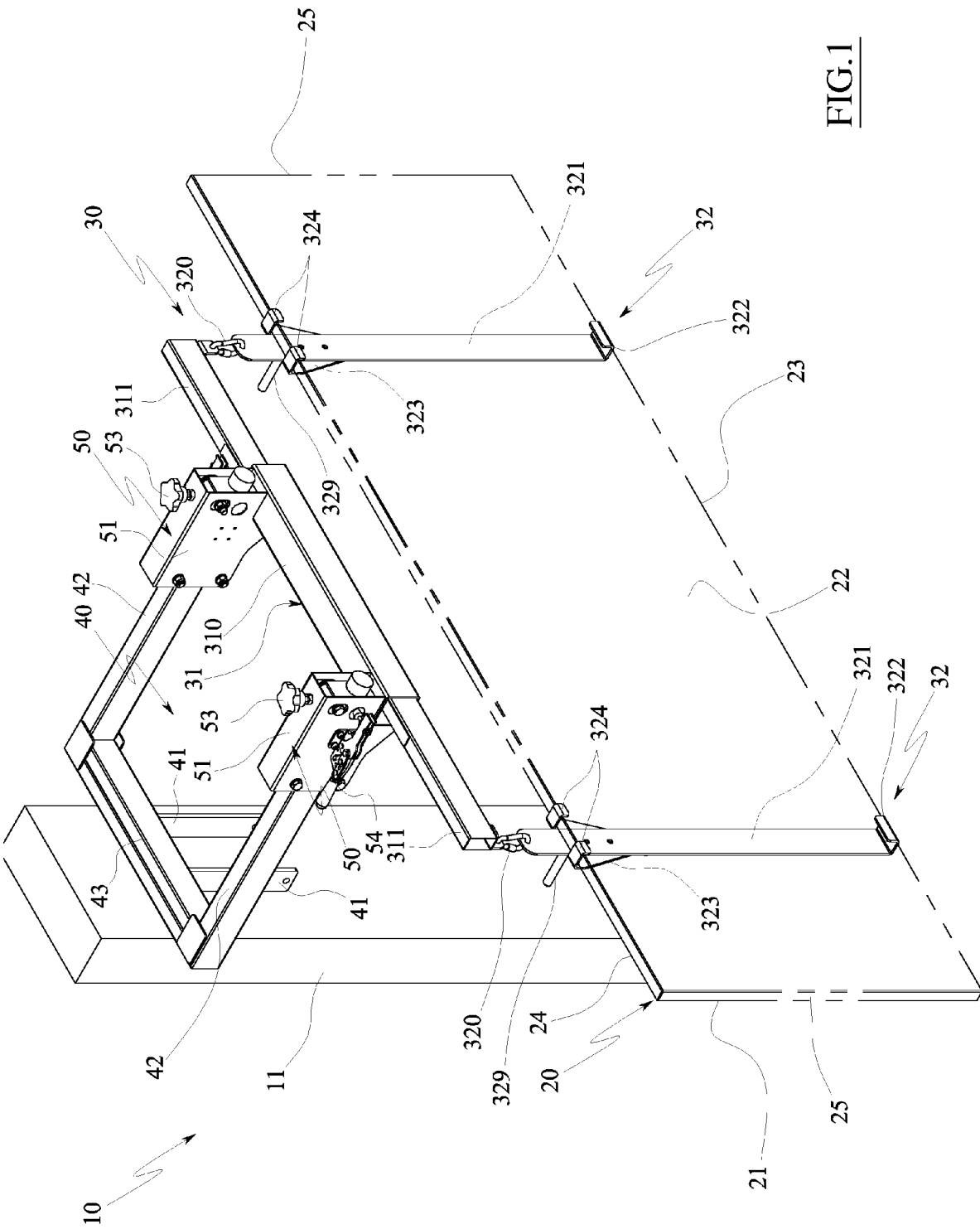
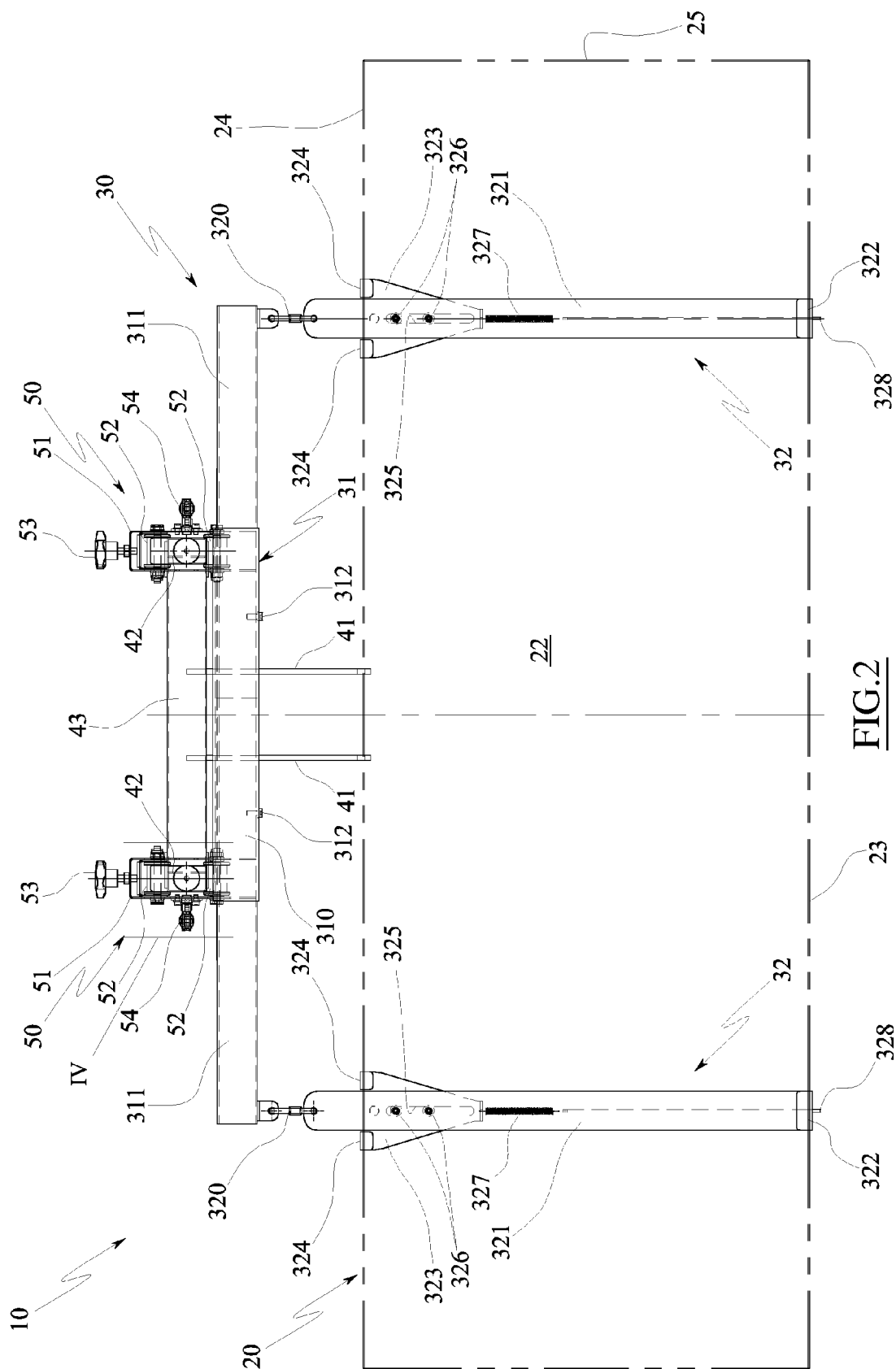


FIG.1



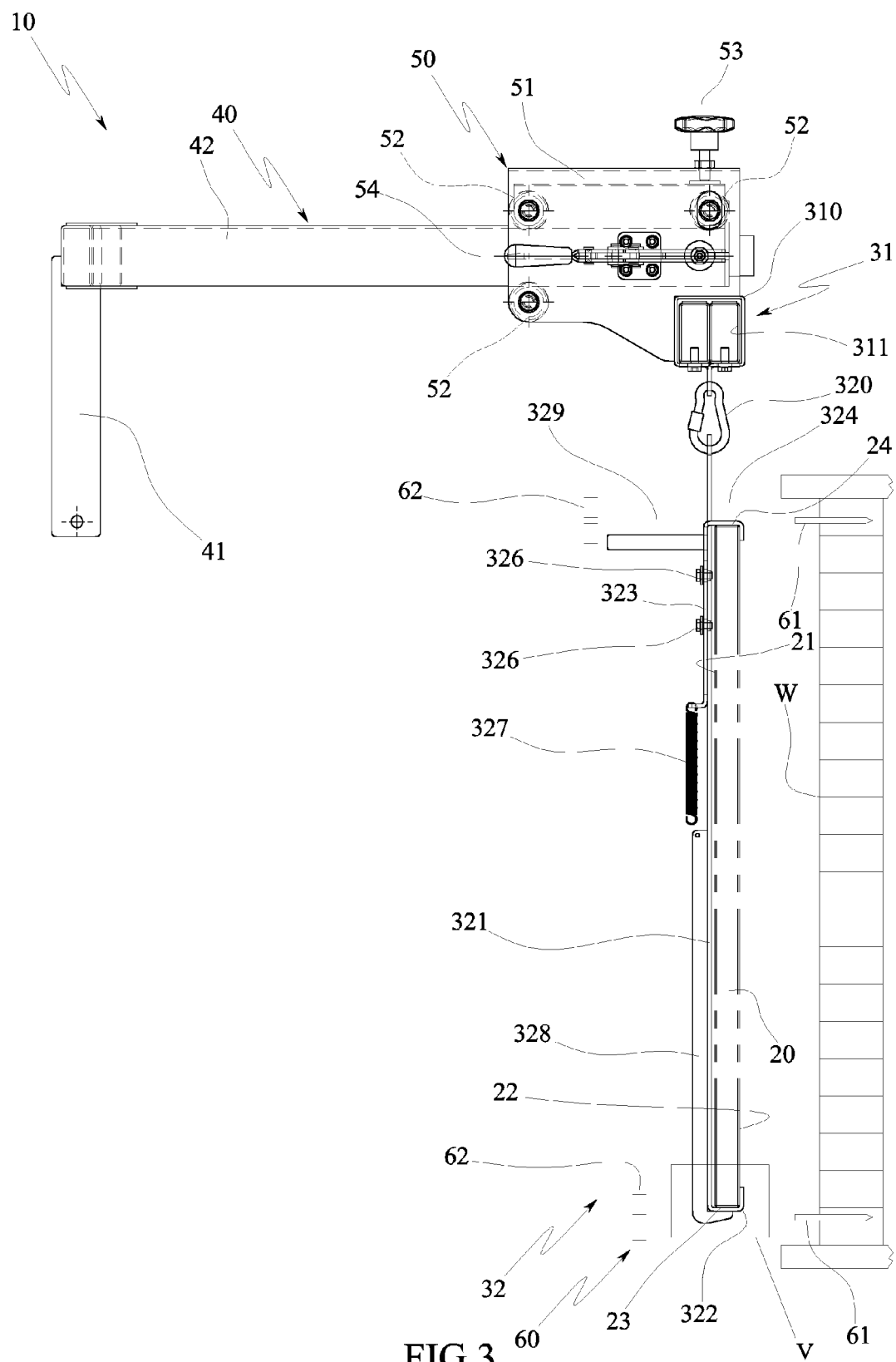


FIG.3

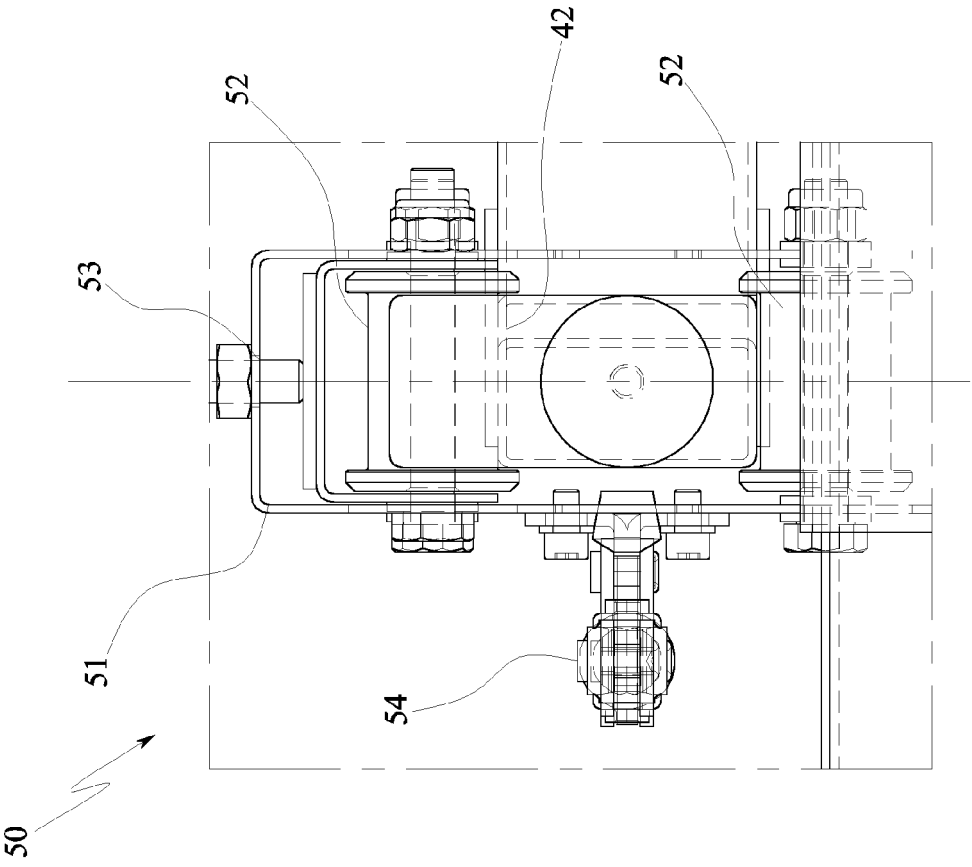


FIG. 4

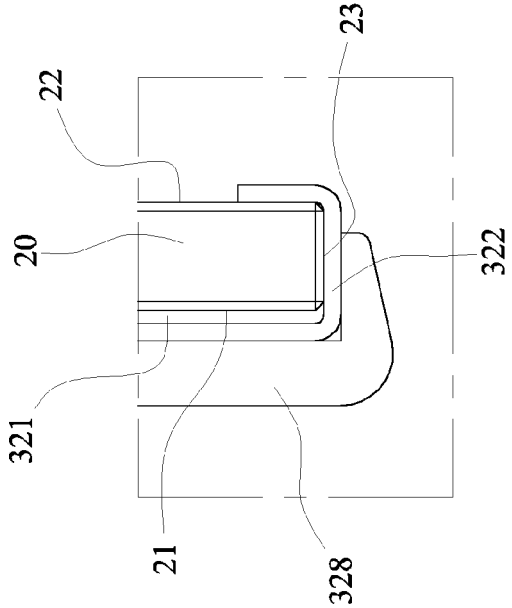


FIG. 5

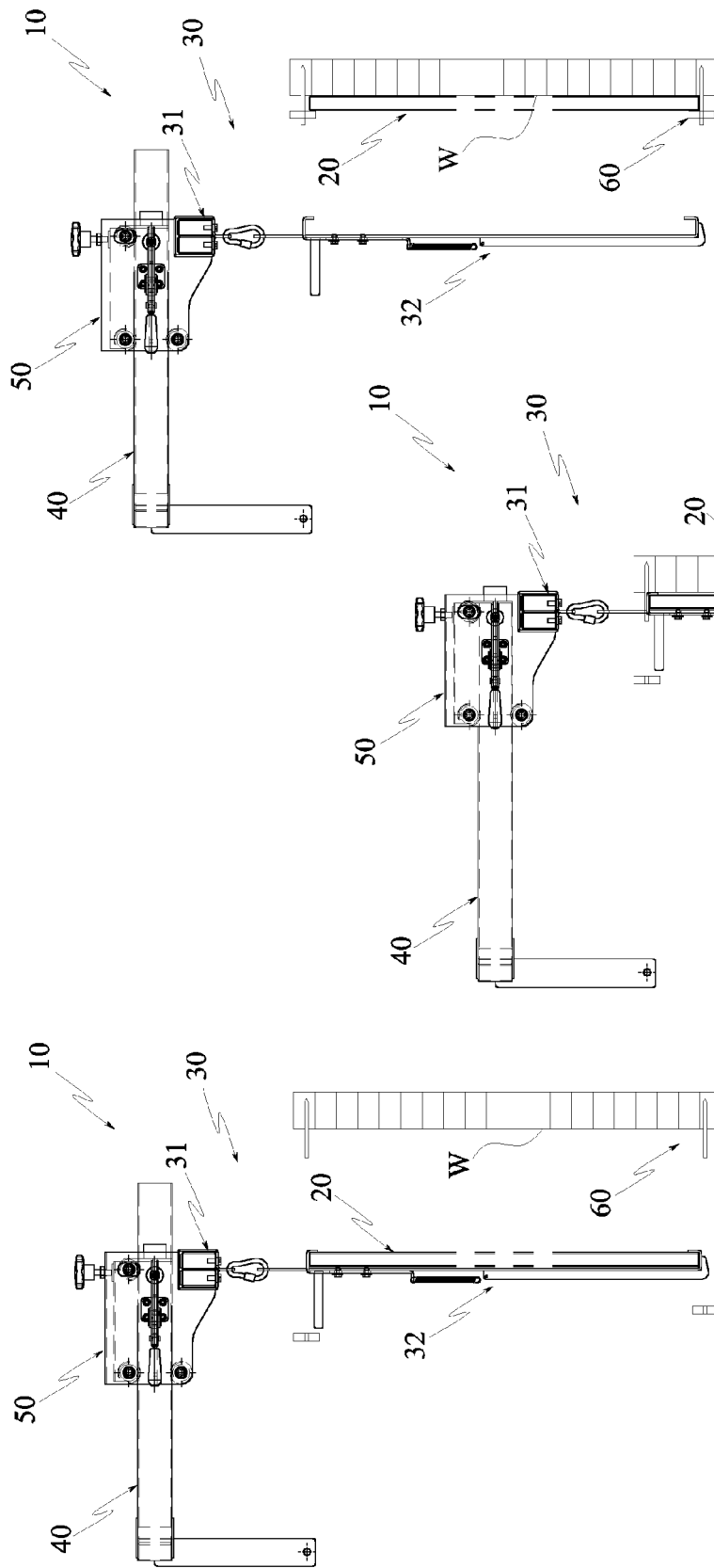


FIG. 6a

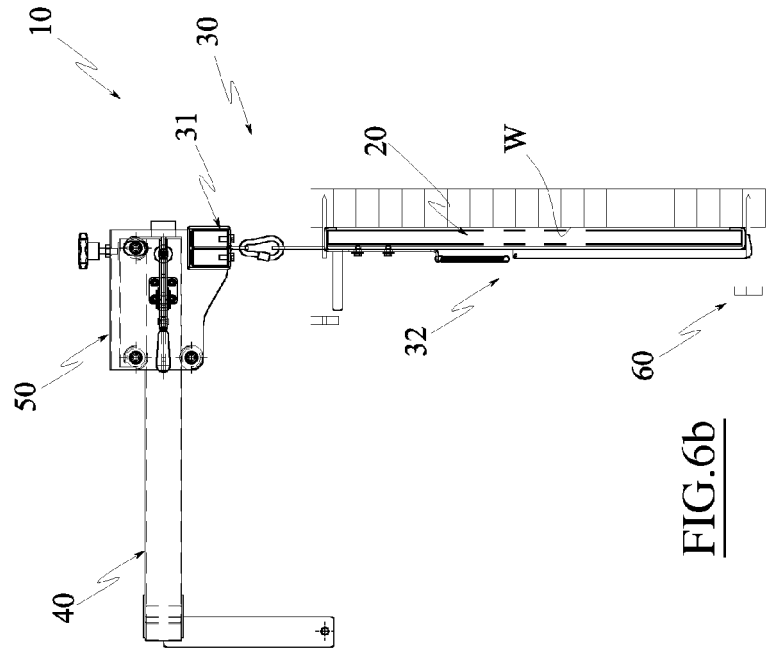


FIG. 6b

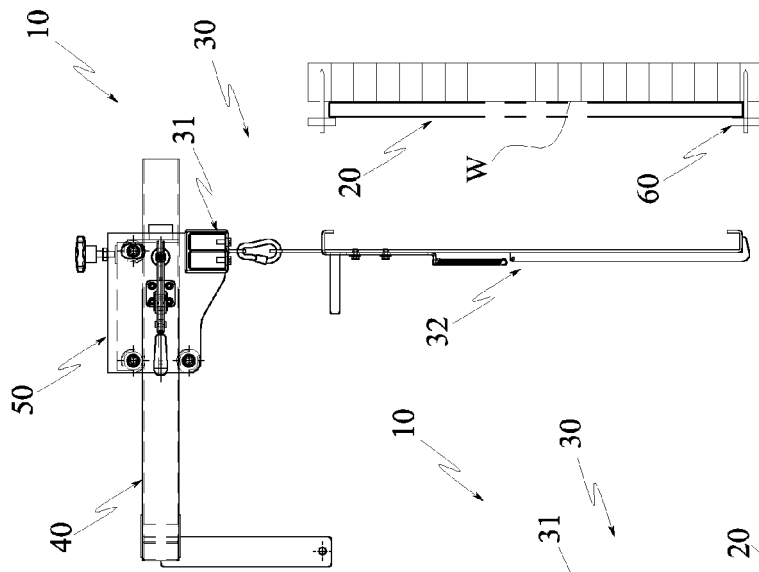


FIG. 6c



EUROPEAN SEARCH REPORT

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Place of search Munich		Date of completion of the search 1 April 2016	Examiner Bourgoin, J
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