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(54) **Dual-station baler device**

(57) The present invention relates to a baler device (1) provided for successively forming bales (3) one after the other, comprising: a pre-pressing station (4) having a hingeable pressing door (5), a main pressing station (6) and a connecting duct (7) between the pre-pressing station and main pressing station which is formed by an upper wall and a lower wall, wherein the pressing door (5) forms, together with a panel-shaped element (8) which is rotatable about a horizontal axis, the upper and the lower wall of the connecting duct (7) during the displacement of the pre-pressed material (2) from the pre-pressing station (4) to the main pressing station (6). A baler device of this type allows practically all materials to be pressed into hard, compact bales in an efficient and simple manner.

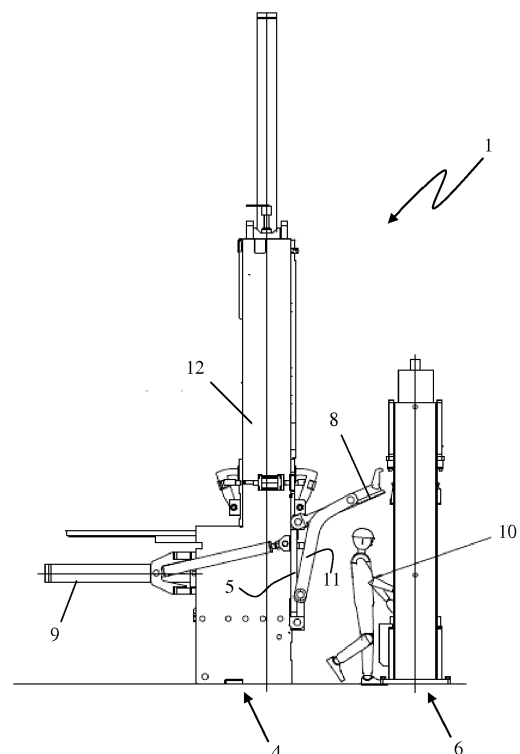


Fig. 1

Description

[0001] The present invention relates to a baler device provided for successively forming bales one after the other, comprising: a pre-pressing station having a hingeable pressing door, a main pressing station and a connecting duct between the pre-pressing station and main pressing station along which the pre-pressed material is displaced from the pre-pressing station to the main pressing station and which is formed by an upper wall and a lower wall. Balers configured in this way are also referred to as dual-station balers.

[0002] Balers in which the material which is fed in is first pre-pressed in a pre-pressing station in order to then be further pressed in a main pressing station are known per se and exist in various embodiments. Such devices fully automatically or semiautomatically press a compressible material, such as for example natural and synthetic fibres, paper, cardboard, foam, plastic or the like, with a pressure force between 50 and 5000 kN to form bales. After the pressing, the formed bales can be tied, manually or automatically, with the aid of, for example, a PES (polyester) strap, steel strap or iron wire.

[0003] In a device of this type, the material which is fed in is first pre-pressed, during which process the counter-pressure required during the pre-pressing is built up by pressing against a so-called pressing door and against the lower wall of the zone (loading zone) in which the material to be pressed is located. Once the material has been pre-pressed, the pressing door must be moved or rotated in order for the pre-pressed material to be displaced by means of a movable ram via a connecting duct to the main pressing station, where the final bale is formed.

[0004] The abovementioned connecting duct for a dual-station baler comprises an upper wall and a lower wall and may be formed in various ways, as shown in international patent publication WO 00/38908. For example, in a first embodiment, the duct may be formed by fixedly arranged upper and lower panels which extend horizontally. In this case, the pre-pressing station and the connecting duct are separated by a pressing door which is vertically displaceable between an open position and a closed position. This embodiment has the disadvantage that the operator cannot access the main pressing station in order to manually apply a wrapping, as a result of which it can only be applied in a fully automatic system.

[0005] In a second and third embodiment, the pressing door is hingeable between an open position and a closed position. In the closed position, the pressing door serves as a pressing or partition wall, whereas in the open position, the pressing door will form the upper wall of the connecting duct. In the second embodiment, the lower wall is still formed by a fixedly arranged lower panel which extends horizontally. The second embodiment also has the disadvantage that it can only be used in a fully automatic system, since the operator cannot access the main pressing station. Said fixedly arranged lower panel is re-

placed by a movable panel in the third embodiment. In this case, the lower panel is connected to the movable ram in such a way that the lower panel will form the lower wall of the connecting duct during displacement of the pre-pressed material from the pre-pressing station to the main pressing station. Although this embodiment is not limited to a fully automatic system, it does still have a number of disadvantages: complex construction owing to the need to provide the movable panel with a guide and a mechanical coupling which, as soon as the movable panel is extended, allows the panel to be decoupled so that the bale can advance further until it is situated between the rams of the main pressing station.

[0006] European patent publication EP 0 198 992 also describes a method for forming the connecting duct. In a specific embodiment, for example, the pressing door is replaced by a system having two grid-like structures (forks), each of which is constructed from a number of prongs (bars) which are arranged next to one another (at a distance) and have a free end. During the pressing, the prongs of both structures are in the same vertical plane and the material is pushed against the prongs of both structures. In order to form the connecting duct, one of the structures hinges upwards and the other structure hinges downwards until they reach a position in which both structures are arranged parallel to one another. Such an embodiment has the disadvantage, however, that there is a large loss of material, since, on the one hand, pressing is not carried out against a complete (closed) wall and, on the other hand, material may be lost during the displacement of the pre-pressed material in the connecting duct owing to material falling through the prongs of the grate. Moreover, the system may become blocked if too much material stacks up (becomes jammed) between the prongs of one or both of the structures, as a result of which they are no longer able to move towards one another fully in order to form the vertical plane.

[0007] As the various solutions for forming the connecting duct each have their own disadvantages, the object of the present invention is to provide a baler device in which the connecting duct is formed in an alternative manner during the displacement of the pre-pressed material from the pre-pressing station to the main pressing station, and in which it is possible for an operator to manipulate the bale formed in the main pressing station, in particular to provide it with a wrapping material.

[0008] The object of the invention is achieved by providing a baler device for successively forming bales one after the other, comprising: a pre-pressing station having a hingeable pressing door, a main pressing station and a connecting duct between the pre-pressing station and main pressing station along which the pre-pressed material is displaced from the pre-pressing station to the main pressing station and which is formed by an upper wall and a lower wall, wherein the pressing door is plate-shaped and forms, together with a panel-shaped element which is rotatable about a horizontal axis, the upper and

the lower wall of the connecting duct during the displacement of the pre-pressed material from the pre-pressing station to the main pressing station. Usually, the lower wall of the connecting duct is formed by the pressing door, in particular the front wall of the pressing door, and the upper wall is formed by the panel-shaped element. However, in an alternative embodiment, it is also possible for the lower wall of the connecting duct to be formed by the panel-shaped element and the upper wall by the pressing door. The pressing door is preferably configured as a flat panel. Since the pressing door is plate-shaped and use is also made of a panel-shaped element, a connecting duct will be formed with both the upper wall and the lower wall thereof being impermeable to the material of which the bale is composed, so that there is no undesired loss of material, both during the pressing and during the displacement in the direction of the main pressing station.

[0009] Such a baler device has the advantage that it is of simple design and that fewer mechanical couplings are required in comparison with the known devices in order to form the connecting duct during the displacement of the pre-pressed material from the pre-pressing station to the main pressing station. Furthermore, since no connecting duct is formed during the process of pre-pressing, there is free space available at that time, meaning that the main pressing station is easily accessible, for example by an operator.

[0010] According to a preferred embodiment of the baler device according to the invention, said pressing door is hingeable between a closed position in which the material which is fed in is pre-pressed in the pre-pressing station and an open position in which the pre-pressed material is displaceable in the direction of the main pressing station.

[0011] In an advantageous embodiment of the baler device according to the invention, the panel-shaped element is connected to the pressing door, so that the pressing door and the panel-shaped element move simultaneously during formation of the connecting duct. Preferably, the pressing door and the panel-shaped element are connected to one another via at least one connecting rod.

[0012] In a preferred embodiment of the baler device, the device comprises a movable ram in order to displace the pre-pressed material in the direction of the main pressing station. The ram is preferably hydraulically driven.

[0013] According to a particular embodiment, the pressing door comprises drive means. Said drive means are preferably hydraulic drive means. The drive means are preferably provided in order to displace the pressing door between an open and a closed position and in order to keep the pressing door in its open or closed position. The ram also preferably comprises hydraulic drive means. The pressing door and the ram are preferably each driven separately. The pressing door is driven and can hinge open in order in this way to form the lower wall

(or upper wall) of the connecting duct. During the process of hingeing open, the panel-shaped element will be displaced from a starting position into a final position in which it will form the upper wall (or lower wall) of the connecting duct. Following this, the ram will move forwards and will transport the bale from the pre-pressing station to the main pressing station. Conversely, when the ram returns the pressing door will hinge closed again as a result of which the panel-shaped element will also return to its starting position.

[0014] With the baler device according to the invention, the user has the opportunity to choose whether he wishes to tie the formed bales automatically or manually. If the user wishes to tie the formed bales automatically, the baler device according to the present invention comprises, in a more preferred embodiment, a tying device provided for tying the formed bale with a tying material. The tying device is in particular provided in order to automatically tie the formed bales in one tying cycle. Said tying material is preferably configured in the form of wire or in the form of a belt and is in particular made of iron, steel or plastic.

[0015] According to a particular embodiment of the baler device according to the invention, said device comprises a wrapping device provided in order to wrap the formed bale in a wrapping material. Said wrapping material may be a sheet material which is made of cardboard, for example, but may also be a flexible material, such as a plastic film or textile, for example. In this case, the pre-pressing station and/or main pressing station preferably comprises clamping elements for the wrapping material.

[0016] In a more particular embodiment of the baler device according to the invention, the angle formed by the plane of the pressing door and the plane of the panel-shaped element when the pressing door is in the closed position is smaller than, greater than or equal to 90° . Preferably, the angle formed by the plane of the pressing door and the plane of the panel-shaped element is greater than or equal to 90° . Arranging these elements in this way forms the necessary space between the pre-pressing station and main pressing station for an operator to be able to conveniently wrap the previously formed bale whilst material for the next bale is being pre-pressed (at which time the pressing door is closed).

[0017] According to a most particular embodiment of the baler device according to the invention, the pressing door and the panel-shaped element are arranged substantially parallel to one another when the pressing door is in the open position.

[0018] In a specific embodiment of the baler device according to the invention, the device further comprises one or more stop elements on which the pressing door and/or the panel-shaped element rest during the displacement of the pre-pressed material from the pre-pressing station to the main pressing station.

[0019] In an alternative embodiment, the pressing door is connected to the panel-shaped element via a connect-

ing means in such a way that the forces which the pre-pressed material exerts on the pressing door and the panel-shaped element cancel one another out during the complete displacement of the pre-pressed material.

[0020] Below, a more detailed description of the baler device according to the present invention is given in order to further explain the properties of the present invention and to indicate additional advantages and features thereof. It will be clear that nothing in the following description can be interpreted as a limitation of the protection of the present invention defined in the claims.

[0021] In this description, reference numerals are used to refer to the attached drawings, in which:

- *Figure 1: shows a principle view of a baler device according to the invention;*
- *Figure 2: shows a cross section of a baler device according to the invention, in which the pressing door is closed and where the material which is fed in is pre-pressed in the pre-pressing station;*
- *Figure 3: shows a cross section of the baler device according to the invention, in which the pressing door is open and the connecting duct is formed between the pre-pressing station and the main pressing station;*
- *Figure 4: shows a cross section of the baler device according to the invention, in which the pressing door is open and the pre-pressed material is displaced via the connecting duct to the main pressing station by means of the movable ram;*
- *Figure 5: shows a detail view of the area A outlined in Figure 3, showing the embodiment with the fixed stop on which the pressing door rests (in the open position);*
- *Figure 6: shows a detail view of an alternative embodiment of a baler device, in which no fixed stop is required;*
- *Figure 7: shows a view of the underside of the connecting duct of the baler device, in which a fixed stop and clamping elements are illustrated;*
- *Figure 8: shows a view of the underside of the connecting duct of the baler device, where no fixed stop is required.*

[0022] The baler device (1) illustrated in the figures comprises a pre-pressing station (4) suitable for pre-pressing material which is fed in into a bale (2) of pre-pressed material and a main pressing station (6) suitable for further pressing the bale (2) of pre-pressed material into a bale (3) of pressed material. The pre-pressing station (4) and main pressing station (6) may be connected to one another via a connecting duct (7). A vertical filler shaft (12) opens into the loading zone (13) of the pre-pressing station (4). The baler device (1) may be filled via, for example, a loading valve or loading ram (not shown in the figures) or a condenser (not shown in the figures) or a conveyor belt (not shown) which is arranged at the filler shaft (12). The intention of the baler device

(1) according to the invention is primarily to press materials having a low density, such as natural and synthetic fibres (e.g. flax, hemp, sisal, polypropylene fibres, polyester, viscose, etc.), but also optionally paper, cardboard, foam or plastic, into bales.

[0023] In the pre-pressing station (4), the material which is fed in is pre-pressed into a bale of pre-pressed material (2) (illustrated in Figure 2). In order to be able to pre-press the material which has been fed in, the pre-pressing station (4) comprises a pre-pressing ram (14) which is arranged movably in the filler shaft (12). During the feeding in of the compressible material, said pre-pressing ram (14) will move downwards a number of times (this can be programmed via the controls of the baler), as a result of which the material in the loading zone (13) will be compressed.

[0024] The pre-pressing station (4) is further provided with a hydraulically driven pressing door (5) which is configured in the form of a sheet (plate-shaped) and is hinged between an open and a closed position and which can close the outlet of the loading zone (13). In its closed position, the pressing door (5) forms a partition wall between the pre-pressing station (4) and the connecting duct (7). The supplied material is only pre-pressed when the pressing door (5) is in its closed position.

[0025] Once a sufficiently large bale of pre-pressed material (2) has been formed, this must be displaced in the direction of the main pressing station (6). For this purpose, there needs to be a connecting duct (7) between the pre-pressing station (4) and the main pressing station (6). In the device (1) according to the invention, the connecting duct (7) is not permanently present; in principle it is only formed during the displacement of the pre-pressed material to the main pressing station (6) (see Figure 3).

[0026] The connecting duct (7) is formed by an upper wall and a lower wall in order to enable the displacement of material between the pre-pressing station and the main pressing station. In order to now be able to form the connecting duct (7), the pressing door (5) is optionally coupled to a panel-shaped element (8). If a coupling is present, this may be mechanical, via a connecting rod (11) (optionally with a double configuration). When the pressing door (5) is in the closed position (at that moment pressing door is arranged vertically) the panel-shaped element (8) is in its starting position and the angle formed by the plane of the pressing door (5) and the plane of the panel-shaped element is preferably greater than or equal to 90°. By arranging the pressing door (5) and the panel-shaped element (8) in such a way with respect to one another, a space is formed between the pre-pressing station (4) and main pressing station (6), as seen in Figure 1, in which space an operator (10), for example, can conveniently wrap and/or tie the previously formed bale whilst material for the next bale is being pre-pressed (at which time the pressing door is closed).

[0027] At the moment that the pressing door (5) hinges into its open position, in which its front wall forms the

lower wall of the connecting duct (7), the panel-shaped element (8) will be simultaneously displaced into a final position by the (optionally present) mechanical coupling, in which final position the panel-shaped element (8) will form the upper wall of the connecting duct (7). As can be seen, inter alia, from Figure 3, the pressing door (5) and the panel-shaped element (8) are arranged substantially parallel to one another when the pressing door (5) is in the open position.

[0028] Once the connecting duct (7) has been formed, the position of the pressing door (5) or the panel-shaped element (8) can be secured by optionally providing the device (1), in particular the main pressing station, with a fixedly arranged stop element (15) at both ends, as can be seen from Figures 5 and 7, against which stop element (15) the pressing door (5) or, as the case may be, the panel-shaped element (8) rests.

[0029] In an alternative embodiment, and as illustrated in Figures 6 and 8, the stop elements (15) may be omitted by selecting the position (arrangement) of the connecting rod (11) between the pressing door (5) and the panel-shaped element (8) in such a way that a force equilibrium arises, so that the forces which the pre-pressed material exerts on the pressing door and the panel-shaped element cancel one another out when pre-pressed material is being displaced from the pre-pressing station to the main pressing station. A property of pre-pressed material is that it tends to expand or spring back, and this effect generates the same force on the pressing door (5) and on the panel-shaped element (8). The arrangement of the hinge points of pressing door (5) and panel-shaped element (8), and also the arrangement of the engagement points of the connecting rod (11), ensures that these forces cancel one another out and as a result it is not necessary to provide a fixed stop on which the pressing door (5) or, as the case may be, the panel-shaped element (8) rests. The position of the pressing door (5) when it is open or closed is determined by the drive element(s) which keep the pressing door (5) in this position (and therefore cause it to stop).

[0030] The bale (2) of pre-pressed material will be displaced from the pre-pressing station (4) (illustrated in Figure 3) to the main pressing station (6) (illustrated in Figure 4) by means of a movable ram (9) in a horizontally extending duct, which ram (9) is driven (pneumatically, hydraulically or electrically) by a pressing cylinder.

[0031] As soon as the connecting duct (7) is formed, the ram (9) will move forwards in the horizontally extending duct in order to thus transport the bale from the pre-pressing station (4) to the main pressing station (6). When the ram (9) returns, the pressing door will then hinge closed as a result of which the panel-shaped element (8) will also return to its starting position. In the case where the pressing door (5) and the panel-shaped element (8) are not mechanically connected to one another, they are each driven separately.

[0032] The baler device (1) may further be equipped with a tying device provided for tying the formed bale with

a tying material. The tying device will preferably wind a wire-like tying material, such as iron, steel or plastic wire, or string, for example, around the formed bale. The formed bales may also be manually tied by an operator using a tying means of his choice.

[0033] The baler device (1) may further be equipped with a wrapping device provided for wrapping the formed bale in a wrapping material.

[0034] Furthermore, clamping elements (16) may also be fitted to the pressing door (5) and the panel-shaped element (8), which clamping elements (16) ensure that the wrapping material which has already been applied (manually or automatically) to the ram of the main pressing station is clamped, so that this wrapping material does not move when the pre-pressed material (2) is displaced from the pre-pressing station to the main pressing station.

[0035] Once the pre-pressed material has reached the main pressing station (6), the pressing door (5) will move back into its closed position and the wrapping material will therefore be released as a result of this movement. The same process will occur at the edge of the panel-shaped element. According to a particular embodiment, the fixed stop (15) as described above and the provisions (16) for clamping the wrapping material are configured as one unit instead of as separate elements.

[0036] With the baler device (1) according to the invention, it is possible to press both paper, cardboard, foam, plastic, natural and synthetic fibres and also short fibres, smooth fibres, fabric and, more generally, materials having a small granulometry into compact bales in an efficient and simple manner.

Claims

1. Baler device (1) provided for successively forming bales (3) one after the other, comprising: a pre-pressing station (4) having a hingeable pressing door (5), a main pressing station (6) and a connecting duct (7) between the pre-pressing station (4) and main pressing station (6) along which the pre-pressed material (2) is displaced from the pre-pressing station (4) to the main pressing station (6) and which is formed by an upper wall and a lower wall, **characterized in that** the pressing door (5) is plate-shaped and forms, together with a panel-shaped element (8) which is rotatable about a horizontal axis, the upper and the lower wall of the connecting duct (7) during the displacement of the pre-pressed material (2) from the pre-pressing station (4) to the main pressing station (6).
2. Baler device (1) according to Claim 1, **characterized in that** said pressing door (5) is hingeable between a closed position in which material which is fed in is pre-pressed in the pre-pressing station (4) and an open position in which the pre-pressed material (2) is displaceable in the direction of the main pressing

station (6).

3. Baler device (1) according to Claim 1 or 2, **characterized in that** the panel-shaped element (8) is connected to the pressing door (5), so that the pressing door (5) and the panel-shaped element (8) move simultaneously during formation of the connecting duct (7). 5
4. Baler device (1) according to one of the preceding claims, **characterized in that** the device (1) comprises a movable ram (9) in order to displace the pre-pressed material (2) in the direction of the main pressing station (6). 10
5. Baler device (1) according to one of the preceding claims, **characterized in that** said pressing door (5) comprises drive means. 15
6. Baler device (1) according to Claim 5, **characterized in that** the drive means are provided in order to displace the pressing door (5) between an open and a closed position and are provided in order to keep the pressing door (5) in its open or closed position. 20
7. Baler device (1) according to one of the preceding claims, **characterized in that** said device (1) comprises a tying device provided for tying the formed bale (3) with a tying material. 25
8. Baler device (1) according to one of the preceding claims, **characterized in that** said device (1) comprises a wrapping device provided in order to wrap the formed bale (3) in a wrapping material. 30
9. Baler device (1) according to Claim 8, **characterized in that** the pre-pressing station (4) and/or the main pressing station (6) comprises clamping elements (16) for the wrapping material. 35
10. Baler device (1) according to one of the preceding claims, **characterized in that** the angle formed by the plane of the pressing door (5) and the plane of the panel-shaped element (8) when the pressing door (5) is in the closed position is smaller than, greater than or equal to 90°. 40
11. Baler device (1) according to one of the preceding claims, **characterized in that** the angle formed by the plane of the pressing door (5) and the plane of the panel-shaped element (8) when the pressing door (5) is in the closed position is greater than or equal to 90°. 50
12. Baler device (1) according to one of the preceding claims, **characterized in that** the pressing door (5) and the panel-shaped element (8) are arranged substantially parallel to one another when the pressing 55

door (5) is in the open position.

13. Baler device (1) according to one of the preceding claims, **characterized in that** the device (1) further comprises one or more stop elements (15) on which the pressing door (5) and/or the panel-shaped element rest during the displacement of the pre-pressed material (2) from the pre-pressing station (4) to the main pressing station (6).
14. Baler device (1) according to one of Claims 1 to 12, **characterized in that** the pressing door (5) is connected to the panel-shaped element (8) via a connecting means (11) in such a way that the forces which the pre-pressed material exerts on the pressing door and the panel-shaped element during the displacement of the pre-pressed material (2) from the pre-pressing station (4) to the main pressing station (6) cancel one another out.

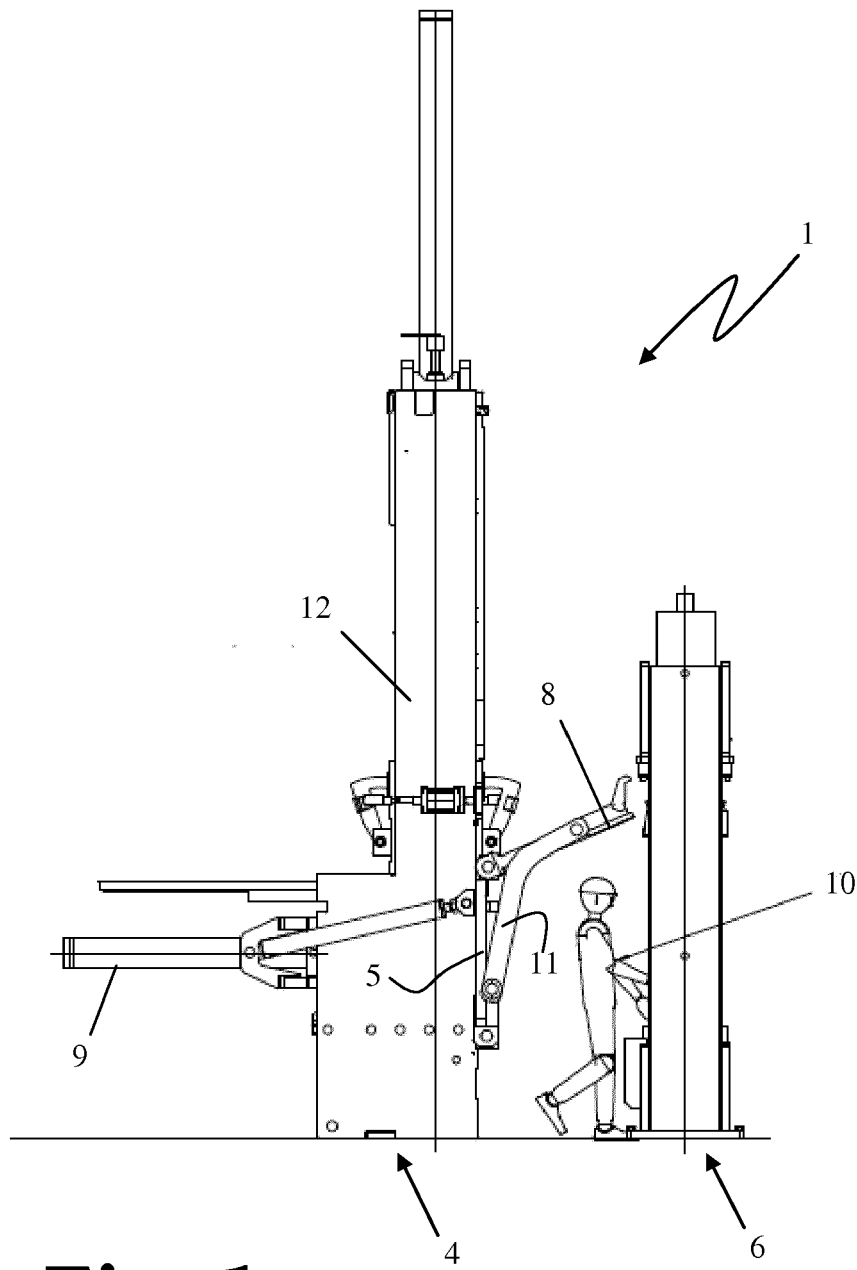


Fig. 1

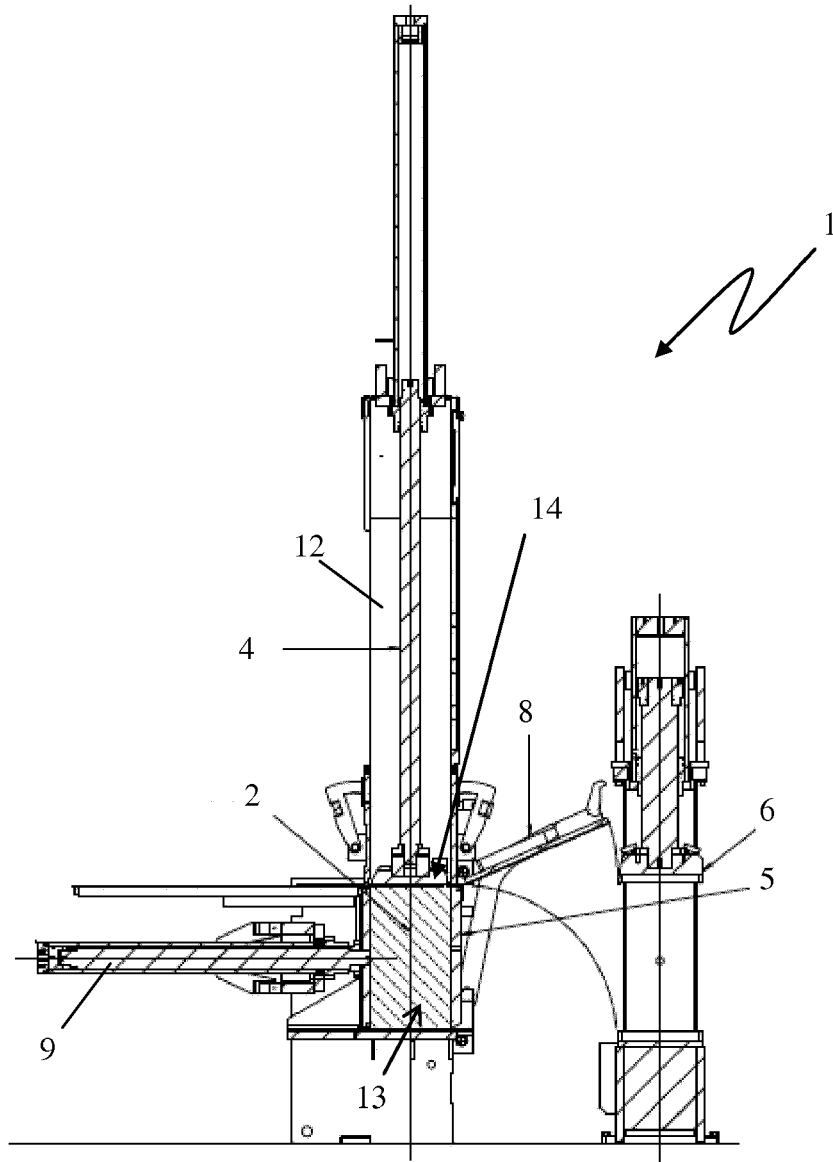


Fig. 2

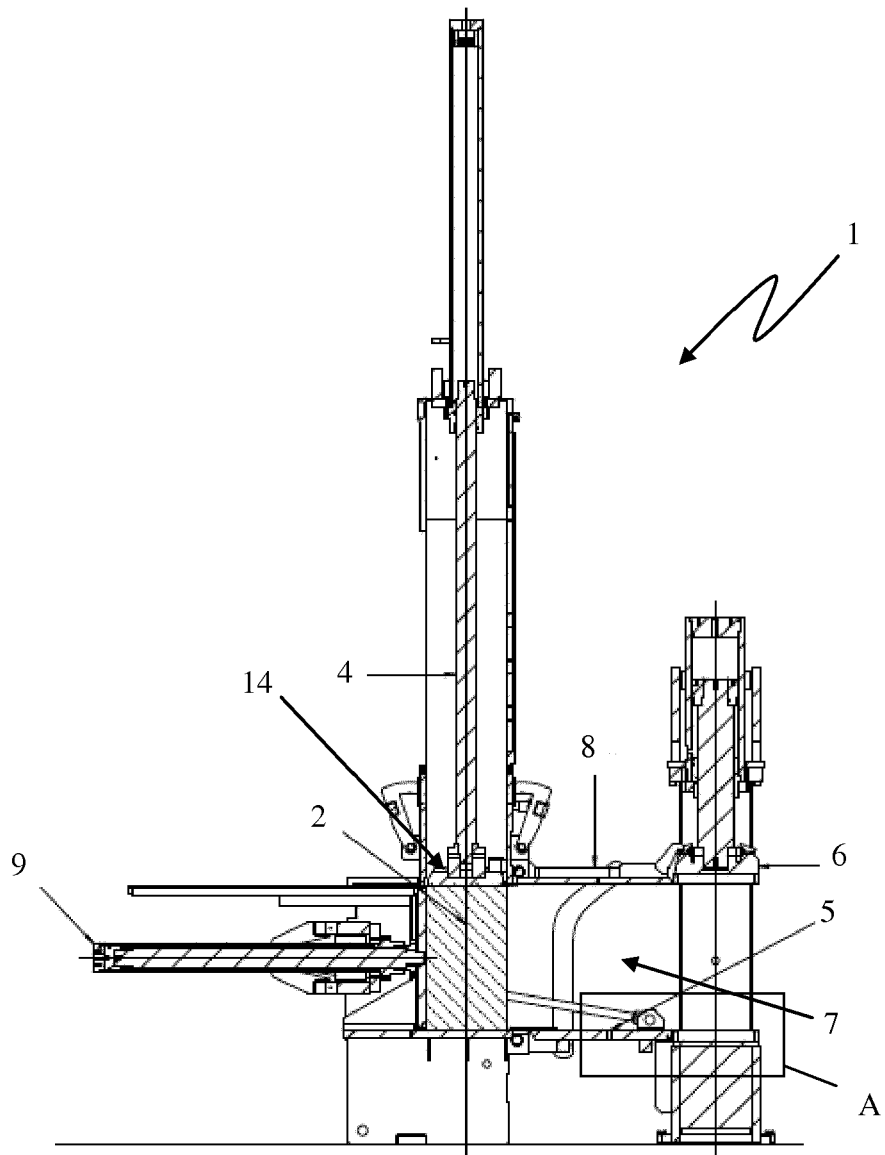


Fig. 3

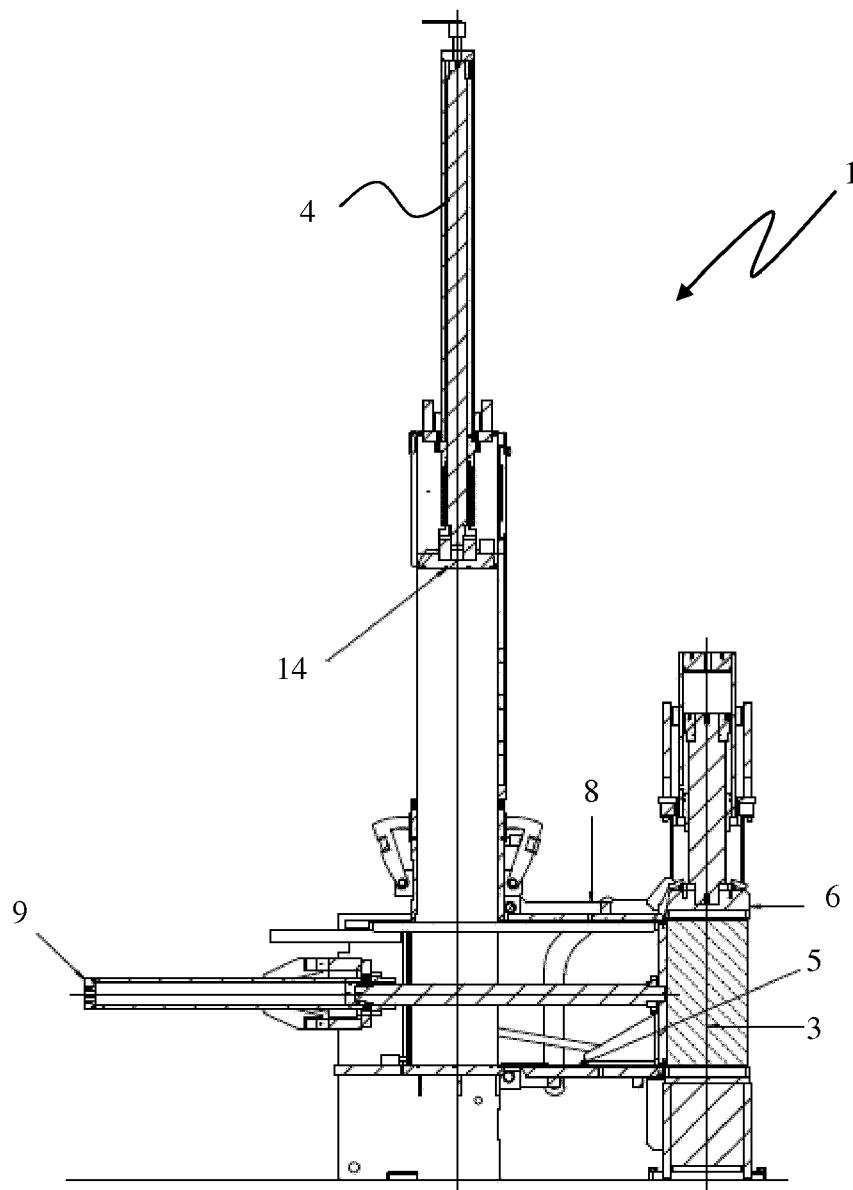


Fig. 4

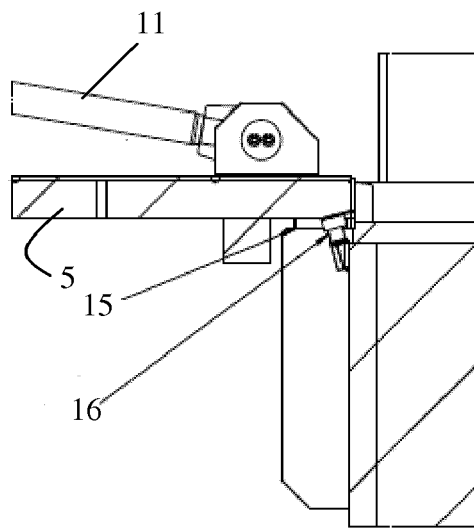


Fig. 5

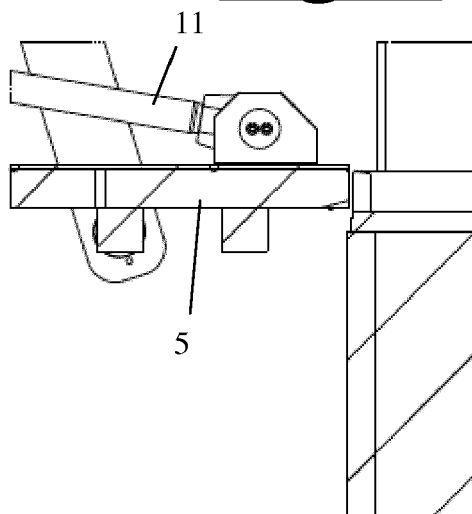


Fig. 6

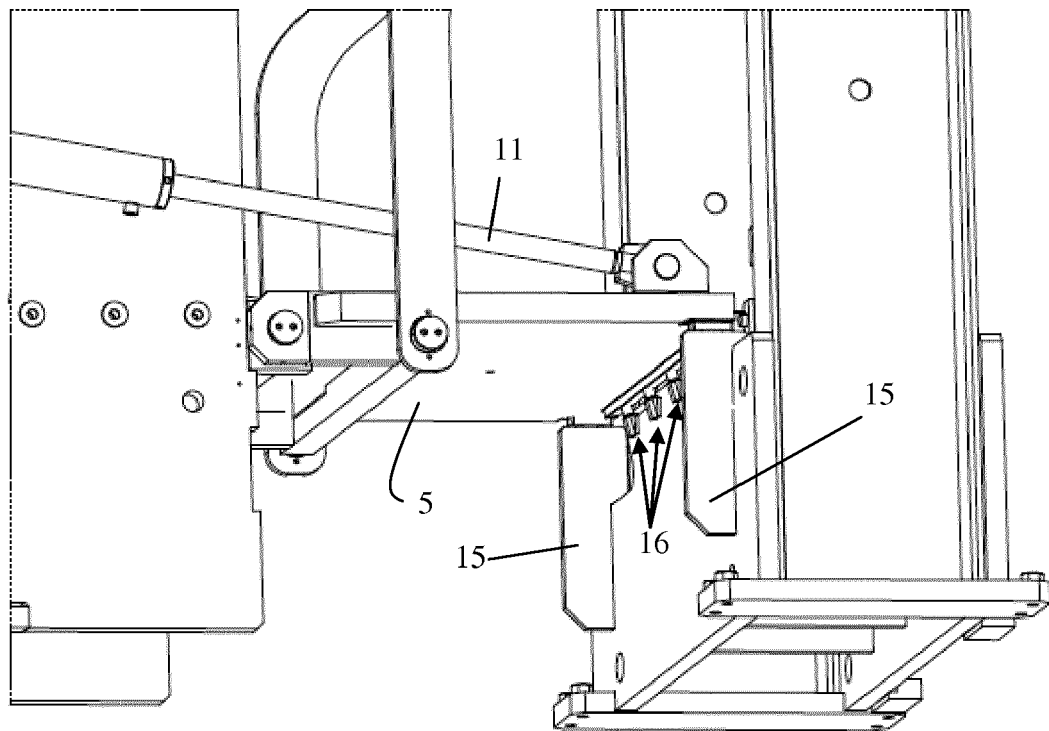


Fig. 7

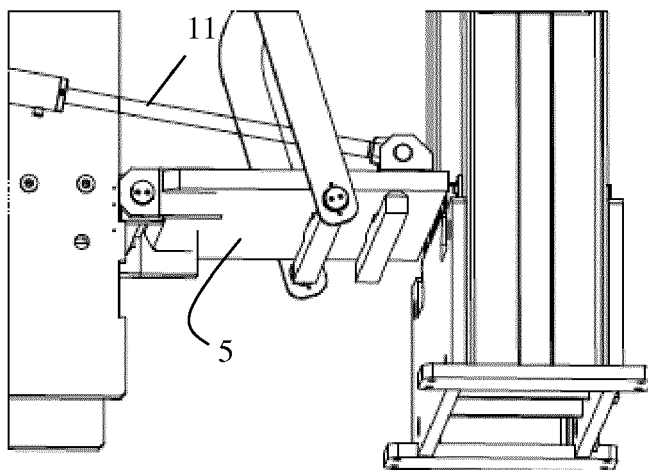


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 5952

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
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Place of search		Date of completion of the search	Examiner
The Hague		16 February 2015	Labre, Arnaud
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 18 5952

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