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(54) Positioning and protection device for bending machines

(57) Positioning and protection device (10) for a bending machine (11), provided at least with a work plane (13) on which one or more metal bars (12) to be shaped are disposed and made to advance. The device (10) comprises at least a covering element (15, 16) having at least a first, operating position in which it extends longitudinally for a substantial part above the work plane (13) of the bending machine (11) and defines at least with the work plane (13) a sliding channel for the metal bars (12). The covering element (15, 16) is associated with movement means (22) able to move it selectively between the first, operating position and a second, discharge position, in which it lowers completely below, or at most flush with, the work plane (13), leaving it completely free.

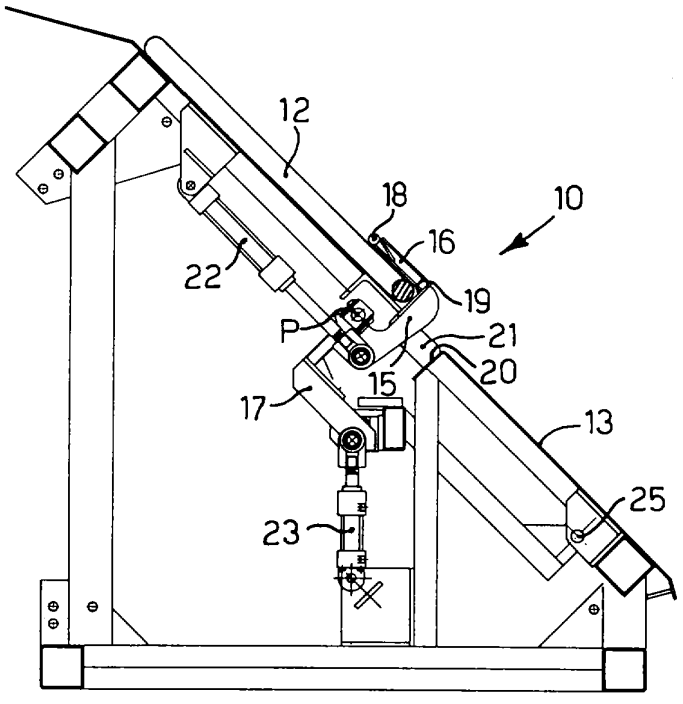

fig. 2

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a positioning and protection device for a bending machine for metal bars provided with an inclined work plane, on which a means for shaping the bars is disposed, for example a bending disk. To be more exact, the protection device according to the present invention is selectively positionable between a first, operating position, in which it is above the inclined work plane and limits the movements of the metal bars being worked, and a second inactive or retracted position, in which it is discharged from the work plane and allows a free movement of the metal bars being worked.

BACKGROUND OF THE INVENTION

[0002] Bending machines for metal bars are known, suitable to produce shaped reinforcement elements, essentially consisting of an inclined work plane on which various members for shaping the bars are disposed, such as for example drawing assemblies, shears, bending assemblies or other.

[0003] It is also known that retractable support devices are provided in order to keep the metal bars being worked in a correct position on the work plane. Such devices have an operating position in which they protrude, for example perpendicularly, from the work plane and retain the bars, and an inactive position in which they are contained in the work plane defining a substantially continuous surface with the latter, and allow to discharge the bars by making them slide downward.

[0004] In known bending machines a retaining and protective guard is also provided, attached to the frame or base structure of the machine, and disposed parallel and above a substantial part of the work plane. The known retaining guard, in cooperation with the support device and with the work plane, defines a sliding channel for the metal bars being worked.

[0005] The known guard not only guarantees protection for the worker but also allows to keep the metal bars close to the work plane, overcoming the normal movements of torsion of the bars, which occur following the shaping operations.

[0006] This known solution, however, has many disadvantages, including the fact that it has to provide a guard which, in order to have a desired structural solidity and also allow to bend very long bars with an ample shaping, must necessarily extend upward, protruding beyond the inclined work plane. This disadvantage entails mainly a considerable increase in height of the overall bulk of the machine.

[0007] This solution does not always allow an easy installation of the known bending machine in already existing industrial sheds, since the necessarily great size in height of the machine could exceed the internal height of the shed.

[0008] This necessary oversizing in height of the guard also entails a considerable increase in its production costs since the guard, which normally extends longitudinally for the whole length of the bending machine, that is, even 12 m and more, requires the use of different material and many working hours to assemble it.

[0009] Moreover, in order to remove it to carry out maintenance operations, the intervention of specialized manpower is required and long operating times.

[0010] Another disadvantage of the known device is the difficulty of removing the bars worked by the machine.

[0011] Indeed, since the guard is disposed above a substantial part of the supporting plane, in the case of bending very long bars or with ample shapings, the terminal segment of the bent part of the bars may remain constrained under the guard, also if the bar is made to slide completely on the inclined work plane until it contacts the ground.

[0012] This disadvantage entails the need to further oversize the machine, increasing overall costs and bulk. Alternatively, it is possible to provide excavations at the foot of the machine to allow an extra travel to discharge the bars, but in practice this solution is very costly and can also entail the risk of accidents for the workers.

[0013] Moreover, the guards normally used are disposed at a fixed height with respect to the work plane and therefore, especially when metal bars with a limited diameter are shaped, they do not actuate an effective contrast against the torsion of the bars.

[0014] Another disadvantage derives from the possible presence of supports for the guard attached to the work plane, which can interfere with the bars being worked in the event of bending of great length.

[0015] EP-A-1.529.573 discloses a plant for bending metal bars, which comprises a number of mobile transverse arms located above the plane in which the bars are made to advance and are bent. These arms have the function to transfer the bars from a stationary structure, located adjacent and above the working plane of the bending unit, to said working plane, and more particularly in the gap defined between the bending pins of the bending unit. However, these arms have only the purpose to move the bars before they are bent, but they have no protective function during the bending cycle. These arms can move above the bending plane and the bending unit according to the transfer cycle of the bars before their bending cycle starts, but they do not have the possibility to move in a non-interference position in which they lower beneath the bending plane in order to free the plane itself, during or after the end of the bending cycle.

[0016] Also JP-A-2002143931 discloses a bending device comprising an arm able to transfer the bars to be bent from a bar placement part to a clamping device, but again the disclosed device has no protection function during the bending cycle and can not move beneath the working plane to free the interference during or after the end of the bending cycle.

[0017] One purpose of the present invention is to achieve a positioning and protection device for bending machines which has limited costs and bulk, while still guaranteeing a correct support and retention of the metal bars being worked, allowing the selective discharge thereof by means of sliding along the inclined work plane of the bending machine, and without interfering with the bars during working.

[0018] Another purpose of the present invention is to achieve a positioning and protection device which allows to discharge the worked metal bars substantially whatever their characteristics of size and/or shape.

[0019] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0020] The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0021] In accordance with the above purpose a positioning and protection device for a bending machine according to the present invention is applied to maintain one or more metal bars in a correct operating position on a work plane of the bending machine and, at the same time, to provide protection for the operators working on the machine.

[0022] The device according to the present invention essentially comprises a covering element having at least a first, operating position in which it extends longitudinally for a substantial part above the work plane of the machine, and is able to define at least with the work plane a sliding channel for the metal bars being worked.

[0023] According to a characteristic feature of the present invention, the covering element is associated with a movement means, which allows it to move between said first, operating position, and a discharge position, in which the covering element is completely below, or at most flush with, the work plane, leaving the latter completely free.

[0024] In this way, the discharge of the shaped metal bars is facilitated, substantially whatever the size or parameters of shape thereof may be, since there is no impediment or obstacle above the work plane.

[0025] This solution also allows to considerably reduce the overall bulk of the bending machine since it is not necessary to provide either an oversizing of the parts, or a guard exceeding the size of the work plane.

[0026] With this solution it is thus possible to install the bending machine easily in already existing industrial sheds, substantially with no risk that the size in height of the bending machine will exceed the internal height of the shed.

[0027] Moreover, since the positioning and protection device according to the present invention is of relatively limited size, even if it is applied over the entire length of the machine, this does not entail an excessive increase in the costs of producing and assembling the machine.

[0028] To allow the covering element to move between the first and the second operating position, located below or at most flush with the work plane, corresponding longitudinal apertures are advantageously made on the work plane of the bending machine.

[0029] In a first form of embodiment of the present invention, the covering element substantially consists of a support portion which, in the first, operating position of the covering element, is disposed substantially perpendicular to the work plane, and a protection portion connected to and extending in length from the support portion for a limited segment of the work plane. In this preferential embodiment the support portion and the protection portion are connected to each other so as to define a single body.

[0030] The extension in length normally provides a segment of greater length, with a desired margin of safety, with respect to the maximum diameter of the metal bars that can be shaped by the bending machine, so as to guarantee to substantially retain all the types of metal bars and possible bent segments thereof.

[0031] In another form of embodiment of the present invention the covering element is pivoted to the frame of the bending machine at a point that lies below the work plane, so that the movement means determines a rotation thereof between the first, operating position and the second, discharge position.

[0032] Advantageously, in correspondence with the longitudinal apertures, supporting blades are provided, separated as desired from each other and able to confer surface continuity to the work plane, when the supporting element and the protection element are in the second, discharge position.

[0033] Thanks to this surface continuity, the bars being discharged are able to slide along the work plane, passing through the longitudinal apertures on the support blades with no risk of blockages or falling into said apertures.

[0034] In this case, the covering element provides, at suitable points of its extension, corresponding notches able to allow the relative passage of the support blades during the movement between the first, operating position and the second, discharge position, without reciprocal interference.

[0035] According to a variant, the device according to the present invention comprises an adjustment means which, in the first, operating position, allows to adjust the height at least of the protection portion of the covering element with respect to the work plane, according to the size of the metal bars being worked and/or their number and/or their parameters of shape.

[0036] This solution allows to adjust the operating height of the covering element to bars substantially of any diameter and/or size, and in variable number.

[0037] In a second form of embodiment, the covering

element comprises the support portion and the protection portion made in two distinct parts, reciprocally movable.

[0038] In this embodiment, the movement means is conformed so as to move the support element and the protection element in two movements, that is, a first unified movement to protrude from the work plane, and a second movement, only of the protection element, to be disposed above the work plane, in order to thus define the passage from the second position to the first position.

[0039] The two movements can be both linear and rotational, and also a combination between a linear and a rotation movement, depending on whether the constraint between the support element and the protection element is achieved, for example, by screw clamping, pivoting or sliding coupling.

[0040] In this solution, the protection element and/or the support element can be conformed so as to define, with a respective surface thereof, the condition of surface continuity of the work plane in the second position to discharge the metal bars.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic front view of a bending machine on which a positioning and protection device according to the present invention is mounted;
- fig. 2 is a section from II to II of fig. 1, with the positioning and protection device in a first, operating position;
- fig. 3 is a section from II to II of fig. 1, with the positioning and protection device in a second, discharge position;
- fig. 4 shows an enlarged detail of fig. 2;
- fig. 5 is a schematic view of a first variant of fig. 1;
- fig. 6 is a schematic view of a second variant of fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

[0042] With reference to the attached drawings, a positioning and protection device 10 according to the present invention is assembled on a bending machine 11 for metal bars 12, in cooperation with an inclined work plane 13 of said bending machine 11.

[0043] The device 10 is configured to be able to selectively assume at least a first, operating position (fig. 2), in which it holds the metal bars 12 being worked close to the work plane 13, and at least a second, discharge position (fig. 3), in which it completely frees the work plane 13 and allows the worked metal bars 12 to be discharged by means of sliding downward, which in no way interferes with the working steps, and particularly the bending, of the bars 12.

[0044] In this case, the positioning and protection device 10 according to the present invention covers substantially the whole length of the work plane 13 and comprises a covering element provided with a support portion 15 and a protection portion 16, in this case welded together substantially in an L-shape so as to constitute a single element. The covering element is pivoted with its support portion 15 to a frame 17 of the bending machine 11, at a point P below the work plane 13.

[0045] It comes within the scope of the present invention that the covering element is C-shaped or otherwise arched, or has a shape with three or more portions.

[0046] In the first, operating position of the device 10 according to the invention, the support portion 15 is disposed substantially perpendicular to the work plane 13 and determines the positioning of the metal bars 12 with respect to the latter, while the protection portion 16 is above the work plane 13 and substantially parallel thereto, so as to function as a protection element for the operator and a contrasting element for the possible forces of torsion which are normally released by the metal bars 12 during shaping.

[0047] In the second, discharge position, the covering element is rotated around the pivoting point P with respect to the first, operating position, so as to be disposed completely below, or at most flush with, the work plane 13, completely freeing the latter.

[0048] In this second position, the shaped metal bars 12 can slide along the work plane 13 and can be discharged freely, substantially whatever their size or the specific shaping parameters.

[0049] To allow the selective positioning of the covering element between the first and second position, the work plane 13 is provided longitudinally with a through aperture 20.

[0050] In correspondence with the through aperture 20 there are supporting blades 21 disposed transversely, in this case at regular intervals, so as to prevent the shaped metal bars 12, sliding along the work plane 13, from falling or jamming inside the through aperture 20.

[0051] Advantageously, the support blades 21 are about one meter distant from each other, so as to substantially prevent any type of metal bars 12, especially if already shaped, from falling or jamming inside the through aperture 20.

[0052] As shown in fig. 1, the covering element comprises, at opposite points on its extension, respective through notches 24 which allow the passage thereof through the supporting blades 21, during the movement between the first and second position, and vice versa.

[0053] The support portion 15 comprises at least a supporting surface 19 on which, in the first, operating position of the device 10, the metal bars 12 are able to stop, so that they can be positioned with respect to the work plane 13, while the protection portion 16 has a length such as to extend in length above the work plane 13 by an entity such as to guarantee a secure cover of the metal bars

12 being worked, whatever their size and number.

[0054] In this way, the covering element operates on the bent segments of the metal bars 12 disposed on the supporting surface 19, so as to contrast the release of the torsions of the metal bars 12 and prevent any twisting in the shaping thereof.

[0055] To be more exact, the protection portion 16 has a structure reinforced by means of specific reinforcement elements 18, especially in correspondence with its free end, so as to contrast with greater strength and effectiveness any releases of torsion of the metal bars 12 even of great entity, with no risk of breakages and/or permanent deformation.

[0056] The positioning and protection device 10 also comprises a first actuator 22 (figs. 2 and 3), in this case linear of the oil-dynamic type, disposed substantially parallel and below the work plane, and connected to the support element 15, so as to determine the rotation of the covering element around the pivoting point P, between the first position and the second position and vice versa.

[0057] With particular reference to the enlargement in fig. 4, the frame 17 to which the covering element is pivoted is selectively movable by means of a relative second actuator 23.

[0058] In this case, the frame 17 is pivoted by means of a relative pin 25 to a lower surface of the work plane 13, so as to constrain, with respect to the work plane 13, the movement imparted by the second actuator 23.

[0059] In this way, in the first, operating position of the device 10 according to the invention, the kinematic cooperation between the movement imparted by the second actuator 23 and the constrained movement of the frame 17, determines a substantially parallel adjustment displacement of the protection portion 16 of the covering element with respect to the work plane 13.

[0060] As shown by the line of dashes in fig. 4, the adjustment displacement allows to define the height of the channel inside which the metal bars 12 are disposed and made to advance, so as to adapt the height on each occasion in relation to the size and/or number of the metal bars 12 being worked.

[0061] By means of a suitable command and control unit, not shown here, it is possible for the operator to preset the positioning values of the protection portion 16 with respect to the work plane 13 and/or to interpolate the positioning movement between the first, operating position and the second, discharge position, and the adjustment displacement.

[0062] The first actuator 22 and the second actuator 23 can be managed without distinction by individual hydraulic units or by a single common hydraulic unit.

[0063] It is clear, however, that modifications and/or additions of parts may be made to the positioning and protection device 10 as described heretofore, without departing from the scope of the present invention.

[0064] For example, the scope of the present invention, as shown in the embodiment illustrated in fig. 5, may include a solution in which the covering element consists of a support portion 115 and a protection portion 116 made in two distinct pieces and pivoted together and to the frame of the bending machine 11. In this embodiment, in the first, operating position, shown by a line of dashes, the support portion 115 is rotated inclined and protruding with respect to the work plane 13 in order to stop the metal bars 12, while the protection portion 116 is rotated with respect to the support portion 115 and is disposed parallel and above the work plane 13. In the second, discharge position, shown by a continuous line, the protection portion 116 is bent back inside the support portion 115, so as to cooperate with the outer surface of the latter so as to substantially close the through aperture 20 and define a segment of surface continuity of the work plane 13.

[0065] It also comes within the scope of the present invention to provide that, as schematically shown in fig. 6, the support portion 215 and the protection portion 216 are reciprocally sliding with respect to each other so as to define the first, operating position, shown by a line of dashes, and the second, discharge position, in which they substantially close the through aperture 20 in order to define the desired surface continuity of the work plane 13.

[0066] According to another variant, the first and the second actuator 22 and 23, instead of the oil-dynamic type, as shown, can be without distinction of the electromechanical type, mechanical, electronic or other.

[0067] According to another variant, a retractable door is provided to close the through aperture 20 in the discharge position of the covering element.

[0068] It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of positioning and protection device for bending machines, having the characteristics as set forth in the claims and hence all coming within the scope of protection defined thereby.

Claims

1. Positioning and protection device for a bending machine (11), provided at least with a work plane (13) on which one or more metal bars (12) to be shaped are disposed and made to advance, said device comprising at least a covering element (15, 115, 215, 16, 116, 216) having at least a first, operating position in which it extends longitudinally for a substantial part above said work plane (13) of said bending machine (11) and defines at least with said work plane (13) a sliding longitudinal channel for said metal bars (12), **characterized in that** said covering element is associated with movement means (22) able to move it selectively between said first, operating position and a second, discharge position, in which it lowers completely below, or at most flush with, said work plane

(13), leaving it completely free.

2. Device as in claim 1, **characterized in that** said covering element comprises at least a first portion (15, 115, 215) having the function, in said first, operating position, of supporting said metal bars (12) being worked, and a second portion (16, 116, 216) having the function, in said first, operating position, of protecting and retaining said metal bars (12) being worked.

3. Device as in claim 2, **characterized in that** said first portion (15, 115, 215) is connected to said second portion (16, 116, 216) so as to constitute substantially a single body therewith.

4. Device as in claim 1, **characterized in that** said movement means comprises at least an actuator member (22) associated with said work plane (13) and connected to said covering element (15, 115, 215, 16, 116, 216).

5. Device as in claim 3, **characterized in that** said first portion (15) and said second portion (16) are welded to each other substantially in an L-shape, a C-shape or an arch, or so as to form a broken line of three or more segments.

6. Device as in claim 2, **characterized in that** said first portion (115) and said second portion (116) are reciprocally pivoted and movable one with respect to the other in rotation.

7. Device as in claim 2, **characterized in that** said first portion (215) and said second portion (216) are reciprocally sliding and movable with respect to each other in translation.

8. Device as in any claim hereinbefore, **characterized in that** said covering element (15, 115, 215, 16, 116, 216) is pivoted to a frame (17) of said bending machine (11) at a point (P) lying below said work plane (13).

9. Device as in claim 8, **characterized in that** it also comprises at least a through aperture (20) made on said work plane (13) and able to allow the movement of said covering element (15, 115, 215, 16, 116, 216) between said first and said second position.

10. Device as in claim 9, **characterized in that** it also comprises a plurality of supporting blades (21) disposed in correspondence with said through aperture (20) and able to confer a surface continuity on said work plane (13), when said covering element (15, 115, 215, 16, 116, 216) is in said second, discharge position.

11. Device as in claim 10, **characterized in that** said covering element (15, 115, 215, 16, 116, 216) is provided with corresponding notches (24) in correspondence with said supporting blades (21), to allow movement between said first, operating position and said second, discharge position, without reciprocal interference.

12. Device as in any claim hereinbefore, **characterized in that** it also comprises adjustment means (23) able to allow, in said first, operating position, to adjust the height, in the first, operating position, between the covering element (15, 115, 215, 16, 116, 216) and said work plane (13).

13. Device as in claim 12, wherein said covering element (15, 16) is associated with a frame (17) of said bending machine (11), **characterized in that** said adjustment means comprises at least an actuator member (23) connected to said frame (17), in order to move it with respect to said work plane (13).

14. Device as in any claim hereinbefore, **characterized in that** said covering element (15, 115, 215, 16, 116, 216) is conformed so as to define, with a respective surface, a condition of surface continuity with said work plane (13) in said second, discharge position.

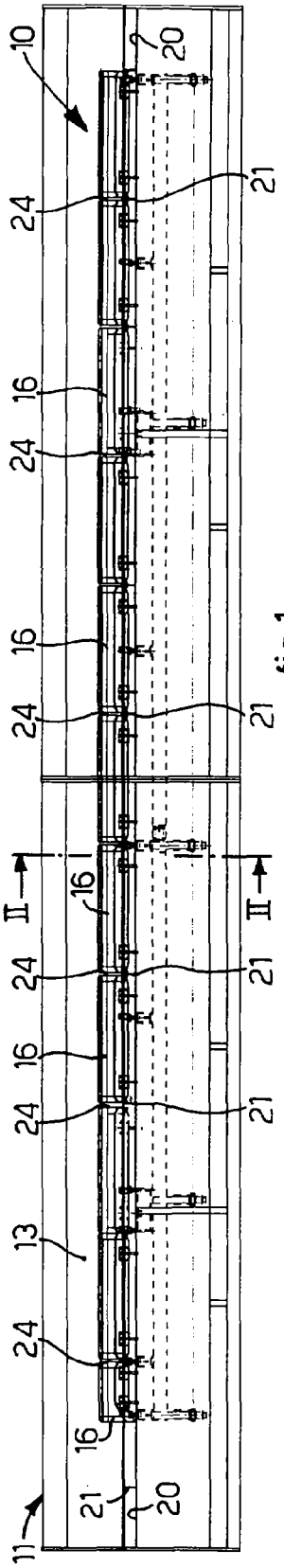
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fig.1

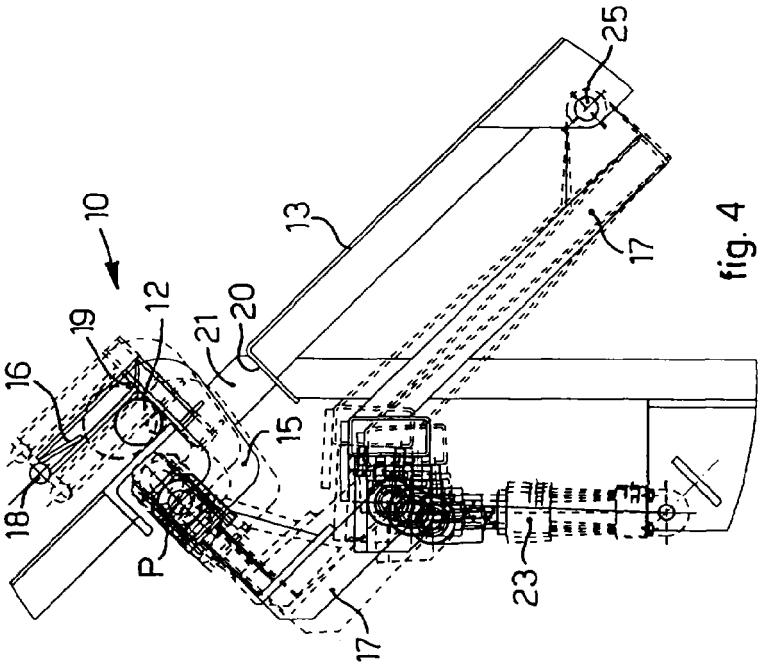
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fig. 4

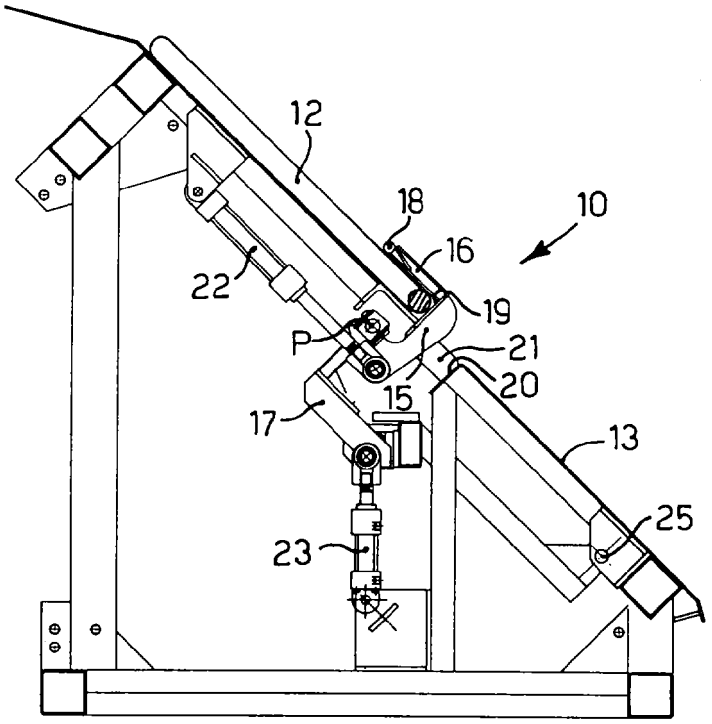
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fig. 2

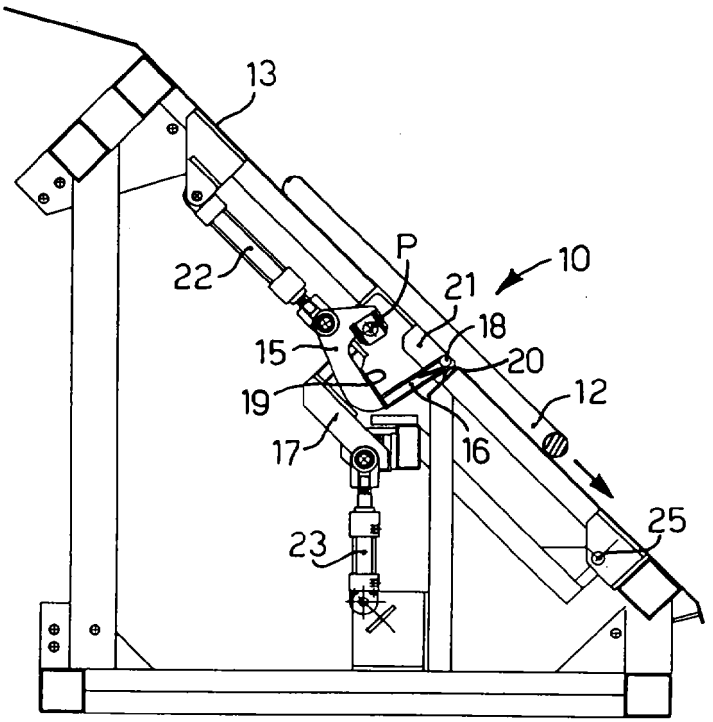
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fig. 3

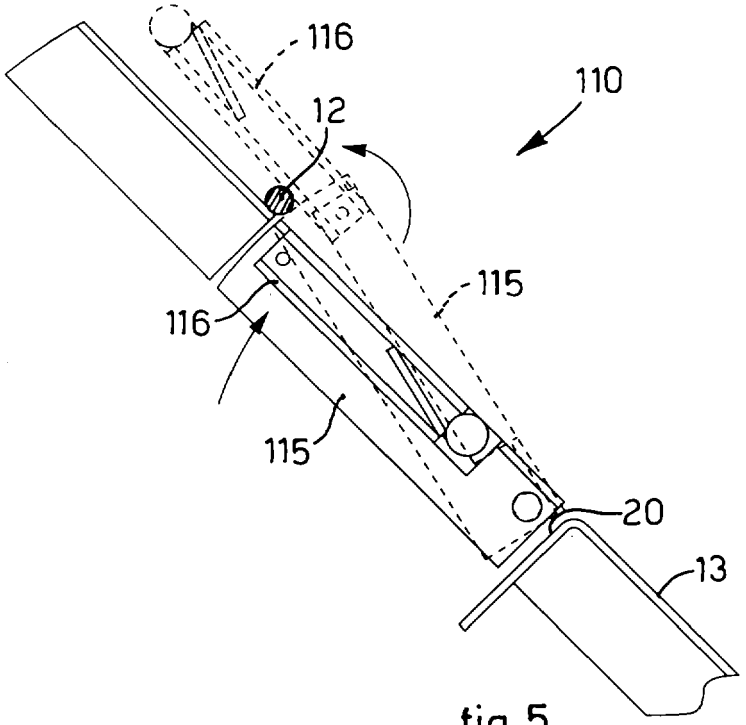

fig. 5

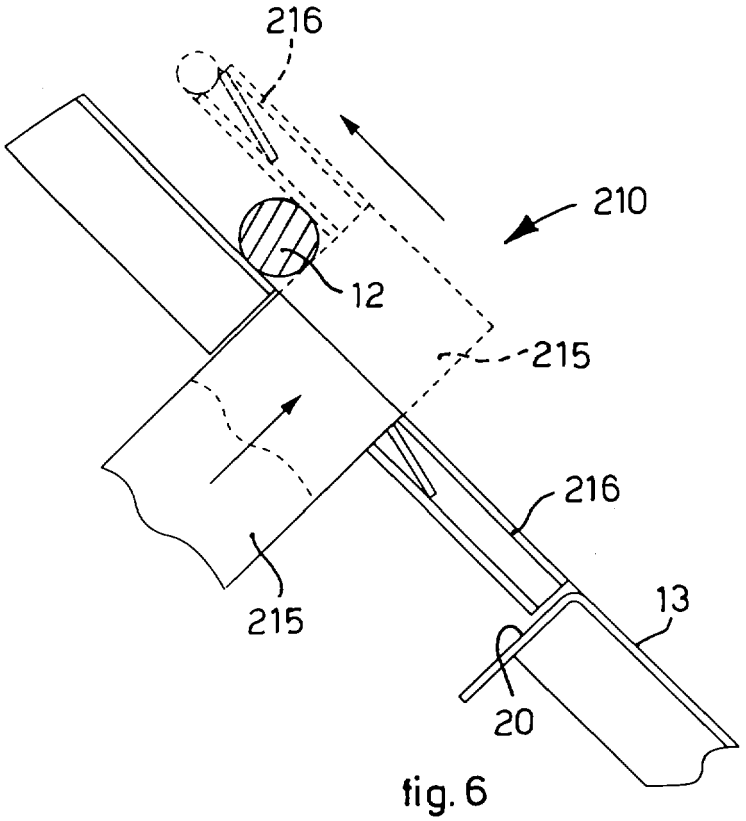

fig. 6

REFERENCES CITED IN THE DESCRIPTION

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