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(54) **UNLOADING APPARATUS FOR A BLANKING PRESS**

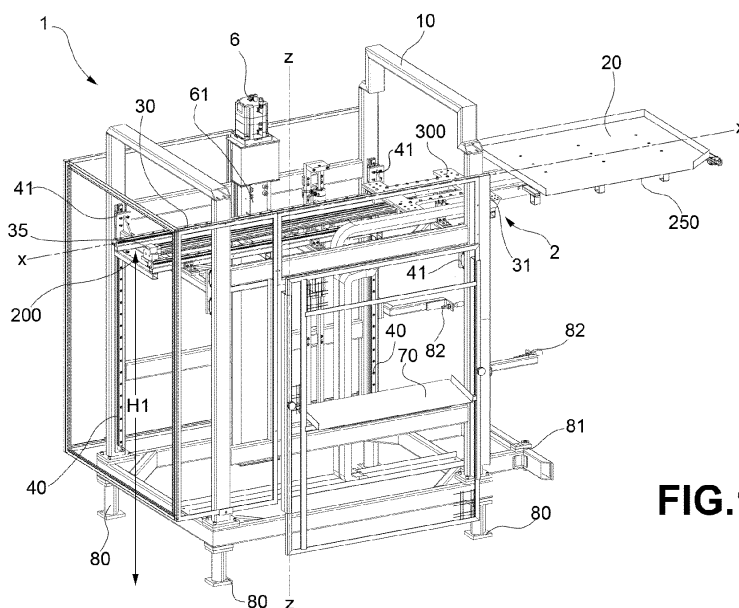
(57) An unloading apparatus (1) for extracting a piece from a blanking press (9), comprising a primary frame (10) and an extraction group (2), operable in translation along a vertical axis (Z-Z) between a raised position (S) and a lowered position (A).

The extraction group (2) in turn comprises a secondary frame (200) and a collection tray (20). When the extraction group (2) is in the raised position (S), the collection tray (20) is operable in translation along a horizontal

axis (X-X), and when the extraction group (2) is in the lowered position (A), the collection tray (20) is operable in rotation to unload the piece.

A blanking system comprising a blanking press (9) and apparatus (1) according to the invention.

An extraction method for extracting a piece from a blanking press by means of an apparatus (1) according to the invention.



**FIG.1**

## Description

### Field of application

[0001] The present invention relates to an unloading apparatus for extracting a piece from a blanking press, a blanking system, and an extraction method.

[0002] For the production of semi-finished products, usually made of aluminum, such as by die casting, a blank is generally obtained that has a number of portions that need to be removed, such as foundry or molding burrs or those portions consisting of the material that has occupied the gates and wells.

[0003] It is therefore necessary to remove the unwanted parts; the whole of these operations is referred to here as "blanking."

[0004] Blanking presses, or blanking-burring presses, perform mechanical blanking operations on the blank, involving the separation of unwanted portions, thus obtaining a semi-processed or semi-finished piece on which further mechanical finishing operations may be performed.

[0005] In the blanking press, having performed the blanking operations, the piece usually remains housed in the movable die, positioned above and at a certain distance from the fixed die. The piece must be separated from the movable die and extracted from the press, i.e., taken out of the press, to be sent on to further processing.

[0006] The separation from the die is generally accomplished by operating appropriate devices applied to the die, called "extractors".

[0007] There are therefore a number of known solutions for extracting the piece from the press.

[0008] For example, when possible, the piece is manually extracted by an operator. Obviously, such a solution requires a constant engagement of employees and, furthermore, requires the operators to work closely with the blanking press, for example at least inserting their arms between the dies. These operations are therefore extremely dangerous and involve a high risk of injury to the operator.

[0009] Alternatively, some mechanical devices, known as "evacuators" or "evacuation apparatuses," are known.

[0010] Typically, these devices involve a horizontally translating collection plate suitable for entering between the two dies of the blanking press to house the piece following the blanking operations.

[0011] Once the collection plate has been moved out of the blanking press, an operator is expected to retrieve the piece, either manually or by collection means, and place it in a collection area.

[0012] Alternatively, once the collection plate is moved out of the blanking press, the piece is slid onto unloading ramps and taken directly to the collection area without the involvement of operators.

[0013] Disadvantageously, these solutions are rather impractical.

[0014] In fact, generally, the height at which blanking

presses work, and consequently the height at which the collection plate is located, is quite elevated.

[0015] The operator is therefore forced to reach that height, for example by means of ladders or hoists, and then return to working height to replace the piece.

[0016] Sometimes, moreover, unloading ramps are very inclined, possibly causing pieces to fall or roll in an unwanted manner, or not very inclined but very long, taking up too much work space.

### Object of the invention

[0017] Therefore, there appears to be a significant need to provide a blanking press capable of overcoming the drawbacks typical of the prior art.

[0018] This requirement is met by an unloading apparatus for extracting a piece from a blanking press according to independent claim 1, a blanking system according to claim 14, and an extraction method according to claim 15. The claims dependent thereon describe preferred or advantageous embodiments of the invention, comprising further advantageous features.

### Description of the drawings

[0019] The features and advantages of the unloading apparatus will become apparent from the description below of some preferred embodiments, given by way of indicative and non-limiting example, with reference to the attached figures, wherein:

- Fig. 1 is an axonometric view of an unloading apparatus in an embodiment of the invention, in which the extraction group is in the raised position and the collection tray is in the extraction configuration;
- Fig. 2 is an axonometric view of an unloading apparatus in an embodiment of the invention, in which the extraction group is in the raised configuration and the collection tray is in the receiving configuration;
- Fig. 3 is an axonometric view of an unloading apparatus in an embodiment of the invention, in which the extraction group is in the lowered configuration and the collection tray is in the loading configuration;
- Fig. 4 is an axonometric view of an unloading apparatus in an embodiment of the invention, in which the extraction group is in the lowered configuration and the collection tray is in the unloading configuration;
- Fig. 5 is an axonometric view of a blanking system according to the invention.
- Fig. 6 is a partial view of the apparatus according to an embodiment of the invention, in which the tray is in the unloading configuration;
- Fig. 7 is a partial view of the apparatus comprising an electric motor and transmission members according to an embodiment of the invention.

### Description of an embodiment

**[0020]** With reference to the aforesaid figures, an unloading apparatus for extracting a piece from a blanking press 9 has been referred to collectively as reference number 1.

**[0021]** According to the invention, the apparatus 1 comprises:

- i) a primary frame 10;
- ii) an extraction group 2, supported by the primary frame 10, operable in translation along a vertical axis Z-Z between a raised position S in which the extraction group 2 is at a predefined extraction height H1 and a lowered position A in which the extraction group 2 is at a predefined unloading height H2 lower than the extraction height H1.

**[0022]** According to the invention, the extraction group 2 comprises:

- a secondary frame 200;
- a collection tray 20 supported by the secondary frame 200.

**[0023]** According to the invention, when the extraction group 2 is in the raised position S, said collection tray 20 is operable in translation along a horizontal axis X-X, between an advanced extraction position E for collecting the piece, and a retracted receiving position R.

**[0024]** The tray 20 has at least one free side 250 which extends in a substantially parallel direction to said horizontal axis X-X.

**[0025]** According to the invention, when the extraction group 2 is in the lowered position A, said collection tray 20 is operable in rotation between a loading configuration C and an unloading configuration SC in which said tray is rotated with respect to the loading configuration, for unloading the piece from the free side 250 of the collection tray 20.

**[0026]** Advantageously, providing for the piece to be collected from the press at an extraction height H1 and for the same piece to be unloaded at an unloading height H2 that is lower than the extraction height H1 allows the collecting and unloading operations to be separated into two separate moments, simplifying the mechanisms involved in the two operations, and most importantly, allowing the piece to be handled for unloading only when a lower height is reached, which provides greater safety for the operators managing the process.

**[0027]** Preferably, the primary frame 10 is substantially box-shaped, with four pillars, one at each corner of the primary frame 10.

**[0028]** Preferably, the primary frame 10 is shaped in such a way as to contain the extraction group 2 while simultaneously allowing the translation of the collection tray 20 and the passage of the piece.

**[0029]** In an embodiment of the invention, the apparatus 1 comprises:

tus 1 comprises:

- longitudinal sliding guides 40 extending along extension directions parallel to the vertical axis Z-Z, supported by said primary frame 10;
- longitudinal sliding members 41, e.g. carriages, which slide in said longitudinal sliding guides 40.

**[0030]** Preferably, there are four longitudinal sliding guides 40, housed one of each of the four pillars of the primary frame 10, respectively.

**[0031]** Preferably, the longitudinal sliding members 41 are stably constrained with the secondary frame 200 of the extraction group 2 so that the extraction group 2 is slidable in said longitudinal sliding guides 40.

**[0032]** In an embodiment of the invention, the apparatus 1 comprises:

- transverse sliding guides 30 supported by said secondary frame 200;
- transverse sliding members 31, e.g., carriages, which slide in said transverse sliding guides 30;
- a first pneumatic piston 35, supported by said secondary frame 200, operatively connected with said transverse sliding members 31, suitable for activating them in translation.

**[0033]** Preferably, said transverse sliding members 31 are stably constrained with said collection tray 20, so that the collection tray 20 is slidable in said transverse sliding guides 30.

**[0034]** Preferably, the transverse sliding members 31 are engaged with a carriage-carrier cross 300. This carriage-carrier cross 300 is engaged with the collection tray 20, so that said carriage-carrier cross 300 is also slidable in the horizontal axis X-X.

**[0035]** This carriage-carrier cross 300 is suitable for balancing the weight of the collection tray 20 when it is in the extraction position E and houses the piece, so as to avoid sudden movements or breakage of the apparatus 1.

**[0036]** In an embodiment, the apparatus 1 comprises a second pneumatic piston 55 supported by the secondary frame 200 and engaged with the collection tray 20 in an engagement portion 25 of said collection tray 20, so that said collection tray 20 is operable in rotation by the translation of said second pneumatic piston 55.

**[0037]** Preferably, the apparatus 1 also comprises a chute element 70 supported by the primary frame 1, and the collection tray 20, when it is in the unloading configuration SC, is aligned with said chute element 70 along said free side 250 to facilitate the unloading of the piece.

**[0038]** In a further embodiment of the invention, the apparatus 1 comprises:

- an electric motor 6;
- transmission members 61 operatively connected with the electric motor 6 and with the extraction group

2, suitable for transmitting the motion from said electric motor 6 to the extraction group 2 to enable the translation of the extraction group 2.

**[0039]** Preferably, the electric motor 6 is of the brushless type.

**[0040]** Preferably, moreover, the electric motor 6 comprises an inverter. The inverter allows the extraction and unloading cycle to be managed precisely and the operating speed to be optimized.

**[0041]** Furthermore, according to a preferred embodiment, the transmission members 61 comprise a worm screw element 610 and a nut, or screw nut, 611 engaged with the extraction group 2.

**[0042]** Preferably, the electric motor 6 engages and rotatably moves said worm screw element 610, causing the extraction group 2 to be translated along the vertical axis Z-Z.

**[0043]** According to a preferred embodiment, moreover, the transmission members 61 also comprise a connection joint 620, suitable for connecting the electric motor 6 to the worm screw element 610.

**[0044]** Preferably, moreover, the transmission members 61 also comprise a support element 630, such as a bearing, suitable for supporting said worm screw element 610 in such a way as to allow it to rotate and simultaneously support part of its weight.

**[0045]** Preferably, the apparatus 1 comprises a control unit 7, operatively connected with the extraction group 2 and with the electric motor 6, suitable for controlling the activation of the extraction group 2 and of the tray 20.

**[0046]** Furthermore, preferably, the primary frame 10 comprises ground support feet 80, suitable for supporting said apparatus 1 and for counteracting any misalignments and undesired movements due to evacuation operations.

**[0047]** These support feet 80 comprise adjustment means suitable for enabling a height adjustment of said support feet 80, so that said apparatus 1 may be leveled.

**[0048]** Preferably, the apparatus 1 comprises connection elements 81 housed on the primary frame 10, suitable for engaging the apparatus 1 with a blanking press 9.

**[0049]** According to an advantageous variant, the apparatus 1 comprises auxiliary connection arms 82 housed on the primary frame 10, suitable for entering into contact with the blanking press 9 and suitable for counteracting any misalignments and/or undesired movements due to the extraction operations.

**[0050]** Preferably, the apparatus 1 further comprises protective panels housed on said primary frame 10, suitable for isolating the apparatus 1 and preventing undesired contact with an operator.

**[0051]** In a preferred embodiment, the control unit 7 is suitable for processing a signal coming from the blanking press 9, and is suitable for translating said signal into a maximum stroke Hmax of the extraction group 2 along the vertical axis Z-Z.

**[0052]** In an embodiment of the invention, the apparatus

1 comprises movement sensors, e.g., absolute encoders, housed on the primary frame 10 or in the motor 6.

**[0053]** Said movement sensors are suitable for detecting the effective translation height Heff of the extraction group 2.

**[0054]** The control unit 7 enables the translation of the extraction group 2 in accordance with a detection of the movement sensors of an effective height Heff lower than said maximum stroke Hmax, and the control unit 7 blocks the translation of the extraction group 2 in accordance with a detection of the movement sensors of an effective height Heff equal to said maximum stroke Hmax.

**[0055]** According to an alternative embodiment, the control unit 7 is suitable for transposing said maximum stroke Hmax into a maximum number of motor revolutions, and suitable for forcing the electric motor 6 to perform said maximum number of engine revolutions, so as to adjust the translation of the extraction group 2 along the vertical axis Z-Z.

**[0056]** The present invention also relates to a blanking system comprising a blanking press 9 and an apparatus 1 according to the invention, applied to the blanking press.

**[0057]** The present invention also relates to a method of extracting a piece exiting a blanking press 9, said method comprising the steps of:

- a) providing an apparatus 1 according to the invention;
- b) bringing the extraction group 2 into the raised position S;
- c) bringing the collection tray 20 to the extraction position E to house a piece from a blanking press;
- d) bringing the collection tray 20 into the receiving position R;
- e) bringing the extraction group 2 into the lowered position A;
- f) bringing the collection tray 20 into the unloading configuration SC to enable the unloading of the piece from the free side 250.

**[0058]** Innovatively, the unloading apparatus for extracting a piece from a blanking press, the blanking system, and the extraction method described above largely fulfill the object of the present invention by overcoming the typical problems of the prior art.

**[0059]** Innovatively, in fact, the unloading apparatus optimizes the processes of extracting and unloading pieces from a blanking press.

**[0060]** Advantageously, the unloading apparatus operates in total safety for the people using it, such as maintenance workers and/or toolmakers. Advantageously, moreover, the unloading apparatus operates in total safety for those components that compose it (i.e. worm screw element, tray).

**[0061]** Advantageously, the control unit activates the movements of the unloading apparatus according to what is happening inside the blanking press.

**[0062]** Advantageously, the unloading apparatus makes it possible to automate the extraction process without directly involving an operator, who is required only to remotely control the process via the control unit.

**[0063]** Advantageously, the extraction method according to the invention makes it possible to shorten the time required to carry out piece extraction and unloading operations.

**[0064]** A person skilled in the art may, in order to meet specific needs, make several changes to the embodiments of this invention or substitutions of elements with other functionally equivalent ones.

**[0065]** These variants are also contained within the scope of protection as defined by the following claims.

#### List of reference numbers:

#### **[0066]**

1 apparatus	20
10 primary frame	
Z-Z vertical axis	
2 extraction group	
X-X horizontal axis	
200 secondary frame	25
20 collection tray	
25 engagement portion	
250 free side	
30 transverse sliding guides	
31 transverse sliding members	30
35 first pneumatic piston	
E extraction position	
R receiving position	
S raised position	
A lowered position	35
40 longitudinal sliding guides	
41 longitudinal sliding members	
55 second pneumatic piston	
C loading configuration	
SC unloading configuration	40
6 electric motor	
61 transmission members	
610 worm screw element	
611 screw nut	
620 connection joint	45
630 support element	
7 control unit	
80 support feet	
81 connection elements	
82 auxiliary connection arms	50
9 blanking press	

#### **Claims**

1. An unloading apparatus (1) for extracting a piece from a blanking press (9), comprising:

i) a primary frame (10);  
 ii) an extraction group (2), supported by the primary frame (10), operable in translation along a vertical axis (Z-Z) between a raised position (S) in which the extraction group (2) is at a predefined extraction height (H1) and a lowered position (A) in which the extraction group (2) is at a predefined unloading height (H2) lower than the extraction height (H1), comprising:

a secondary frame (200);  
 a collection tray (20) supported by the secondary frame (200),  
 wherein, when the extraction group (2) is in the raised position (S), said collection tray (20) is operable in translation along a horizontal axis (X-X), between an advanced extraction position (E) for collecting the piece, and a retracted receiving position (R),  
 said tray (20) having at least one free side (250) which extends in a substantially parallel direction to said horizontal axis (X-X), and wherein, when the extraction group (2) is in the lowered position (A), said collection tray (20) is operable in rotation between a loading configuration (C) and an unloading configuration (SC) in which said tray is rotated with respect to the loading configuration, for unloading the piece on the free side (250) of the collection tray (20).

2. Apparatus (1) according to claim 1, comprising:

- longitudinal sliding guides (40) extending along extension directions parallel to the vertical axis (Z-Z), supported by said primary frame (10);  
 - longitudinal sliding members (41), e.g. carriages, which slide in said longitudinal sliding guides (40);

said longitudinal sliding members (41) being stably constrained with the secondary frame (200) of the extraction group (2), so that the extraction group (2) is slidable in said longitudinal sliding guides (40).

3. Apparatus (1) according to any one of the preceding claims, comprising:

- transverse sliding guides (30) supported by said secondary frame (200);  
 - transverse sliding members (31), e.g. carriages, which slide in said transverse sliding guides (30);  
 - a first pneumatic piston (35), supported by said secondary frame (200), operatively connected with said transverse sliding members (31), suitable for activating them in translation;

wherein said transverse sliding members (31) are stably constrained with said collection tray (20), so that the collection tray (20) is slidable in said transverse sliding guides (30).

4. Apparatus (1) according to any one of the preceding claims, comprising a second pneumatic piston (55) supported by said primary frame (10), engaged with the collection tray (20) in an engagement portion (25) of said collection tray (20), so that said tray (20) is operable in rotation by means of the translation of said second pneumatic piston (55).

5. Apparatus (1) according to any one of the preceding claims, comprising:

- an electric motor (6);
- transmission members (61) operatively connected with the electric motor (6) and with the extraction group (2), suitable for transmitting the motion from said electric motor (6) to the extraction group (2) to enable the translation of the extraction group (2).

6. Apparatus (1) according to claim 5, comprising a control unit (7), operatively connected with the extraction group (2) and with the electric motor (6), suitable for controlling the activation of the extraction group (2) and of the tray (20).

7. Apparatus (1) according to any one of the preceding claims, wherein the primary frame (10) comprises ground support feet (80), suitable for supporting said apparatus (1) and for counteracting any misalignments and undesired movements due to evacuation operations, said support feet (80) comprising adjustment means suitable for enabling a height adjustment of said support feet (80), such as to enable the height to be varied and/or said apparatus (1) to be levelled.

8. Apparatus (1) according to any one of the preceding claims, comprising connection elements (81) housed on the primary frame (10), suitable for engaging said apparatus (1) with a blanking press (9).

9. Apparatus (1) according to any one of the preceding claims, comprising auxiliary connection arms (82) housed on the primary frame (10), suitable for entering into contact with the blanking press (9) and suitable for counteracting any misalignments and/or undesired movements due to extraction operations.

10. Apparatus (1) according to any one of the preceding claims, further comprising protective panels housed on said primary frame (10), suitable for isolating the apparatus (1) and preventing undesired contact with an operator.

11. Apparatus (1) according to claim 6, wherein the control unit (7) is suitable for processing a signal coming from the blanking press (9), and is suitable for translating said signal into a maximum stroke (Hmax) of the extraction group (2) along the vertical axis (Z-Z).

12. Apparatus (1) according to claim 11, comprising movement sensors, e.g. optical encoders, housed on the primary frame (10),

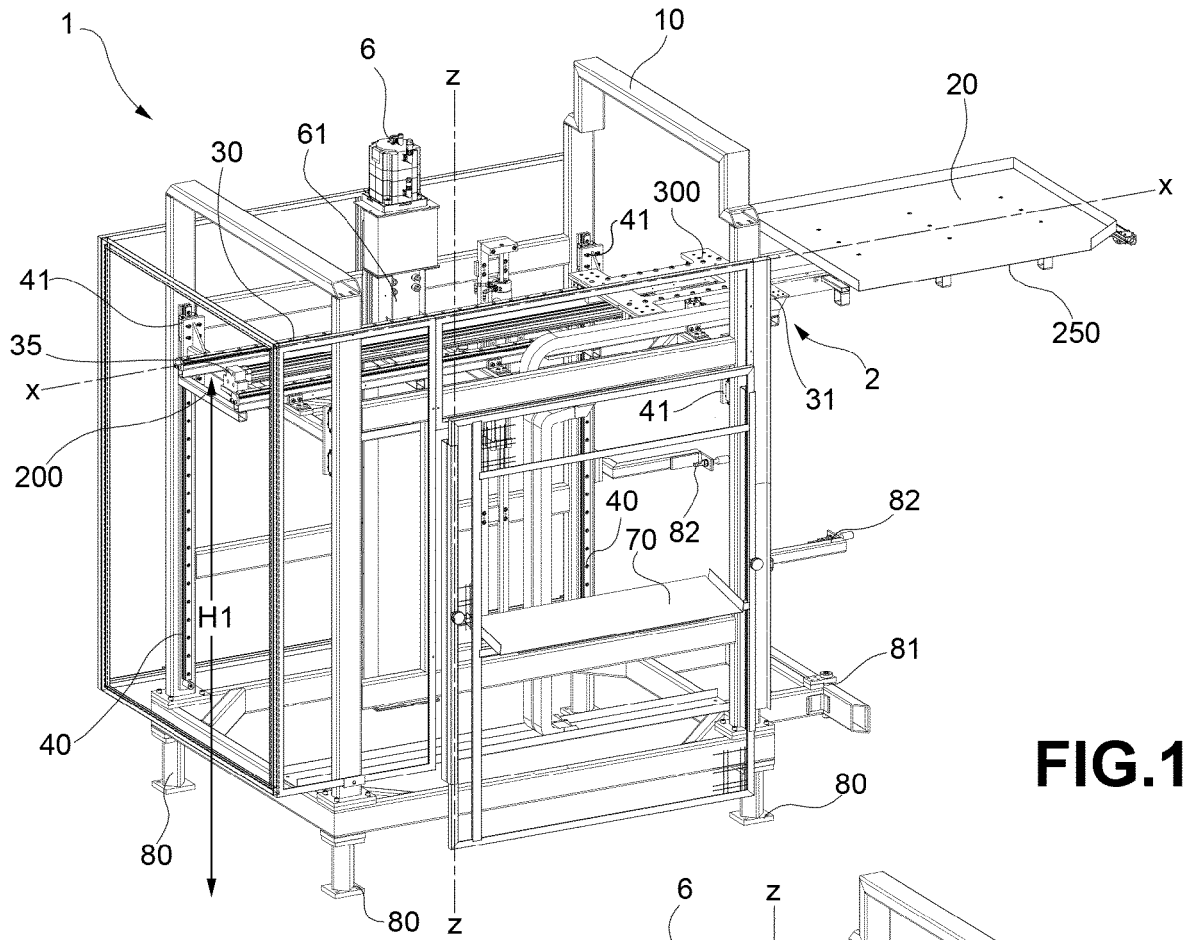
said movement sensors being suitable for detecting the effective translation height (Heff) of the extraction group (2), wherein the control unit (7) enables the translation of the extraction group (2) in accordance with a detection of the movement sensors of an effective height (Heff) lower than said maximum stroke (Hmax), and wherein the control unit (7) blocks the translation of the extraction group (2) in accordance with a detection of the movement sensors of an effective height (Heff) equal to said maximum stroke (Hmax).

13. Apparatus (1) according to claim 11, wherein the control unit (7) is suitable for transposing said maximum stroke (Hmax) into a maximum number of motor revolutions, and suitable for forcing the electric motor (6) to perform said maximum number of motor revolutions, so as to adjust the translation of the extraction group (2) along the vertical axis (Z-Z).

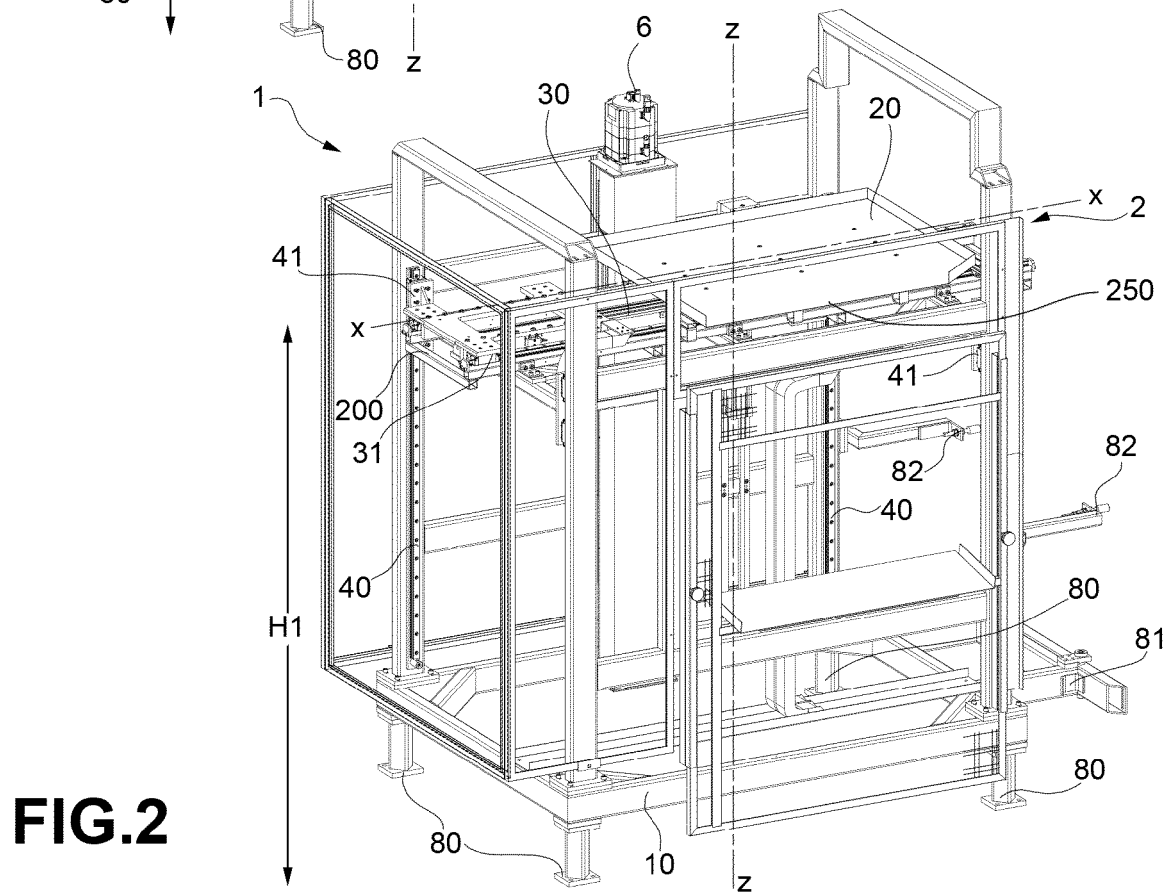
14. A blanking system comprising a blanking press (9) and an apparatus (1) according to any one of the preceding claims, applied to the blanking press.

15. An extraction method for extracting a piece exiting a blanking press (9), said method comprising the steps of:

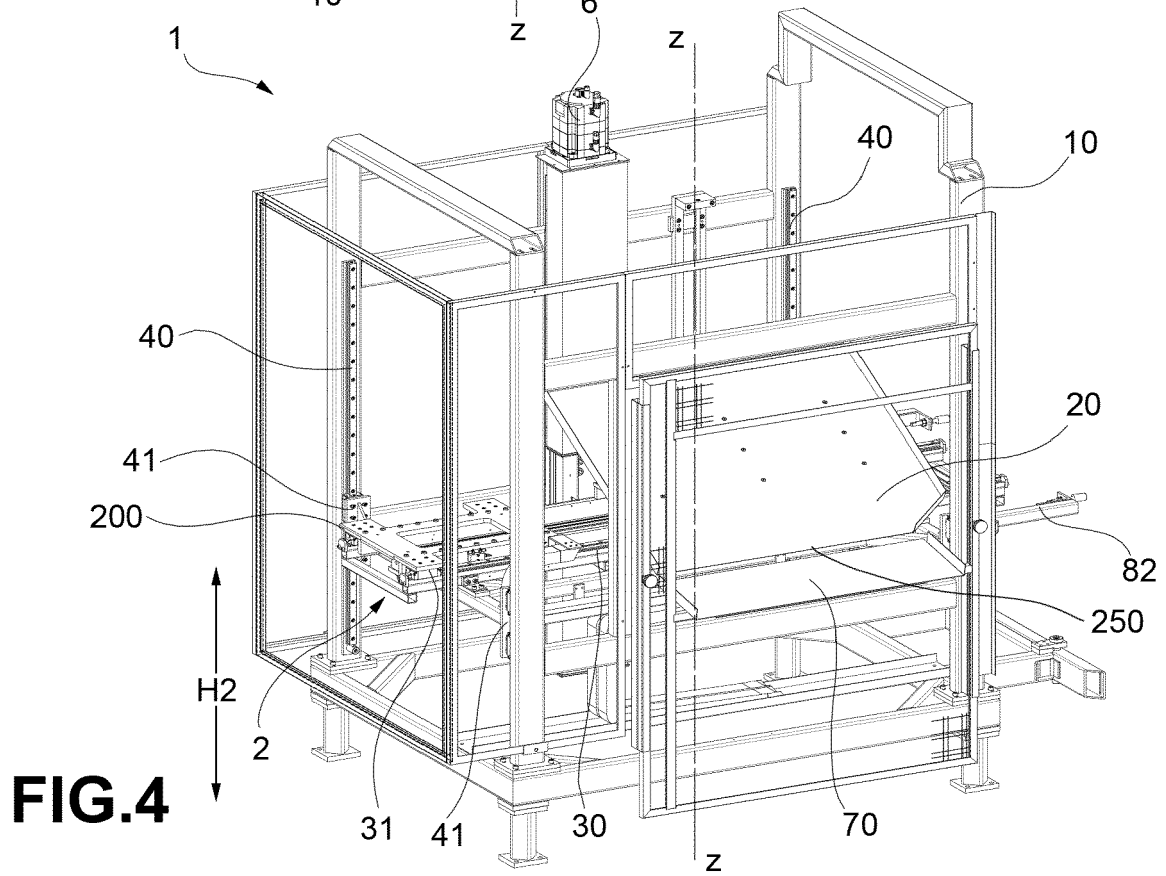
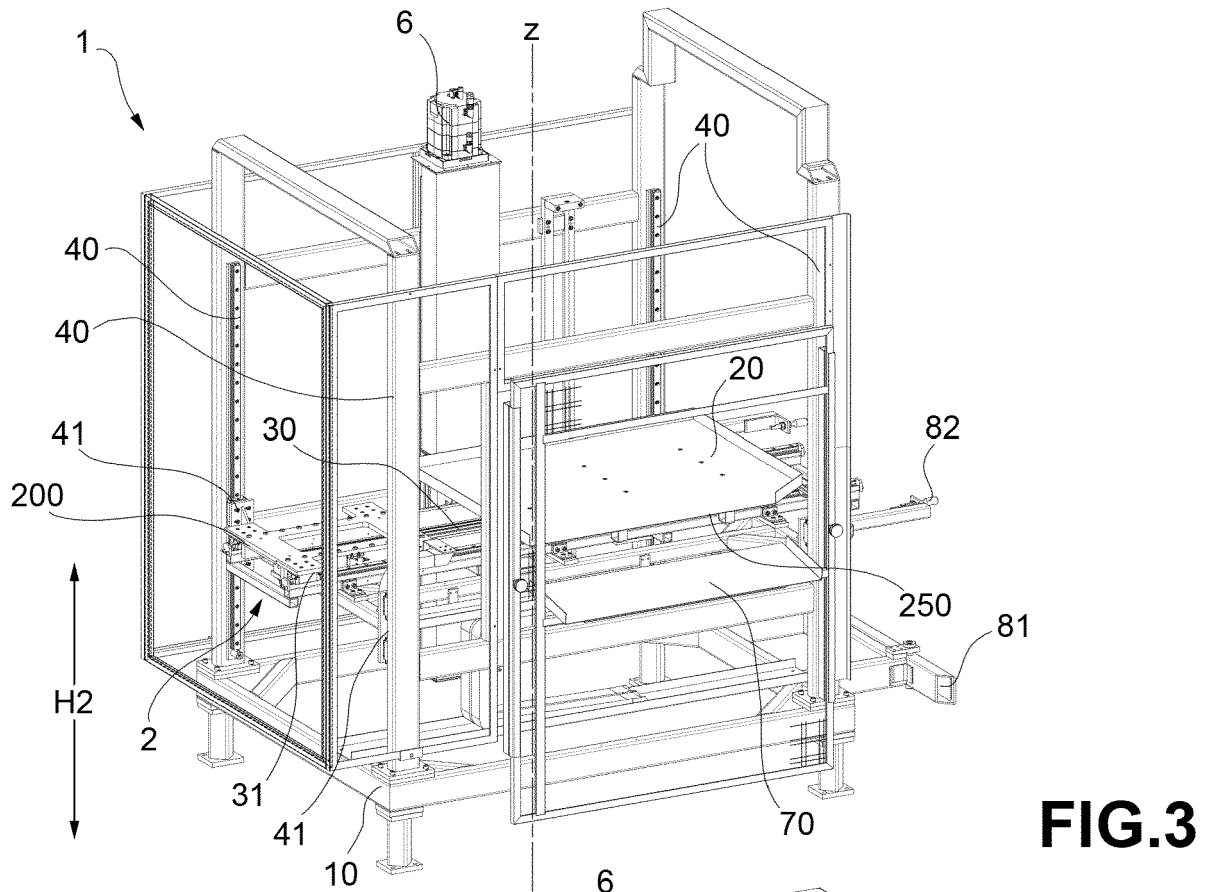
- a) providing an apparatus (1) according to any one of claims 1 to 13;
- b) bringing the extraction group (2) into the raised position (S);
- c) bringing the collection tray (20) into the extraction position (E) to house a piece from a blanking press;
- d) bringing the collection tray (20) into the receiving position (R);
- e) bringing the extraction group (2) into the lowered position (A);
- f) bringing the collection tray (20) into the unloading configuration (SC), to enable the unloading of the piece on the free side (250).

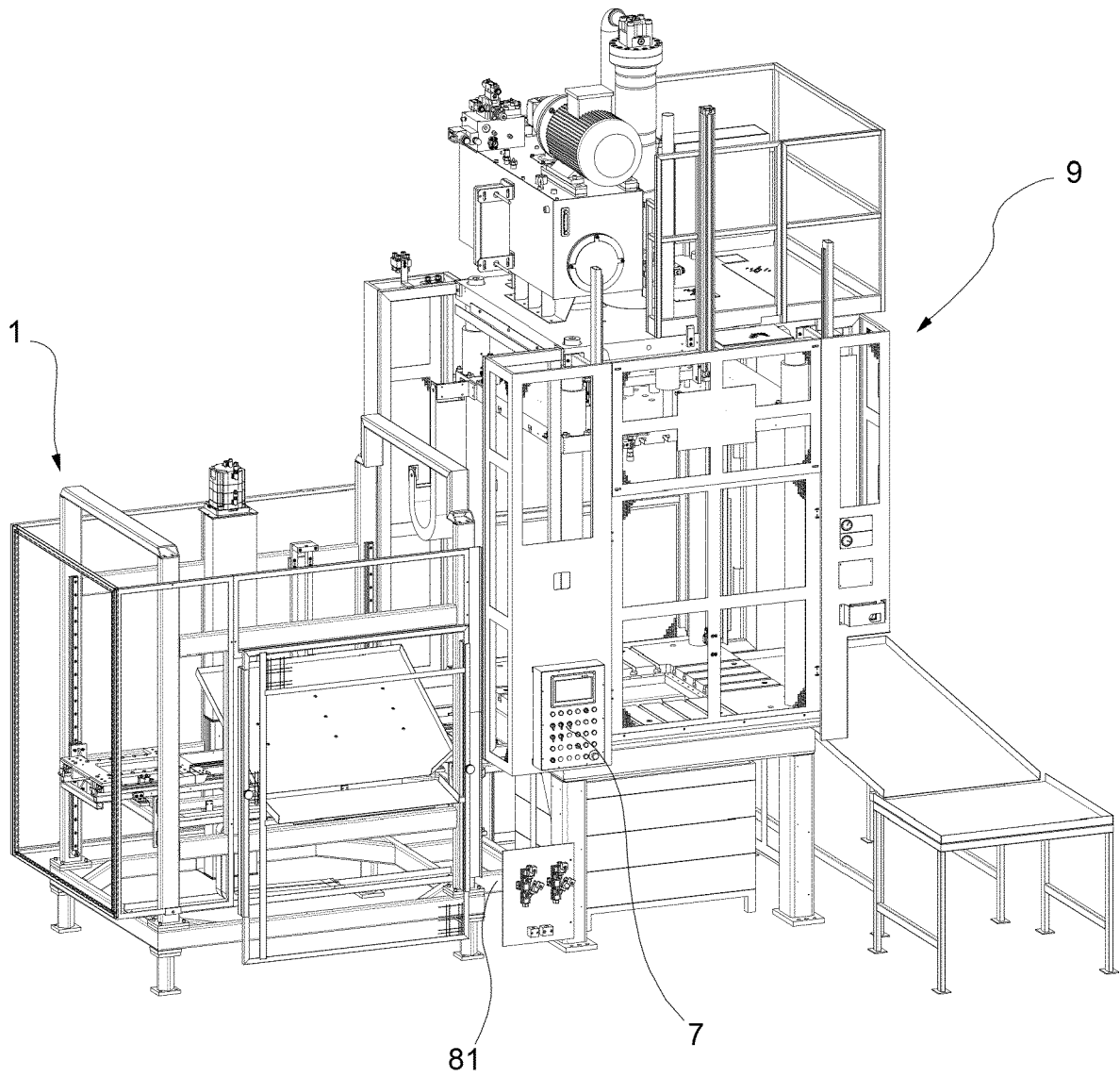


**FIG.1**



**FIG.2**





**FIG.5**

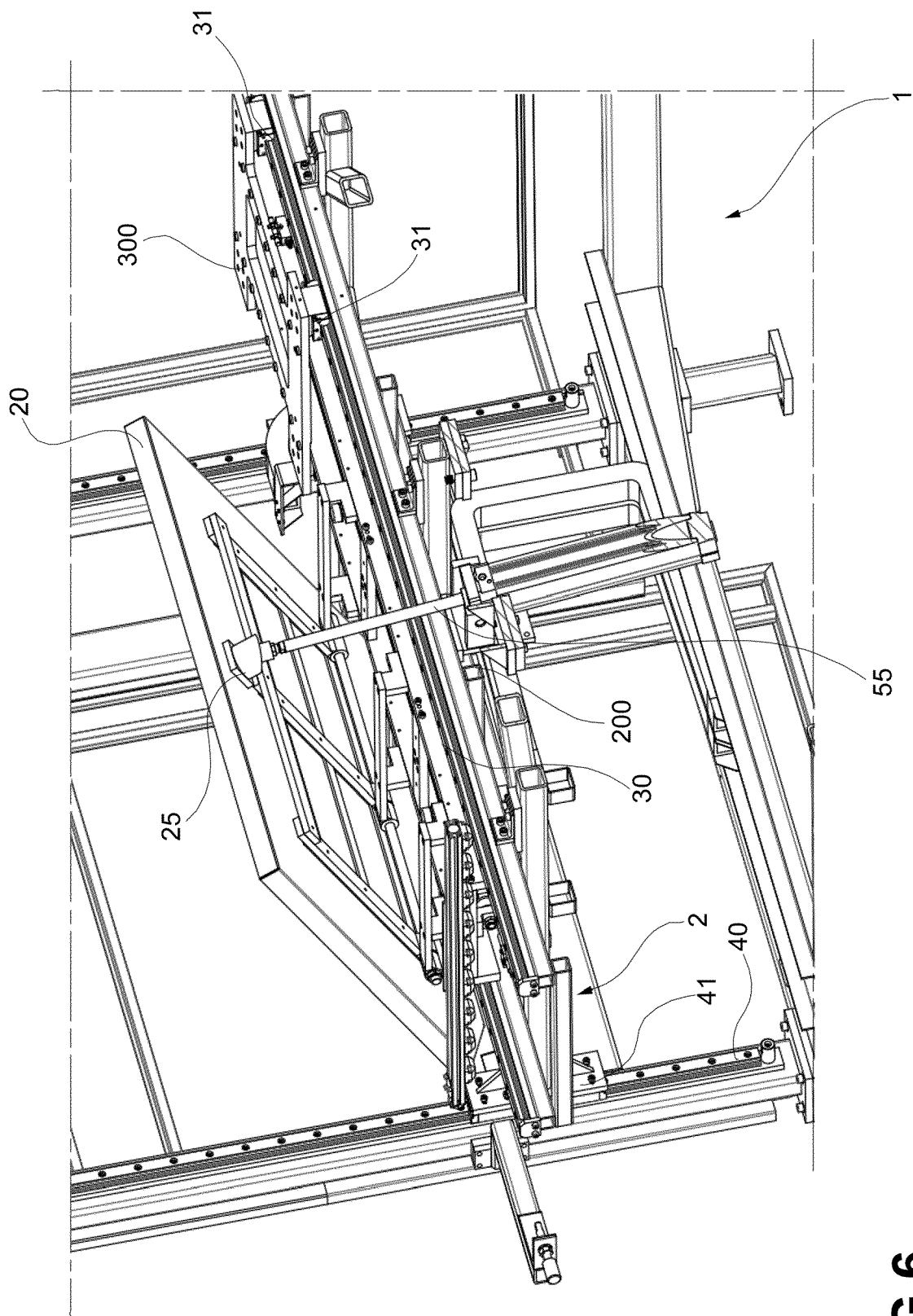
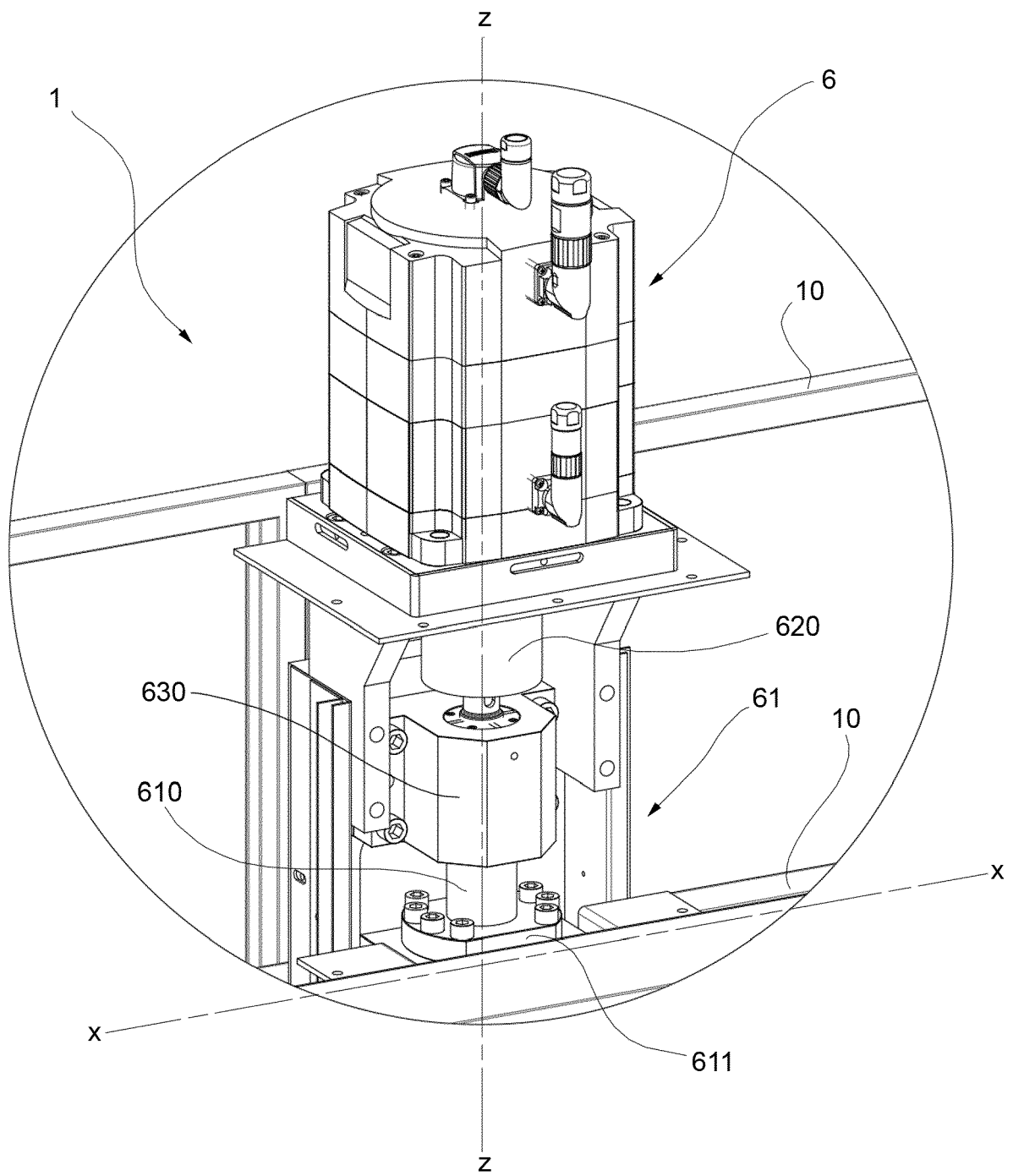


FIG.6



**FIG.7**



## EUROPEAN SEARCH REPORT

Application Number

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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The present search report has been drawn up for all claims			
Place of search <b>The Hague</b>		Date of completion of the search <b>14 February 2023</b>	Examiner <b>Labre, Arnaud</b>
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	

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

EP 22 19 8421

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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