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(54) EQUIPMENT FOR THE MECHANICAL FORMING OF SHEET-SHAPED ELEMENTS

(57) The piece of equipment (1) for the mechanical machining of sheet-shaped elements comprises:
- a press bending machine (2) having:
- a bearing structure (3) which has a work surface (4) having a containment seat (5) for containing a portion to be bent (6a) of a sheet-shaped element (6) to be bent;
- pressing means (7) associated in a movable manner with the bearing structure (3) along a direction of sliding (A) moving close to / away from the work surface (4) and adapted to bend the portion to be bent (6a);
- a central management unit operatively connected to said pressing means (7) and programmed to control the movement thereof along said direction of sliding (A);

- an accompanying device (8) having:
- a base frame (9) for resting on the ground;
- a supporting surface (10) of the sheet-shaped element (6) associated with the base frame (9) and movable in rotation with respect to a relative axis of oscillation (B);
- actuating means (11) for actuating the rotation of the supporting surface (10) with respect to the axis of oscillation (B);

wherein the accompanying device (8) comprises:
- detection means (12) for detecting the position of the pressing means (7) along the direction of sliding (A); and
- at least an independent management unit, distinct from the central management unit and programmed for the adjustment of the rotation of the supporting surface (10) depending on the position detected by the detection means (12).

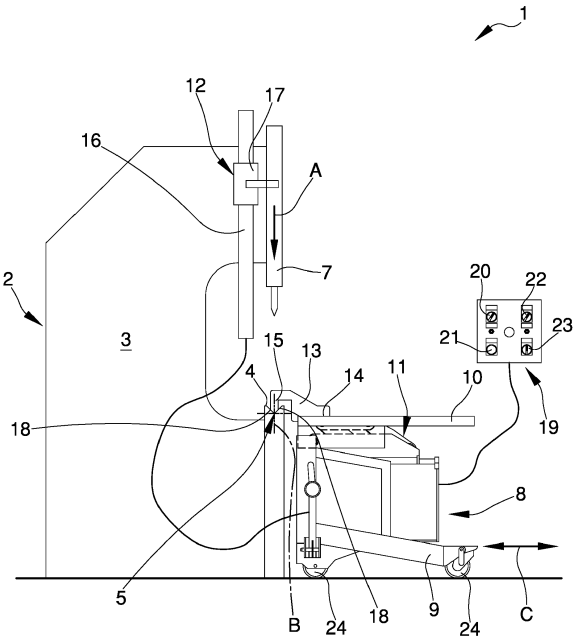


Fig.1

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Description

[0001] The present invention relates to a piece of equipment for the mechanical machining of sheet-shaped elements in metal material or the like.

[0002] In the particular sector of the machining and, in particular, bending of sheet-shaped elements with varying thicknesses, equipment is known comprising pressing-bending machines having a bearing structure which defines a work surface designed to support the sheet-shaped elements to be machined, such as metal sheets, metal, plastic products or the like, and pressing means of the type of a work tool, such as e.g. a punch, a shaping or cutting element, movable with respect to the bearing structure nearer and away from the supporting surface.

[0003] In order to make the bending operations of the sheet-shaped elements easier and more practical and faster, the equipment of known type comprises at least an accompanying device adapted to support and accompany the portion of the sheet-shaped element not included in the bending operations, in particular in those cases in which the dimensions of the sheet-shaped element are particularly high.

[0004] Generally, the accompanying devices of known type are placed on the front part of the bearing structure of the press bending machine and comprise a base frame made of metal material, mounted on the bearing structure, with which is associated at least a supporting surface, made e.g. of sheet metal, arranged at the work surface.

[0005] The supporting surface is adapted to support and accompany the sheet-shaped elements during the bending phase in which the sheet-shaped element elevates with respect to a reference position in which it is substantially extended and horizontal.

[0006] In particular, the supporting surface is movable in rotation with respect to a relative axis of oscillation between a reference position, in which it is substantially horizontal and the pressing means rest at the portion to be bent, and a work position in which the supporting surface rotates around the axis of oscillation substantially positioning itself inclined with respect to the reference position.

[0007] In such work position the supporting surface is adapted to accompany the sheet-shaped element during the bending phase of the portion to be bent.

[0008] Generally, the accompanying devices are rigidly connected to the front part of the press bending machine by means of suitable linear guides chosen by the operator according to the dimensions of the sheet-shaped elements.

[0009] In the cases in which the use of the accompanying devices is not actually necessary, the accompanying devices can be demounted from the bearing structure or placed in a non-operative position, wherein the accompanying element does not obstruct the front part of the bearing structure, enabling the operator to have freedom of manual handling and forward movement above the work surface of the sheet-shaped elements during the relative bending operations.

[0010] The accompanying devices of known type also have controlled and independent movement such as to allow the rotation of the supporting surface in perfect synchrony with the elevation of the sheet-shaped element during the bending phase of the portion to be bent, sustaining and accompanying the surface of the sheet-shaped element adjacent to the portion to be bent.

[0011] The accompanying devices permit supporting the sheet-shaped elements to be bent, including very thick, simplifying and making easier the manual operations performed by the operators to support and guide the sheet-shaped elements during the bending operations performed by means of the pressing means and preventing any falls and/or slipping of the sheet-shaped elements during such operations.

[0012] The equipment of known type is equipped with a suitable management unit adapted to command the movement of the pressing means along the direction of sliding and, at the same time, the rotation of the supporting surface during the bending operations of the portion to be bent.

[0013] The synchronism between the bending and rotation operations of the supporting surface permits avoiding the damaging counter bending of the sheet-shaped elements when pressing is performed with inching operation or suddenly stopped.

[0014] Further types of equipment of known type are described in the patent documents JPS60162527, JPS59147716 and EP0249775.

[0015] This equipment of known type does however have a number of drawbacks.

[0016] The main drawback is tied to the fact that the equipment of known type has one or more accompanying devices, the operation of which is closely tied to the operation of the press bending machine.

[0017] More precisely, the press bending machine has a numerical management unit adapted to command the operation of the accompanying device and the operation of the press bending machine itself in a simultaneous way the one to the other.

[0018] Another drawback is tied to the complexity and low flexibility and versatility of use in the cases when, for example, it is necessary to use the accompanying devices on different press bending machines made by different manufacturers.

[0019] Another drawback is the higher cost of such equipment, this being provided with a dedicated accompanying device and commanded by the same numerical management unit.

[0020] The main aim of the present invention is to provide a piece of equipment for the mechanical machining of sheet-shaped elements which is versatile and easily adaptable to the dimensional characteristics of the sheet-shaped elements to be machined.

[0021] Within such aim, one object of the present invention is to provide a piece of equipment for the me-

chanical machining of sheet-shaped elements having an accompanying device with independent operation with respect to the operation of the machine, in such a way as to allow its installation and correct functional synergy with any available press bending machine.

[0022] Another object of the present invention is to provide a piece of equipment for the mechanical machining of sheet-shaped elements which allows to overcome the aforementioned drawbacks of the prior art within the ambit of a simple, rational, easy, efficient to use and cost-effective solution.

[0023] The aforementioned objects are achieved by the present piece of equipment for the mechanical machining of sheet-shaped elements having the characteristics of claim 1.

[0024] Other characteristics and advantages of the present invention will become more evident from the description of a preferred, but not exclusive, embodiment of a piece of equipment for the mechanical machining of sheet-shaped elements, illustrated by way of an indicative, but non-limiting example, in the attached drawings in which:

Figure 1 is a side view of a piece of equipment according to the invention in a configuration of alignment of the accompanying device with respect to the bearing structure;
Figure 2 is a side view of the piece of equipment according to the invention in a reference position;
Figure 3 is a side view of the piece of equipment according to the invention in a work position;
Figure 4 is a side view of the piece of equipment according to the invention in a reference position.

[0025] With particular reference to these illustrations, reference numeral 1 globally indicates a piece of equipment for the mechanical machining of sheet-shaped elements.

[0026] The piece of equipment 1 comprises a press bending machine 2 having a bearing structure 3 which has a work surface 4 having a containment seat 5 for containing a portion to be bent 6a of a sheet-shaped element 6.

[0027] The machine 2 comprises pressing means 7 which are associated in a movable manner with the bearing structure 3 along a direction of sliding A moving close to / away from the work surface 4 and adapted to bend the portion to be bent 6a. More particularly, the pressing means 7 are movable vertically in translation.

[0028] Such pressing means 7 can, for example, be of the type of a punch for bending the portion to be bent 6a, of a cutting blade or made up of a forming element, adapted to give the sheet-shaped element 6 a particular shape.

[0029] The machine 2 is provided with a central management unit operatively connected to the pressing means 7 and programmed to control the movement thereof along the direction of sliding A.

[0030] Such central management unit is of the type of a numerical management unit having a programmable logic dedicated to the movement of the pressing means 7 for bending the portion to be bent 6a.

[0031] The piece of equipment 1 also comprises an accompanying device 8 having:

- a base frame 9 for resting on the ground;
- a supporting surface 10 of the sheet-shaped element 6 associated with the base frame 9 and movable in rotation with respect to a relative axis of oscillation B; and
- actuating means 11 for actuating the rotation of the supporting surface 10 with respect to the axis of oscillation B.

[0032] In detail, the piece of equipment 1 comprises movement means 24, in turn comprising at least two wheels associated with the base frame 9 to move the accompanying device 8 along a moving nearer and/or away direction, indicated in the illustrations by the arrow R, with respect to the machine 2.

[0033] With reference to the particular embodiment solution, the wheels 24 are associated below the base frame 9.

[0034] The base frame 9 has a plurality of wheels for relative movement and ground anchoring means.

[0035] It cannot however be ruled out that the base frame 9 be equipped with removable fastening means for fastening in fixed position to the bearing structure 3.

[0036] Usefully, the accompanying device 8 comprises adjustment means for adjusting the height of the supporting surface 10 with respect to the axis of oscillation B. Such adjustment means can, for example, be of the type of a handwheel keyed to means for the vertical translation of the supporting surface 10.

[0037] The actuating means 11 are, for example, of the type of an electric motor operatively keyed to a ball-bearing screw with which the bottom face of the supporting surface 10 is associated.

[0038] Such screw is adapted to the rotation of the supporting surface 10 with respect to the axis of oscillation B.

[0039] Advantageously, the piece of equipment 1 comprises detection means 12 adapted to detect the position of the pressing means 7 along the direction of sliding A.

[0040] The accompanying device 8 comprises an independent management unit, distinct and independent from the central management unit, and programmed for the adjustment of the rotation of the supporting surface 10 depending on the position detected by the detection means 12.

[0041] Preferably, the independent management unit is of the type of a programmable logic unit, commonly known by the code PLC.

[0042] Alternative embodiments cannot however be ruled out wherein the independent management unit is of the type of a micro controller or of a micro processor. The detection means 12 comprise a detector device adapted to detect the position of the pressing means 7

along the direction of sliding A and operatively connected to the independent management unit, the latter being programmed to command the actuating means 11 depending on the position detected by the detector device 12.

[0043] Advantageously, the detector device 12 comprises a position transducer having a fixed part 16, associated with the bearing structure 3, and a movable part 17, associated with the pressing means 7.

[0044] Preferably, the detector device 12 is of the type of an optical scale having the fixed part 16 and the movable part 17.

[0045] Alternative embodiments cannot however be ruled out wherein the detector device 12 is e.g. of the type of a proximity sensor, an optical sensor or the like. The piece of equipment 1 comprises removable positioning means 13 for the positioning of the accompanying device 8 with respect to the machine 2 depending on the axis of oscillation B in a configuration of alignment.

[0046] In other words, the removable positioning means 13 permit the correct positioning of the base frame 9, suitably spaced apart from the bearing structure 3 so that the position of the supporting surface 10 is such that the relative rotation occurs around the axis of oscillation B.

[0047] In the particular embodiment shown in the illustrations, the removable positioning means 13 comprise at least a coupling body provided with a first abutment surface 14, arranged in contact with at least a portion of the supporting surface 10, and a second abutment surface 15, arranged in contact with at least a portion of the work surface 4.

[0048] More in detail, the first abutment surface 14 is arranged in contact with a portion of the supporting surface 10, turned towards the bearing structure 3, while the second abutment surface 15 is arranged in contact with the containment seat 5.

[0049] The first abutment surface 14 has a substantially angular profile, which in the configuration of alignment is arranged in contact with at least two faces of the supporting surface 10 at right angles to one another.

[0050] The second abutment surface 15 has a pointed profile substantially complementary with the profile of the containment seat 5, in such a way as to enable its substantial fitting to measure inside the containment seat itself in the configuration of alignment.

[0051] In such configuration of alignment, the accompanying device 8 is positioned in such a way that the axis of oscillation B is substantially arranged inside the containment seat 5.

[0052] It therefore follows that the accompanying device 8 can be associated with the machine 2, that the base frame 9 can be fixed to the front part of the bearing structure 3 or that it is arranged at the front part of the bearing structure 3 but detached from it.

[0053] The independent management unit comprises acquisition means of at least a reference position of the pressing means 7 with respect to the containment seat 5, and of at least a work position, in which the pressing means 7 are movable downwards along the direction of sliding A starting from the reference position. The signals relating to the reference position and to the work position are provided by the detector device 12 to the acquisition means.

[0054] Within the scope of the present treatise, by the expression reference position is meant the particular position of the pressing means 7, movable along the direction of sliding A and arranged in contact with the portion to be bent 6a, which in turn is arranged at the containment seat 5.

[0055] More in detail, in such reference position, the portion to be bent 6a is extended and resting on the work surface 4 above the containment seat 5 and the pressing means 7 contact the portion to be bent 6a in a contact point.

[0056] Within the scope of the present treatise, by the expression work position is meant the interval within which the pressing means 7 are movable inside the containment seat 5 starting from the reference position as far as the bottom surface of the containment seat itself.

[0057] The independent management unit comprises storage means for storing the reference position.

[0058] In particular, the storage means are adapted to store the position of the pressing means 7 at the contact point.

[0059] The storage of the data relating to the reference position in the contact point is done every time the sheet-shaped element 6 structurally changes, in particular in terms of thickness.

[0060] The independent management unit comprises calculation means of the data relating to the variation in the position of the pressing means 7 between the reference position and the work position, the calculation means being adapted to actuate the actuating means 11 for the rotation of the supporting surface 10 depending on such data.

[0061] More in detail, the values provided by the acquisition means define the interval of movement of the pressing means 7 between the point of contact with the sheet-shaped element in the reference position and the point of contact of the portion to be bent 6a with the surface of the containment seat 5 at the end of bending.

[0062] The calculation means comprise at least a software program for processing the data relating to the change between the reference position and the work position and for providing a signal of activation of the actuating means 11.

[0063] The containment seat 5 has a substantially elongated shape along the work surface 4 and the axis of oscillation B extends substantially longitudinally to the containment seat 5.

[0064] Furthermore, the containment seat 5 comprises a pair of walls 18 converging towards the axis of oscillation B defined inside the containment seat itself.

[0065] The mutual position of such walls 18 defines the opening and the shape of the containment seat 5.

[0066] The calculation means are operatively connect-

ed to the actuating means 11 for the relevant switch between:

- a first configuration, in which the pressing means 7 are arranged in the reference position and steady in contact with the portion to be bent 6a at the point of contact, the actuating means 11 are deactivated and the supporting surface 10 is arranged substantially horizontal; in such a first configuration the storage means being adapted to store and provide the reference position to the calculation means; and
- a second configuration, in which the pressing means 7 are movable, starting from the reference position, to the work position inside the containment seat 5 at a predefined descent speed, and in which the actuating means 11 are activated by means of the calculation means for the rotation of the supporting surface 10 at a relative predefined angular rotation speed.

[0067] In the switch from the first configuration to the second configuration, the actuating means 11 are adapted to start the rotation of the supporting surface 10 with respect to the axis of oscillation B in such a way that, in the switch of the pressing means 7 from the reference position to the work position, the rotation of the supporting surface 10 accompanies the elevation of the sheet-shaped element 6 with a predefined angular rotation speed proportionate to the predefined descent speed of the pressing means 7 along the direction of sliding A.

[0068] Usefully, the independent management unit comprises control means operatively connected to the actuating means 11 for the adjustment of the angular rotation speed of the supporting surface 10 depending on the opening angle.

[0069] In particular, the control means affect the operation of the actuating means 11 by adjusting the angular rotation speed provided to the supporting surface 10, in such a way as to keep the supporting surface itself in contact with the sheet-shaped element 6 during the bending of the portion to be bent 6a.

[0070] More in detail, depending on the size of the opening angle and on the thickness of the sheet-shaped element 6, the descent speed of the pressing means 7 along the direction of sliding A being equal, the bending of the portion to be bent 6a inside the containment seat 5 results in the sheet-shaped element 6 having an elevation speed higher than the angular rotation speed of the supporting surface 10 defined by the actuating means 11.

[0071] Within the scope of the present treatise, by the expression elevation speed is meant the change over time of the position of the sheet-shaped element 6, adjacent to the portion to be bent 6a, during the relative inclination upwards with respect to the reference position in which it is horizontally arranged. Preferably, the control means are of the type of a potentiometer adjustable by the operator to control the angular rotation speed of the supporting surface 10. In the preferred embodiment shown in the illustrations, the piece of equipment 1 comprises a piloting device 19 operatively connected to the independent management unit and having at least one of:

- a first selector element 20 operable by an operator for the manual command of the actuating means 11;
- a second selector element 21 operable by the operator for the command of the storage means;
- a third selector element 22 operable by the operator for the transmission of the opening value of the containment seat 5 to the independent management unit;
- a fourth selector element 23 operable by the operator for the adjustment of the control means and of the angular rotation speed of the supporting surface 10 depending on the opening angle.

[0072] In the embodiment shown in the illustrations, the piloting device 19 is of the type of a console provided with the selector elements 20, 21, 22, 23 and operatively connected to the independent management unit.

[0073] In particular, the first selector element 20 enables the operator to perform manually or automatically the rotation of the supporting surface 10 around the axis of oscillation B.

[0074] In the case of manual operation of the accompanying device 8, the operator can freely rotate the supporting surface 10 by means of a suitable manual command device.

[0075] Such manual command device can be integrated in the piloting device 19 or, alternatively, in the base frame 9.

[0076] In both cases, the manual command device is operatively connected to the actuating means 11.

[0077] In the event of automatic operation mode being selected, by means of the second selector element 21, the operator enables the storage of the data relating to the reference position defined by the point of contact of the pressing means 7 with the sheet-shaped element 6.

[0078] In particular, the automatic operation mode provides for an initial calibration phase in which the pressing means 7 are moved, by means of the manual command of the operator, along the direction of sliding A at the portion to be bent 6a.

[0079] The operator, by means of the operation of the second selector element 21, allows the storage means detecting the reference position.

[0080] Starting from the reference position, the pressing means 7 are movable to the work position downwards inside the containment seat 5 and the calculation means are adapted to activate the actuating means 11 according to the data relating to the variation between the reference position and the work position. The operator provides to the independent management unit the opening value of the containment seat 5 by means of the third selector element 22 and adjusts the angular rotation speed of the supporting surface 10 by means of the fourth selector

element 23, so that the angular rotation speed substantially coincides with the elevation speed of the sheet-shaped element 6.

[0081] The third selector element 22 can be of the type of a numerical keypad adjustable by the operator and operatively connected to the independent management unit.

[0082] At the end of the initial calibration phase, the piece of equipment 1 can be used in the automatic operation mode as long as the structural characteristics of the sheet-shaped element 6 and the opening of the containment seat 5 remain unchanged. Otherwise, it will be necessary to again proceed with a new initial calibration phase.

[0083] The present invention also describes a method for the mechanical machining of sheet-shaped elements, comprising the steps of:

- providing the piece of equipment 1;
- positioning the accompanying device 8 with respect to the machine 2 in the configuration of alignment;
- providing the sheet-shaped element 6 arranged resting at least in part on the supporting surface 10 and on the work surface 4;
- arranging the pressing means 7 at the portion to be bent 6a in the reference position;
- storing the reference position, by means of the acquisition means, provided by the detector device 12;
- detecting the work position, provided by the detector device 12, in which the pressing means 7 are movable downwards along the direction of sliding A, starting from the reference position for the bending of the portion to be bent 6a;
- adjusting the angular rotation speed depending on the data relating to the variation of the position of the pressing means 7 in the work position and of the opening value of the containment seat 5, so as to command the actuating means 11 for the rotation of the supporting surface 10 depending on such data.

[0084] In particular, during the positioning of the accompanying device 8 in the alignment position with respect to the machine 2, the removable positioning means 13 are interposed between the accompanying device 8 and the machine 2 and, in particular, the angular profile of the abutment surface 14 is arranged in abutment with the portions of at least two faces transversal to each other of the supporting surface 10.

[0085] The abutment protrusion 15 is fitted to measure and in contact with the pair of walls 18 of the containment seat 5.

[0086] In such configuration of alignment, the accompanying device 8 is positioned in such a way that the axis of oscillation B is substantially arranged inside the containment seat 5.

[0087] At the end of positioning, wherein the removable positioning means 13 are removed, the supply follows of the sheet-shaped element 6, to be substantially arranged above the supporting surface 10.

[0088] More in detail, during the arrangement phase, the portion to be bent 6a is arranged, by means of manual movement by the operator, on the work surface 4 at the containment seat 5, while the part of the sheet-shaped element not involved in the bending operation is arranged on the supporting surface 10.

[0089] In the movement phase, the pressing means 7 are movable downwards along the direction of sliding A at a substantially constant sliding speed defined by means of the central management unit until contact is made with the portion to be bent 6a in the reference position.

[0090] More in detail, in the reference position, the central management unit interrupts the movement of the pressing means 7 by means of the manual control of the operator and the operator acquires the reference position by pressing the second selector element 21.

[0091] In the storage phase in fact, the quota of the pressing means 7 arranged resting on the portion to be bent 6a, without any pressing or deforming action being applied of the portion to be bent itself, is stored by means of the storage means of the independent management unit.

[0092] Starting from the reference position, the central management unit commands the descent of the pressing means 7 towards the inside of the containment seat 5 for the bending of the portion to be bent 6a.

[0093] In particular, the central management unit is adapted to command the descent of the pressing means 7 at the predefined descent speed.

[0094] Preferably, the descent speed of the pressing means 7 is substantially equal to 10 mm/s, but a descent speed with different values cannot be ruled out.

[0095] The calculation then follows of the data relating to the change in position of the pressing means 7 from the reference position to the work position to command the actuating means 11.

[0096] The switch from the reference position to the work position results in the actuating means 11 being activated by means of the independent management unit for the rotation of the supporting surface 10 at the predefined angular rotation speed, in such a way that the sheet-shaped element 6, which elevates with respect to the reference position with the forward movement of the bending of the portion to be bent 6a, is accompanied and held by the supporting surface 10.

[0097] In the work position, the pressing means 7 are movable downwards along the direction of sliding A as far as the position calculated by the central management unit of the machine.

[0098] The phase of adjustment of the angular rotation speed permits ensuring the supporting surface 10 rotates with respect to the axis of oscillation B with an angular rotation speed proportionate to the elevation speed of the sheet-shaped element 6 and that the supporting surface 10 maintains contact with and accompanies the

sheet-shaped element 6 during the bending of the portion to be bent 6a.

[0099] Preferably, the adjustment phase is performed by the operator by operating the fourth selector element 23 by means of which it is possible to intervene on the control means, in turn connected to the actuating means 11, to change the angular rotation speed.

[0100] It has in practice been ascertained how the described invention achieves the intended objects and in particular the fact is underlined that the equipment made this way is equipped with an accompanying device and detection means, the operation of which is totally independent from the operation of the press bending machine.

[0101] It can be easily appreciated that, according to need, the accompanying device and the detection means can be installed on any press bending machine available on the market.

[0102] It therefore follows that the present invention has greater flexibility and versatility of use, simplifying the installation operations and the costs to be borne by customers.

Claims

1. A piece of equipment (1) for the mechanical machining of sheet-shaped elements, comprising:

- at least a press bending machine (2) having:

  - at least a bearing structure (3) which has a work surface (4) having at least a containment seat (5) for containing at least a portion to be bent (6a) of a sheet-shaped element (6) to be bent;
  - pressing means (7) associated in a movable manner with said bearing structure (3) along a direction of sliding (A) moving close to / away from said work surface (4) and adapted to bend said portion to be bent (6a);
  - at least a central management unit operatively connected to said pressing means (7) and programmed to control the movement thereof along said direction of sliding (A);

- at least an accompanying device (8) having:

  - at least a base frame (9) for resting on the ground;
  - at least a supporting surface (10) of said sheet-shaped element (6) associated with said base frame (9) and movable in rotation with respect to a relative axis of oscillation (B);
  - actuating means (11) for actuating the rotation of said supporting surface (10) with respect to said axis of oscillation (B);

characterized by the fact that said accompanying device (8) comprises:

- detection means (12) for detecting the position of said pressing means (7) along said direction of sliding (A); and
- at least an independent management unit, distinct from said central management unit and programmed for the adjustment of the rotation of said supporting surface (10) depending on the position detected by said detection means (12).

2. The piece of equipment (1) according to claim 1, **characterized by** the fact that it comprises removable positioning means (13) interposable between said machine (2) and said accompanying device (8) for the positioning of said accompanying device (8) in a configuration of alignment with respect to said machine (2) depending on said axis of oscillation (B).

3. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said removable positioning means (13) comprise at least a first abutment surface (14) arranged in contact with at least a portion of said supporting surface (10) and at least a second abutment surface (15) arranged in contact with at least a portion of said work surface (4).

4. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said detection means (12) comprise at least a detector device (12) adapted to detect the position of said pressing means (7) along said direction of sliding (A) and operatively connected to said independent management unit, the latter being programmed to command said actuating means (11) depending on the position detected by said detector device (12), and by the fact that said detector device (12) comprises at least a position transducer having a fixed part (16) associated with said bearing structure (3) and a part associated with said pressing means (7) with respect to said fixed part (16), said detector device (12) being adapted to provide to said independent management unit the values relating to the detected position of said movable part (17) with respect to said fixed part (16).

5. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said independent management unit comprises:

- acquisition means of at least a reference position of said pressing means (7) with respect to said containment seat (5) and of at least a work position, in which said pressing means (7) are

movable downwards along said direction of sliding (A) starting from said reference position;
- storage means for storing said reference position;
- calculation means of data relating to the variation in the position of said pressing means (7) from said reference position to said work position, said calculation means being adapted to actuate said actuating means (11) for the rotation of said supporting surface (10) depending on said data.

6. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said actuating means (11) are switchable between:

- a first configuration, in which said pressing means (7) are arranged in said reference position, said actuating means (11) are deactivated and said supporting surface (10) is arranged substantially horizontal; and
- a second configuration, in which said pressing means (7) are arranged in said work position, said actuating means (11) are active and adapted to rotate said supporting surface (10) at a relative angular rotation speed.

7. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that said containment seat (5) has a substantially elongated shape along said work surface (4) and said axis of oscillation (B) extends substantially longitudinally to said containment seat (5), said containment seat (5) comprising a pair of walls (18) converging towards said axis of oscillation (B).

8. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that it comprises at least a piloting device (19) operatively connected to said independent management unit and having at least one of:

- a first selector element (20) operable by an operator for the manual command of said actuating means (11);
- a second selector element (21) operable by said operator for the command of said storage means;
- a third selector element (22) operable by said operator for the transmission of the opening value of said containment seat (5) to said independent management unit;
- a fourth selector element (23) operable by said operator for the adjustment of said actuating means (11) and of the angular rotation speed of said supporting surface (10).

9. The piece of equipment (1) according to one or more of the preceding claims, **characterized by** the fact that it comprises movement means (24), in turn comprising at least two wheels (24) associated with said base frame (9) to move said accompanying device (8) along a moving nearer and/or away direction (R) with respect to said machine (2).

10. An accompanying device (8) for press bending machines (2) of the type having:

- at least a bearing structure (3) which has a work surface (4) having at least a containment seat (5) of at least a portion to be bent (6a) of a sheet-shaped element (6) to be bent;
- pressing means (7) associated movable with said bearing structure (3) along a direction of sliding (A) moving close to / away from said work surface (4) and adapted to bend said portion to be bent (6a);

said accompanying device (8) having:

- at least a base frame (9) for resting to the ground;
- at least a supporting surface (10) of said sheet-shaped element (6) associated with said base frame (9) and movable in rotation with respect to a relative axis of oscillation (B);
- actuating means (11) for actuating the rotation of said supporting surface (10) with respect to said axis of oscillation (B);

and being **characterized by** the fact that it comprises:

- detection means (12) for detecting the position of said pressing means (7) along said direction of sliding (A); and
- at least an independent management unit and programmed for the adjustment of the rotation of said supporting surface (10) depending on the position detected by said detection means (12).

11. The accompanying device (8) according to claim 10, **characterized by** the fact that it comprises removable positioning means (13) for the positioning of said accompanying device (8) in a configuration of alignment with respect to said machine (2) depending on said axis of oscillation (B).

12. The accompanying device (8) according to one or more of claims 10 and 11, **characterized by** the fact that said removable positioning means (13) comprise at least a first abutment surface (14) arranged in contact with at least a portion of said supporting surface (10) and at least a second abutment surface

(15) arranged in contact with at least a portion of said work surface (4).

13. The accompanying device (8) according to one or more of claims 10 to 12, **characterized by** the fact that said independent management unit comprises:

- acquisition means of at least a reference position of said pressing means (7) with respect to said containment seat (5), and of at least a work position, in which said pressing means (7) are movable downwards along said direction of sliding (A) starting from said reference position, said reference position and said work position being provided by said detector device (12);
- storage means for storing said reference position;
- calculation means of data relating to the variation in the position of said pressing means (7) from said reference position to said work position, said calculation means being adapted to actuate said actuating means (11) for the rotation of said supporting surface (10) depending on said data.

14. The accompanying device (8) according to one or more of claims 10 to 13, **characterized by** the fact that said independent management unit comprises control means of said actuating means (11) for the adjustment of the angular rotation speed of said supporting surface (10).

15. The accompanying device (8) according to one or more of claims 10 to 14, **characterized by** the fact that it comprises at least a piloting device (19) operatively connected to said independent management unit and having at least one of:

- a first selector element (20) operable by an operator for the manual command of said actuating means (11);
- a second selector element (21) operable by said operator for the command of said storage means;
- a third selector element (22) operable by said operator for the transmission of the opening value of said containment seat (5) to said independent management unit;
- a fourth selector element (23) operable by said operator for the adjustment of said actuating means (11) and of the angular rotation speed of said supporting surface (10).

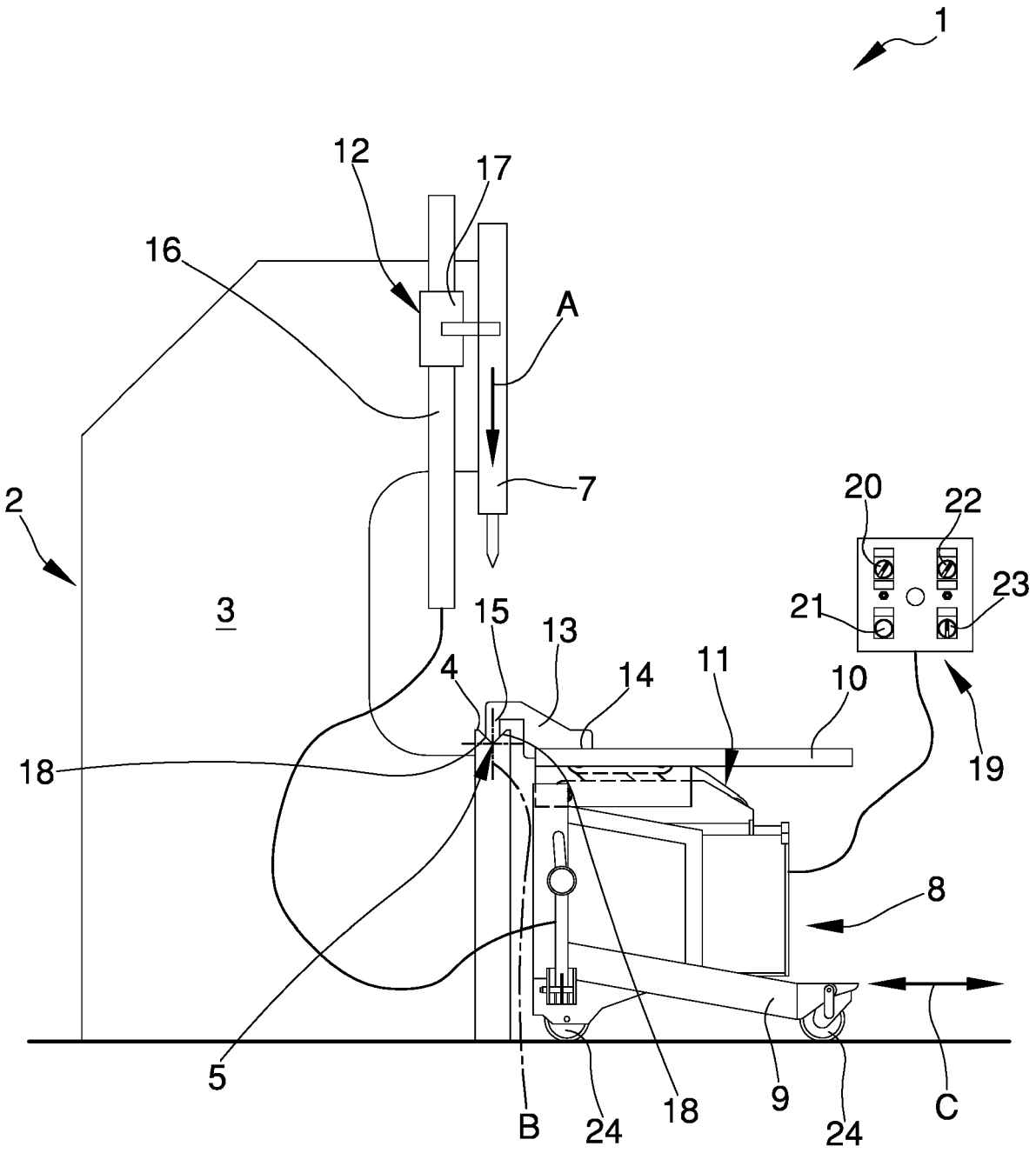


Fig.1

Fig.2

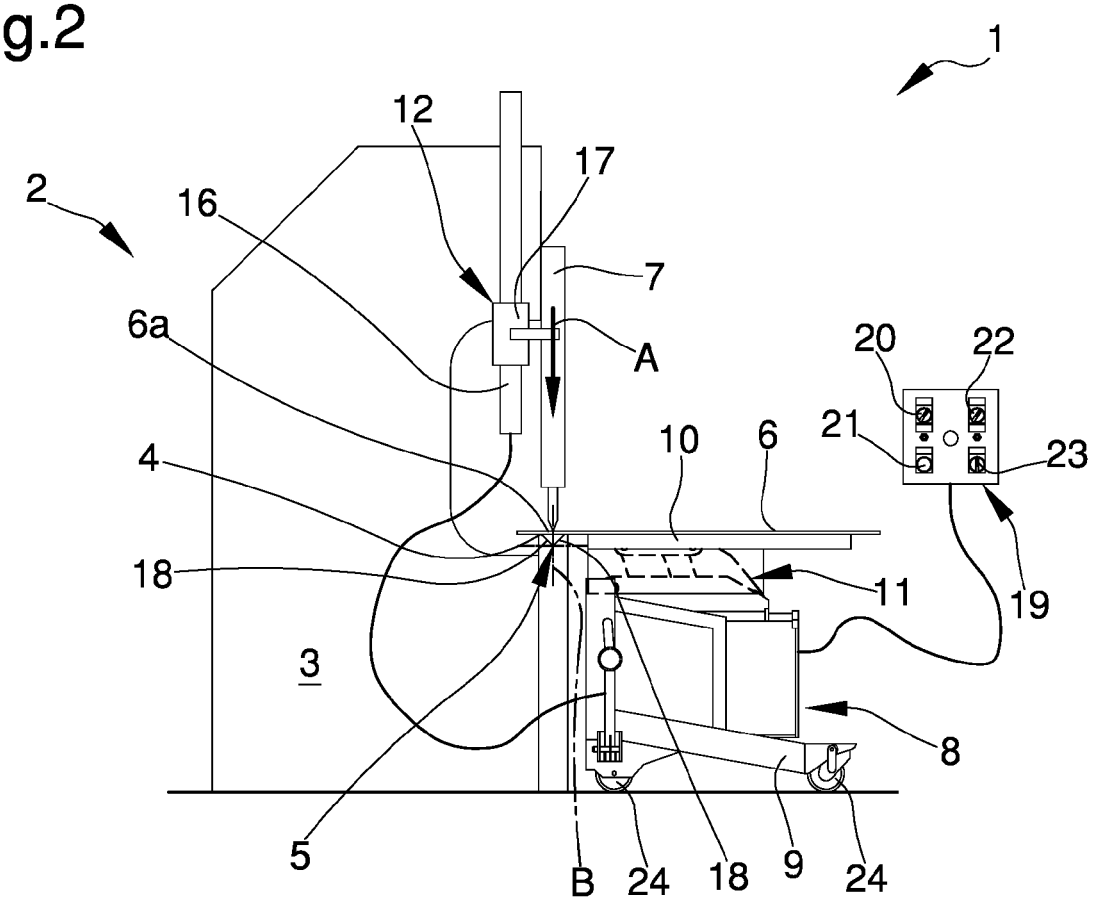
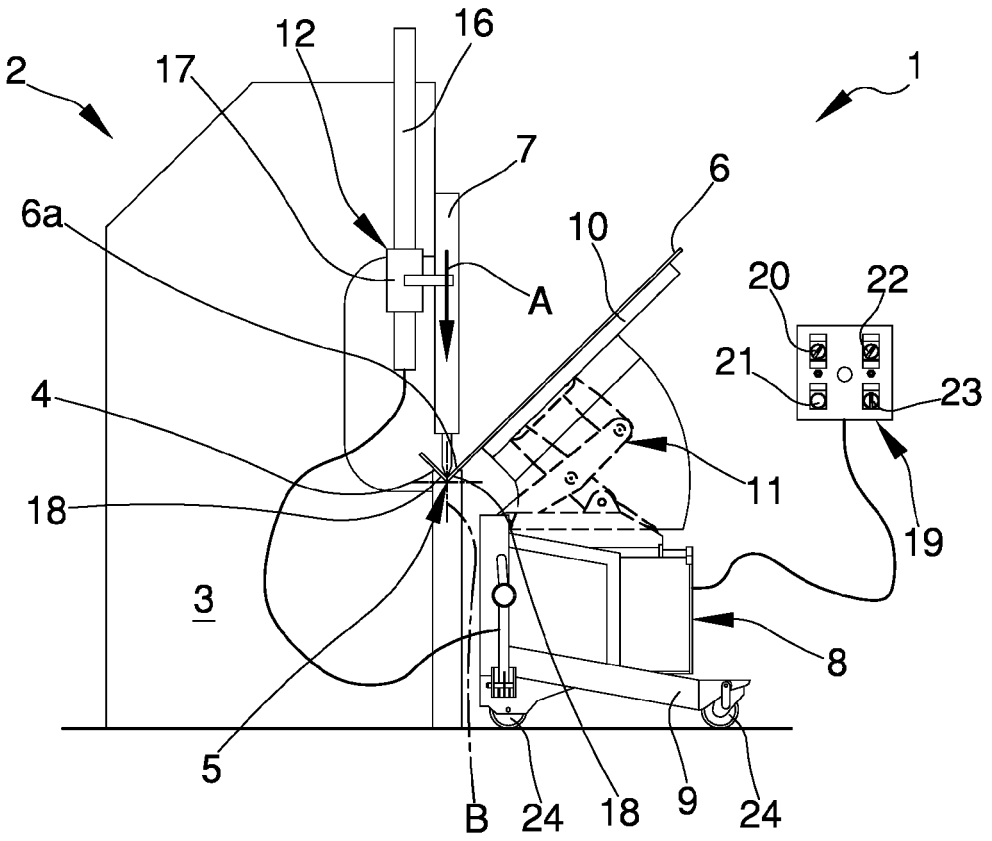

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Fig.3


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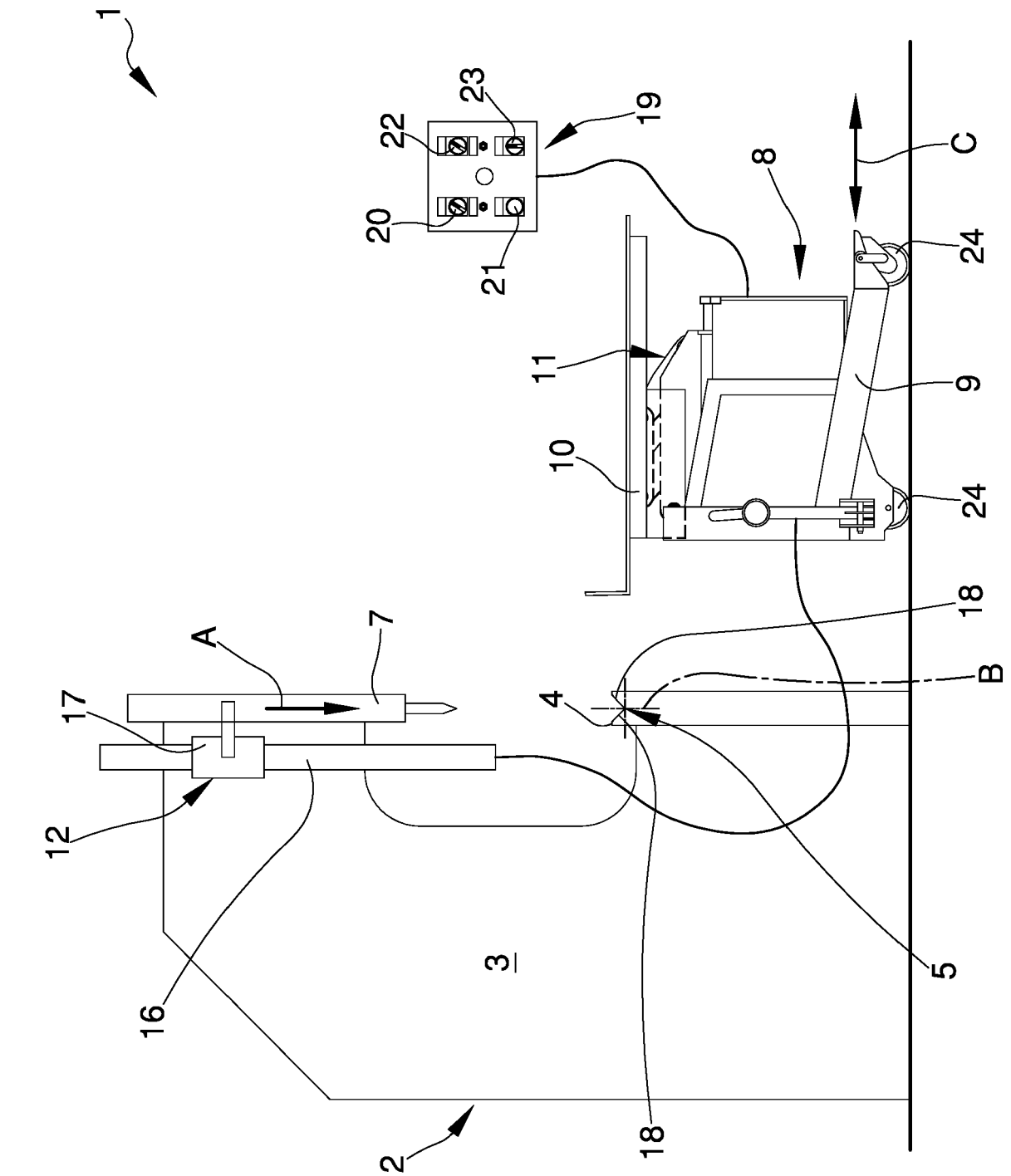


Fig.4

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EUROPEAN SEARCH REPORT

Application Number
EP 17 18 5033

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP S60 162527 A (MITSUBISHI ELECTRIC CORP) 24 August 1985 (1985-08-24) * abstract; figures 8,9 *	1-15	INV. B21D5/02
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TECHNICAL FIELDS SEARCHED (IPC)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 November 2017	Vinci, Vincenzo

CATEGORY OF CITED DOCUMENTS

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27-11-2017

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