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(72) Inventors:
• Del Fabro, Marcello
33100 Udine (IT)
• Del Fabro, Giorgio
33019 Tricesimo (UD) (IT)

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(74) Representative:
Petraz, Gilberto Luigi
GLP S.r.l.
Piazzale Cavedalis 6/2
33100 Udine (IT)

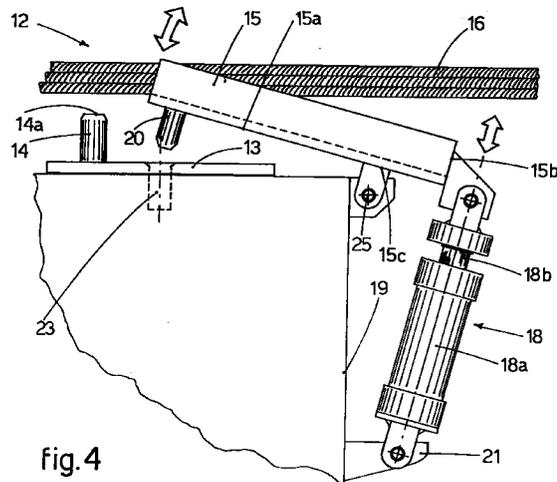
(71) Applicant:
M.E.P. Macchine Elettroniche Piegatrici S.p.A.
I-33010 Reana del Rojale (UD) (IT)

(54) Bending method for a double shaping machine and the relative double shaping machine with movable winged elements

(57) Bending method for a double shaping machine to bend metallic sections for making left-hand and right-hand bends of 90° and more, the shaping machine comprising two bending stations (10a, 10b) between which there is a gripper element (17), each of the bending stations (10a, 10b) comprising a bending assembly (12) with a rotary disk (13) including a winged contrasting element (15) and a bending pin (14), in which, in order to carry out two consecutive bends, in opposite directions to each other, on the same round piece (16), the following steps are included:

- the first bend is made on the round piece (16);
- the winged contrasting element (15) is raised, and the round piece (16) is also raised, up to a level at least higher than the top (14a) of the bending pin;
- the rotary disk (13) is rotated so as to carry the bending pin (14) to the opposite side of the round piece (16) with respect to the position occupied for the first bend to be made;
- the winged contrasting element (15) is re-positioned;
- the round piece (16) advances to a position corresponding to the next bend to be made;
- a bend is made in the opposite direction to that of the bend made previously.

Double shaping machine to carry out the method as above wherein each winged contrasting element (15) is associated with an actuator (18) to lift it above the bending plane by a level correlated to the height of the bending pin (14) and to the lower level on which the round piece (16) to be shaped lies.



Description

This invention concerns a bending method for a double shaping machine, and the relative double shaping machine with movable winged elements as set forth in the respective main claims.

The invention is used preferably, but not only, to shape large dimension round pieces used for reinforcement purposes in the building trade, but can in any case be used to bend pipes, bars or other sections in general, of whatever section.

In the following description, for practical reasons, we shall refer to the specific use of the invention for round pieces for reinforced concrete and therefore the term round piece shall be taken to include any section whatsoever which may be used to make bars and/or brackets for reinforcement purposes.

The term round piece shall also be taken to include bundles of round pieces placed one on top of the other and shaped at the same time.

The state of the art covers shaping machines used to make bars and/or brackets for reinforced concrete in the building trade. These machines are normally structured to include a double shaping station, each one including its own bending assembly, so as to allow two bending operations to be carried out at the same time.

At least one of the bending stations is movable on guides, which allows the station to be brought nearer to or distanced from the other according to the distance between the subsequent bending operations.

There is normally at least one gripper element between the two bending stations; the gripper element may be movable with respect to the bending stations and its function is to guide and retain the round piece which is to be shaped, and also to contrast the bending action.

The bending assemblies of this type of shaping machine substantially consist of a rotary disk with a central contrasting pin and a peripheral bending pin. The round piece which is to be bent is inserted between the two pins of each bending assembly and then it is shaped by the disk rotating in a desired direction and at a desired angle according to the geometry of the piece required.

This conformation of the bending assembly has proved to be unsatisfactory, however, as it often causes undesired deformations of the round piece in proximity of the contrasting pin, since in this zone the round piece is not sufficiently contained laterally.

In order to overcome this shortcoming, the central contrasting pin has been replaced by a contrasting element associated with the rotary disk and comprising a hollow which contains the round piece as it passes through; this element is elongated lengthwise and is known as a winged element.

This solution is adopted, for example, in DE 94 06 880 and in EP-A-0 015 354.

The winged element functions as a contrasting ele-

ment so that the round piece is laterally contained for an extended portion and is therefore less subject to deformation on the horizontal plane in the zone of the winged element and during the bending step.

Another problem which has been found in shaping machines known to the state of the art concerns the displacement of the bending pin from one side to the other with respect to the piece to be shaped, so as to make it possible to perform left- and right-hand bends to 90° and more on the same bar or on the same bundle of bars.

Because of the structure of these machines for shaping large dimension round pieces, it is not possible to temporarily lower the rotary disk on which the bending pin is attached below the working plane so that the bending pin can pass below the piece which is to be shaped and then pass to the other side thereof.

Some embodiments have proposed a bending pin of the retractable type, including a working position where it emerges completely from the rotary disk, and a second transfer position where it is lowered below the disk and is taken from one side to the other of the piece to be shaped in relation to the bend to be made.

This solution however makes it necessary to use rotary disks of a particularly complex structure, and has proved inefficient against the slightest deformation of the bending pin.

In fact, the diameters of the round pieces to be worked (even as much as 50 mm) and the considerable power of the machines often cause the deformation and/or inclination of the bending pin which is therefore difficult to move if it is to be lowered into a retraction seating.

Moreover, the actuation systems which are required to give high power to the bending assembly cause further difficulties in the lowering of the bending pin below the working plane.

Another proposed embodiment includes two bending pins arranged separated at a distance on the same rotary disk, one for right-hand bends and the other for left-hand bends, but with this solution it is not possible to achieve bends of more than about 45°.

Yet another solution includes grippers outside the relative bending station which are activated in order to temporarily lift the round piece and allow the bending pin to pass from one side to the other, by means of rotating the rotary disk. However this solution causes problems because of the excessive distance between the axis of the bending station and the elements which lift the round piece.

Yet another solution teaches to use a bending disk bearing a central contrasting pin associated with a peripheral bending pin and another disk, outside the first, bearing another pair of contrasting pins.

This solution is complex and does not solve the problem of allowing the bending pin to pass efficiently and simply from one side of the bundle to the other.

DE 94 06 880 describes a shaping machine with

two bending stations between which there is a fixing assembly which is also movable, in which each bending station has a bending assembly with a rotary disk bearing a contrasting element of the type with a lengthwise guide and a bending pin arranged on the periphery.

DE'880 substantially teaches to include command means so as to automatically define the position of the fixing assembly with respect to the two bending stations in such a way that the fixing assembly is always located at the centre of the two bending stations during the bending step.

This document does not propose any solution to carry out consecutive right- and left-hand bends even of 90° on the same round piece, using a single bending pin.

DE'880 only provides an expulsion device to extract the bars from the bending heads; the expulsion device intervenes at the end of the bending operations.

A further disadvantage of shaping machines known to the state of the art is that there is a large accumulation of scale and dirt in the channels through which the round pieces have to pass and also on the working plane. This is caused by the type of material which is being worked, which normally consists of bars taken from the warehouse or store rooms exposed to environmental factors.

This dirt accumulates particularly in the contrasting elements of the longitudinal guide type, and can in the long term begin to interfere with the bending operations and create considerable operational problems which have an effect on the quality of the final product.

The present applicants have designed, tested and embodied this invention to overcome the shortcomings of the state of the art and to provide further advantages.

This invention is set forth and characterised in the main claim, while the dependent claims describe variants of the idea of the main invention.

The purpose of the invention is to provide a shaping machine with contrasting elements of the longitudinal guide type, or wings, which will allow the bending pin to move from one side to the other of the round piece to be shaped, using a system which is structurally simple, rapid and functional, regardless of the diameter of the round piece to be shaped and/or the type of bending to be performed.

It is thus possible to achieve a bending method wherein right- and left-hand bends, even of 90°, are carried out in succession, using a single bending pin mounted on the periphery of the rotary bending disk.

A further purpose of the invention is to obtain this movement with a system which will improve and accelerate the production cycle of the machine, and make it more versatile without needing substantial changes to be made in the functional parts thereof.

Another purpose of the invention is to allow the dirt and scale which has accumulated in the hollow through which the round piece passes to be automatically discharged from the contrasting winged elements.

In its general structure, the shaping machine according to the invention is substantially of the conventional type and includes two movable bending stations, each of which is equipped with a bending assembly with a rotary bending disk on which a winged contrasting element and a peripheral bending pin are mounted.

In an intermediate position between the two bending stations, the machine includes a gripper element, which is also movable with respect to the two bending stations, to retain and guide the round piece to be shaped.

According to the invention, each winged element is associated with at least an actuator which allows it to be raised with respect to the rotary disk, whenever it is necessary to displace the bending pin from one side to the other of the round piece to be shaped so as to perform consecutive bends to the left and right of up to 90° and more.

This movement of the winged element is activated in the intermediate steps between one bending cycle and the next and causes the round piece, or bundle of round pieces, enclosed therein to be lifted by a height at least mating with that of the bending pin.

The lifting of the winged element, and therefore of the round piece enclosed therein, makes it possible to rotate the disk on which the bending pin is mounted and therefore to make the pin pass under the round piece so as to allow it to be correctly positioned on the other side from that where the previous bend took place.

Once the bending pin has been positioned, the actuator is repositioned to take the winged element back to its seating, which is associated with the rotary disk, so as to perform a new bending operation on the round piece: this bend is made in the opposite direction to the previous one.

According to a first embodiment, the winged element is raised on a plane substantially perpendicular to the working plane and therefore to the rotary disk, with the winged element being maintained substantially parallel to that plane.

According to a variant, the winged element is raised with a rotation movement, which causes it to be inclined towards the outer part of the bending station; in this embodiment the winged element is constrained by hinge means to the structure of the machine at its rear edge.

In this embodiment, by inclining the winged element, it is possible to discharge the waste or other dirt from the guide channel of the winged element itself.

It is also possible to prevent or at least limit the dirt entering the housing hole of the winged element pin.

According to another variant, the gripper element placed between the two bending stations is associated with an actuator which allows the gripper element, and therefore the round pieces held therein, to be raised or lowered as necessary in a coordinated manner with the movements of the winged elements.

The fact that the gripper element is movable gives

further support to the round piece as it is being raised and therefore prevents deformations and flections thereof.

Therefore the shaping machine considerably reduces the working times of the production cycle, whatever the geometry of the bending operation or the diameter of the round pieces.

In the event that the round pieces as they are raised should bend downwards on the rotary disk and thus not ensure a sufficient space for transit, the bending pin can rotate through the widest angle of rotation in such a way that it passes below the winged element and thus is taken to the correct position with respect to the round pieces.

The attached figures are given as a non-restrictive example and show some preferred embodiments of the invention as follows:

- Fig.1 shows a view from above of the shaping machine according to the invention;
- Fig.2 shows a side view of the shaping machine as in Fig.1;
- Fig.3 shows a detail of the shaping machine in Figs. 1, 2 with the winged elements raised;
- Fig.4 shows a variant of Fig.3.

The shaping machine 10 for round pieces 16 for reinforced concrete according to the invention includes two bending stations 10a, 10b arranged in a line and movable on rails 11 so as to move closer to/further from each other according to the working cycle.

Each bending station 10a, 10b comprises a bending assembly 12 consisting of a rotary disk 13 on the periphery of which there is a bending pin 14 solidly associated.

In cooperation with the rotary disk 13 and the bending pin 14 there is a winged contrasting element 15, equipped with a longitudinal hollow through which the round piece 16 passes lying on a parallel plane to the rotary disk 13.

In an intermediate position between the bending stations 10a, 10b there is a gripper element 17 suitable to retain and guide the round pieces 16 during the bending step.

The gripper element 17 may also be movable with respect to the bending stations 10a and 10b so as to maintain a desired reciprocal position with respect thereto, during the bending cycle.

According to the invention, each winged element 15 is associated with at least a relative actuator 18.

According to a variant, there are two or more actuators 18 for each winged element 15.

The actuator 18 allows the winged element 15 to be raised with respect to the working plane defined by the rotary disk 13, at least to a point where the lower edge 15a of the winged element 15, or the round piece 16 placed lower down, is at a greater height than the top 14a of the bending pin 14.

The raising of the winged element 15 makes it possible, by rotating the rotary disk 13 in either one direction 24 or the other (Fig. 1), for the bending pin 14 to pass from one side of the round pieces 16 to the other, so as to bend the round piece 16 in the opposite direction to the previous bending operation.

Then, when a particular bend has been achieved, for example, to the right, the actuator 18 is activated, the rotary disk 13 is rotated until the bending pin 14 is taken to the opposite side of the round piece 16, then the actuator 18 carries the winged element 15 back to its working position, the round piece 16 is made to advance lengthwise as far as the position of the new bend, and then the new bend is achieved with an opposite direction to that of the previous bend.

In a first embodiment as shown in Figs. 2, 3, the stationary element 18a of the actuator 18 is solidly associated with the housing structure 19 of the relative bending station 10a, 10b, in a retracted position inside the said structure, while the movable element 18b of the actuator 18 is solid at the lower part with the winged element 15 in an outer area where it cannot come into contact with the rotary disk 13.

According to this solution, the winged element 15 is raised on a plane substantially perpendicular to the plane on which the round pieces 16 lie, the winged element being maintained substantially parallel to this plane.

As it is raised/lowered, the winged element 15 is guided by a pin 20 cooperating with a mating central hole 23 made in the housing structure 19 and communicating with the central hole on the rotary disk 13.

According to the variant shown in Fig. 4, the winged element 15 is rotated as it is raised and is therefore inclined downwards on the side of the relative bending station 10a or 10b placed in front of the complementary bending station 10b or 10a.

This embodiment involves no direct intervention on the housing structure 19 of the bending station 10a, 10b, it occupies no inner spaces inside the housing structure 19, and moreover, it is possible, with this embodiment, to discharge outwards any scale or other dirt which has accumulated in the guide channel of the winged element 15, preventing this dirt from going onto the working surface of the housing structure 19 and/or penetrating inside the hole 23.

In this embodiment, the actuator 18 is placed outside the housing structure 19 and has one of its ends constrained to the said structure; in this case, the actuator 18 is attached in an oscillating manner to the housing structure 19 on a bracket element 21.

The other end of the actuator 18 is pinned to the rear end 15b of the winged element 15 in an area which does not come into contact with the round pieces 16.

The winged element 15 is connected to the housing structure 19 in proximity with its lower rear end 15c by means of a hinge constraint 25, and can oscillate on a vertical plane substantially corresponding with the

plane on which the round pieces 16 lie.

The winged element 15 is raised or inclined by the action of the movable element 18b of the actuator 18.

In this case, the lower end of the pin 20 is advantageously reamed so as not to come into contact with the walls of the hole 23 as the winged element 15 is raised and rotated.

According to the embodiment shown in Fig. 2, the gripper element 17 is associated with its own actuator 22 which allows it to be raised or lowered in conjunction with the movement of the winged elements 15.

In this embodiment, when one or both winged elements 15 are raised, the gripper element 17 is also raised, which gives support to the round pieces 16 in the event that there is a great distance between the stations 10a, 10b and such as to lead to unwanted flexions and deformations of the round pieces 16.

Claims

1. Bending method for a double shaping machine to bend metallic sections, either individually or in bundles, such as round pieces for use in reinforced concrete and suchlike for making consecutive left-hand and right-hand bends of 90° and more, the shaping machine comprising two bending stations (10a, 10b) of which at least one is movable lengthwise with respect to the other, there also being included between the two bending stations (10a, 10b) a gripper element (17), each of the bending stations (10a, 10b) comprising a respective bending assembly (12) consisting of a rotary disk (13) including a winged contrasting element (15) and a bending pin (14) arranged on the periphery, the method being characterised in that, in order to carry out two consecutive bends, in opposite directions to each other, on the same round piece (16), the method includes the following steps:
 - the first bend is made on the round piece (16);
 - the winged contrasting element (15) is raised, and consequently the round piece (16) contained therein is also raised, up to a level at least higher than the top (14a) of the bending pin;
 - the rotary disk (13) is rotated in one or another direction (24) so as to carry the bending pin (14) to the opposite side of the round piece (16) with respect to the position occupied for the first bend to be made;
 - the winged contrasting element (15) is re-positioned in cooperation with the rotary disk (13);
 - the round piece (16) advances to a position corresponding to the next bend to be made;
 - a bend is made in the opposite direction to that of the bend made previously.
2. Bending method as in Claim 1, in which the winged contrasting element (15) is raised on a plane substantially perpendicular to the plane on which the round pieces (16) lie.
3. Bending method as in Claim 1, in which the winged contrasting element (15) is oscillated rotating with respect to the plane on which the round pieces (16) lie, in a direction facing outwards with respect to the relative bending station (10a, 10b).
4. Method as in any claim hereinbefore, in which, when the winged contrasting elements (15) are raised, the round piece (16) is raised in a mating manner also in correspondence with the intermediate gripper element (17) between the two bending stations (10a, 10b).
5. Double shaping machine with winged contrasting elements (15) to bend metallic sections such as round pieces (16) for use in reinforced concrete in the building trade or suchlike, the machine comprising two bending stations (10a, 10b) arranged in a line of which at least one (10b) is movable lengthwise with respect to the other (10a), there also being included between the two bending stations (10a, 10b) at least a gripper element (17), each of the bending stations (10a, 10b) comprising a structure (19) to support a respective bending assembly (12) consisting of a rotary disk (13) including a winged contrasting element (15) and a bending pin (14) arranged on the periphery, the winged element (15) comprising a channel for the passage and lateral containment of the round pieces (16) which are to be shaped, the machine being characterised in that each winged element (15) is associated with an actuator (18) to raise the winged element (15) with respect to the bending plane defined by the rotary disk (13) by a level correlated to the height of the bending pin (14) and to the lower level on which the round piece (16) lies.
6. Shaping machine as in Claim 5, in which the actuator (18) is associated with the housing structure (19) of the relative bending station (10a, 10b).
7. Shaping machine as in Claim 5 or 6, in which the actuator (18) is arranged at least partly inside the structure (19) and has the actuation element (18b) movable on an axis substantially perpendicular to the plane on which the round piece (16) lies.
8. Shaping machine as in Claim 5 or 6, in which the actuator (18) is arranged at least partly outside the structure (19) and has the actuation element (18b) movable on an inclined axis with respect to the plane on which the round piece (16) lies.
9. Shaping machine as in any claim from 5 to 8 inclu-

sive, in which the winged element (15) includes a lower guide pin (20) cooperating with a mating hole (23) in the rotary disk (13) and in the housing structure (19).

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10. Shaping machine as in any claim hereinbefore, in which the gripper element (17) is associated with its own lifting actuator (22) which is functionally governed by the activation of at least one actuator (18) associated with the winged element (15).

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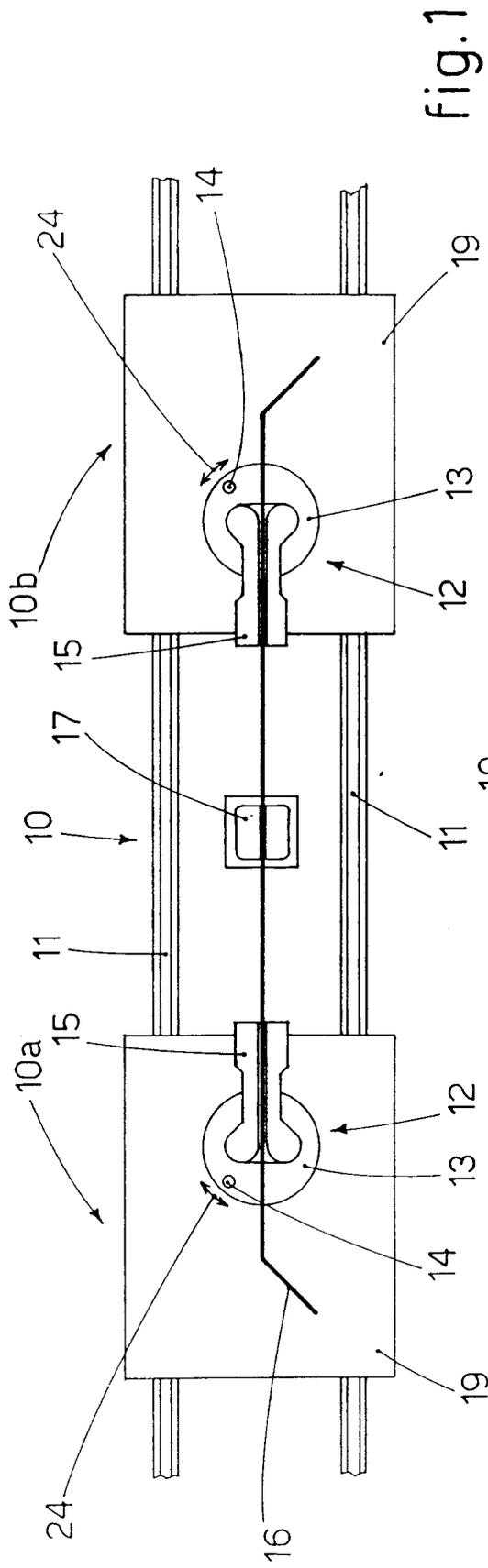


fig.1

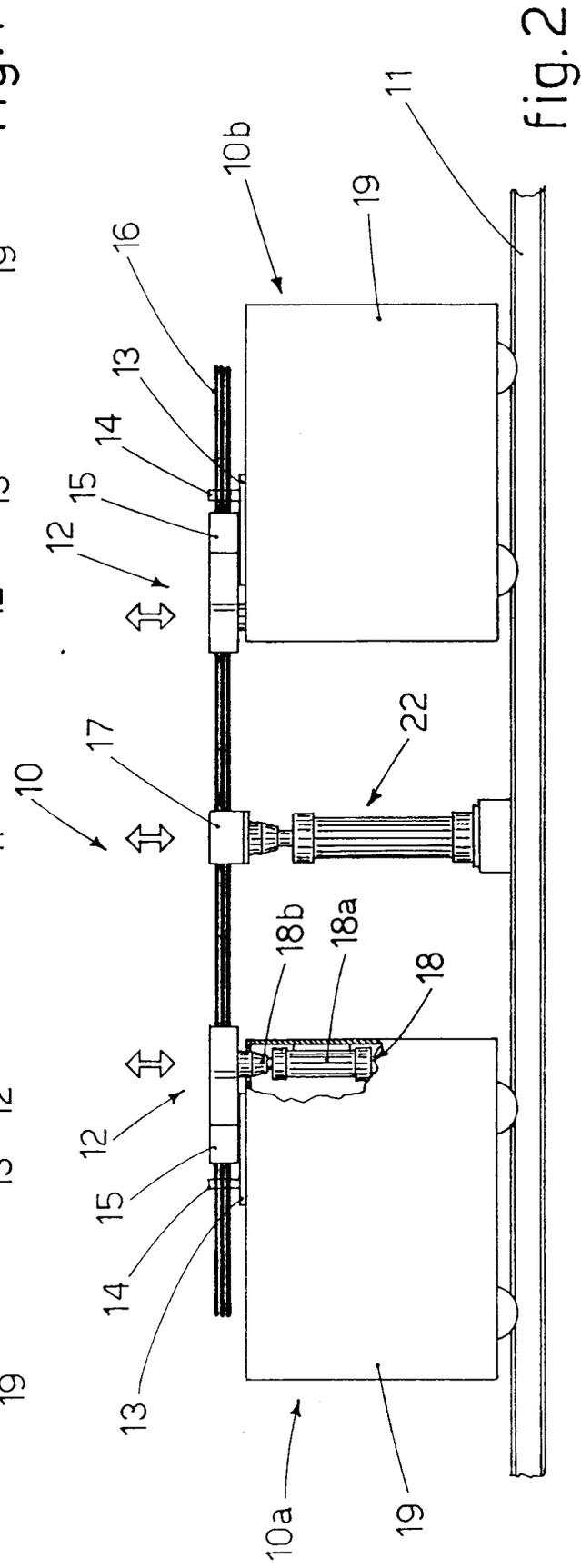
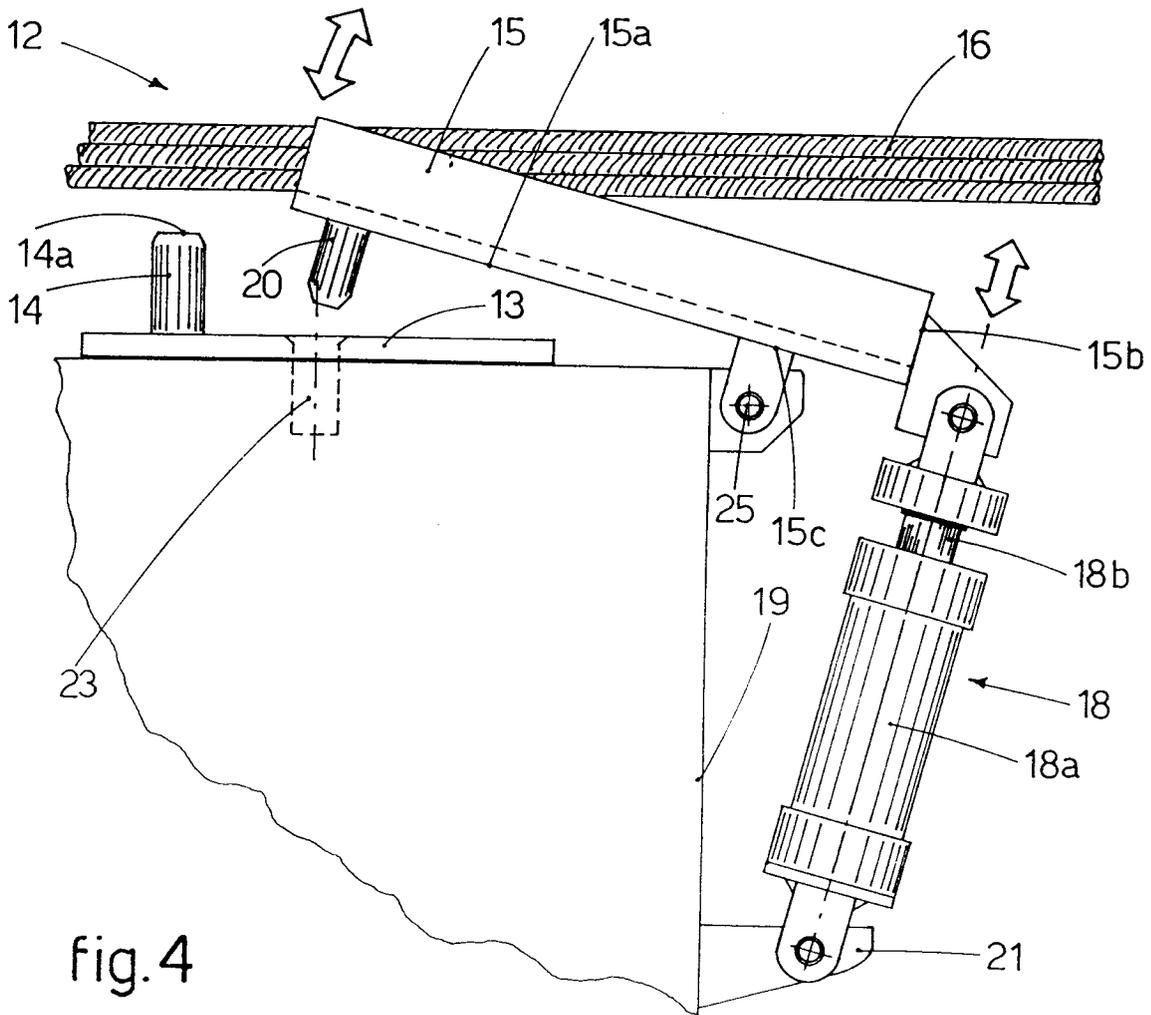
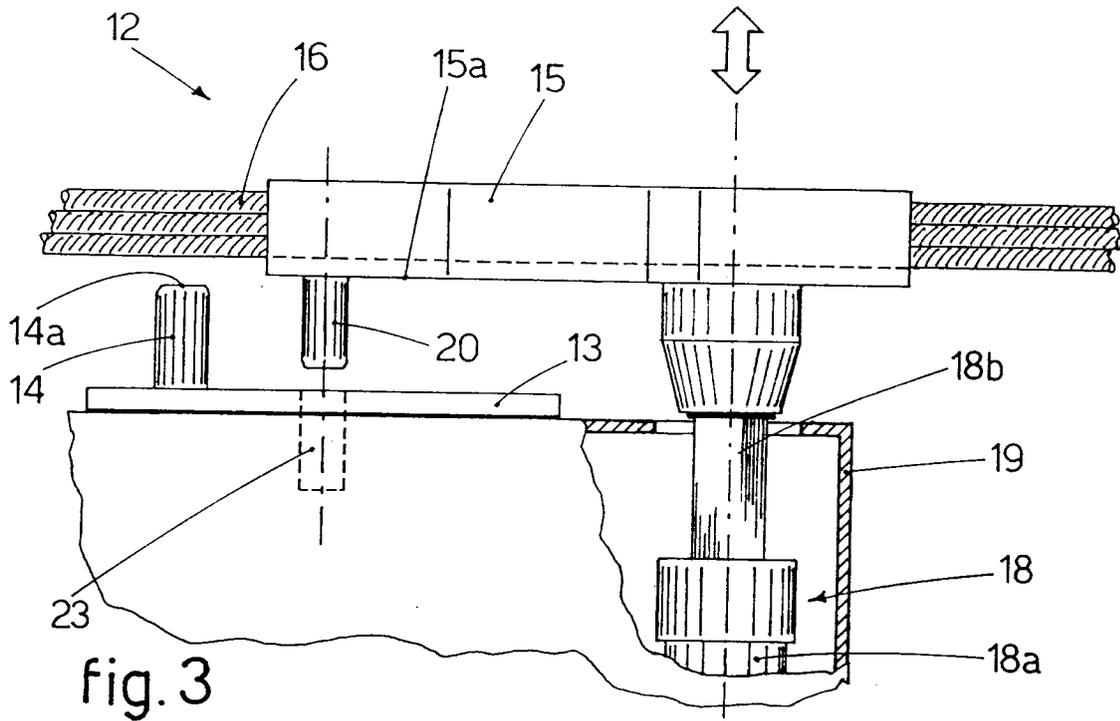


fig.2





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EUROPEAN SEARCH REPORT

Application Number
EP 97 11 6477

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DE 94 06 880 U (PROGRESS AG) 7 July 1994 * the whole document * ---	1,5	B21D11/12
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B21D
Place of search	Date of completion of the search	Examiner	
THE HAGUE	12 November 1997	Peeters, L	
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