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(71) Applicant: **GOSUDARSTVENNY PROEKTNO-KONSTRUKTORSKY INSTITUT TEKHNOLOGII MONTAZHA PROMYSHLENNOGO OBORUDOVANIA - GIPROTEKHMONTAZH**
ul. Arbat, 5
Moscow 121019(SU)

(72) Inventor: **RAIKHLIN, Mark Mikhailovich**
Volgogradsky pr., 9-89
Moscow, 109316(SU)

(74) Representative: **Bibby, William Mark et al**
Mathisen, Macara & co. The Coach House
6-8 Swakeleys Road
Ickenham Uxbridge UB10 8BZ(GB)

(54) HOISTING DEVICE.

(57) A weight lifting device comprises a tubular mast (1) having loading and accumulating branches (2, 3) with carrying elements (4) mounted therein, a mechanism (6) for moving the carrying elements (4) along the branches (2, 3) and from one branch (2 or 3) to the other, a hydraulic cylinder (8), a sleeve (25) mounted under the base of the mast (1), two pushers (28, 29) mounted with the possibility of interaction with the lateral surface of the carrying element (4) for moving it from one branch (2 or 3) to the other and each kinematically connected in turn, through a double-arm lever (32, 33), to the corresponding side of a frame (14) mounted on the rod (10) of the hydraulic cylinder (8) with the possibility of movement in relation to it in a plane perpendicular to the axis of the rod and in the direction from one branch to the other. On the rod (10) of the hydraulic cylinder (8) are mounted two cantilevers (39, 40) each provided with a roller (41) at its end, and the arm of each double-arm lever (32,33) interacting with the pusher (28, 29) is provided with a profiled surface (35) designed to interact with the corresponding roller (41) during the movement of the rod (10) of the hydraulic cylinder (8) towards the base of the mast (1) so that the pusher (28, 29) disengages from the coupling with the carrying element (4) and comes back to the initial position. The weight lifting device is intended for lifting especially heavy loads.

EP 0 464 209 A1

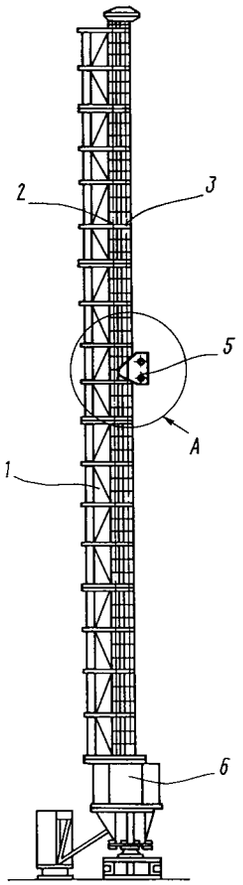
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FIG.1

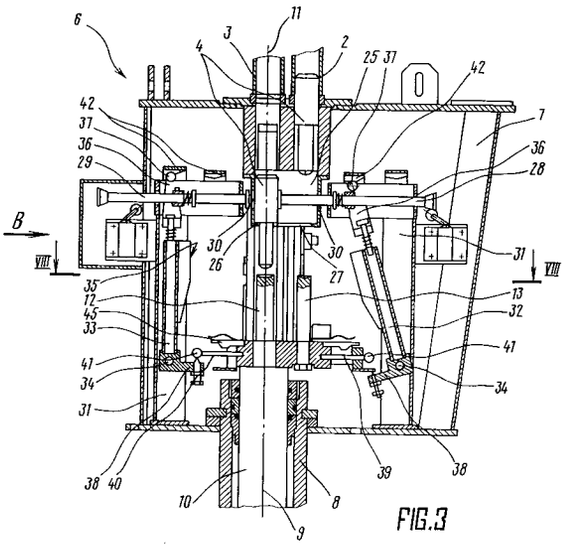
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FIG.3

Technical Field

The disclosed technical solution relates to load-handling equipment, particularly to hoisting devices.

Prior Art

Known in the prior art is a hoisting device comprising a vertical mast having a guide with load-carrying members moving thereon. The load-carrying member nearest to the top of the mast supports a bracket for fastening the load. The load-carrying members are moved along the guide by a hydraulic cylinder installed in the lower part of the mast. The load-carrying members are brought to, and withdrawn from, the guide manually (SE, C, 417082).

Manual control of movement of load-carrying members impairs reliability of the device and complicates its operation.

Another known hoisting device comprises a tubular mast provided with load and storage uprights arranged parallel to each other along the mast and provided with movably-installed load-carrying members one of which, located nearest to the top of the mast in the load upright supports a load-fastening bracket, and a mechanism for transferring the load-carrying members along the uprights and from one upright to the other, said mechanism being located in the base of the mast. This mechanism comprises a vertical hydraulic cylinder with two rods arranged coaxially with storage and load uprights, respectively, and a horizontal hydraulic cylinder whose rod has a grab for load-carrying member and moves it from under one upright into alignment with the mouth of the other upright, and has swivelling spring-loaded stops under each upright, said stops having projections for fixing said stops in closed position, for moving load-carrying members under their force of gravity, and a removable bushing installed on one or the other rod of the vertical hydraulic cylinder depending on the direction of movement (SU, A, 914467).

Such a hoisting device is characterized by difficulties in ensuring strictly alternate operation of vertical and horizontal hydraulic cylinders which impairs reliability of the device. Besides, when swivelling stops located under the load upright are spread apart, the removable bushing installed on the rod of the vertical hydraulic cylinder arranged coaxially with the load upright is subjected to loading not only along the vertical axis and constituted by the weight of the load and that of the load-carrying members located in said load upright but also by the load acting along the horizontal axis and originated by friction between the projections of swivelling stops and the face surface of the load-carrying member proportional to the weight of the load which calls for the necessity of building up an additional force by the vertical hydraulic cylinder and results in heavy wear of swivelling stops and the surface of the removable bushing.

Finally, there is a known hoisting device comprising a tubular mast having load and storage uprights arranged parallel to each other along the mast and provided with movably installed load-carrying members one of which, located nearest to the top of the mast in the load upright supports a load-fastening bracket, and a mechanism for transferring the load-carrying members along the uprights and from one upright to the other, said mechanism being located at the base of the mast. The mechanism comprises a hydraulic cylinder secured in such a manner that the axis of its rod coincides with the axis of the load upright, a guiding device installed under the mast base and having the form of an oval sleeve with a cutout in its bottom determining the trajectory of movement of load-carrying members from one upright to the other, two pushrods installed with a provision for moving towards each other in the direction perpendicular to the axis of the hydraulic cylinder rod and for interacting with the side surface of the load-carrying member located in the guiding device for transferring it from one upright to the other, each linked kinematically by a two-arm lever with the corresponding side of a frame installed on the cylinder rod with a provision for moving relative to said rod in the plane perpendicular to the rod axis in the direction from one upright to the other.

However, the known device is capable of working reliably when hoisting loads weighing up to 200 t. In case of heavier loads the mechanism for transferring load-carrying members from one upright to the other is not sufficiently reliable in this device.

Thus, in case of vibrations inevitably occurring in operation of the hoisting device the load-carrying member may tilt in the guiding device and may destroy the lower part of the mast when the improperly (tiltably) standing load-carrying member is moved by the cylinder rod.

The load-carrying member may also loose stability while it is being moved upward in alignment with the upright, when it rests only on the end of the cylinder rod because, rising together with the rod, is the frame that has kept the spring-loaded lever in inclined position wherein the end of the pushrod which has transferred the load-carrying member from under one upright into alignment with the other one is located inside the guiding device. While the frame moves upward, the return spring shifts the spring-loaded lever to the initial position and withdraws the pushrod from the guiding device. Thus, the load-carrying member moving into

alignment with the upright will for some time stay in instable position and, since its centre of gravity is located above the supporting point (end of cylinder rod), vibration of the hoisting device may originate an overturning moment which will tumble the load-carrying member before it comes into alignment with the upright.

Besides, movement of the load-carrying member inside the guiding device under the force of friction which is directly proportional to the weight of the member (growing with increased load capacity of the device) may also create an overturning moment applied to the load-carrying member and then, as soon as the frame stops holding the two-arm lever in inclined position, the load-carrying member acted upon by the overturning moment will force the pushrod from the guiding device and tumble on its bottom which may also result in a breakdown.

Disclosure of the Invention

The main object of the invention is to provide the hoisting device with two-arm levers and load-carrying members so designed that would ensure reliable operation of the device of any load capacity and would permit reducing the size of the transfer mechanism and, consequently, of the device as a whole.

This object is achieved by providing a load-hoisting device comprising a tubular mast with load and storage uprights arranged parallel to each other along the mast axis and having load-carrying members arranged movably along the uprights, the load-carrying member nearest to the top of the mast in the load upright supporting a load-fastening bracket, a mechanism for transferring the load-carrying members along the uprights and from one upright to the other, said mechanism being located in the base of the mast and having a body accommodating a hydraulic cylinder whose rod axis coincides with the axis of the load upright, a guiding device installed under the base of the mast and having the form of an oval sleeve with a cutout in its bottom determining the trajectory of movement of load-carrying members from one upright to the other, two pushrods installed with a provision for moving towards each other in the direction perpendicular to the axis of the hydraulic cylinder rod and for interacting with the side surface of the load-carrying member located in the guiding device for transferring it from one upright to the other, each linked kinematically by a two-arm lever with the corresponding side of a frame installed on the cylinder rod with a provision for moving relative to said rod in the plane perpendicular to the rod axis in the direction from one upright to the other wherein, according to the invention, the hydraulic cylinder rod carries two brackets arranged at an angle to the rod axis, each bracket having a roller at its end and the arm of each two-arm lever interacting with the pushrod has a profiled surface adapted for engaging the roller while the cylinder rod moves to the base of the mast so that the pushrod comes out of engagement with the load-carrying member and returns to the initial position.

It is practicable that the movement of pushrods in the body of the transfer mechanism should be limited by installing the end position stops of each pushrod and that the ends of the lever arms interacting with the pushrods should be spring-loaded relative to the other part of the arm and provided with a roller capable of interacting with the stops installed in the end positions of the respective pushrod.

It is desirable that the stability of the load-carrying members in the guiding device should be increased by making them of a complicated shape formed by two coaxial cylinders of different diameters, the smaller of them being smaller and the larger of them being larger than the width of the cutout in the bottom of the guiding device and that the working position of the load-carrying member should be the one in which its larger-diameter part is directed towards the top of the mast and the smaller-diameter part, to its base.

The hoisting device realized in accordance with the present invention is reliable and has smaller dimensions combined with a higher load capacity.

Forced turning of the two-arm levers under the effect of the rollers secured on the rod brackets and interacting with the profiled surface of the levers during the movement of the rod and the introduction of pushrod end position stops has made it possible to ensure strictly directional movement of the load-carrying members from the guiding device to the corresponding upright of the mast and to prevent the pushrods from coming out of the guiding device before completion of the transfer of the load-carrying member from one upright of the mast to the other.

Construction of the load-carrying member in the form of two cylinders of different diameters has made it possible to bring the centre of gravity of the load-carrying member as close as possible to the surface of its support (towards the bottom of the sleeve of the guiding device) thereby ensuring its stability under any vibrations of the hoisting device.

Brief Description of the Drawings

Now the invention will be described by way of example with reference to its concrete embodiment and appended drawings wherein:

Fig. 1 is a general view of the disclosed inven-

tion;

Fig. 2 is fragment A in Fig. 1, enlarged;

Fig. 3 is a transfer mechanism of load-carrying members, section across plane of arrangement of pushrods, enlarged;

Fig. 4 is a view along arrow B in Fig. 3, longitudinal section along the axis of the load upright ;

Fig. 5 is the same as in Fig. 4, longitudinal section along the axis of the storage upright;

Fig. 6 is the same as in Fig. 4 with cylinder rod extended;

Fig. 7 is the same as in Fig. 5 with cylinder rod extended;

Fig. 8 is section taken along line VIII-VIII in Fig. 3, enlarged.

Best Mode of Carrying out the Invention

The hoisting device illustrated in Figs 1,2 comprises a tubular mast 1 with two uprights 2 and 3 arranged parallel to each other along the mast 1, a load upright 3 and a storage upright 2. Located movably along the uprights 2 and 3 are load-carrying members 4, the nearest of them to the top of the mast 1 in the load upright 3 supporting a bracket 5 intended for fastening the load to be hoisted (not shown in the drawings).

A mechanism 6 located in the lower part of the mast 1 is intended to transfer the load-carrying members 4 along the uprights 2 and 3 and from one upright (2 or 3) to the other.

The mechanism 6 has body 7 (Figs 3,4,5,6,7,8) accommodating a hydraulic cylinder 8 installed so that the axis 9 of its rod 10 coincides with the axis 11 of the load upright 3. The rod 10 of the hydraulic cylinder 8 carries two pins 12 and 13, pin 12 being arranged coaxially with the load upright 3 while pin 13, with storage upright 2.

The rod 10 also has a frame 14 installed with a provision for moving relative to said rod 10 in guides 15 perpendicularly to the axis 9 of the rod 10 in the direction from one pin 12 or 13 to the other; the frame 14 can occupy two end positions corresponding to hoisting or lowering of the load.

Installed on the frame 14 are spring-loaded rollers 16 capable of interacting with a pair of swivelling stops 17 and with a swivelling stop 18 the fulcrums 19 of which are secured in the body 7, said stops being disposed under the uprights 2 and 3, stops 17 under the load upright 3 and the stop 18, under the storage upright 2.

The swivelling stops 17 and 18 have the form of two-arm levers whose fulcrums 19 are located in their centre of gravity.

The stops 17 and 18 have projections 20 at one end, interacting with the load-carrying members 4 located in the uprights 2 and 3 with the stops 17 and 18 in closed position.

Projections 20 prevent the load-carrying members 4 from moving under the force of gravity.

The stops 17 and 18 have profiled surfaces 21 over which the roller 16 of the frame 14 roll when the rod 10 of the cylinder 8 moves to the base of the mast 1 and bring the stops 17 or 18 into open position in which they come out of interaction with the load-carrying members 4.

The body 7 accommodates a spring mechanism 22 (Fig. 4) provided for returning the stops 17 and 18 to the closed position. Said mechanism 22 comprises handle 23 and tension springs 24.

Besides, the body 7 of the transfer mechanism 6 houses a guiding device 25 (Fig. 4) which determines the trajectory of movement of load-carrying members 4 from one upright, for example, upright 3 to the other, upright 2, and vice versa.

The guiding device 25 has the form of an oval sleeve (sleeve 25 hereinunder) secured under the base of the uprights 2 and 3 on the body 7 of the mechanism 6 for transferring the members 4, the open end of the sleeve 25 being directed towards the mouths of uprights 2 and 3.

The bottom 26 (Figs 3,5) of the sleeve 25 has a cutout 27 through which pins 12 and 13 pass towards the ends of the lower load-carrying members 4 contained in the uprights 2 and 3.

The transfer mechanism 6 of the load-carrying members 4 also has two pushrods 28 (Fig. 3) and 29 installed in the body 7 with a provision for moving towards each other in the direction perpendicular to the axis 9 of the rod 10 of the hydraulic cylinder 8. Said pushrods pass through holes 30 made in the wall of the sleeve 25 for interaction with the side surface of the load-carrying member 4 contained in the sleeve 25.

The pushrods 28 and 29 move the load-carrying member 4 contained in the sleeve 25 from under the upright 2 (3) under the upright 3 (2).

The pushrods 28 and 29 can move in guide bushings secured in the upper parts of L-shaped brackets 31 rigidly connected with the body 7 and are linked kinematically and alternately, each, by two-arm levers 32,33, respectively, with the movable frame 14 in its end positions. The fulcrums 34 of the levers 32 and 33 are also mounted on the brackets 31.

Each one of two-arm levers 32 and 33 has a profiled surface 35 with sections "a", "b" and "c" while the end 36 of the arm of each lever 32 and 33 interacting with the corresponding pushrod 28 and 29 is spring-loaded relative to the remaining part of this arm and has a roller 37. Besides, the end of the other arm 38 of each two-arm lever 32 and 33 interacts with the frame 4 in one of its end positions.

The rod 10 of the hydraulic cylinder 8 has two brackets 39,40 set perpendicularly to the axis 9 of

said rod 10 and having rollers 41 at the ends, each roller engaging the profiled surface 35 of the corresponding two-arm lever 32 or 33 while the rod 10 of the hydraulic cylinder 8 is moving towards the base of the mast 1.

Installed on the body 7 of the mechanism 6 for transferring the load-carrying members 4 are stops 42 of the end positions of each pushrod 28 and 29, said stops interacting with the rollers 37 of the levers 32 and 33.

The shape of each load-carrying member 4 is formed by coaxial different-diameter cylinders 43 (Fig. 4) and 44, the diameter of the smaller cylinder 43 being smaller and that of the larger cylinder being larger than the width of the cutout 27 in the bottom 26 of the sleeve. The working position of the member 4 is the one in which the cylinder 44 faces the top of the mast 1.

The hoisting device functions as follows.

The load or cargo sling is fastened to the load bracket 5 (Fig. 1) in its downmost position. The storage upright 2 is filled full with the load-carrying members 4 the lowest of which rests by the larger-diameter cylinder 44 on the projection 20 (Fig. 5) of the stop 18 located under the storage upright 2. One of the load-carrying members 4 is located in the guiding device, i.e. sleeve 25, rests by the cylinder 44 on its bottom 26 and is fixed between the wall of the sleeve 25 and the end of the pushrod 28 under the load upright 3.

The frame 14 (Fig. 8) is shifted to the right (towards the storage upright 2) and engages the arm 38 of the two-arm lever 32. This end position of the frame 4 corresponds to load-hoisting operation.

At this stage the pushrod 28 is extended and presses the load-carrying member 4 to the wall of the sleeve 25 (the member 4 being stationed under the load upright 3). The rollers 16 (Fig. 5) of the frame 14 interact with section "a" of the profiled surface 21 in the lower-part of the stop 18.

Before hoisting the load, the handles 23 (Figs 4,7) of the stop-returning spring mechanism 22 are set to a position wherein the springs 24 connected with the stops 17 located under the load upright 3 are stretched, thus keeping the stops 17 under the load upright 3 in the closed position.

As the hydraulic cylinder 8 (Fig. 3) is set in operation and its rod 10 with the pins 12 and 13, starts extending, the frame 14 mounted on the rod 10 disengages the arm 38 of the two-arm lever 32.

As the rod 10 (Fig. 6) with the pins 12 and 13 keeps extending further, said pins 12 and 13 enter the sleeve 25 through the hole 27 in its bottom. The pin 12 pushes upward the smaller-diameter cylinder 43 of the load-carrying member 4 contained in the sleeve 25, the body of the member 4 spreads apart the projections 20 of the stops 17 which cover the mouth of the load upright 3 and the member 4 enters the load upright 3.

In the course of this movement the larger-diameter cylinder 44 of the load-carrying member 4 moves between the wall of the sleeve 25 and the end of the pushrod 28 as if in guides. During further extension of the rod 10 with the pins 12 and 13 the roller 41 engages the profiled surface 35 of the lever 32 which turns about axis 34. The roller 37 of the spring-loaded end 36 of the lever 32 comes out of the stop 42 and, as the roller 41 moves on over the surface 35 of the lever 32, the latter withdraws the pushrod 28 through the hole 30 from the sleeve 25 and shifts it into the end position wherein the roller 37 is fixed in the second stop 42. After the load-carrying member 4 has entered the load upright 3, it acts on the load-carrying member 4 which supports the load bracket 5, and moves said load-carrying member 4 along the load upright 3 to a height equal to that of the load-carrying member 4.

During the further upward movement of the rod 10 (Fig. 6) with the pins 12 and 13 the load-carrying member 4 that has entered the load upright 3 rises above the projections 20 of the stops 17 which are closed under the cylinder 44 by the springs 14 of the return mechanism 22.

Simultaneously, the pin 13 (Fig. 7) lifts the lower load-carrying member 4 contained in the storage upright 2 above the projection 20 of the stop 18 which is withdrawn by the spring-loaded roller 16.

If the rod 10 (Fig. 6) with the pins 12 and 13 goes down, the load-carrying member 4 delivered into the load upright 3 will come to rest on the projections 20 of the stops 17 while the lower load-carrying member 4 contained in the storage upright 2 will start moving down resting on the pin 14 while the spring-loaded roller 16 will roll over section "c" of the profiled surface 21 of the stop 18 and hold it and, consequently, the projection 20 in the withdrawn position, thus ensuring free movement of the lower load-carrying member 4 from the upright 2 down into the sleeve 25.

During further downward movement of the rod 10 the roller 16 will come over to section "b" of the surface of the stop 18 and will turn the latter relative to axis 19 in which case the projection 20 will close the mouth of the storage upright 2, keeping the load-carrying members 4 remaining there from falling out under the force of gravity.

As soon as the cylinder 44 of the load-carrying member 4 delivered from the storage upright 2 comes on the bottom 26 of the sleeve 25, and the rod 10 with frame 14 continues to go down, said frame will press the arm 38 of the lever 32 which will turn and force the pushrod into the sleeve 25. The pushrod 28 will shift the load-carrying member

4 from under the mouth of the upright 2 under the mouth of the load upright 3. During turning of the lever 32, the roller 37 acted upon by the frame 14 will come out of the stop 42 of one end position of the pushrod 28 and will be fixed in the stop 42 of the other end position thus preventing overturning of the load-carrying member 4.

Reciprocating movement of the rod 10 will transfer the load-carrying members 4 automatically from the storage upright 2 to the load upright 3 with simultaneous lifting of the load bracket 5.

To lower the bracket 5, the spring 24 connected with the base of the stop 18 must be tensioned by means of the handles 23 of the return mechanism 22 while the springs 24 connected with the bases of the stops 17 must be slackened. Simultaneously, the frame 14 must be moved to the left and fixed with, for example, lock 45 (Fig. 3) which will ensure its interaction with the two-arm lever 33 and, consequently, movement of the pushrod 29. The spring-loaded rollers 16 of the frame 14 will engage the profiled surface 21 of the stops 17 installed under the load upright 3.

Reciprocating motion of the rod 10 will ensure successive transfer of the load-carrying members 4 from the load upright into the storage upright 2 and lowering of the bracket 5.

Industrial Applicability

The load hoisting device can be used successfully in any branch of engineering for erection of extra-heavy equipment including vertical structures by the method of turning them around a vertical joint.

Claims

1. A hoisting device comprising a tubular mast (1) with a load and a storage uprights (3,2) arranged parallel to each other along the axis of the mast (1) and provided with load-carrying members (4) movably-installed on said uprights (3,2) one of which, nearest to the top of the mast (1) in the load upright (3) supporting a bracket (5) for fastening the load, a mechanism (6) for transferring the load-carrying members (4) along the uprights (2,3) and from one upright (2 or 3) into the other, said mechanism being located in the base of the mast (1) and having a body (7) accommodating a hydraulic cylinder (8) installed so that an axis (9) of its rod (10) coincides with an axis (11) of the load upright (3), a guiding device installed under the base of the mast (1) and having the shape of an oval sleeve (25) with a cutout (27) in its bottom (26) which determines the trajectory of movement of the load-carrying members (4) from one upright (2 or 3) into the other, two pushrods (28,29) installed with a provision for their counteropposed movement in the direction perpendicular to the axis (9) of the rod (10) of the hydraulic cylinder (8) and interacting with the side surface of the load-carrying member (4) contained in the guiding device for its transfer from one upright (2 or 3) to the other, said pushrods being alternately kinematically linked, each, by a two-arm lever (32,33) with the corresponding side of the frame (14) installed on the rod (10) of the hydraulic cylinder (8) with a provision for moving relative to it in the plane perpendicular to the axis (9) of the rod (10) in the direction from one upright to the other **characterized** in that the rod (10) of the hydraulic cylinder (8) carries two brackets (39,40) set at an angle to the axis (9) of the rod (10), each bracket having a roller (41) on the end, and the arm of each two-arm lever (32,33) interacting with the pushrod (28,29) has a profiled surface (35) adapted to interact with the roller (41) while the rod (10) of the hydraulic cylinder (8) is moving towards the base of the mast (1) so that the pushrod (28 or 29) comes out of contact with the load-carrying member (4) and returns to the initial position.

2. A hoisting device as claimed in Claim 1 **characterized** in that the body (7) of the transfer mechanism (6) is provided with end position stops (42) of each pushrod (28 and 29) and the ends (36) of the arms of the levers (32,33) interacting with the pushrods (28,29) are spring-loaded relative to the remaining part of the arm and each of them has a roller (37) capable of interacting with the stops (42).

3. A hoisting device as claimed in Claim 1 **characterized** in that the load-carrying members (4) are shaped by two coaxial different-diameter cylinders (43 and 44), the smaller diameter being smaller and the larger diameter being larger, than the width of the cutout (27) in the bottom (26) of the guiding device and the working position of the load-carrying member (4) is the one in which its part of a larger diameter is directed towards the top of the mast (1) while its smaller-diameter part, towards the base of the mast (1).

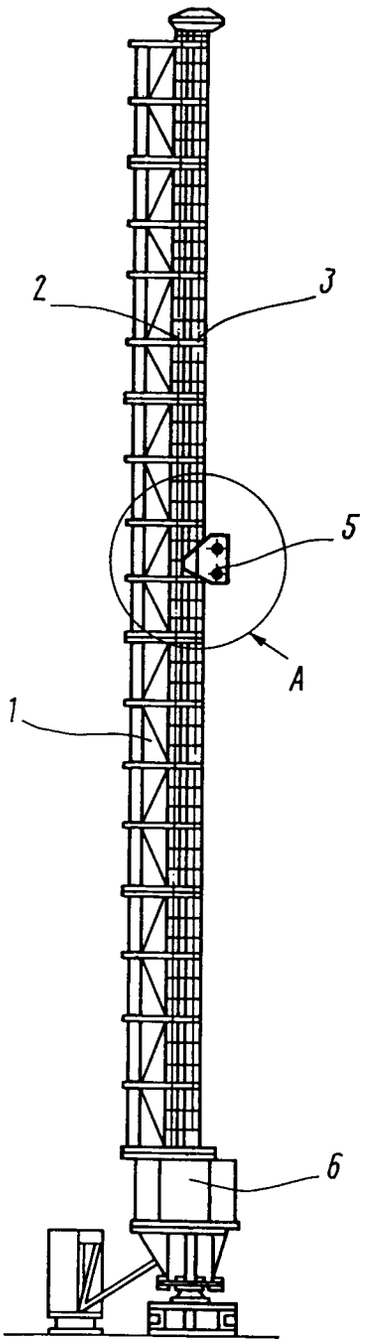

FIG.1

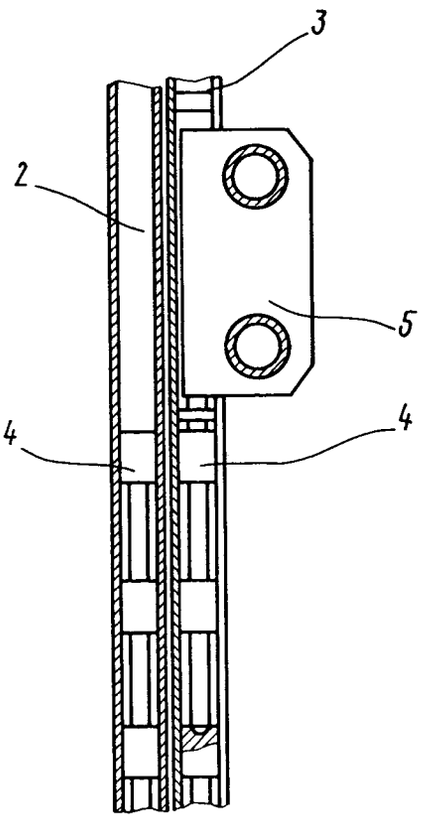

FIG.2

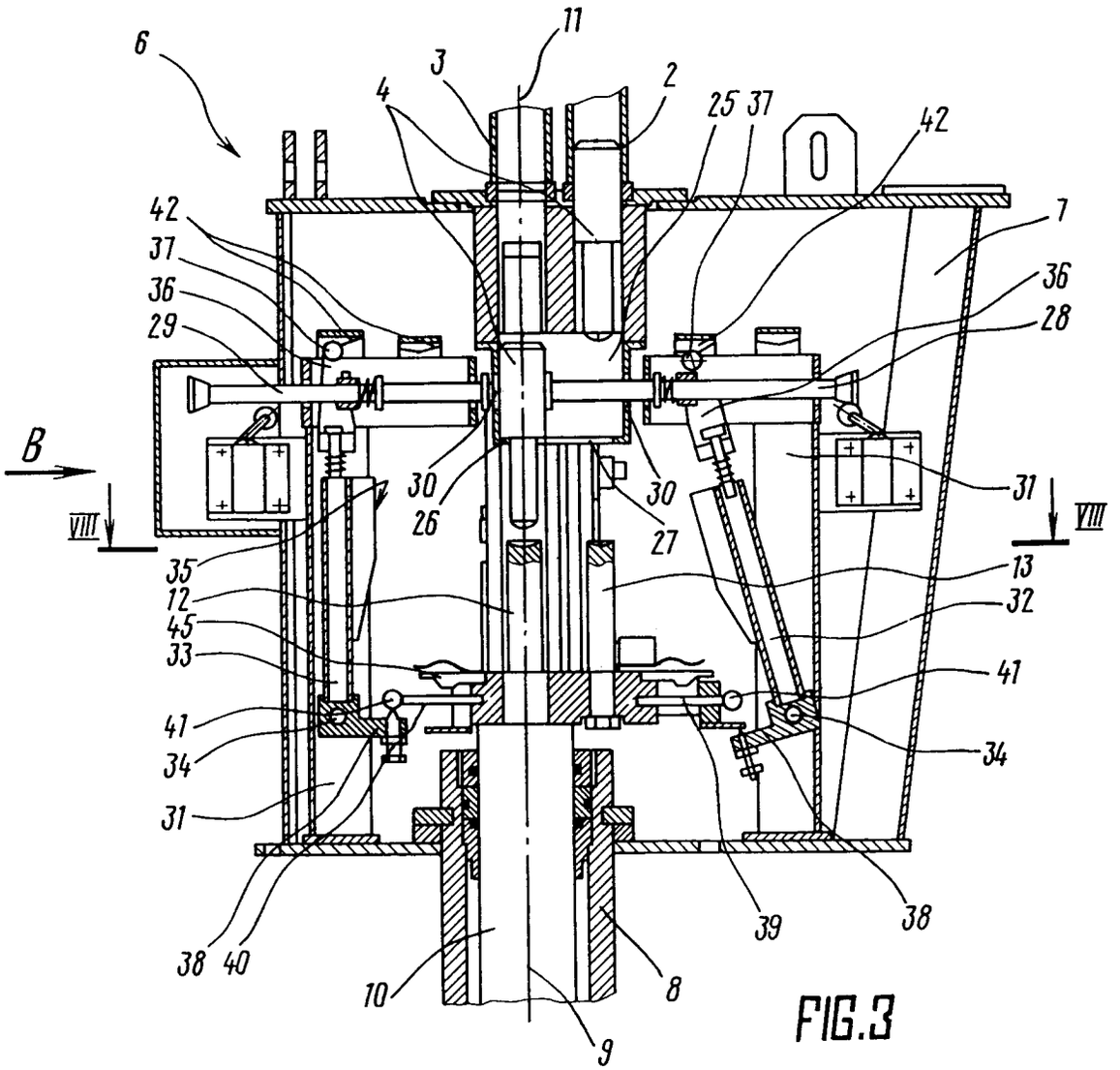
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FIG.3

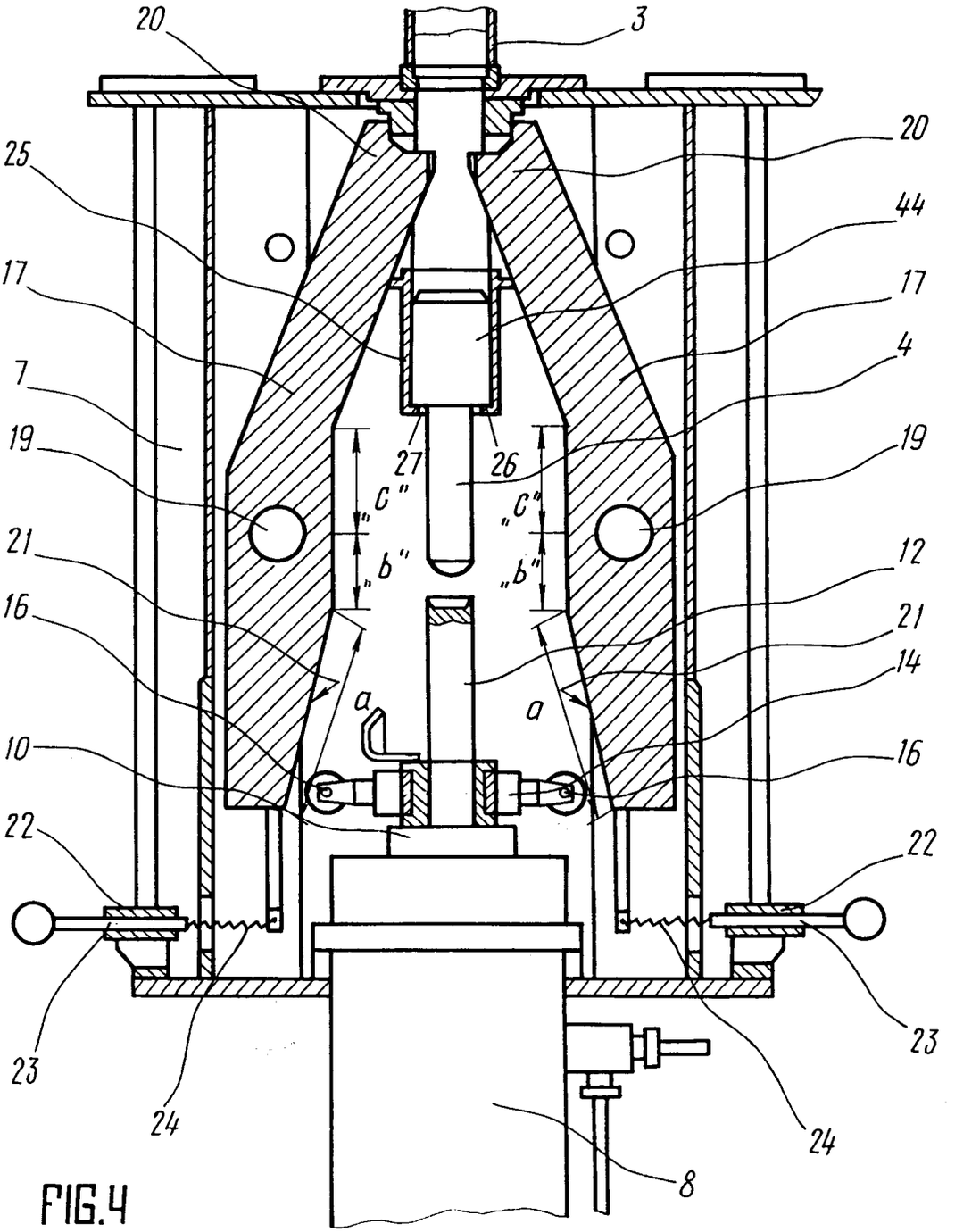
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FIG.4

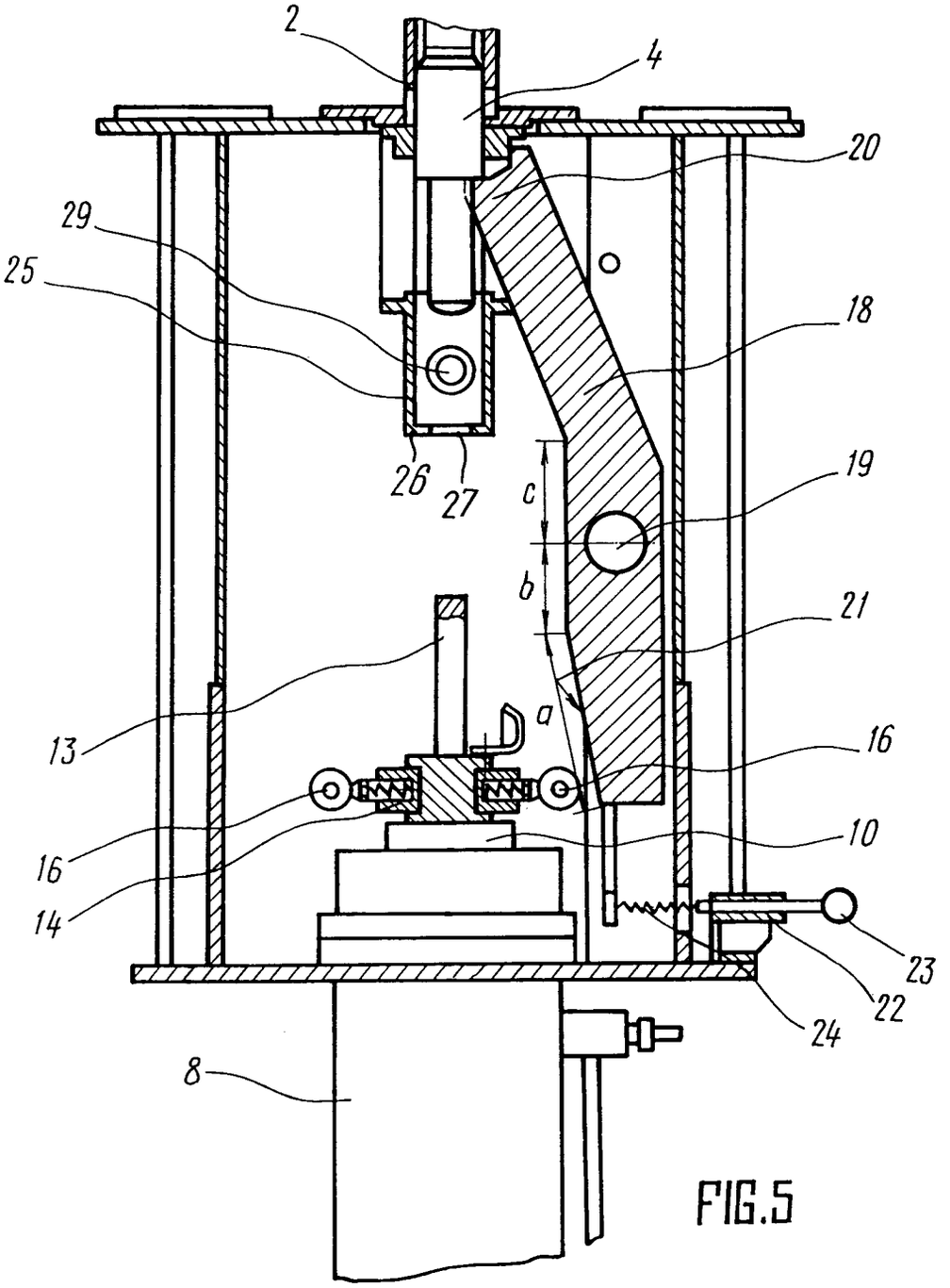

FIG.5

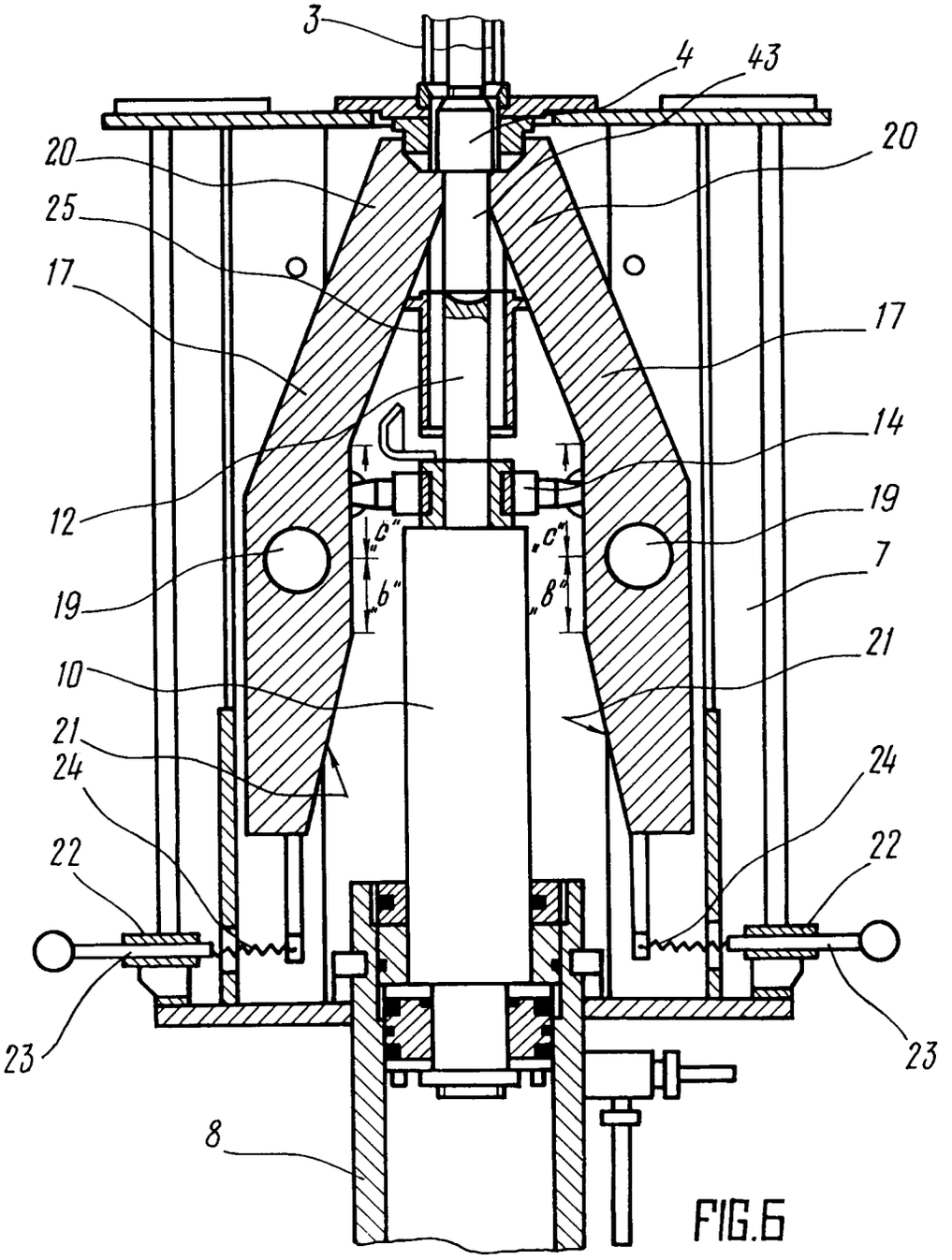

FIG.6

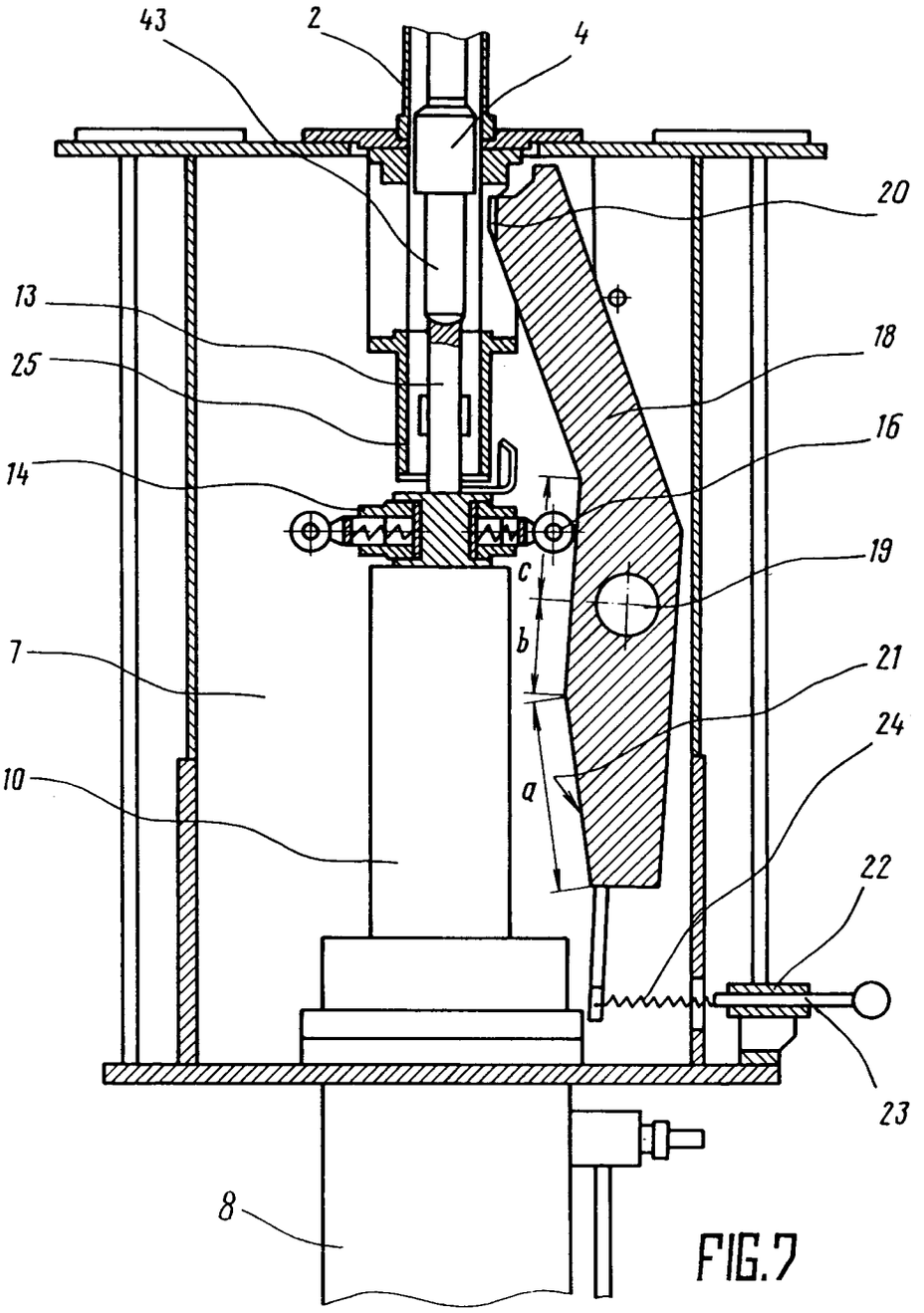

FIG.7

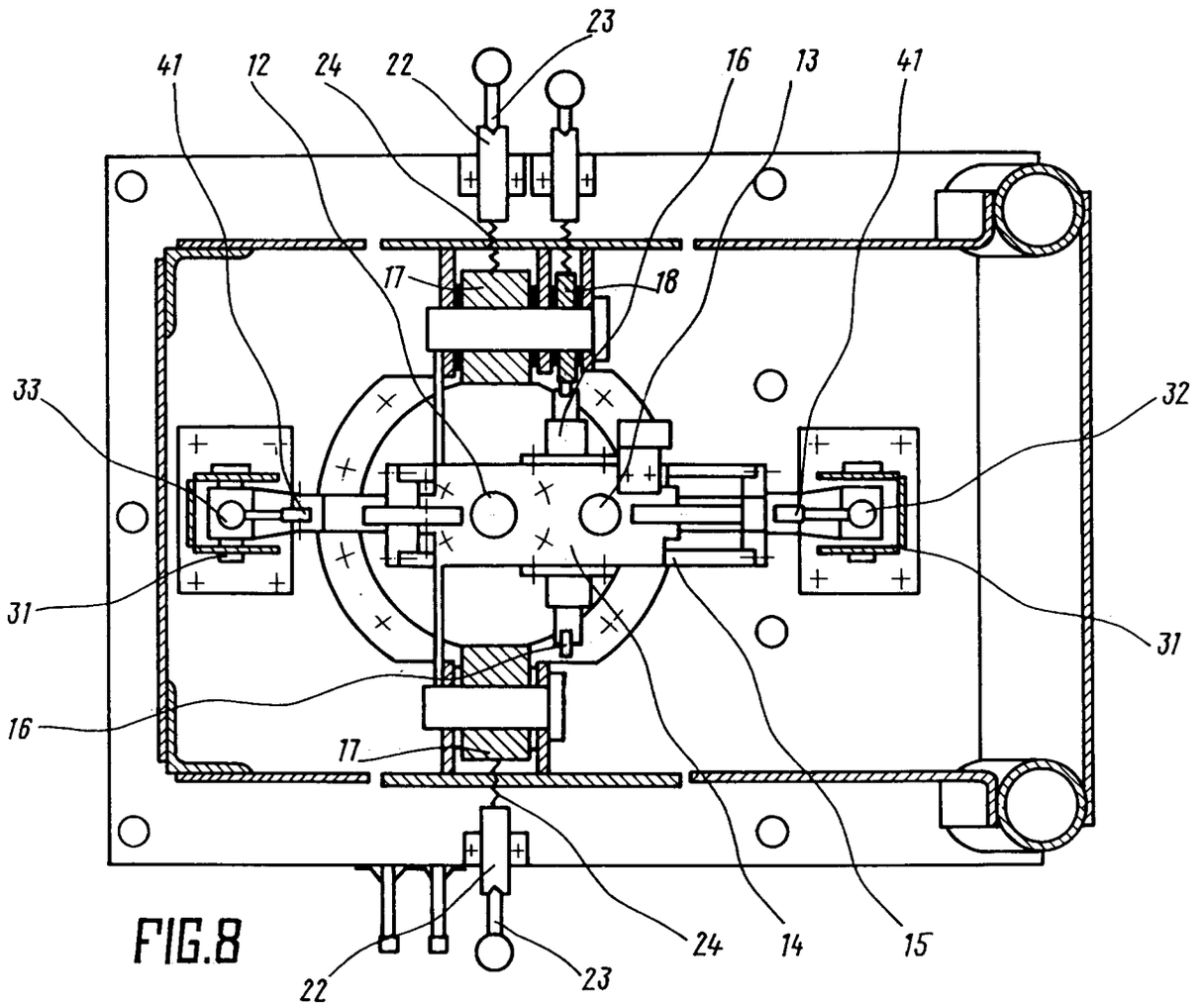

FIG.8

INTERNATIONAL SEARCH REPORT

International Application No PCT/SU 90/00032

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[5]: B66 B9/04, B66 F 1/00

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[5]	B66 B 9/04, B66 F 1/00

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category [10]	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	SU, A1, 914467, (Gosudarstvenny proektno - konstruktorsky institut tekhnologii monta zha promyshlennogo oborudovania "Giprotekhmontazh") 25 March 1982 (25.03.82), fig. 1,3	1
A	SU, A1, 1051025, (Gosudarstvenny proektno - konstruktorsky institut tekhnologii monta zha promyshlennogo oborudovania "Giprotekhmontazh") 30 October 1983 (30.10.83), figure 3	1-3
A,E	WO, 90/06276, A1, (Gosudarstvenny proektno - konstruktorsky institut tekhnologii monta zha promyshlennogo oborudovania "Giprotekhmontazh") 14 June 1990 (14.06.90), figure 3	1-3

* Special categories of cited documents: [14]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
22 January 1991 (22.01.91)	14 February 1991 (14.02.91)

International Searching Authority	Signature of Authorized Officer
ISA/SU	