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

(11) **EP 3 339 201 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
05.02.2020 Bulletin 2020/06

(51) Int Cl.:
B65B 69/00 *(2006.01)*

(21) Application number: **17210402.8**

(22) Date of filing: **22.12.2017**

(54) **BALE OPENING DEVICE**

VORRICHTUNG ZUM AUFMACHEN VON BALLEN

DISPOSITF D'OUVERTURE DE BALLES

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(30) Priority: **22.12.2016 IT 201600130386**

(43) Date of publication of application:
27.06.2018 Bulletin 2018/26

(73) Proprietor: **Teuman S.A.S. di Nicolini Marco**
29010 Alseno (PC) (IT)

(72) Inventor: **NICOLINI, Marco**
29017 FIORENZUOLA D'ARDA (PC) (IT)

(74) Representative: **Dallaglio, Fabrizio et al**
Ing. Dallaglio S.R.L.
Via Mazzini 2
43121 Parma (IT)

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Printed by Jouve, 75001 PARIS (FR)

Description

[0001] The present finding relates to the field of lines for the processing and disposal of waste materials, which arrive packaged preferably in bales.

[0002] The compaction of waste materials, which is one of the preprocessing operation to which the waste materials are subjected before being sent to the actual processing, and which consists in the reduction, by compression, of the material into shapes having different sizes and geometry according to the processing needs, is known.

[0003] This operation is carried out with specific types of presses, which, according to the size and geometry of the end product, are referred to as:

- Balers, for compaction into bales;
- Briquetting presses for processing into briquettes or small blocks, and pelletizers for the production of pellets or small cylinders.

[0004] Compaction into bales is particularly useful in processing plants of selected materials (cardboards, newspapers, plastic containers, aluminium cans, wooden crates, etc.); in fact, the bales can be easily moved by simple carts, and allow facilitating the storage operations in warehouses and means of transportation (trucks, trains, etc.).

[0005] The present invention relates to the device for opening said bales that are packaged, i.e., wrapped with metal wires and sometimes also wrapping material.

[0006] More precisely, said apparatuses are used for opening the compacted waste material in order to be able to process the contents thereof.

[0007] Apparatuses configured to open bales packaged and/or tied with wrapping material are known (see e.g. US 4 348 801 or US 5 105 527). They comprise:

- A support structure for supporting the bale to be opened;
- A gripping mechanism configured to be inserted with the bale, to grip said wrapping material, and then to be moved away from the bale with said gripped wrapping material;
- Extraction means inserted with the wrapping material and adapted to move it away from the bale and deliver it to removing means configured to remove said wrapping material;
- Said removing means and gripping means being mutually arranged so as to enable said gripping element and go back to said support structure essentially when said removing means are actuated to remove said wrapping material.

[0008] The drawback of the prior art is that, once the compacted waste packages are opened, the bale wrapping materials cannot be suitably separated.

[0009] Furthermore, as described for example in the documents US 43488021 and US 5105527, devices for opening said packaged bales are known, which comprise gripping means for the wrapping wires that have to be positioned at the single wires. This does not ensure a reliable gripping, since said wires are not always positioned in an even and reproducible manner.

[0010] Furthermore, as regards the storage of the wires recovered from the packaging, the document US 43488021 does not provide a system for the compaction thereof in order to optimize their storage.

[0011] On the other hand, the document US 5105527 provides for a complex discharge system by transferring and cutting means of said wires or wrapping material.

DISCLOSURE AND ADVANTAGES OF THE INVENTION

[0012] Therefore, a first object of the present invention is to provide to the art an improved bale opening device, which solves the mentioned drawbacks, in the context of a solution which is simple, functional, and quite cost-effective.

[0013] Such and other objects are achieved by virtue of the characteristics of the invention set forth in the independent claim 1. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

[0014] In particular, an implementation form of the present invention provides a device that provides for efficiently separating the wrapping materials, such as for example iron wires or any other similar materials that have not to be mixed with the contents of the bale.

[0015] The present finding provides for positioning the wrapped bale in the structure of the bale opening device; said bale is generally wrapped by one or more wires arranged in contact with the side surface thereof, preferably arranged so that each wire forms a ring; when the bale is in place in the structure, the present finding provides for transversally push it, thus pressing it against an abutment; meanwhile, a blade enters until intercepting the wires or possible plastic wrapping material, where present. An intercepting and tensioning means, typically a rod, is inserted in the bale and then between the wires, and it is subsequently moved away so as to tight said wires. Then, the blade is actuated, thus cutting the wires; the tensioning means provides for extracting and winding the wires on said blade for the consecutive expulsion of the wire skein. The bale is then released.

[0016] By virtue of this solution, an efficient device that allows the complete extraction of the wires and the separation from the remaining material of the bale is implemented. By virtue of the fact that the intercepting means are configured as a rod, it is possible to intercept all the wires without having to necessarily verify any single positions of said wires.

[0017] Another aspect of the invention is to provide a device in which there is not a passage of wrapping material from the gripping to the removing means. On the

contrary, by a single intercepting means, the wires are intercepted, tensioned, and wound in a skein for the expulsion.

[0018] In such a manner, by means of said intercepting means it is achieved not only the removal of the wrapping wires, but also the compaction thereof in order to optimize the subsequent storage.

[0019] By virtue of this solution, the cutting system is also simple, since it is built-in in the same compacting means.

[0020] Therefore, the advantages of the finding can be mainly related to the simplicity of the means implemented and the separation efficiency.

[0021] Said objects and advantages are all achieved by the bale opening device, which is the subject matter of the present finding, which is characterized by what is indicated in the claims set forth below.

BRIEF DESCRIPTION OF THE FIGURES

[0022] This and other features will be more apparent from the following description of some embodiments, which are illustrated by way of example only and not by way of limitation in the appended drawing tables.

- Figs. 1 and 1A show different views, of which an axonometric one, of the bale opening device in accordance with the invention;
- Fig. 2 shows in axonometric view a detail of the intercepting means that are integral to the bale opening device and are configured to intercept the wrapping wires of the bale, and subsequently to exert a tensioning force thereupon;
- Fig. 3 shows a detail of the gripping means of the package of material to be opened by said bale opening device;
- Fig. 4 shows in axonometric view the front and rear of one of the holding and cutting means of the device in question.
- Fig. 5 shows a detail in axonometric view of the cutting means of the device.

DESCRIPTION OF THE INVENTION

[0023] With particular reference to Fig. 1 and 1A, a bale opening apparatus or device 10 for opening bales 20 packaged with wrapping material 30 such as wires or straps, where each wire 30 is preferably adapted to define a ring about a side surface 21 of the bale 20 is represented.

[0024] A first subject matter of the invention is the method for the opening of said bales 20 and the separation of the wrapping material 30 from the content of the bale 20.

[0025] As stated, the bale 20 is packaged and/or tied with at least one or more wires 30 and arranged in a removal structure.

[0026] The process implemented by the present invention to carry out the separation of the wrapping material 30, which by for the sake of simplicity will be referred to as wires 30 herein below, provides for holding the bale 20, and carrying out a series of operations while keeping the bale 20 stationary and hold by the holding means 2.

[0027] In a preferred embodiment said holding means 2 comprise two substantially planar and opposite surfaces, configured to contact two opposite sides of the side surface 21 of the bale 20.

[0028] With the so-hold bale 20, the process first provides for at least intercepting its one or more wrapping wires 30 and for exerting a force adapted to cause the side tensioning of said one or more wires 30. Preferably the above-mentioned force is in a perpendicular direction to the side surface 21 or side of the bale 20 wrapped by said one or more wires 30.

[0029] Since the wires 30 are annularly wrapped, the tensioning of the wires 30 is caused by exerting an action of moving away or "detachment" from the bale 20.

[0030] In the case of multiple wires 30, said process provides for causing the tensioning by the interaction with the wires 30 sections on a same side with respect to the side surface of the wrapped bale 20.

[0031] This action is preparatory to the subsequent real cutting action. In fact, after the tensioning, the wires 30 are cut by the special cutting means 4.

[0032] Preferably the cutting occurs through means that are already in place, since they are part of the compression and holding means 2.

[0033] After cutting the wires 30, they are removed and extracted.

[0034] It is highlighted that in this tensioning operation the wires 30 are removed from the tensioning side. In more detail, said removal action occurs while the action of moving away from the side of the bale 20 that created that tensioning is continued. The removal is preferably completed by performing, simultaneously to the parting action, a winding action of the cut wires 30.

[0035] In fact, the tensioning action is such that, once the wires 30 have been tensioned, they are also blocked to facilitate the subsequent winding, so that the removal action (in this case, by winding) is established in the shortest time possible as soon as the cutting means 4 have cut the wires 30.

[0036] By virtue of this solution, it is possible, by the winding step, to optimize the expulsion of the wires 30, since they are more compacted, which promotes the subsequent storage thereof.

[0037] Once the removal is complete, it is provided for stopping the holding of said bale 20.

[0038] In brief, the process providing for acting on the hold bale 20 consists of:

a. Intercepting its one or more wrapping wires 30,
b. Exerting a tensioning force on said one or more wires 30,
c. Cutting the wires 30,
d. Removing the cut wires 30 preferably by blocking

and winding said one or more wires 30.

[0039] The bale opening device 10 comprises a resting plane 1 on which the bale 20 is positioned, and holding means 2 configured to hold the bale 20 packaged and/or tied with at least one or more wires 30 annularly wrapped about the side surface 21 of the bale 20.

[0040] According to a preferred embodiment said apparatus further comprises intercepting means 3, typically comprising a rod 31, which is configured to intercept and tension said one or more wires 30, and cutting means 4 operating according to the following steps:

a) the intercepting means 3 insert within the ring of said one or more wires 30 of the hold bale 20;
b) the intercepting means 3 translate, thus moving the wires 30 away from the bale 20 and tensioning them;
c) the cutting means 4 cut said one or more wires 30;
d) the intercepting means 3 remove and separate the wires 30 from the bale 20;
e) the holding means 2 move away from the bale 20 after the removal of the wires 30.

[0041] In the case of multiple wires 30, the intercepting means 3 are configured to intercept them from a same side 21a of the side surface 21 of the wrapped bale 20.

[0042] In accordance with a further aspect of the invention, the intercepting means 3 comprise the rod 31, which extends according to a vertical direction Z that is substantially perpendicular to the surface passing through each ring formed by the wires 30.

[0043] In accordance with a possible embodiment, the rod 31 is configured to insert within the rings formed by the wires 30, by a translation according to the vertical direction Z.

[0044] In a formulation of the present finding, said intercepting means 3 are configured to carry out a first translation according to a horizontal direction Y perpendicular to the side 21a of the bale 20, by moving the wires 30 away from the bale 20 and putting them in tension.

[0045] In the embodiment illustrated, with particular reference to Figs. 1A, 2 and 3, it is noted that the intercepting means 3 are movable vertically, or in a substantially vertical direction Z, being supported on a frame 32 translating in the vertical direction indicated with Z.

[0046] Said frame 32, hence the intercepting means 3, is also movable according to the horizontal direction Y perpendicular to the side 21a in which the wires 30 are intercepted by the intercepting means 3; according to an aspect of the finding, for example, said translation occurs through rolling means that slide on corresponding tracks and the actuation by at least one pneumatic or hydraulic or electric cylinder.

[0047] The cutting means 4 comprise two blades 41 and 42, at least one blade 41 of which being movable, which, in the case of multiple wires 30 is configured to intercept all the wires on the same side with respect to the wrapped bale 20.

[0048] In accordance with a characteristic of the present finding the movable blade 41 is configured to cut the wires 30 by a translation according to the vertical direction Z.

[0049] Said blade 41 comprises a plurality of teeth 43 that are arranged inclined with respect to the vertical direction Z so as to hold the wires 30 more within the blade during the cutting. By virtue of this solution, there is an increased assurance to be able to cut all the wires 30 that are hold by the inclined surface of the tooth 43.

[0050] Furthermore, the two blades 41 and 42 are preferably positioned so that the inclination of the teeth 43 thereof is the opposite, i.e., for example, the movable blade 41 will have its teeth 43 upwardly sloped, while the fixed blade 42 will have its teeth 43 downwardly sloped, or vice versa.

[0051] In such a manner the wires 30 remain blocked until the cutting within an area defined by the teeth 43 of the two blades 41 and 42.

[0052] An embodiment further provides that the cutting means 4 are preferably arranged on the holding means 2.

[0053] According to a preferred embodiment the cutting means 4 are positioned opposite to the tensioning means 3, i.e., on the side opposite the intercepting side 21a.

[0054] An aspect of the invention provides that the tensioning means 3 are also arranged at the holding means 2.

[0055] According to a further aspect of the invention, once the cutting of the wires 30 has been carried out, in order to remove and separate them from the bale 20, the intercepting means 3 are configured to carry out a second translation in the same tensioning direction Y such as to move them farther away from the bale 20.

[0056] In order to complete the extraction, a preferred solution is the one providing for the rotation of the intercepting means 3 during the moving away from the bale 20, so as to extract said one or more wires 30 by wrapping them about the intercepting means 3 themselves.

[0057] An aspect of the finding provides that the intercepting means 3 are able to rotate about a rotational axis arranged according to the vertical direction Z.

[0058] In order to enhance the holding of the wires 30 especially in the initial wrapping step, the intercepting means 3 comprise an abutment element 5, which blocks said wires 30 during the rotation. A preferred embodiment provides that the abutment element 5 blocks the wires 30 on the rod 31.

[0059] Once the wrapping is completed, the wires 30 are extracted from the intercepting means 3, by an expulsion element that make them slide along the intercepting means 3 until making them fall in a suitable collecting container.

[0060] However, it is understood that what has been described above has given by way of non-limiting example; therefore, possible detail variations which would be necessary due to technical and/or functional reason are

already intended to fall within the same protection scope defined by the claims set forth below.

Claims

1. A bale opening device (10) comprising holding means (2) configured to hold a bale (20) packaged and/or tied with at least one or more wires (30), wherein each wire (30) is adapted to substantially define a ring about a side surface (21) of the bale (20), the device comprising intercepting means (3) and cutting means (4), wherein:

   a. said intercepting means (3) are configured to intercept and tension said one or more wires (30), inserting themselves within the ring formed by said one or more wires (30) of the hold bale (20);
   b. said cutting means (4) are configured to cut said one or more tensioned wires (30); **characterised in that**
   c. said intercepting means (3) are adapted to be rotated in order to extract said one or more wires (30) by winding.

2. The bale opening device (10) according to claim 6, **characterized in that** the intercepting means (3) are configured to intercept multiple wires (30) on a same side (21a) of the wrapped side surface (21).

3. The bale opening device (10) according to claim 7, **characterized in that** the intercepting means (3) are configured to carry out a first translation according to a horizontal direction (Y) perpendicular to the side (21a) of the bale (20) moving the wires (30) away from the bale (20) and putting them in tension.

4. The bale opening device (10) according to the claims 7 and 8, **characterized in that** the intercepting means (3) are configured to carry out a second translation according to the horizontal direction (Y), i.e., in the same tensioning direction, moving further from the bale (20) to remove and separate the wires (30).

5. The bale opening device (10) according to one of the previous claims, **characterized in that** the intercepting means (3) comprise a rod (31) extending according to a vertical direction (Z) which is substantially perpendicular to the surface passing through each ring formed by said wires (30), the rod (31) being configured to insert within said rings of wires (30) by a translation according to the vertical direction (Z).

6. The bale opening device (10) according to one of the previous claims, **characterized in that** the intercepting means (3) further comprise an abutment element (5) configured to get close to the rod (31) and block the wires (30), thus holding them during the rotation of said intercepting means (3).

7. The bale opening device (10) according to claim 6 **characterized in that** the cutting means (4) are arranged on the holding means (2).

8. The bale opening device (10) according to claims 6 and 12, **characterized in that** the cutting means (4) comprise a fixed blade (42) and at least one movable blade (41) configured to cut the wires (30) by a translation according to the vertical direction (Z).

9. The bale opening device (10) according to claim 13, **characterized in that** the fixed blade (42) and the movable blade (41) comprise a plurality of teeth (43) arranged inclined with respect to the vertical direction (Z) so as to hold the wires (30) within the blade (41, 42) during the cutting.

10. The bale opening device (10) according to claim 15 **characterized in that** the two blades (41, 42), movable and fixed, are positioned so that the inclination of the teeth (43) is opposite, where the movable blade (41) teeth (43) are upwardly sloped, and the fixed blade (42) teeth (43) are downwardly sloped, or vice versa.

Patentansprüche

1. Ballenöffnungsvorrichtung (10), Haltemitteln (2) umfassend, die zum Halten eines Ballens (20) ausgeführt sind, der mit mindestens einem oder mehreren Drähten (30) verpackt und/oder gebunden ist, wobei jeder Draht (30) dazu ausgelegt ist, im Wesentlichen einen Ring um eine Seitenfläche (21) des Ballens (20) herum zu definieren, wobei die Vorrichtung Abfangmittel (3) und Schneidemittel (4) umfasst, wobei:

   a. die genannten Abfangmittel (3) derart konfiguriert sind, um den einen oder die mehreren Drähte (30) abzufangen und zu spannen, wobei sie sich in den Ring einfügen, der durch den einen oder die mehreren Drähte (30) des gehaltenen Ballens (20) gebildet wird;
   b. die genannten Schneidmittel (4) derart konfiguriert sind, um den einen oder die mehreren gespannten Drähte (30) zu schneiden; **dadurch gekennzeichnet, dass**
   c. die genannten Abfangmittel (3) so beschaffen sind, dass sie gedreht werden können, um den einen oder die mehreren Drähte (30) durch Wickeln herauszuziehen.

2. Ballenöffnungsvorrichtung (10) nach Anspruch 6, **dadurch gekennzeichnet, dass** die Abfangmittel

(3) derart konfiguriert sind, dass sie mehrere Drähte (30) auf einer gleichen Seite (21a) der aufgewickelten Seitenfläche (21) abzufangen.

3. Ballenöffnungsvorrichtung (10) nach Anspruch 7, **dadurch gekennzeichnet, dass** die Abfangmittel (3) derart konfiguriert sind, um eine erste Verlagerung gemäß einer horizontale Richtung (Y) senkrecht zu der Seite (21a) des Ballens durchzuführen (20), wobei sie die Drähte (30) vom Ballen (20) wegführen und sie in Spannung setzen.

4. Ballenöffnungsvorrichtung (10) nach Ansprüchen 7 und 8, **dadurch gekennzeichnet, dass** die Abfangmittel (3) derart konfiguriert sind, dass sie eine zweite Translation gemäß der horizontalen Richtung (Y), d.h. in der gleichen Spannrichtung, ausführen, wobei sie sich vom Ballen (20) entfernen, um die Drähte (30) zu entfernen und trennen.

5. Ballenöffnungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Abfangmittel (3) eine Stange (31) aufweisen, die sich entsprechend einer vertikalen Richtung (Z) erstreckt, die im wesentlichen senkrecht zur Oberfläche ist, die durch jeden Ring passiert, der durch die genannten Drähte (30) gebildet ist, wobei die Stange (31) derart konfiguriert ist, dass sie in die genannten Ringe der Drähte (30) durch eine Verschiebung gemäß der vertikalen Richtung (Z) eingesetzt wird.

6. Ballenöffnungsvorrichtung (10) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Abfangmittel (3) ferner ein Anschlagelement (5) umfassen, der derart konfiguriert, dass es sich bis nahe an der Stange (31) erstreckt und die Drähte (30) blockiert, wodurch sie während der Drehung der genannten Abfangmittel (3) gehalten werden.

7. Ballenöffnungsvorrichtung (10) nach Anspruch 6, **dadurch gekennzeichnet, dass** die Schneidmittel (4) an den Haltemitteln (2) angeordnet sind.

8. Ballenöffnungsvorrichtung (10) nach Ansprüchen 6 und 12, **dadurch gekennzeichnet, dass** die Schneidmittel (4) eine feststehende Klinge (42) und mindestens eine bewegliche Klinge (41) umfassen, die derart konfiguriert sind, dass sie die Drähte (30) durch eine Translation nach der vertikaler Richtung (Z), schneiden.

9. Ballenöffnungsvorrichtung (10) nach Anspruch 13, **dadurch gekennzeichnet, dass** die feststehende Klinge (42) und die bewegliche Klinge (41) eine Vielzahl von Zähnen (43) umfassen, die geneigt in Bezug auf die vertikale Richtung (Z) derart angeordnet sind, dass sie die Drähte (30) während des Schneidens in der Klinge (41, 42) halten.

10. Ballenöffnungsvorrichtung (10) nach Anspruch 15, **dadurch gekennzeichnet, dass** die beiden beweglichen und feststehenden Klingen (41, 42) derart positioniert sind, dass die Neigung der Zähne (43) entgegengesetzt ist, wobei die Zähne (43) der beweglichen Klinge (41) sind nach oben geneigt, und die Zähne (43) der feststehenden Klinge (42) sind nach unten geneigt, oder umgekehrt.

Revendications

1. Dispositif d'ouverture de balle (10) comprenant des moyens de maintien (2) configurés pour maintenir une balle (20) emballée et/ou attachée avec au moins un ou plusieurs fils (30), chaque fil (30) étant adapté pour définir substantiellement un anneau autour d'une surface latérale (21) de la balle (20), le dispositif comprenant des moyens d'interception (3) et des moyens de coupe (4), dans lequel:

a. lesdits moyens d'interception (3) sont configurés pour intercepter et tendre ledit un ou plusieurs fils (30), en s'insérant eux-mêmes dans l'anneau formé par ledit un ou plusieurs fils (30) de la balle (20) à maintenir;
b. lesdits moyens de coupe (4) sont configurés pour couper lesdits un ou plusieurs fils tendus (30), **caractérisé en ce que**
c. lesdits moyens d'interception (3) sont adaptés pour être mis en rotation afin d'extraire lesdits un ou plusieurs fils (30) par enroulement.

2. Dispositif d'ouverture de balle (10) selon la revendication 6, **caractérisé en ce que** les moyens d'interception (3) sont configurés pour intercepter plusieurs fils (30) sur un même côté (21a) de la surface latérale enveloppée (21).

3. Dispositif d'ouverture de balle (10) selon la revendication 7, **caractérisé en ce que** les moyens d'interception (3) sont configurés pour effectuer une première translation selon une direction horizontale (Y) perpendiculaire au côté (21a) de la balle (20), en éloignant les fils (30) de la balle (20) et en les mettant en tension.

4. Dispositif d'ouverture de balle (10) selon les revendications 7 et 8, **caractérisé en ce que** les moyens d'interception (3) sont configurés pour effectuer une deuxième translation selon la direction horizontale (Y), c'est-à-dire dans la même direction de tension, en s'éloignant de plus en plus loin de la balle (20) pour retirer et séparer les fils (30).

5. Dispositif d'ouverture de balle (10) selon l'une des revendications précédentes, **caractérisé en ce que** les moyens d'interception (3) comprennent une tige (31) s'étendant selon une direction verticale (Z) qui est sensiblement perpendiculaire à la surface passant à travers chaque anneau formé par lesdits fils (30), la tige (31) étant configurée pour s'insérer à l'intérieur desdits anneaux de fils (30) par une translation selon la direction verticale (Z).

6. Dispositif d'ouverture de balle (10) selon l'une des revendications précédentes, **caractérisé en ce que** les moyens d'interception (3) comprennent en outre un élément de butée (5) configuré pour s'approcher de la tige (31) et bloquer les fils (30), en les maintenant ainsi pendant la rotation desdits moyens d'interception (3).

7. Dispositif d'ouverture de balle (10) selon la revendication 6, **caractérisé en ce que** les moyens de coupe (4) sont disposés sur les moyens de maintien (2).

8. Dispositif d'ouverture de balle (10) selon les revendications 6 et 12, **caractérisé en ce que** les moyens de coupe (4) comprennent une lame fixe (42) et au moins une lame mobile (41) configurée pour couper les fils (30) par translation selon la direction verticale (Z).

9. Dispositif d'ouverture de balle (10) selon la revendication 13, **caractérisé en ce que** la lame fixe (42) et la lame mobile (41) comprennent une pluralité de dents (43) agencées inclinées par rapport à la direction verticale (Z) de manière à maintenir les fils (30) dans la lame (41, 42) pendant la coupe.

10. Dispositif d'ouverture de balle (10) selon la revendication 14, **caractérisé en ce que** les deux lames (41, 42), mobiles et fixes, sont positionnées de manière à ce que l'inclinaison des dents (43) soit opposée, où les dents (43) de la lame mobile (41) sont inclinées vers le haut, et les dents (43) de la lame fixe (42) sont inclinées vers le bas, ou inversement.

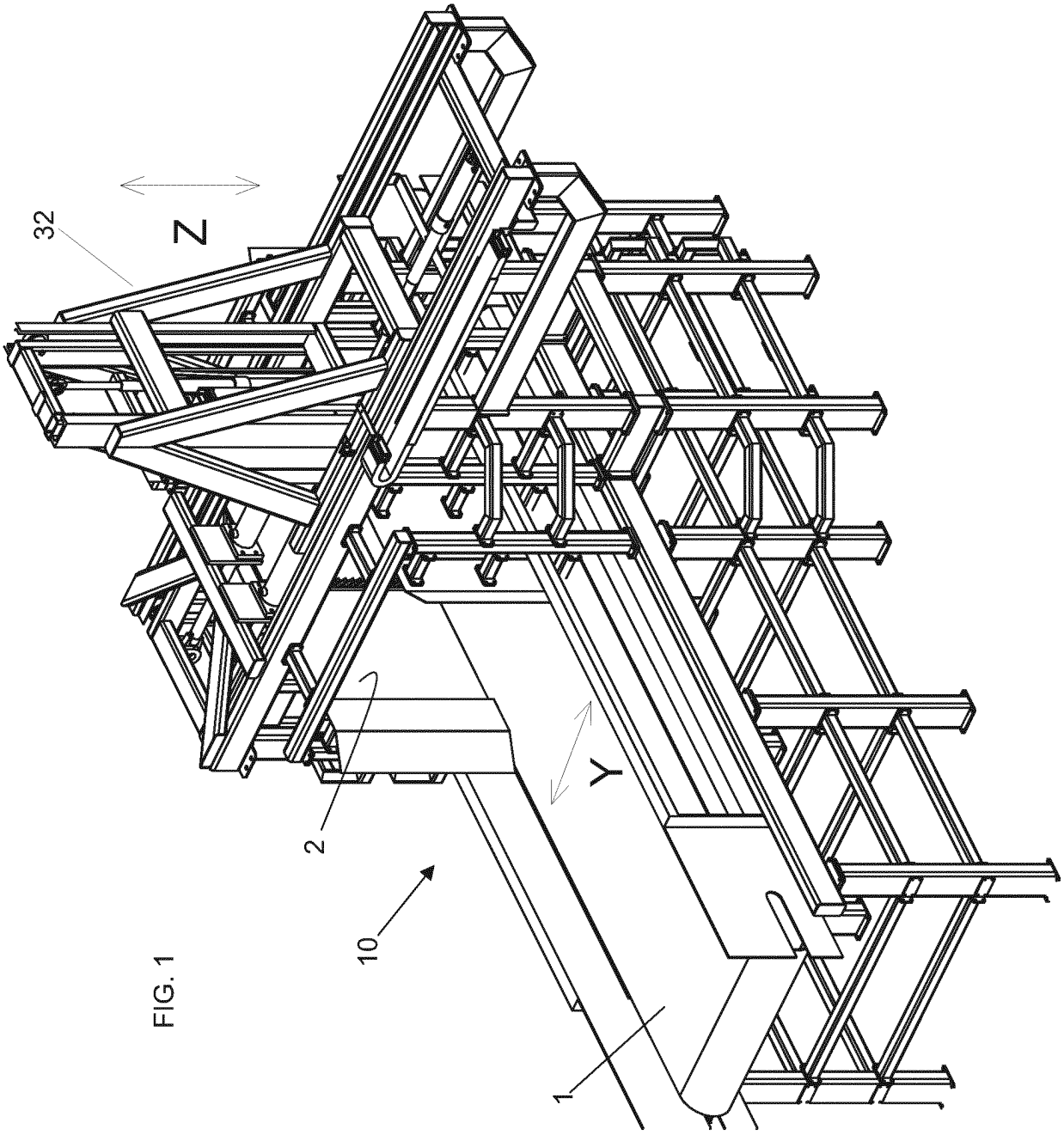


FIG. 1

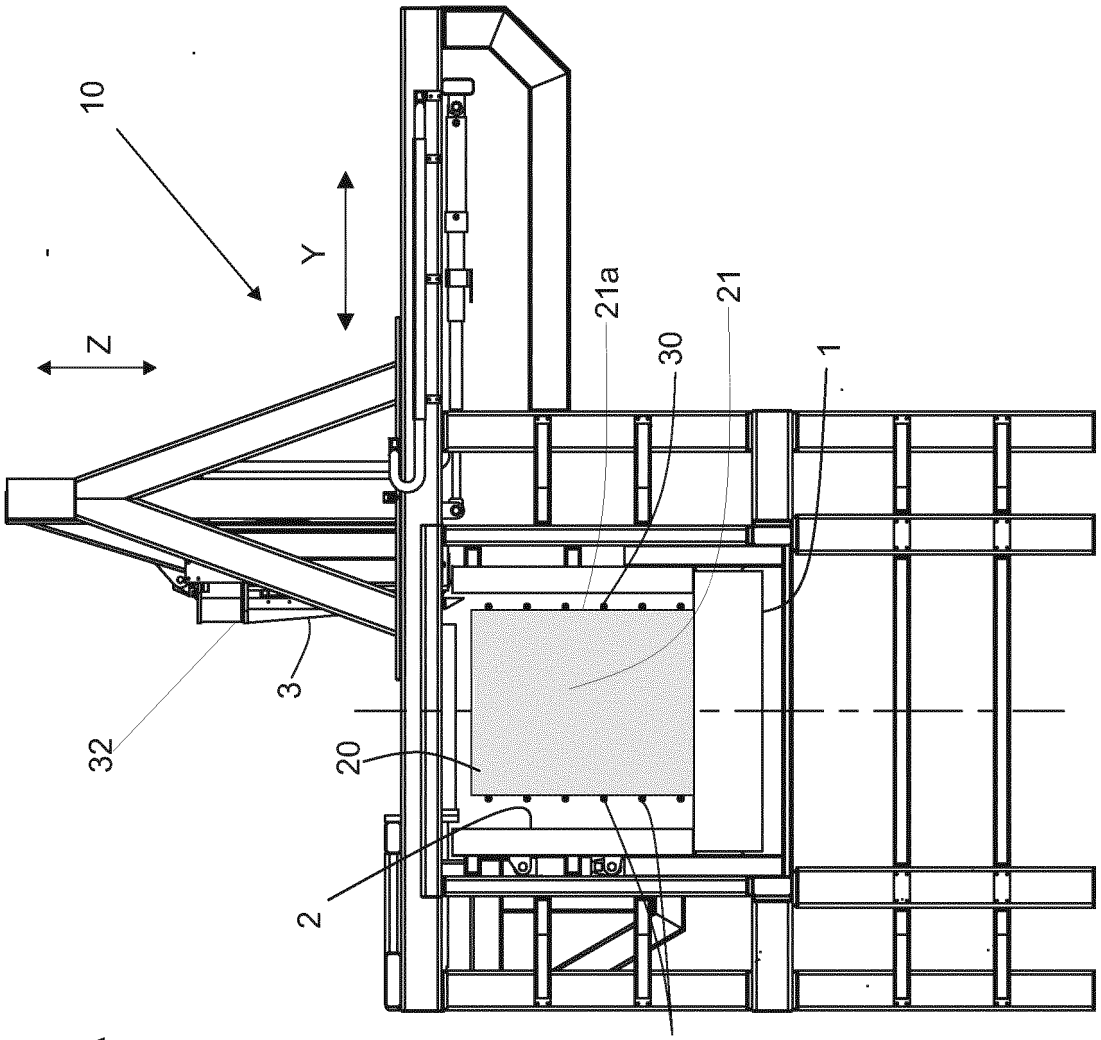


FIG. 1A

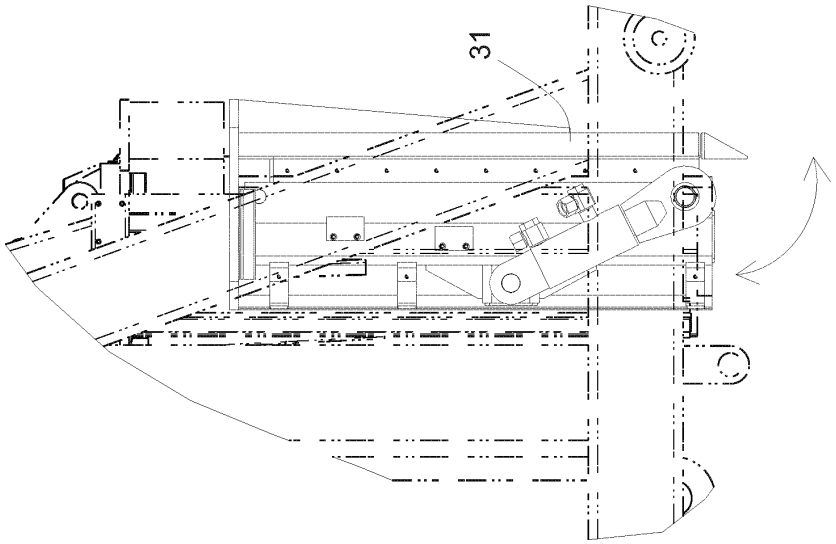


FIG. 3

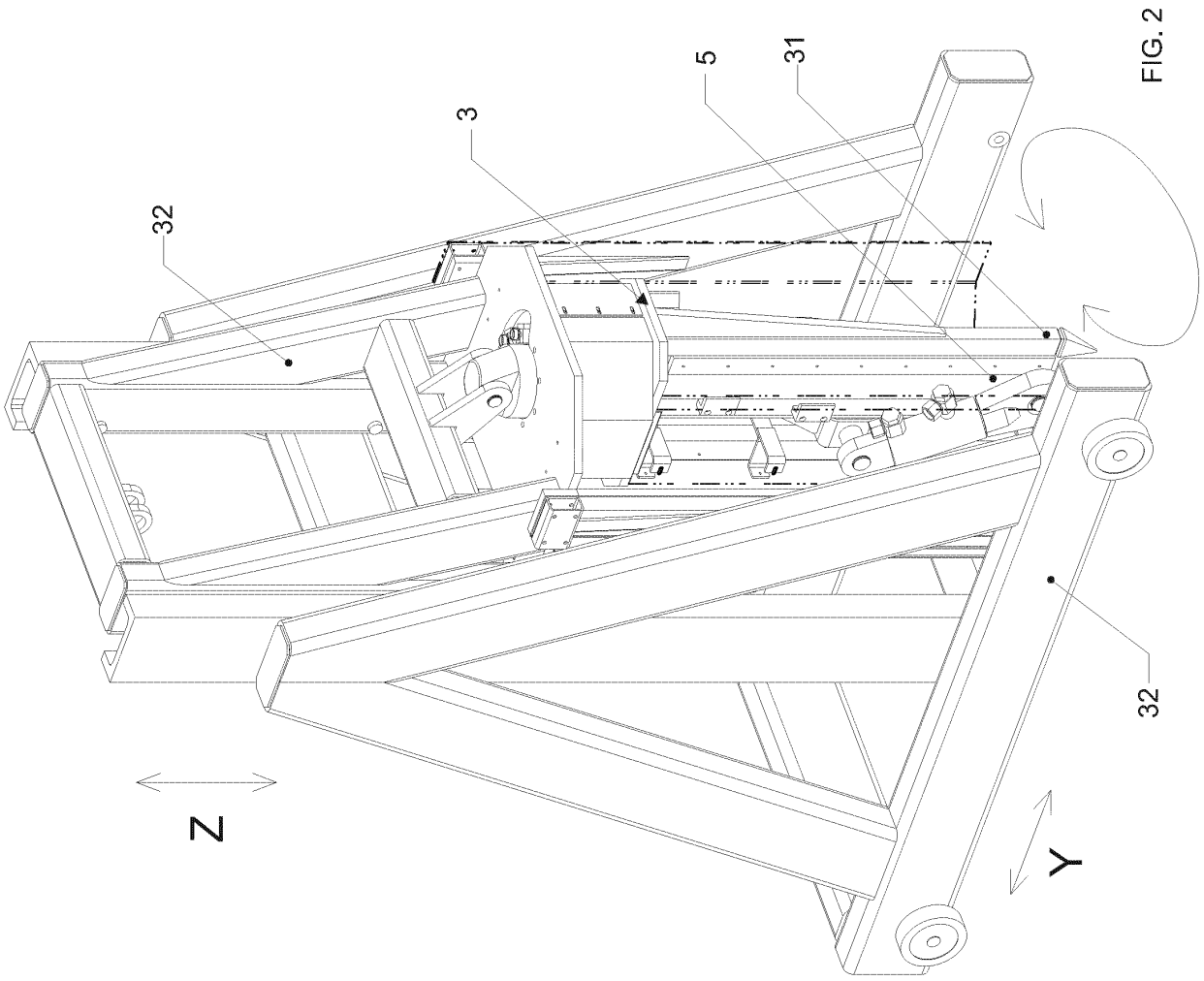


FIG. 2

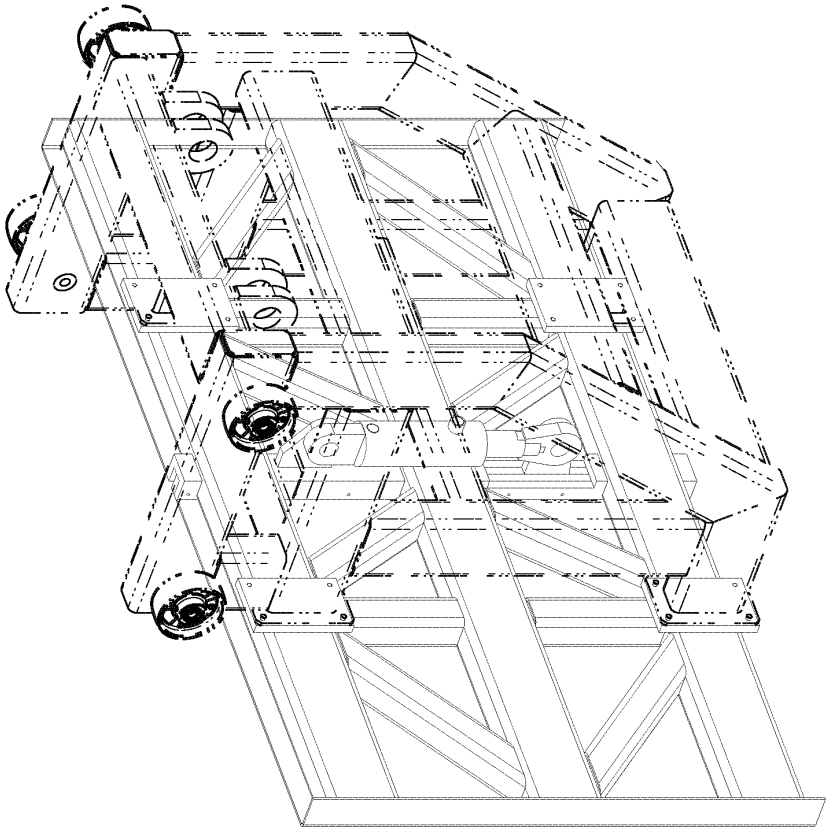


FIG. 4

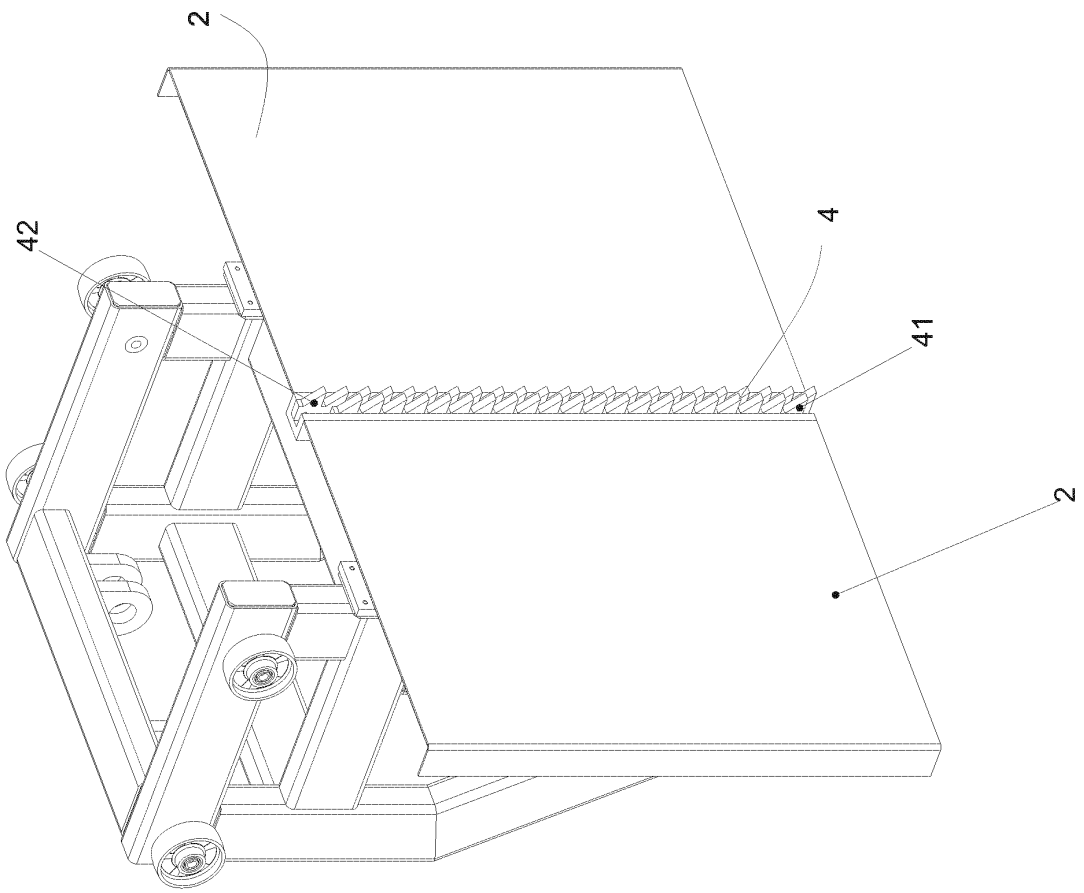
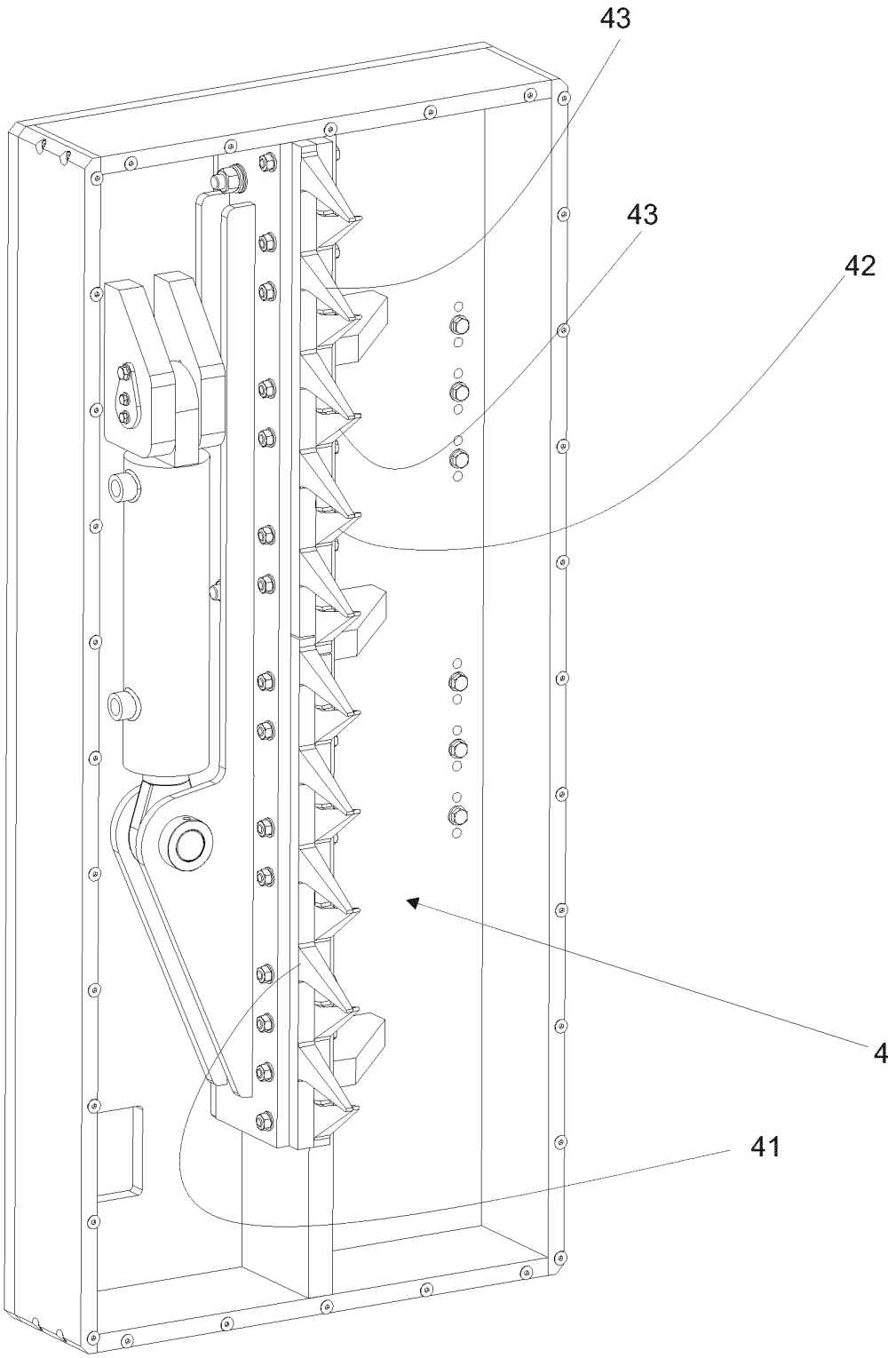


FIG. 5



REFERENCES CITED IN THE DESCRIPTION

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