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(54) **Tube bending machine**

Rohrbiegemaschine

Machine de flexion de tube

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Description

OBJECT OF THE INVENTION

[0001] The present invention relates to a machine for bending tubes of any length (short, medium or long) according to the preamble of claim 1 (see US-B1-6 434 995), without having to withdraw the tube to be bent, in order to effect curves with a different radius and/or in different bending planes.

[0002] The machine which is the subject of the present invention is also suitable for bending tubes designated as hybrid, that is to say tubes formed from lengths of metal and lengths of rubber or other non-metallic material.

THE STATE OF THE ART

[0003] Tube-bending machines are known which bend tubes by setting about the bending starting from one end of the tube to be bent and keeping the other end of said tube in the positioning device. Tubes bent with said known machines have the disadvantage of oscillating and/or undergoing deformation subsequently to bending because they are left lacking adequate support, in a so-called overhanging position, that is to say restrained at a single point and subjected to the force of gravity.

[0004] In relation to the bending of tubes generally designated hybrid, that is to say tubes formed from lengths of metal and lengths of rubber or other non-metallic material, the known tube-bending machines have great difficulty in bending said hybrid tubes, because said machines set about bending the tube starting from just one end of said tube, and the bending devices can easily touch the non-metallic parts of the tube, with the risk of damaging it.

[0005] Among tube-bending machines, an orbital machine for bending long tubes is also known, described in document US 7.093.475. Said machine includes a bending head mounted on a U-shaped arm which rotates around the horizontal axis of the tube to be bent. The machine described in said document has the disadvantage of being able to manipulate tubes of small size because the weight of the head mounted on the above-mentioned U-shaped arm must be small for structural reasons relating to the shape of said arm. Furthermore, the length of the tubes to be bent is anyway limited by the breadth of the U which constitutes the above-mentioned arm, the overall dimensions of the bent tube being limited by the breadth of the U formed by the above-mentioned arm.

[0006] The machine described in document US 7.093.475 is capable of bending tubes only in one plane of curvature, having therefore a limited productive capacity.

DESCRIPTION OF THE INVENTION

[0007] An object of the present invention is to create a machine for bending metal or hybrid tubes, that is to say tubes formed from lengths of metal and lengths of rubber or other non-metallic material, of any size and length, with characteristics which are such as to be able to overcome the disadvantages mentioned with reference to the known art.

[0008] These and other objects are achieved by means of a tube-bending machine according to claim 1.

[0009] This and other preferred characteristics will become clearer from the following description of some embodiments illustrated, purely by way of example in the attached drawings in which:

Figure 1 shows a perspective view of the whole of a tube-bending machine which is the subject of the present invention with a positioning device suitable for rotating through up to 360°;

Figure 2 shows the machine of fig. 1 highlighting the locking device and the means suitable for rotating said device up to 360° around fulcrum (F);

Figure 3 shows the machine of fig. 1 highlighting the two locking devices and the means suitable for rotating said devices up to 360° around fulcrums (F) and (G);

Figure 4 shows the machine of fig. 1 with a second bending device.

[0010] With reference to Figure 1, no. (1) indicates a machine for bending tubes, consisting of a supporting base (2) which supports a positioning device (3) for the tube to be bent (7) of wholly metallic or hybrid type, that is to say formed from lengths of metal and lengths of rubber or other non-metallic material, by one or more devices (4) for bending the tube (7) to be bent. Said positioning device (3) consists of a turret (5) and a positioning arm (6).

[0011] Said machine also includes means known to persons skilled in the art for the purpose of making the positioning device (3), by means of the translation of turret (5) and/or device (4), take up mutual positions for the purpose of allowing said device (4) to be moved, according to methods known to persons skilled in the art, for the purpose of bending said tube (7) on the basis of the preset work programme.

[0012] Said Figure 1 also shows the positioning device (3) provided with means (8) for rotating the positioning arm (6) through up to 360° around the central axis (Y) of the tube (7) to be bent, so as to be able advantageously to bend said tube (7), particularly of hybrid type, in various bending planes having in common said central axis (Y), having among other things the possibility of locking the tube in the intermediate area and being able to start indifferently from either of its ends, thus overcoming the disadvantages of the known machines.

[0013] Figure 2 shows the machine of fig. 1, highlight-

ing the positioning arm (6) equipped with a locking device (9) for the tube (7) to be bent. Said locking device (9) is provided with means (10) for rotating through up to 360° around a fulcrum (F) so as to rotate said tube (7) for the purpose of being able to bend either end of said tube (7) alternatively by means of device (4) on the basis of a preset work programme.

[0014] Figure 3 shows the machine of figure 1, demonstrating another embodiment according to which the positioning arm (6), equipped with two locking devices (12) and (13) for the tube (7) to be bent, is provided with means (10) and (11) for rotating through up to 360° around fulcrum (F) and fulcrum (G) so as to rotate said tube (7) for the purpose of being able to bend either end of said tube (7) alternatively and/or an intermediate part of said tube by means of device (4) on the basis of a preset work programme.

[0015] Figure 4 shows the machine of fig. 1, equipped with a further bending device (14) capable of moving and being moved by known movement means. Equipping machine 1 with further possibilities of bending enables a considerable increase in the possibilities of bending said tube (7).

[0016] The machine 1 can be susceptible of numerous variations particularly as regards the positioning of the elements without thereby departing from the scope of the invention as defined by the appended claims.

Claims

1. A tube-bending machine (1), comprising:

- a supporting base (2);
- a positioning device (3) for the tube (7) to be bent,
- at least one device (4) for bending the tube (7) to be bent,
- means for making the positioning device (3) and the device (4) for bending said tube (7) take up mutual positions for bending said tube (7), said positioning device (3) comprising a turret (5) and a positioning arm (6) equipped with means (8) suitable for rotating said positioning arm (6) through 360° around the central axis (Y) of the tube (7) to be bent, in order to position said tube (7) for the purpose of being bent by means of said device (4) in various bending planes **characterised in that** said positioning arm (6) is equipped with at least one locking device (9) for the tube (7) to be bent equipped with means (10) suitable for rotating said locking device (9) through up to 360° around a fulcrum (F) in order to rotate said tube (7) for the purpose of bending either end of the tube (7) alternatively by means of device (4);

2. A tube-bending machine (1) according to claim 1

characterised in that said positioning arm (6) is equipped with two locking devices (12) and (13) for the tube (7) to be bent and means (10) and (11) suitable for rotating said devices through up to 360° respectively around a fulcrum (F) and a fulcrum (G) in order to rotate said tube (7) for the purpose of bending either end of tube (7) alternatively by means of device (4);

3. A tube-bending machine (1) according to one of the preceding claims **characterised in that** it comprises at least one second bending device (14).

15 Patentansprüche

1. eine Rohrbiegemaschine (1), Folgendes umfassend:

- ein Untergestell (2);
- eine Positioniervorrichtung (3) für das zu biegende Rohr (7),
- mindestens eine Vorrichtung (4) zum Biegen des zu biegenden Rohrs (7),
- Mittel, um die Positioniervorrichtung (3) und die Vorrichtung (4) zum Biegen des besagten Rohrs (7) in zueinander passende Positionen zum Biegen des besagten Rohrs (7) zu bringen, wobei die besagte Positioniervorrichtung (3) einem Drehhalterbock (5) und einen Positionierarm (6) umfasst und mit einem Mittel (8) ausgestattet ist, das dafür geeignet ist, den besagten Positionierarm (6) um 360° um die Mittelachse (Y) des zu biegenden Rohrs (7) zu drehen, damit das besagte Rohr (7) positioniert werden kann, um es mithilfe der besagten Vorrichtung (4) in verschiedenen Biegeebenen zu biegen; **dadurch gekennzeichnet, dass** der besagte Positionierarm (6) mit mindestens einer(1) Arretierungsvorrichtung (9) für das zu biegende Rohr (7) sowie mit einem Mittel (10) ausgestattet ist, das dafür geeignet ist, die besagte Arretierungsvorrichtung (9) um bis zu 360° um eine Achse (F) zu drehen, damit das besagte Rohr (7) gedreht werden kann, um wahlweise eines seiner beiden Enden mithilfe der besagten Vorrichtung (4) zu biegen;

2. eine Rohrbiegemaschine (1) gemäß Anspruch; **dadurch gekennzeichnet, dass** der besagte Positionierarm (6) mit zwei Arretierungsvorrichtungen (12) und (13) für das zu biegende Rohr (7) sowie mit Mitteln (10) und (11) ausgestattet ist, die geeignet sind, die besagten Vorrichtungen um bis zu 360° um die Achse (F) beziehungsweise die Achse (G) zu drehen, damit das besagte Rohr (7) gedreht werden kann, um wahlweise eines seiner beiden Enden mithilfe der besagten Vorrichtung (4) zu biegen;

3. eine Rohrbiegemaschine (1) gemäß einem der vorstehenden Ansprüche; **dadurch gekennzeichnet, dass** sie mindestens eine zweite Biegevorrichtung (14) umfasst.

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Revendications

1. Machine de pliage de tubes (1) comprenant:

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- une base de support (2)
- un dispositif de positionnement (3) du tube (7) à plier,
- au moins un dispositif (4) pour plier le tube (7) à plier,
- des moyens pour faire que le dispositif de positionnement (3) et le dispositif (4) pour plier le dit tube (7) prennent des positions réciproques pour plier le dit tube (7), le dit dispositif de positionnement (3) comprenant une tourelle (5) et un bras de positionnement (6) équipé de moyens (8) aptes à tourner le dit bras de positionnement (6) complètement 10 de 360° autour de l'axe central (Y) du tube (7) à plier, afin de positionner le dit tube (7) dans le but d'être plié par le dit dispositif (4) dans différents plans de pliage **caractérisé en ce que** le dit bras de positionnement (6) est équipé avec au moins un dispositif de blocage (9) du tube à plier (7) équipé de moyens (10) aptes à tourner le dit dispositif de blocage (9) complètement jusqu'à 360° autour d'un point de levier (F) afin de tourner le dit tube (7) dans le but de plier une quelconque des extrémités du tube (7) alternativement par le dispositif (4);

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2. Machine de pliage de tubes (1) selon la revendication 1 **caractérisée en ce que** le dit bras de positionnement (6) est équipé avec deux dispositifs de blocage (12) et (13) afin que le tube (7) soit plié avec les moyens (10) et (11) en mesure de tourner les dits dispositifs complètement jusqu'à 360° respectivement autour d'un point de levier (F) et d'un point de levier (G) afin de tourner le dit tube (7) dans le but de plier alternativement une des extrémités du tube (7) avec le dispositif (4);
3. Machine de pliage de tubes (1) selon l'une quelconque des revendications précédentes **caractérisée en ce qu'**elle comprend au moins un deuxième dispositif de pliage (14).

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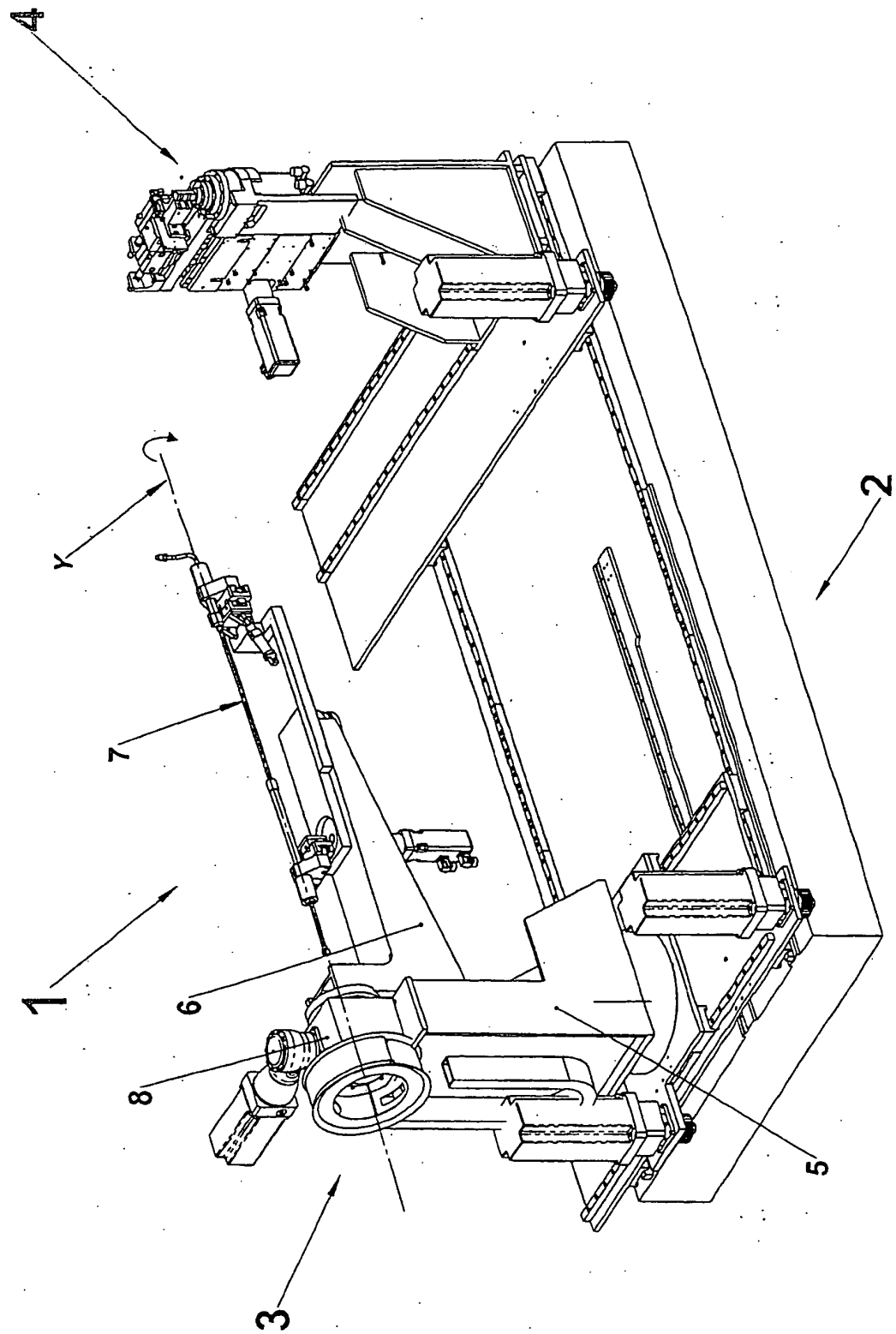


Fig. 1

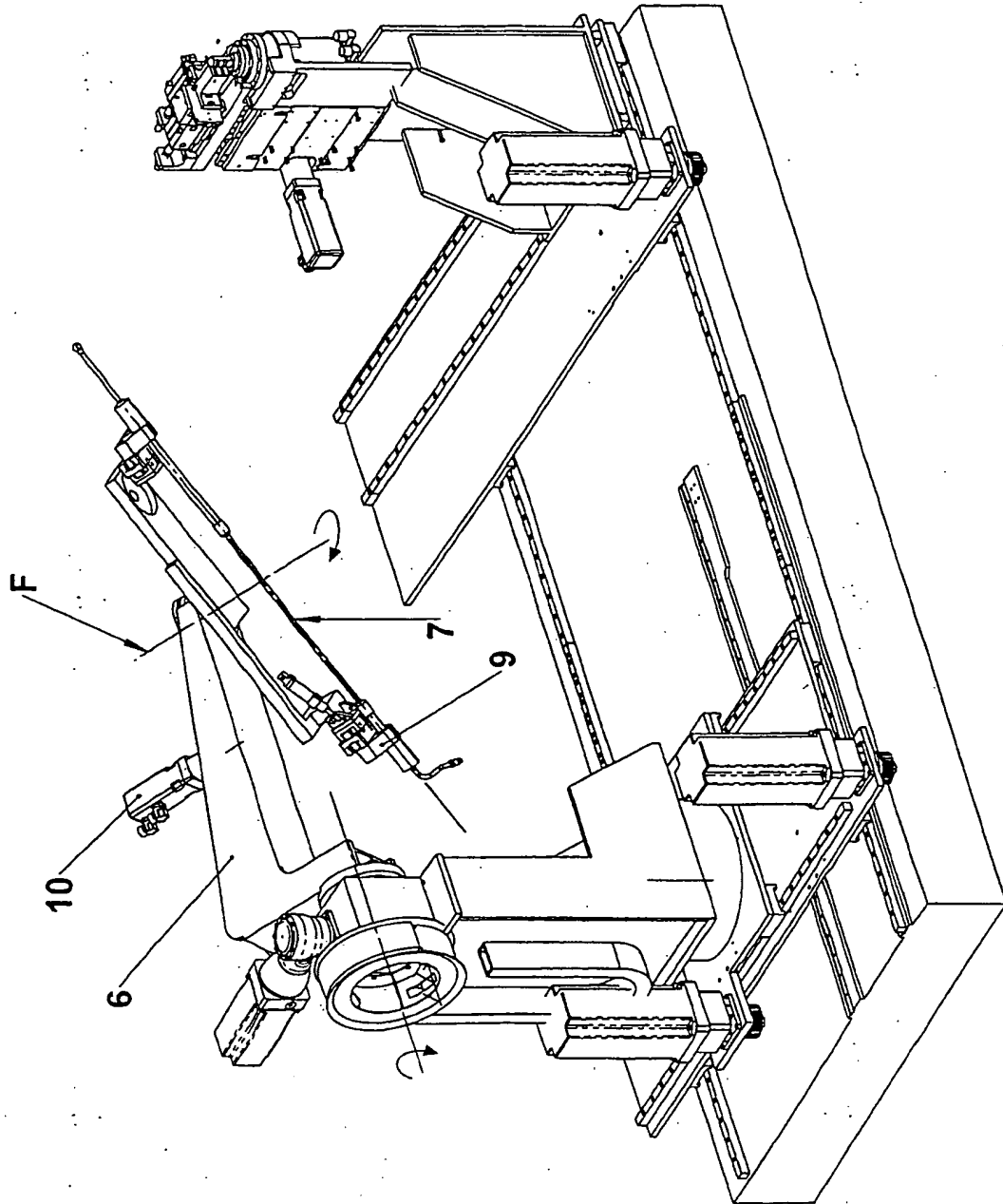


Fig. 2

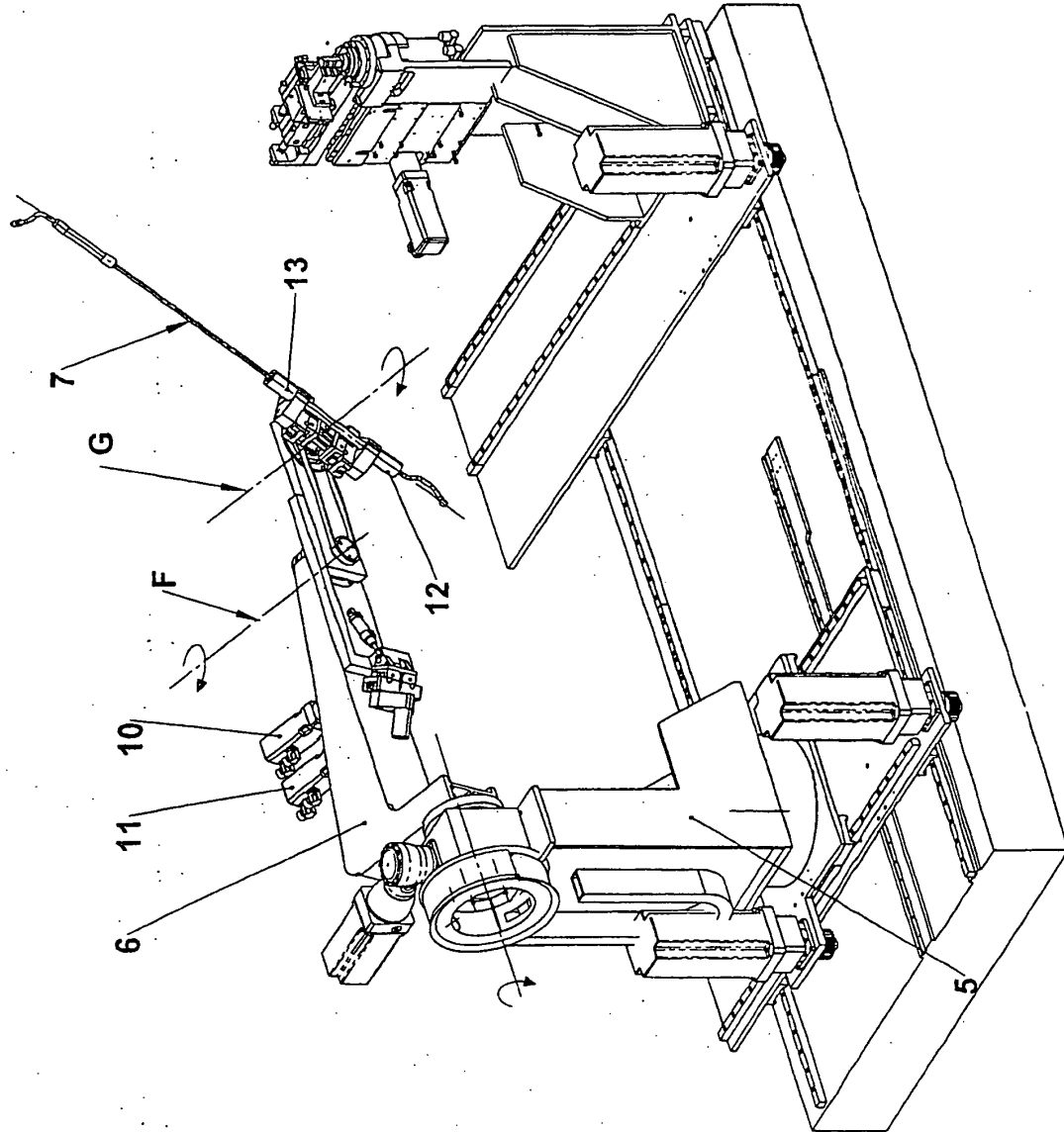
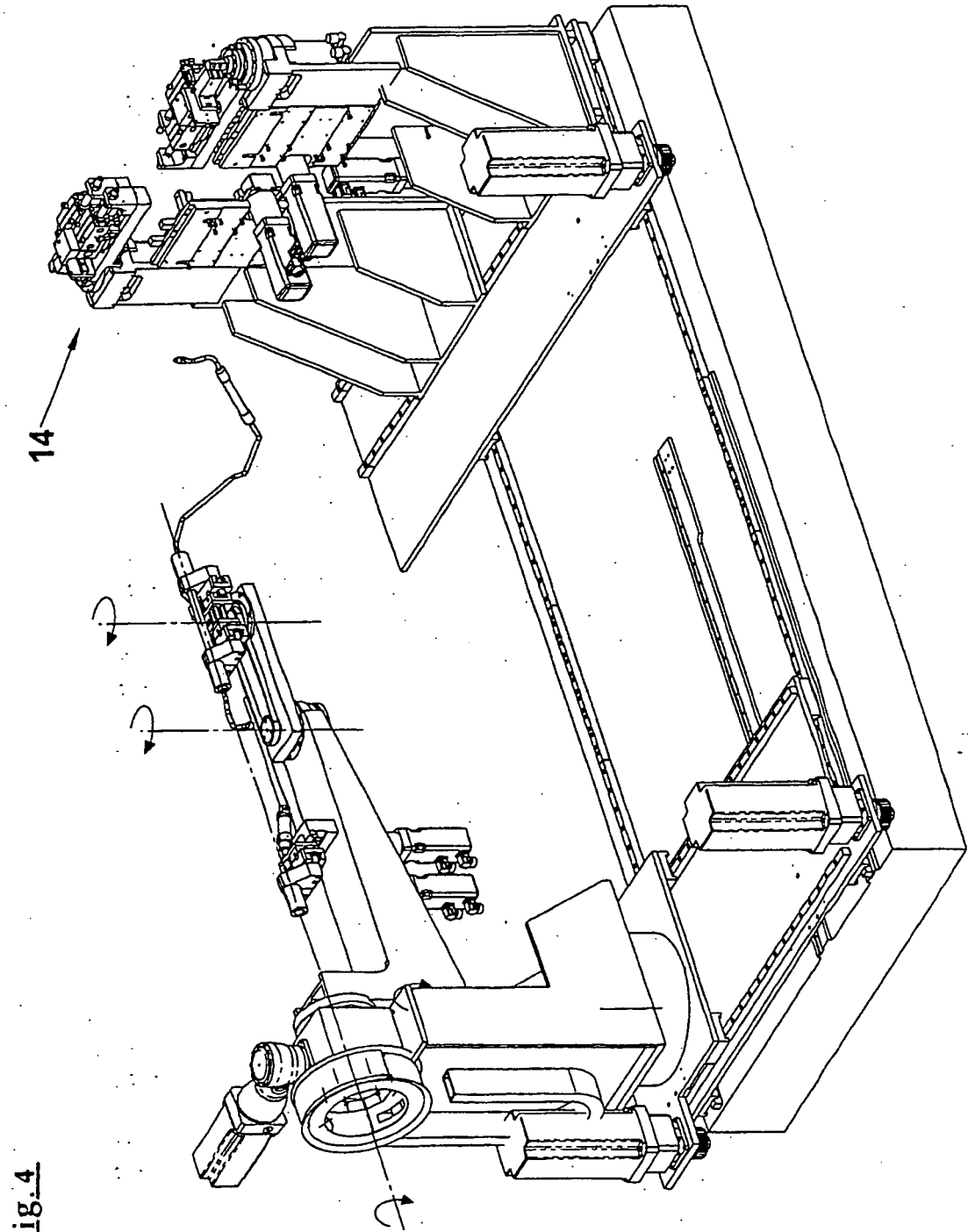


Fig.3



REFERENCES CITED IN THE DESCRIPTION

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