(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 864 387 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
16.09.1998 Bulletin 1998/38

(51) Int. Cl.[6]: **B21F 1/02**, B21D 3/05

(21) Application number: **97117690.4**

(22) Date of filing: **13.10.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV RO SI

(30) Priority: **13.03.1997 IT BO970143**

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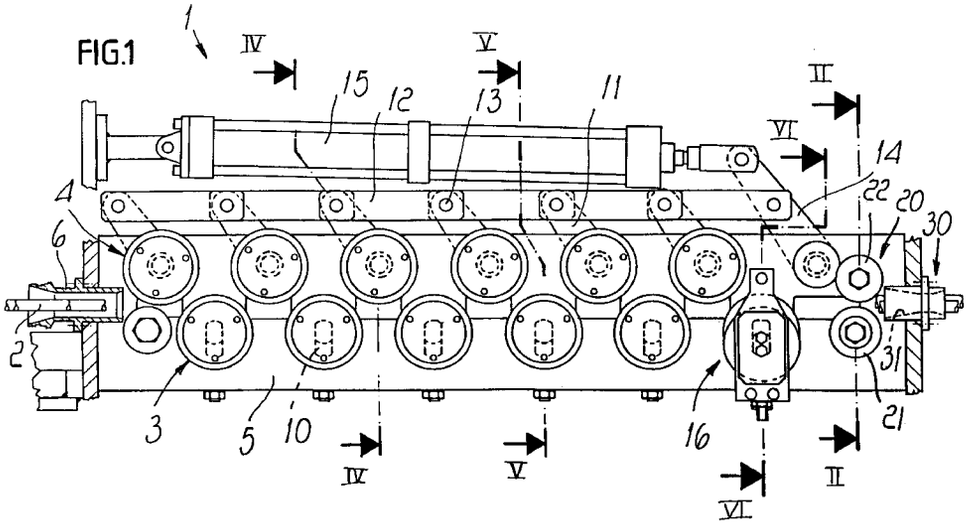
(54) Twin-wire straightener for metallic materials in wire form and the like.

(57) The twin-wire straightener for metallic materials in wire form comprises a double set of straightening elements (3, 4) which are supported so that they rotate in mutually opposite directions along parallel axes and between which two wires (2) to be straightened, arranged side by side on a plane of arrangement which is parallel to the axes of the straightening elements (3, 4), are inserted along a preset longitudinal advancement axis; the straightening elements are peripherally provided with a twin groove meant to be engaged by the wires (2) to be straightened. The straightener has, downstream of the straightening elements, a device (20) for tilting the plane of arrangement of the wires, which has a first conical roller (21) and a second conical roller (22) which are supported so that they can rotate freely about axes which are parallel to the axes of the straightening elements (3, 4). The conical rollers (21, 22) are arranged so that they are mutually spaced and have mutually opposite tapers, so as to act respectively on the wires (2) with mutually opposite thrust components which are oblique with respect to the plane that is parallel to the axes of the straightening elements (3, 4).

FIG.1



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Description

The present invention relates to a twin-wire straightener for metallic materials in wire form and the like.

In the field of the treatment of metallic materials in wire form, profiles and the like, machines are conventionally employed which are equipped with suitable straightening elements. In particular, in the field of machines for treating iron rods for reinforced concrete, said machines generally have at least one straightener provided with a plurality of mutually opposite straightening elements constituted by contrarotating wheels; the materials being treated, which arrive from bars and from rolls or reels, are inserted between said wheels along a preset longitudinal advancement axis.

Said machines often have two straighteners arranged in series, in which one has wheels provided with vertical axes and the other one has wheels provided with horizontal axes, said straighteners being meant to correct a corresponding Cartesian component of the curvature.

In particular, twin-wire machines are known which allow to simultaneously treat two wires, which are arranged longitudinally side by side along said advancement axis. In these machines, the straighteners are provided with straightening elements which are peripherally provided with a twin groove meant to be engaged by the two wires to be straightened.

In twin-wire machines the problem is therefore felt of tilting the plane of arrangement of the wires to be straightened during transfer from the first straightener to the second straightener. In the first straightener, the two wires are in fact superimposed on a vertical plane, whilst in the second straightener they are arranged side by side on a horizontal plane.

Tilting devices are currently known for this purpose which are substantially constituted by a tubular cam provided with a helical profile and are arranged in an intermediate position between the two straighteners.

Said devices, in addition to being relatively expensive, can also cause considerable wear of the surface of the wires being treated and can also negatively affect the straightening of the wires.

The aim of the present invention is to solve the above problem, by providing a twin-wire straightener that allows to tilt the plane of arrangement of the wires that leave said straightener without causing wear and without compromising the correct straightening of said wires.

Within the scope of this aim, an object of the present invention is to provide a twin-wire straightener which is simple in concept, safely reliable in operation, versatile in use and has a relatively low cost.

This aim and this object are both achieved, according to the present invention, by the present twin-wire straightener for metallic materials in wire form and the like, of the type comprising a double set of straightening elements which are supported so that they rotate in mutually opposite directions along parallel axes and between which two wires to be straightened are suitable to be inserted along a preset longitudinal advancement axis, said wires being arranged side by side on a plane of arrangement which is parallel to said axes of the straightening elements, said straightening elements being peripherally provided with a twin groove meant to be engaged by said wires to be straightened, said straightener being characterized in that it comprises a device for tilting the plane of arrangement of said wires, said device having a first and a second conical rollers which are supported so that they can rotate freely, about axes which are parallel to the axes of said straightening elements, downstream of said straightening elements along said longitudinal advancement axis, and are arranged so that they are mutually spaced and have mutually opposite tapers, so as to act respectively on said wires with mutually opposite thrust components which are oblique with respect to said plane that is parallel to the axes of said straightening elements.

The details of the invention will become apparent from the detailed description of a preferred embodiment of the twin-wire straightener, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

figure 1 is a partially sectional view, taken along a longitudinal plane, of the twin-wire straightener according to the invention;
figure 2 is a transverse sectional view thereof, taken along the plane II-II of figure 1, at said tilting device;
figure 3 is a corresponding front view of a detail of said device;
figures 4, 5, and 6 are further sectional views of the straightener, taken respectively along the planes IV-IV, V-V, and VI-VI of figure 1;
figure 7 is a transverse sectional view of a different embodiment of said tilting device;
figure 8 is a corresponding plan view of said tilting device.

With particular reference to the above figures, the reference numeral 1 generally designates the twin-wire straightener for metallic materials 2 in wire form and the like, for example iron rods for reinforced concrete. Hereinafter, for the sake of simplicity, said metallic materials are generally termed wires.

The straightener 1 has, in a per se known manner, a double set of straightening elements 3 and 4, which are supported so that they rotate in mutually opposite directions by a frame 5 about vertically parallel axes; two wires 2 to be straightened are suitable to be inserted between the straightening elements 3 and 4, along a preset longitudinal advancement axis; said wires are mutually superimposed on a vertical plane of arrangement which is parallel to the axes of said straightening elements 3 and 4.

The wires 2 to be straightened are inserted

between the straightening elements 3 and 4 by means of a tubular inlet wire guide 6, which is fixed to the frame 5 of the straightener.

The straightening elements 3 and 4 are conveniently constituted by pairs of mutually opposite wheels, which are peripherally provided with a twin groove 3a, 4a meant to be engaged by said wires 2 to be straightened.

More particularly, on one side with respect to said advancement axis of the wires 2 straightening wheels 3 are fixed, which are supported so that they can rotate on respective pivots 7, while on the opposite side there are provided moving straightening wheels 4, which are rotatably supported on corresponding pivots 8. The position of the fixed wheels 3 can be adjusted individually in a direction which lies transversely to said advancement axis by means of screw elements 9 at respective slots 10 formed in the frame 5 (reference should be made in particular to figure 5).

The pivots 8 of the moving rollers 4 have an eccentric shape and are rigidly coupled to respective levers 11 which are suitable to be rotated through an angle and synchronously on a horizontal plane by means of a connecting rod 12, to which they are pivoted at additional vertical pivots 13. The connecting rod 12 is in turn pivoted to a rocker 14, which is pivoted on a vertical axis to the frame 5 and is meant to be actuated by an actuator 15, for example a pneumatic cylinder.

The straightener 1 is provided with a device for tilting the plane of arrangement of the wires 2, which is generally designated by the reference numeral 20 and is arranged downstream of the straightening elements 3, 4 along said longitudinal advancement axis.

The tilting device 20 is provided with a first conical roller 21 and with a second conical roller 22, which are supported, so that they can rotate freely about vertical axes which are parallel to the axes of the straightening elements 3 and 4, on opposite sides with respect to said advancement axis of the wires 2, and are arranged at an appropriate distance from each other with mutually opposite tapers, so as to act respectively on said wires 2 with mutually opposite thrust components which are oblique with respect to said plane that is parallel to the axes of the straightening elements 3 and 4.

More particularly, by way of non-limitative example, the taper of the first conical roller 21 is directed upward, while the second conical roller 22 is arranged outside the first roller 21, i.e., in a vertically raised position, and its taper is directed downward (see figure 2 in particular).

The conical rollers 21 and 22 are supported, so that they can rotate freely by means of rolling bearings 23 and 24, on respective pivots 25 and 26 which are mounted vertically on the frame 5; the pivots 25 and 26 have, for mounting on the frame 5, respective eccentric portions 25a, 26a which allow to adjust the mutual distance of the conical rollers 21 and 22. The pivots 25, 26 are locked in the active position by corresponding screw means 27, 28.

It should be noted that the conical rollers 21, 22 are arranged on slightly offset vertical planes. In particular, in this example,the first conical roller 21 is arranged on a plane which is shifted slightly backward with respect to the second roller 22 for overall dimension reasons.

Downstream of the conical rollers 21, 22, along the direction of advancement of the wires 2, there is provided a tubular outlet wire guide 30 which is stably fixed to the frame 5. Said outlet wire guide 30 is internally provided with a through cavity 31 which has a converging shape and is contoured so as to form an outlet 32 which is elongated on a plane which lies obliquely with respect to the vertical plane that lies longitudinally to the straightener (see also figure 3).

Finally, the straightener has, upstream of the tilting device 20, an additional straightening element 16 which is aligned with the fixed wheels 3, as shown in detail in figure 6. Said additional straightening element 16 is substantially constituted by a split roller, i.e., a roller formed by two side by side rollers 17 which are peripherally provided with a corresponding groove 17a and are rotatably supported by respective pivots 18. The pivots 18 can be adjusted independently by means of corresponding screw elements 19.

In practice, the additional straightening element 16 allows to independently perform different straightenings of the wires 2 that enter the tilting device 20.

Operation of the twin-wire straightener is easily understandable from the above description.

The wires 2 to be straightened are inserted, by means of the inlet wire guide 6, between the straightening elements 3 and 4, which rotate in mutually opposite directions, and advance along the preset longitudinal axis, so that they are superimposed along a vertical plane of arrangement, engaging the peripheral grooves 3a, 4a of said straightening elements 3 and 4.

When they exit the straightening elements 3 and 4, the wires 2 engage the conical rollers 21, 22 of the tilting device 20. Said conical rollers 21 and 22, provided with opposite tapers, act respectively on the wires 2 with mutually opposite thrust components which are oblique with respect to the vertical advancement plane, causing an opposite lateral movement of said wires.

In practice, the wires 2 are arranged, by means of the thrust of the conical rollers 21 and 22, on a plane which is oblique with respect to the vertical plane that lies longitudinally to the straightener.

The wires 2 then pass through the outlet wire guide 30, provided with an outlet 32 which is elongated on a plane which is likewise oblique with respect to said longitudinal vertical plane, so as to be preset for entering a subsequent straightener provided with straightening rollers having horizontal axes.

The described twin-wire straightener therefore achieves the aim of tilting the plane of arrangement of the wires that exit from said straightener without causing wear and without compromising the correct straight-

ening of said wires. The plane of arrangement of the wires is in fact tilted without friction by means of the pair of freely rotating conical rollers 21 and 22.

The fact should also be noted that the described tilting device is very simple from the constructive and functional point of view and has low costs with respect to conventional devices in addition to being adjustable for the various wire diameters that can be treated.

Figures 7 and 8 illustrate a different embodiment of said device for tilting the plane of arrangement of the wires, which is provided with a first conical roller and with a second conical roller, designated again by the reference numerals 21 and 22 for the sake of clarity, which are arranged so as to have mutually opposite tapers. The conical rollers 21 and 22 are supported so that they can rotate freely, by means of the corresponding rolling bearings 23 and 24, on the respective pivots 25 and 26, which are mounted vertically on the frame 5.

According to the illustrated embodiment, the pivot 25 of the first conical roller 21 has a fixed axis on the frame 5, while the pivot 26 of the second conical roller 22 is guided so that it can slide, by means of a bush 29, in a slot 40 formed on the frame 5; the slot 40 is arranged transversely to the wire advancement direction, substantially on the vertical plane of arrangement of the axes of the conical rollers 21 and 22.

A helical spring 41 is suitable to act elastically on the bush 29 of said pivot 26 and is accommodated in a corresponding seat 42, which is formed on the frame 5 and is aligned with the slot 40. The spring 41 applies a pressure which is appropriately adjustable by means of an adjustment screw 43, which is locked in the active position by means of a nut 44.

The spring 41 pushes the movable conical roller 22 toward the fixed-axis conical roller 21, so as to elastically clamp the wires to be straightened between said rollers 21 and 22. In this manner, correct clamping pressure of the wires on the part of the rollers 21 and 22 is ensured. In particular, said clamping pressure of the rollers 21 and 22 adapts spontaneously to the different dimensions of the rods being treated, without requiring any adjustment.

It is of course possible to provide both conical rollers 21 and 22 so that they can move in the above-described manner and be actuated by respective springs, mounted in mutually opposite positions, for clamping the wires being processed.

Moreover, as shown in said figures 7 and 8, the conical rollers 21 and 22 may be peripherally provided with a respective pair of grooves 21a, 22a which are shaped for example so as to have a circular profile, in order to guide in an optimum manner the wires 2 in the rotation which is required to pass from the straightening elements which have horizontal axes to those which have vertical axes.

It is also possible to subject only one or both of the conical rollers 21 and 22 to actuation means, not shown, which are meant to positively and/or negatively move said rollers 21, 22 transversely to the wire advancement axis, along a corresponding slot 40. In particular, said actuators can cooperate with said spring 41, which is meant to provide a controlled force for the elastic clamping of the wires.

In this manner, the conical rollers 21, 22 can be kept in contact with the wires being treated only during a suitable insertion step and, viceversa, moved away from contact once wire insertion has been completed.

Accordingly, the conical rollers 21, 22 are prevented from being uselessly subjected to wear during normal operation, when their intervention is not required.

Said actuators can of course actuate both the approach of the conical rollers to the active position and their spacing into a disengagement position.

In the practical embodiment of the invention, the materials used, as well as the shape and the dimensions, may be any according to requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A twin-wire straightener for metallic materials in wire form and the like, of the type comprising a double set of straightening elements which are supported so that they rotate in mutually opposite directions along parallel axes and between which two wires to be straightened are suitable to be inserted along a preset longitudinal advancement axis, said wires being arranged side by side on a plane of arrangement which is parallel to said axes of the straightening elements, said straightening elements being peripherally provided with a twin groove meant to be engaged by said wires to be straightened, said straightener being characterized in that it comprises a device for tilting the plane of arrangement of said wires, said device having a first and a second conical rollers which are supported so that they can rotate freely, about axes which are parallel to the axes of said straightening elements, downstream of said straightening elements along said longitudinal advancement axis, and are arranged so that they are mutually spaced and have mutually opposite tapers, so as to act respectively on said wires with mutually opposite thrust components which are oblique with respect to said plane that is parallel to the axes of said straightening elements.

2. A straightener according to claim 1, characterized in that said conical rollers are rotatably supported by respective pivots provided with a corresponding

eccentric portion which allows to adjust the mutual distance of said conical rollers.

3. A straightener according to claim 1, characterized in that downstream of said conical rollers there is provided a tubular outlet wire guide, which is internally provided with a through cavity which converges in the advancement direction of said wires and is shaped so as to form an outlet which is elongated on a plane which lies obliquely to said plane that is parallel to the axes of said straightening elements.

4. A straightener according to claim 1, characterized in that it has, upstream of said tilting device, an additional straightener which is aligned with a plurality of said straightening elements and is provided with a pair of side by side rollers, which are suitable to peripherally engage said pair of wires and are supported rotatably by respective pivots which can be adjusted independently by means of corresponding screw elements.

5. A straightener according to claim 1, characterized in that at least one of said conical rollers is rotatably supported by a pivot which can move at a slot which lies transversely to said longitudinal advancement axis of said wires to be straightened, in order to adjust the mutual distance of said conical rollers.

6. A straightener according to claim 5, characterized in that said moving conical roller is suitable to be actuated by elastic means which act in a direction which is aligned with said slot and are suitable to provide an adjustable elastic pressure for clamping said wires.

7. A straightener according to claim 1, characterized in that at least one of said conical rollers is subjected to actuator means which are meant to positively and/or negatively move said roller transversely to said longitudinal advancement axis of said wires to be straightened, so as to keep said conical rollers in contact with said wires during a controlled treatment step.

8. A straightener according to claim 1, characterized in that said conical rollers are peripherally provided with a respective pair of grooves suitable to guide said wires to be straightened.

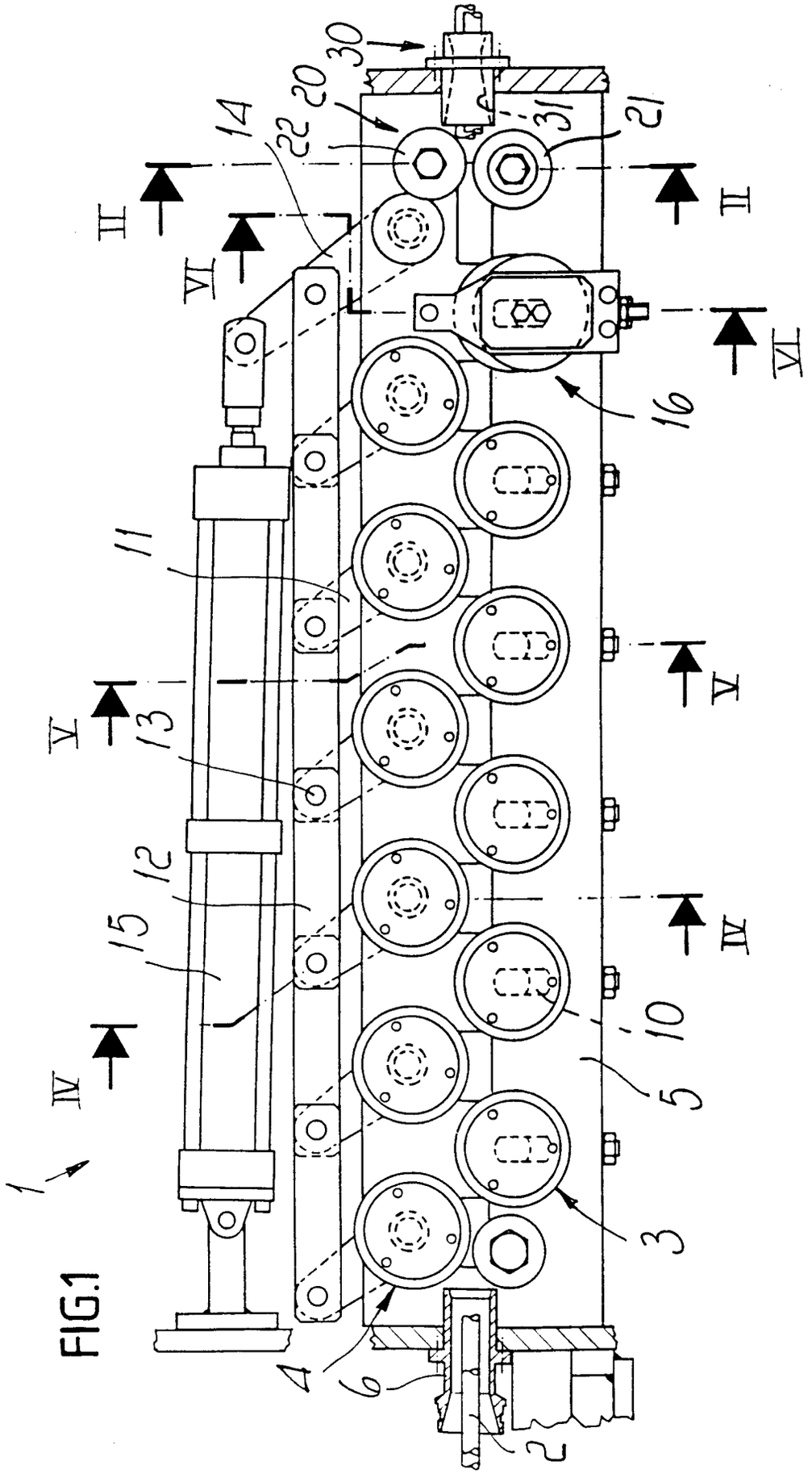

FIG.1

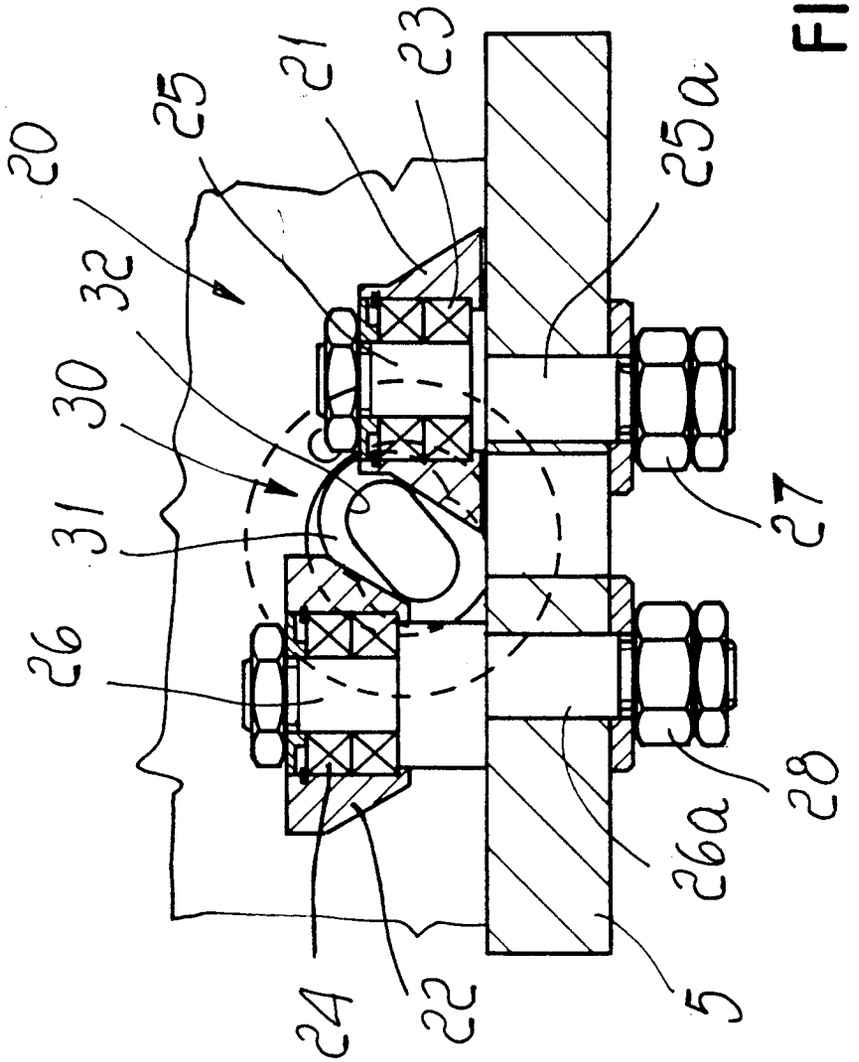

FIG.2

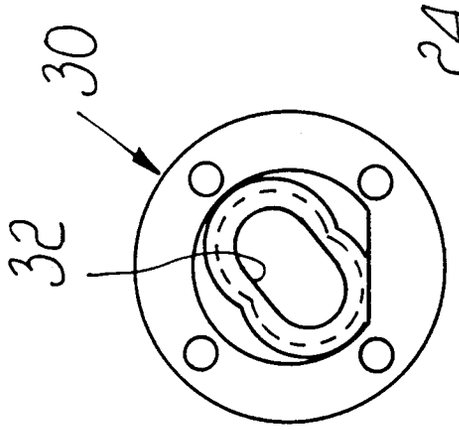

FIG.3

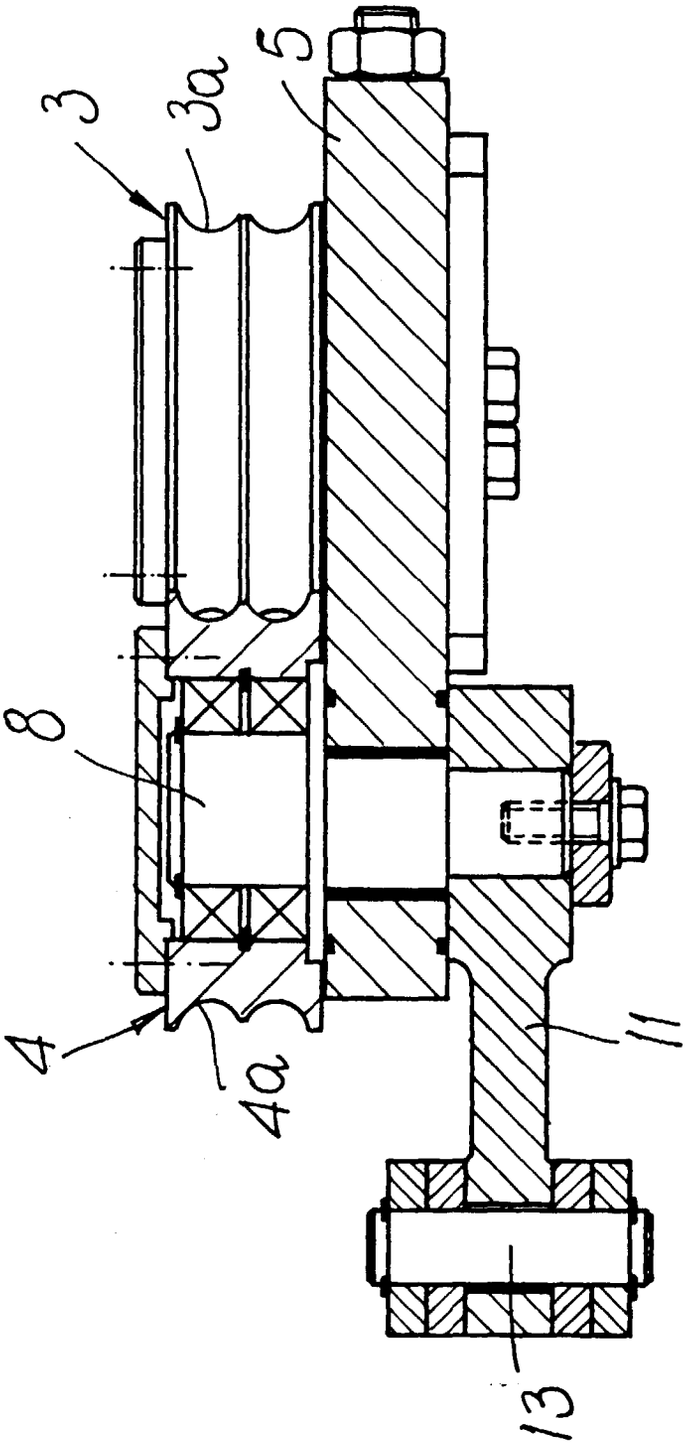

FIG.4

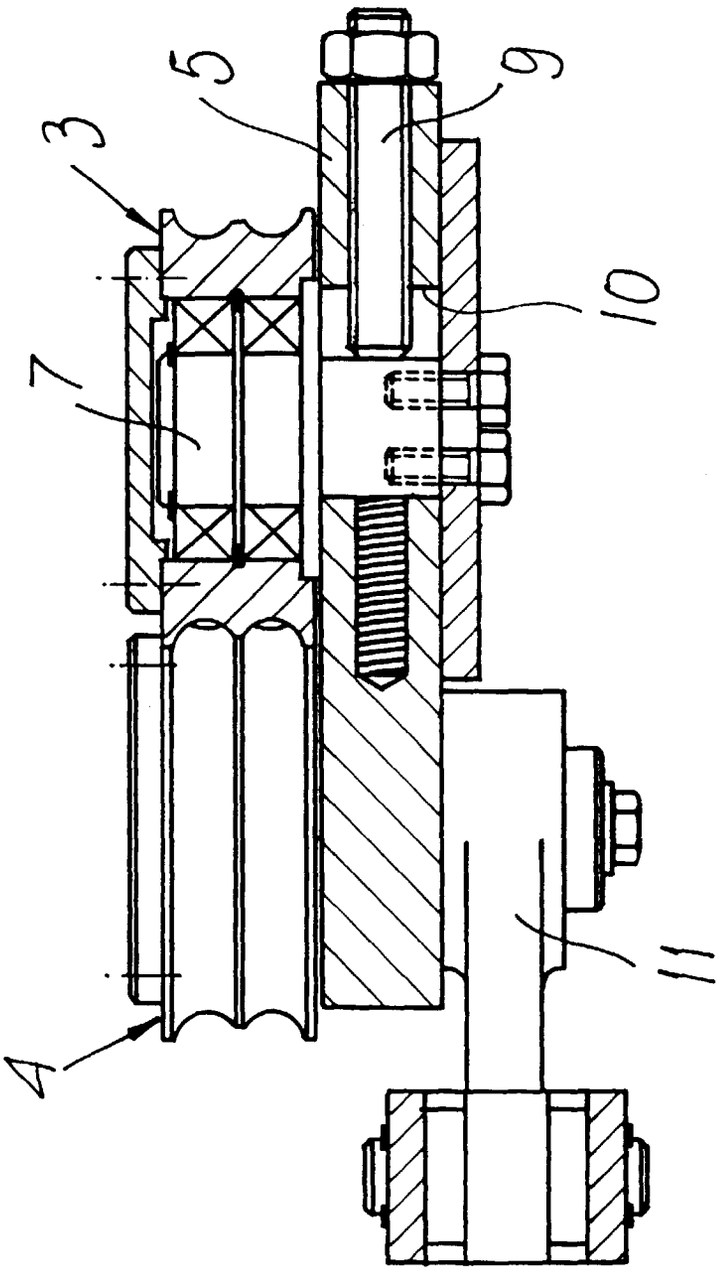

FIG.5

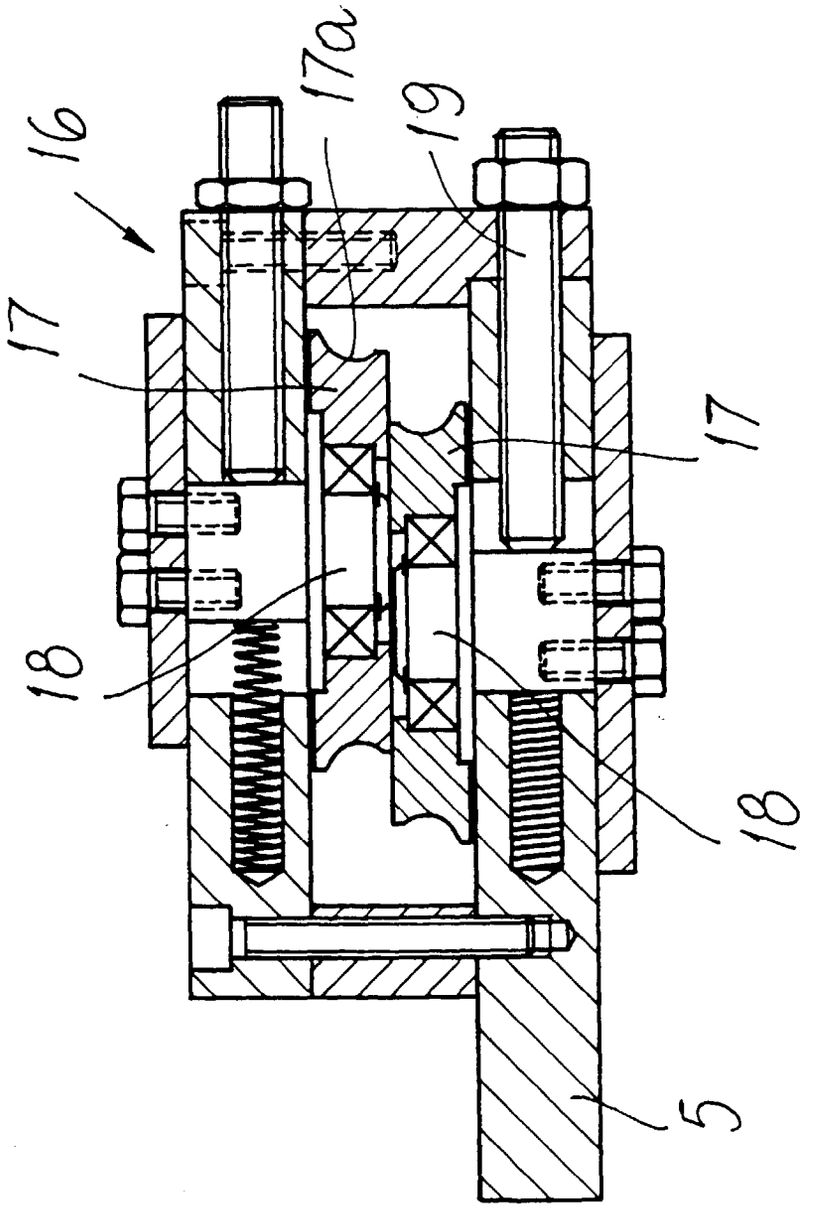

FIG.6

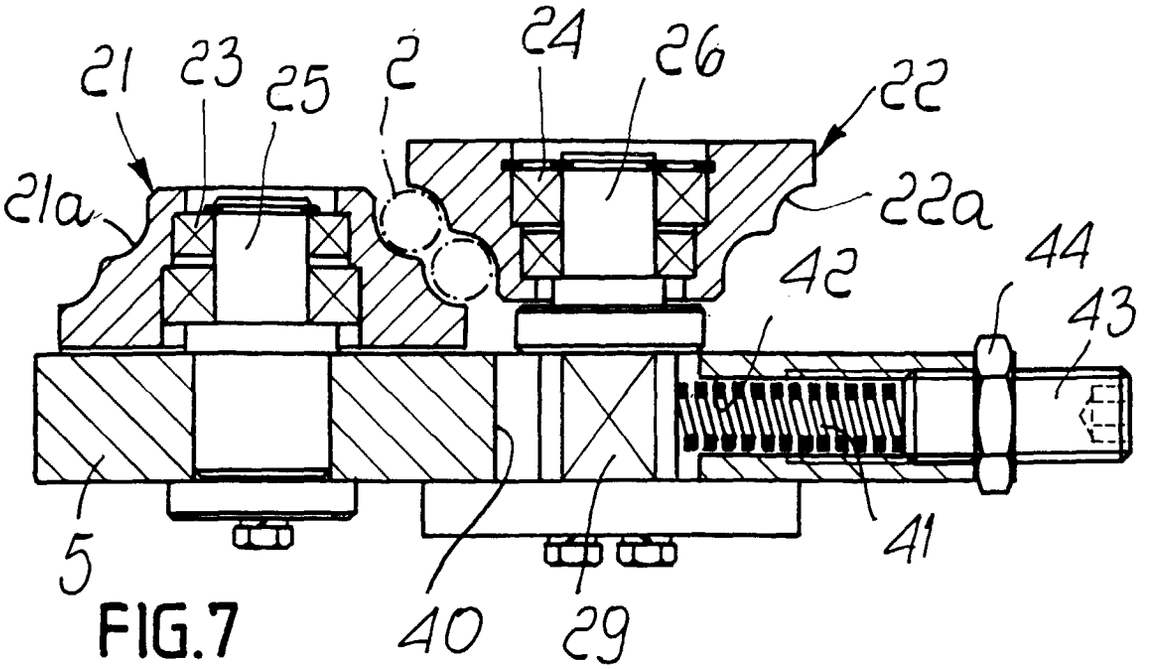

FIG.7

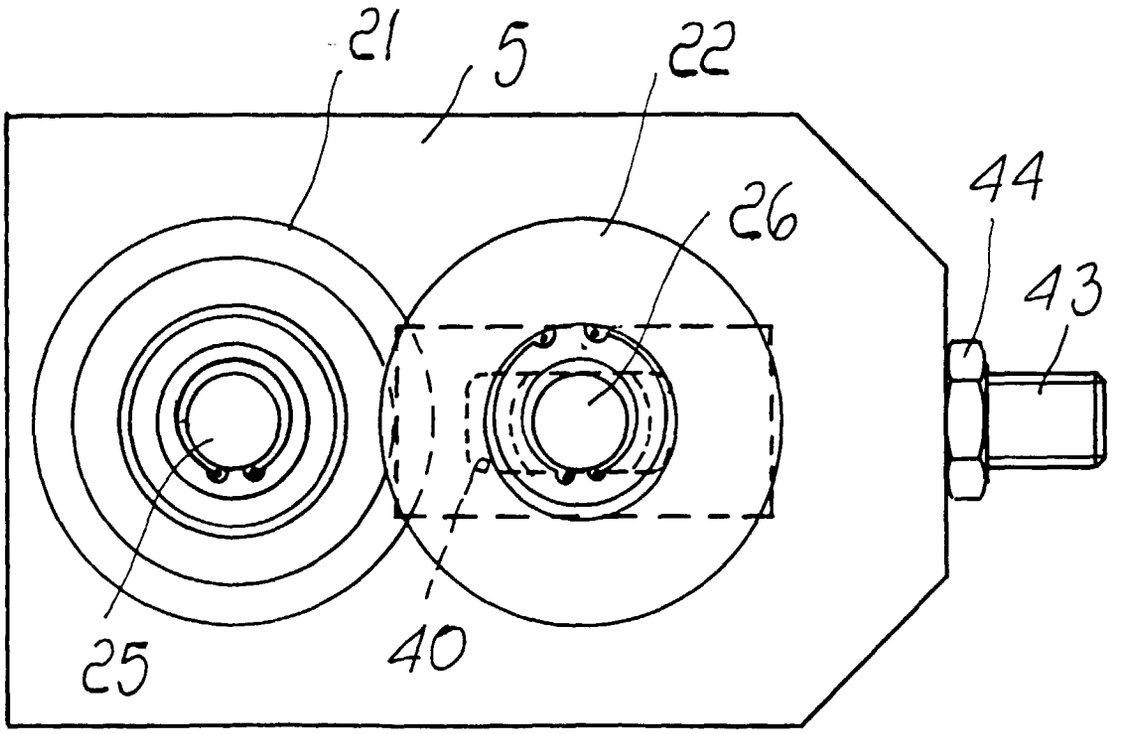

FIG.8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 11 7690

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)
A	WO 93 19865 A (EVG ENTWICKLUNG VERWERT GES ;RITTER KLAUS (AT); RITTER GERHARD (AT) * the whole document *	1	B21F1/02 B21D3/05
A	PATENT ABSTRACTS OF JAPAN vol. 010, no. 081 (M-465), 29 March 1986 & JP 60 221141 A (SHOWA DENSEN DENRAN KK), 5 November 1985, * abstract *	1	
A	US 4 464 919 A (LABBE ROBERT A)		
A	US 3 595 277 A (LEFEVER RICHARD M)		
A	DE 43 11 300 C (WITELS APPARATE MASCHINEN ALBE)		
A	US 2 746 513 A (KIESOW)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B21F
B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	30 March 1998	Gerard, O

CATEGORY OF CITED DOCUMENTS

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