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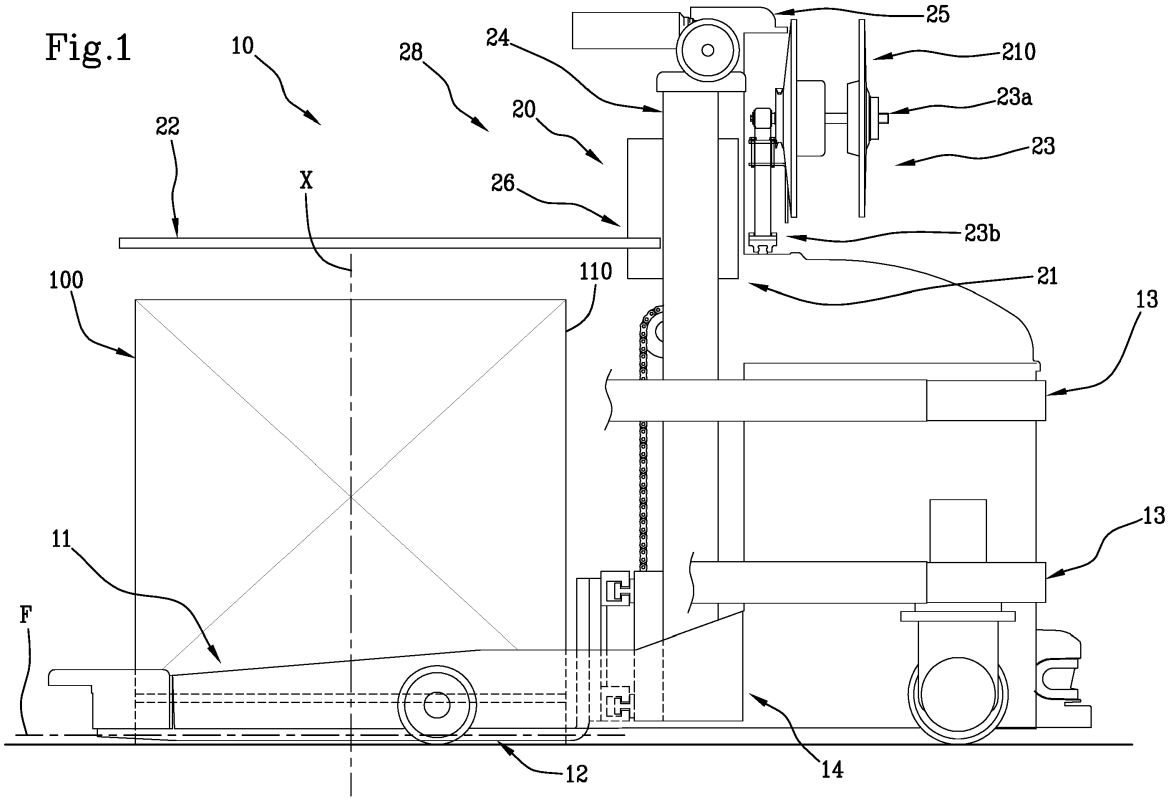
(54) AN AUTOMATED GUIDED VEHICLE FOR MANAGING A PACKAGE

(57) A vehicle for transporting a package (100) comprising tying means (20) of said package (100).

The tying means (20) comprising: a strapping machine (28) suitable for arranging a tie strap (200) around said package (100); a sliding carriage (21) for bearing said strapping machine (28); at least one guide (24) fixed to a structural portion (14) of said automated guided vehicle (10) and operatively associated with said sliding carriage (21), the latter being adapted to slide on the guide (24); and drive means (25) suitable for moving the sliding carriage (21) along said guide (24).

Fig.1



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Description

[0001] The present invention relates to an automated guided vehicle for managing a package.

[0002] Disclosed is in particular an automated guided vehicle, also known by the acronym AGV, used in warehouses or in production departments within the ceramic industry.

[0003] A package, such as a package of tiles, generally comprises a base pallet whereon the tiles are tidily arranged.

[0004] At least two main categories can be structurally distinguished within AGVs of the prior art. A first AGV type exhibits a front forked structure equipped with wheels defining a pair of carriages, one for each side of the vehicle, thereby defining a containment zone of the package arranged on the lifting forks.

[0005] A second AGV type is the so-called "counterbalanced vehicle", or the type comprising a rear weight.

[0006] AGVs of the prior art are such that some drawbacks may occur when packages of tiles as the above ones are to be handled or transferred from the AGV to roller conveyors.

[0007] Indeed, there is recently often the need to handle packages comprising very large and slim tiles resting on pallets and arranged vertically, that is to say resting on one of the thin side edges thereof.

[0008] The pallets are in turn very thin and therefore are subject to bending if stressed.

[0009] Pallets bending may also occur when the same are transferred onto the roller conveyors thus causing the tiles to become unstable and fall to the ground.

[0010] It is an aim of the present invention to provide an automated guided vehicle enabling safer managing of the package, especially when being transferred.

[0011] This task is attained by the automated guided vehicle manufactured according to claim 1.

[0012] Further characteristics and advantages of the present invention will become more apparent from the indicative and therefore non-limiting embodiment of a preferred but not exclusive automated guided vehicle for managing a package, as illustrated in the accompanying drawings in which:

- Figure 1 shows a schematic side view of an automated guided vehicle of the invention herein;
- Figure 2A shows a detail of Figure 1 with some parts missing to better highlight other parts which otherwise would not be visible;
- Figure 2B shows the detail of figure 2A in a different operational configuration;
- Figure 3 shows a schematic plan view of the vehicle of Figure 2B;
- Figure 4 shows a schematic rear view of the vehicle of Figure 2B;
- Figure 5A shows a schematic view of an operational condition of use of the automated guided vehicle herein disclosed;
- Figure 5B shows a schematic view of a different operational condition of the vehicle of figure 5A;
- Figure 5C shows a schematic view of a different and further operational condition of the vehicle of figure 5A.

[0013] With reference to the attached figures according to the present invention, there is shown an automatic guided vehicle 10 (AGV) for carrying a package 100 of the type already described in the prior art.

[0014] It should be appreciated that the invention can also be applied, by way of example but not exclusively, to a vehicle other than an AGV such as a lift truck or the like.

[0015] Moreover, although reference is particularly made to the use of the vehicle referred to with 10 provided for handling ceramic products packages, the invention herein can also be applied for managing and handling packages or product burdens relating to different sectors such as for example food products, profile shapes or rolling mill products, and so on.

[0016] As shown in Figure 1, the automated guided vehicle 10 may be of the type equipped with a front "fork" comprising a pair of front carriages 11 arranged on the sides of the vehicle 10, as already explained in relation to the prior art.

[0017] However, the invention can be applied to counterbalanced AGVs and to AGVs in general.

[0018] The automated guided vehicle 10 comprises lifting forks 12 arranged in the front space between the pair of carriages 11.

[0019] The automated guided vehicle 10 comprises a drive wheel adapted to move and guide the AGV 10, which drive wheel is associated with the wheels of the carriages 11 that can be idle and not adjustable. Advantageously, the automated guided vehicle 10 according to the present invention carries tying means 20 onboard, comprising a strapping machine 28 suitable for arranging a tie strap 200 around the package 100 housed on the lifting forks 12.

[0020] The tying means 20 on board of the AGV 10 comprises a sliding carriage 21 suitable for bearing the strapping machine 28.

[0021] The strapping machine 28 comprises an operating unit 26 and a guide frame 22 of the tie strap 200, integral to the operating unit 26 so as to define an operational body unit.

[0022] The guide frame 22 is adapted to arrange a tie strap 200 along the perimeter of a package 100 of a product for tying thereof.

[0023] The operating unit 26 of the strapping machine 28 is adapted to perform some specific functions of said strapping machine according to methods of the known type, such as: removing the tie strap from the accumulating means as described hereunder, launching the tie strap along the frame followed by welding and cutting thereof.

[0024] In detail, as shown in Figure 3, the guide frame

22 includes a groove 22a (or inner channel) destined to accompany the tie strap 200 around the package 100 to be tied up.

[0025] These operations will be detailed upon explanation of the working principles of the present invention.

[0026] The tying means 20 preferably comprises a storage member 23 of the tie strap 200, said storage member 23 being operatively associated with the strapping machine 28.

[0027] In other words, the storage member 23 provides a tie strap 200 portion to be "launched" along the groove 22a (or inner channel) during the tying step of the package 100.

[0028] The storage member 23 comprises at least a reel 23a for housing a spool 210 of the tie strap 200. Preferably, the storage member 23 has braking means (by way of example of the motorized type), suitable for slowing down the stroke of the spool 210 after the strapping machine 28 performed "launching" of the tie strap 200 through the guide frame 22. The braking means prevents the tie strap 200 wound around the spool 210 from being unwound in an uncontrolled manner due to rotational inertia. The storage member 23 includes a movement member 23b, such as a linear actuator, associated to the reel 23a so as to allow displacement thereof between two alternative configurations: a configuration for replacement of the spool 210 of the tie strap 200 with a new one, and a configuration for use of the storage member 23.

[0029] In the replacement configuration of the reel 210, the reel 23a is placed projecting on one side of the AGV and the tying means 20, so as to be reachable by hand. In the configuration of use of the storage member 23, the reel 23a is placed in the working position, as shown by way of example in the schematic view of Figure 4.

[0030] Owing to the displacement of the storage means 23 based on the two configurations mentioned above, the operator can have an easier access to the reel 23a during replacement operations of the spool 210, and the overall dimensions of the tying means 20 can be simultaneously optimized. Additionally, the displacement of the storage means 23 allows to easily open the inspection panels arranged in the housing of the AGV under the storage member 23 for purposes of maintenance works.

[0031] The tying means 20 also comprises at least one guide 24 which is defined by at least one vertical column 24 fastened to a structural portion 14 of the vehicle 10.

[0032] The sliding carriage 21 is then operatively associated with the guide column 24 and is such as to move along it.

[0033] Preferably, the tying means 20 comprises two vertical guide columns 24 arranged parallel to each other and transversely relative to the forks 12 (see the development direction "F" of the forks in the appended figures).

[0034] The two guide columns 24 are structured in such a way as to allow the sliding of the sliding carriage 21, and thus the run of the strapping machine 28 therealong.

[0035] In particular, the sliding carriage is at least partially housed in the space separating the two guide columns 24.

[0036] Preferably, the sliding carriage 21 moves rigidly along the two guide columns 24 via a pair of rollers and linear guides arranged therebetween.

[0037] In particular, the guide columns 24 are structured and arranged on the AGV 10 so as to guide the run of the strapping machine 28 by means of the sliding carriage 21 along a direction of space "X" of the package 100 of a product.

[0038] Therefore, the above guide frame 22 lies in a plane substantially perpendicular to the direction of space "X" of the package 100 of a product.

[0039] The tying means 20 also comprises actuating means 25 active at least on the sliding carriage 21 and configured for moving along the direction defined by the guide columns 24, the sliding carriage 21 and, consequently, the strapping machine 28 thereto connected.

[0040] The actuating means 25 comprises elements of mechanical power transmission such as a mechanical gear, pulleys and toothed belts or chains, and so on.

[0041] The aforementioned operating unit 26 is functionally associated to the storage means 23, and more specifically to the spool 210; in detail, the strapping step provides a return movement of the tie strap 200 by the unit 26, said tie strap 200 being then launched along the guide frame 22 developing around a package 100.

[0042] As it is known, overall operation of the AGV 10 is performed by a control unit installed onboard the vehicle 10 itself; the control unit is preferably programmed to activate or deactivate the tying means 20.

[0043] In particular, the control unit can be programmed for managing the positioning of the guide frame 22 and the strapping machine 28 by shifting the sliding carriage 21 along a direction of space "X" of the package 100 of a product.

[0044] In the preferred embodiment of the invention, the vehicle AGV 10 comprises compensating means 27 operatively associated with the strapping machine 28 and configured for managing a shifting thereof towards and away from the package 100 which is to be strapped.

[0045] In particular, the compensating means 27 allows a shifting of the strapping machine 28 along a direction transverse to abovementioned columns.

[0046] The compensating means 27 preferably comprises guide rods 27a mounted integral with the carriage, and as many elastic elements 27b, such as coil springs or similar means, to which the shifting is subject. Advantageously, the shifting of the strapping machine 28 and guide frame 22 unit allows recovery of the excess portion of the tie strap 200 when the same is being stretched around the package 100 of a product prior to the welding and cutting steps of the tie strap 200 itself.

[0047] Indeed, in order to attain an effective and firm grip of the tie strap on the package, the latter shall be stretched around it and this is achieved if the welding is

performed when the operating unit 26 is in close proximity to the package.

[0048] However, on the one hand, the packages to be carried may have different sizes and on the other during the vertical shifting of the strapping machine 28, the unit 26 mentioned above shall never interfere in the space occupied by the package carried, so as to prevent any collisions.

[0049] In other words, during the strapping step, the unit 26 recovers and stretches the tie strap by generating a tension force therealong.

[0050] This tension force causes a shifting of the unit 26 along the guide rods 27a towards the package 100 so as to enable the unit itself to advantageously stand close to a side 110 of the package 100.

[0051] Obviously, the side 110 of the cited package 100 is the one facing the tying means 20.

[0052] Following the cutting and welding of the tie strap, the elastic element 27b returns the strapping machine 28 towards the carriage, thus removing the handling unit 26 from the package.

[0053] In fact, once the strapping machine 28 has stretched, recovered the excess portion of the tie strap 200, and finally welded the same around the package 100, the operating unit 26 cuts a flap of the tie strap 200.

[0054] The cutting of the tie strap 200 removes the constraint based on which the strapping machine 28 generates abovementioned reaction force, thereby enabling the springs to exert the return force which causes the strapping machine 28 to shift away and to assume the initial configuration. In this initial configuration, the unit 26 does not interfere with the loading volume surmounting the forks.

[0055] In the schematic drawing of Figure 3, a possible solution with guide rods 27a and springs is illustrated.

[0056] The springs have a predetermined spring constant that does not oppose an excessive force during the tensioning step of the operating unit 26, so as to allow shifting of the unit towards the said side 110 of the package 100.

[0057] At the same time, the elastic constant is such that the springs exert a return force high enough as to allow the return movement of the strapping machine 28 to the initial position once the tying of the package 100 has been performed.

[0058] It should be noted that, in alternative embodiments, the compensating means 27 may comprises return elements of a different kind, such as for example of the pneumatic type, etc.

[0059] The tying means 20 are electrically powered by energy supplied by the vehicle AGV 10, i.e. by the accumulators thereof.

[0060] It should be appreciated that, in the preferred version of the invention, the strapping machine 28 is constructively integrated to the above structural portion 14 of the vehicle 10 so as to define together with it a single functional unit.

[0061] This means that the vehicle 10 is designed in such a way as to comprise the strapping machine 28 herein disclosed within its own structure, which is therefore not a mere juxtaposition of two different functional units.

[0062] In an alternative and not preferred embodiment, the tying means 20 are structured in such a way as to be reversibly mounted on board of the AGV 10.

[0063] In other words, the tying means 20 are structured in such a way as to have overall dimensions allowing them to be reversibly mounted at the front of the AGV, where the lifting forks handling apparatus is located.

[0064] The operation of the AGV 10 of the present invention is outlined here below with the aid of the appended figures.

[0065] Firstly, the AGV 10 is directed towards a loading station for picking up a package 100 (see Figure 5A).

[0066] In this phase, the strapping machine 28, and then the guide frame 22, is in the upper rest position, wherein it does not interfere with the front loading zone (see Figure 5B).

[0067] In other words, the strapping machine is arranged in a position where it does not occupy the front zone provided for receiving the loading so that the package 100 can be loaded.

[0068] The AGV 10 approaches autonomously the package 100 of a product disposed in the loading station, and forks it in a manner as already explained.

[0069] At this point, the tying step around the package 100 is performed by means of the tie strap 200 (see Figure 5C).

[0070] The tying step provides arrangement of the strapping machine 28 through activation of the sliding carriage 21 along a direction of space "X" of the package 100 of a product, that is to say at a given height of the package 100 itself.

[0071] The operating unit 26 performs the launching of the tie strap along the guide frame 22 at the pre-established point, so as to tie the package 100 of a product, in a manner already discussed.

[0072] Tying of the package 100 with tie strap 200 can be optionally repeated by repositioning the strapping machine at a different height and repeating the above steps.

[0073] Following the tying step, the AGV moves towards the package 100 and in the meantime it rearranges the strapping 28 in the upper rest position thereof as described hereinabove.

[0074] Advantageously, the tying of the package 100 of a product can be performed in a completely automatic way, thus without the assistance of an operator.

[0075] The AGV according to the present invention allows to overcome the drawbacks mentioned in relation to the prior art.

[0076] Indeed, there is no danger that the tiles or any other product loaded separate from the pallet and fall to the ground thus breaking, given that, during the transferring step from the AGV to the roller conveyor or any other equipment, the package 100 is tied with the tie strap.

[0077] It is to be noted that the invention herein is con-

figured such as to also allow use of the AGV in the traditional manner, that is to say, for the purpose of transport only, regardless the tying mode.

[0078] The invention thus conceived is susceptible to any variations and modifications falling within the same inventive scope.

[0079] In addition, several constructive aspects of the present invention can be subject to modifications technically equivalent.

Claims

1. A vehicle for transporting a package (100), **characterized in that** it comprises tying means (20) for tying said package (100), said tying means (20) comprising:

   - a strapping machine (28) suitable for arranging a tie strap (200) around said package (100);
   - a sliding carriage (21) for bearing said strapping machine (28);
   - at least one guide (24) fixed to a structural portion (14) of said automated guided vehicle (10) and operatively associated with said sliding carriage (21), the latter being apt for sliding on the guide (24); and
   - actuating means (25) apt for moving the sliding carriage (21) along said guide (24).

2. The vehicle (10) according to the preceding claim, wherein the vehicle is an automated guided type of vehicle.

3. The vehicle (10) according to claim 1, wherein said strapping machine (28) comprises a guide frame (22) for the tie strap (200).

4. The vehicle (10) according to claim 1, wherein said guide comprises two guide columns (24) parallel to each other.

5. The vehicle (10) according to claim 2 or claim 3, comprising an operative unit (26) integral with the guide frame (22), and apt, in cooperation with the latter, for tying a strap (200) around a package (100).

6. The vehicle (10) according to claim 4, wherein said tying means (20) comprises a storage member (23) for storing said tie strap (200), and is functionally associated with said operative unit (26).

7. The vehicle (10) according to claim 5, wherein said storage member (23) comprises at least one reel (23a) for housing a spool (210) of said tie strap (200) and a movement member (23b) associated with said reel (23a) so as to move it alternatively between a configuration for replacement of the spool (210) and a configuration for use.

8. The vehicle (10) according to claim 4, comprising compensating means (27) operatively associated with said strapping machine (28) and apt for managing a shifting of the operative unit (26) alternatively towards or away from said package (100).

9. The vehicle (10) according to claim 7, wherein said compensating means (27) comprises at least one guide rod (27a) mounted on said carriage (21) on which said unit (26) is slidably mounted, and at least an elastic means (27b) for returning the unit (26) away from the package (100).

10. The vehicle (10) according to at least one of the preceding claims, wherein said strapping machine (28) is constructed integrally with said structural portion (14) of the vehicle (10) so as to define a single functional unit.

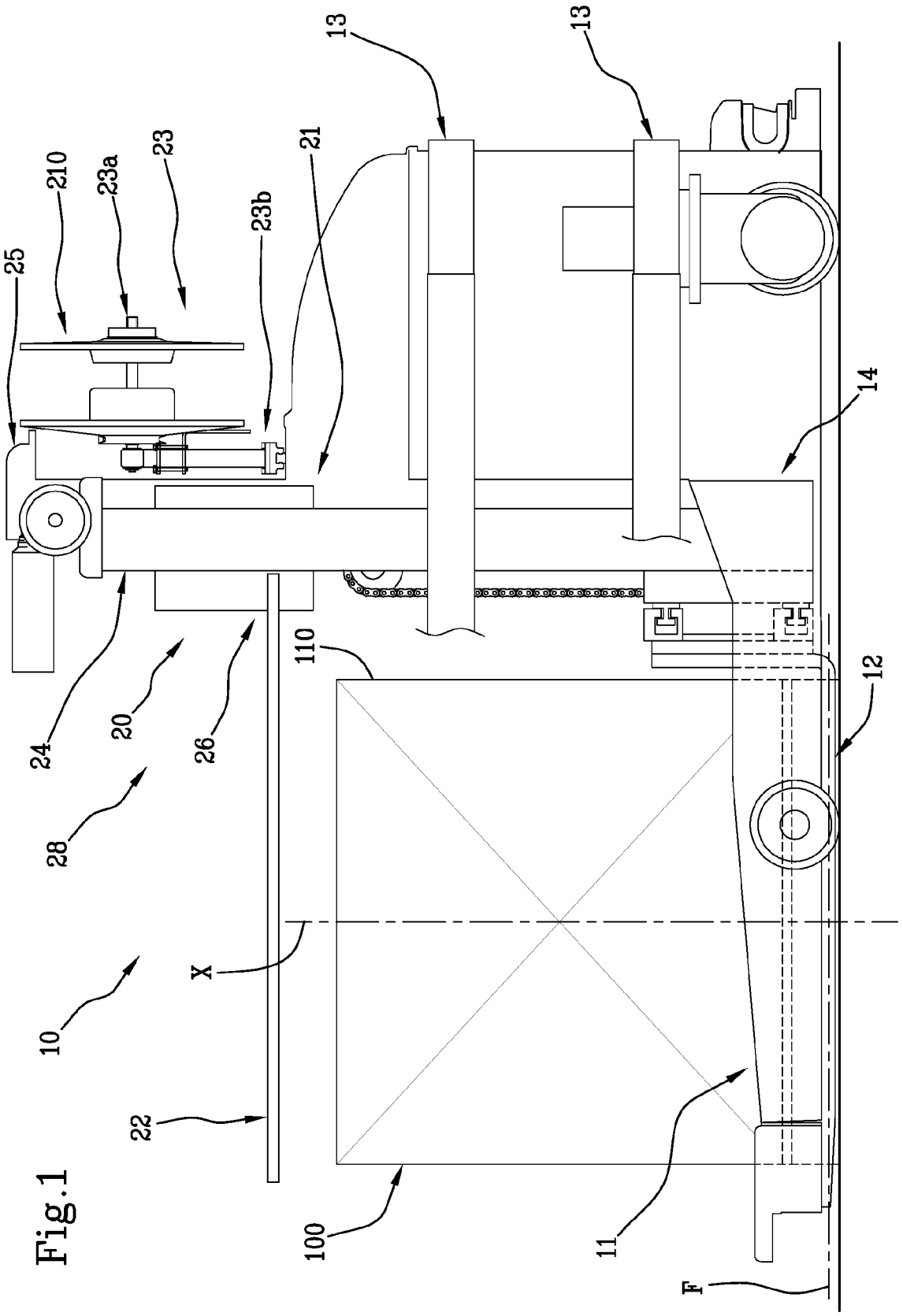


Fig.1

Fig.2a

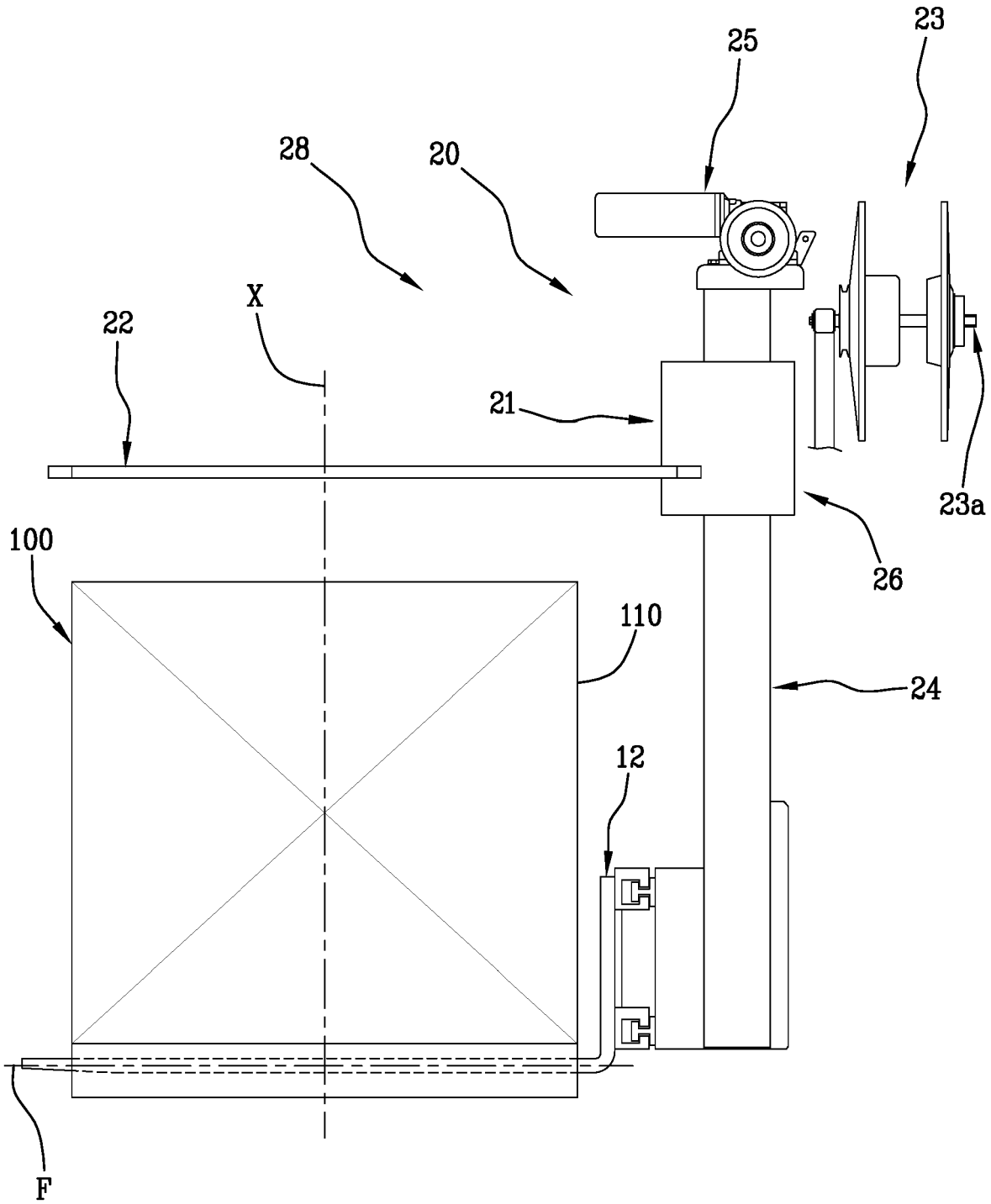


Fig.2b

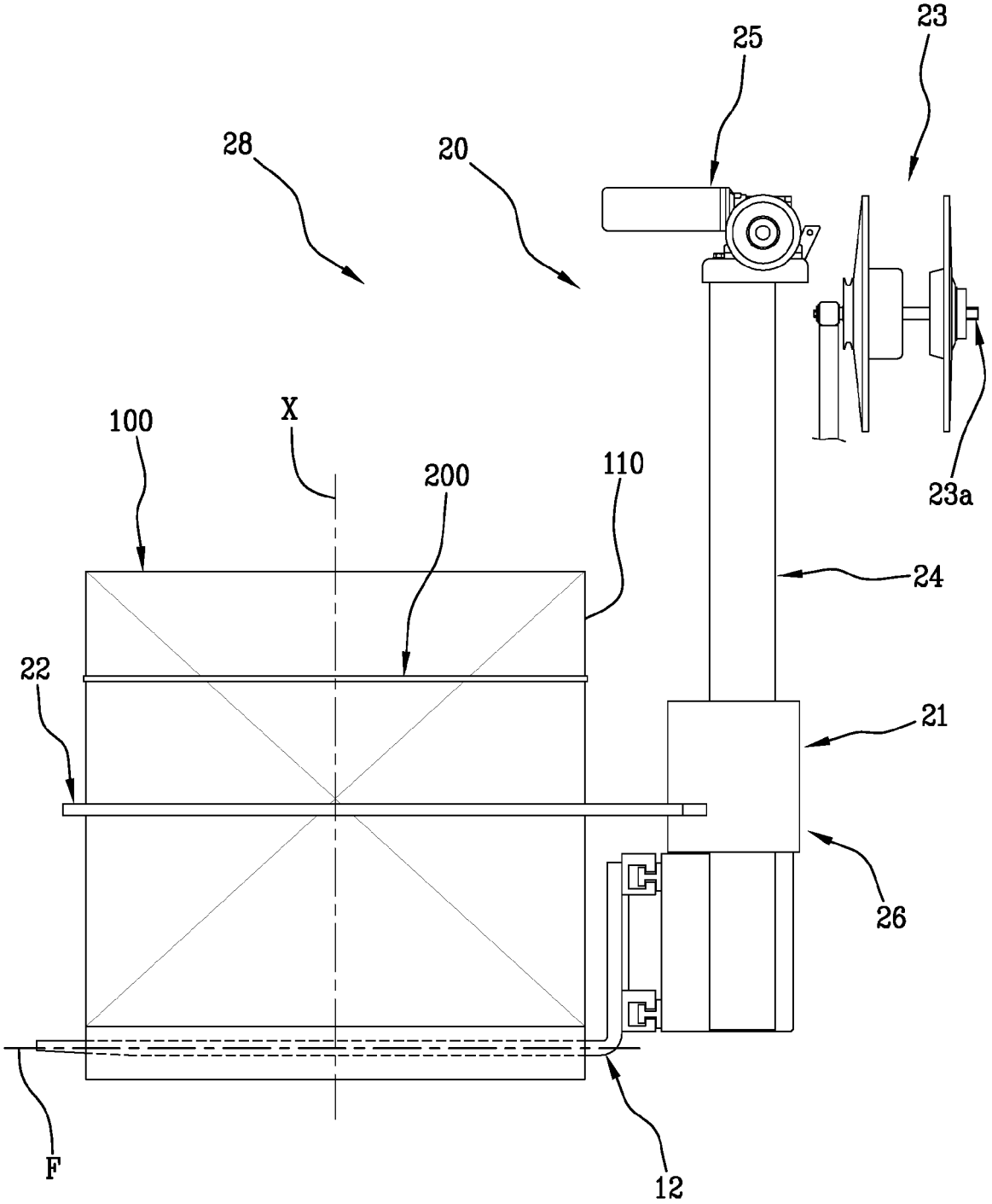
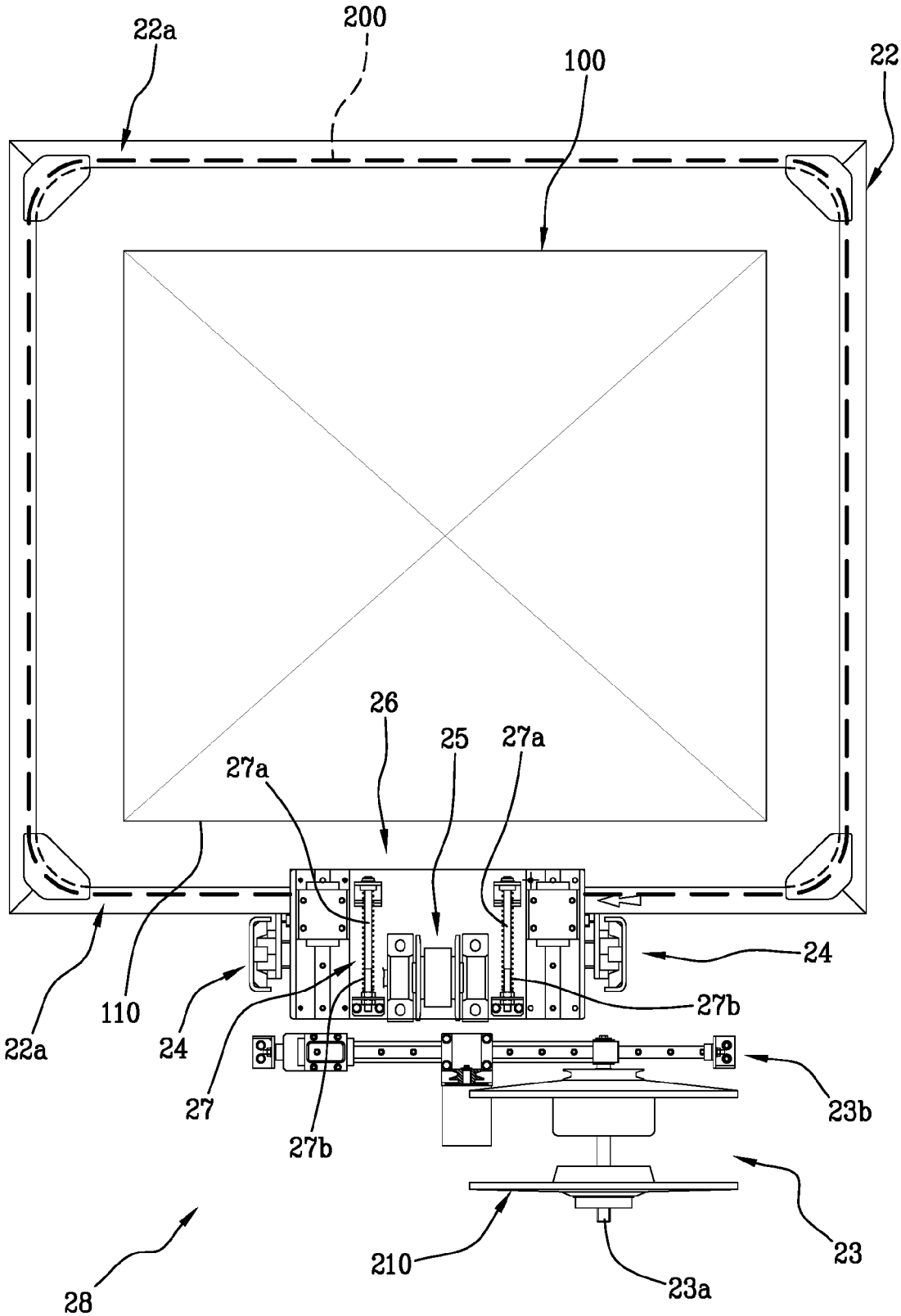


Fig.3


22a
200
100
22
26
25
27a
27a
24
110
22a
24
27b
27
27b
23b
23
210
23a
28

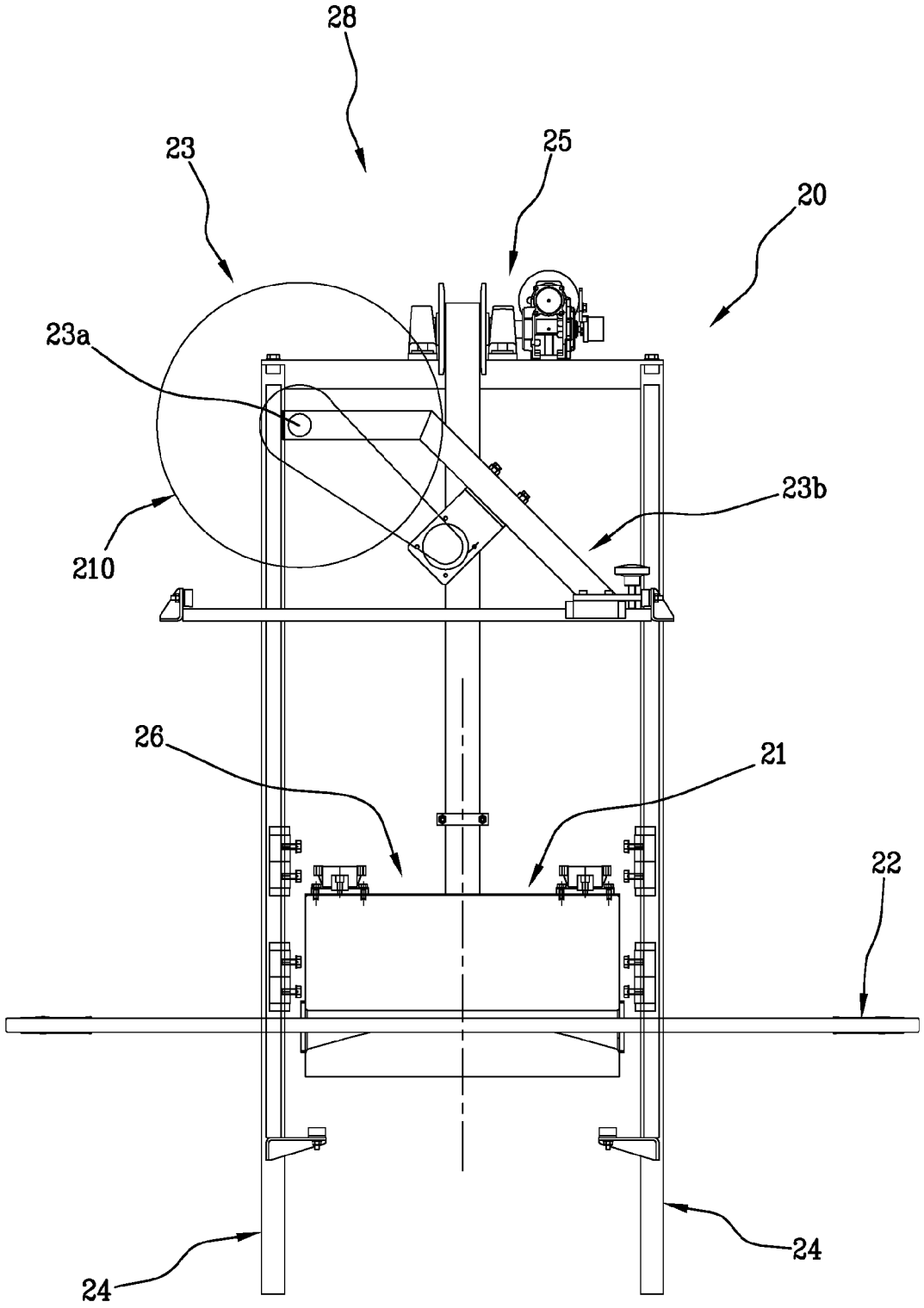


Fig.4

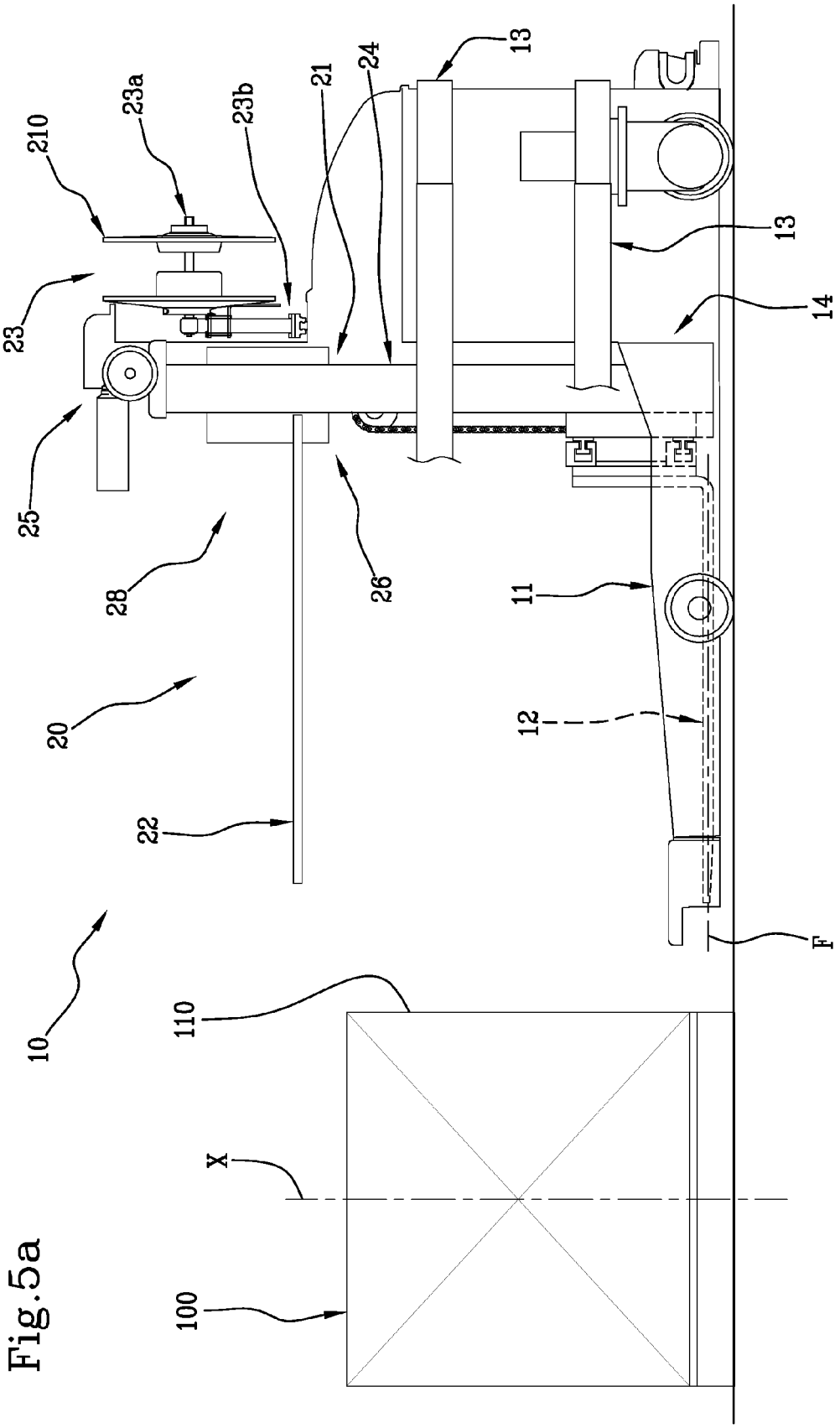


Fig.5a

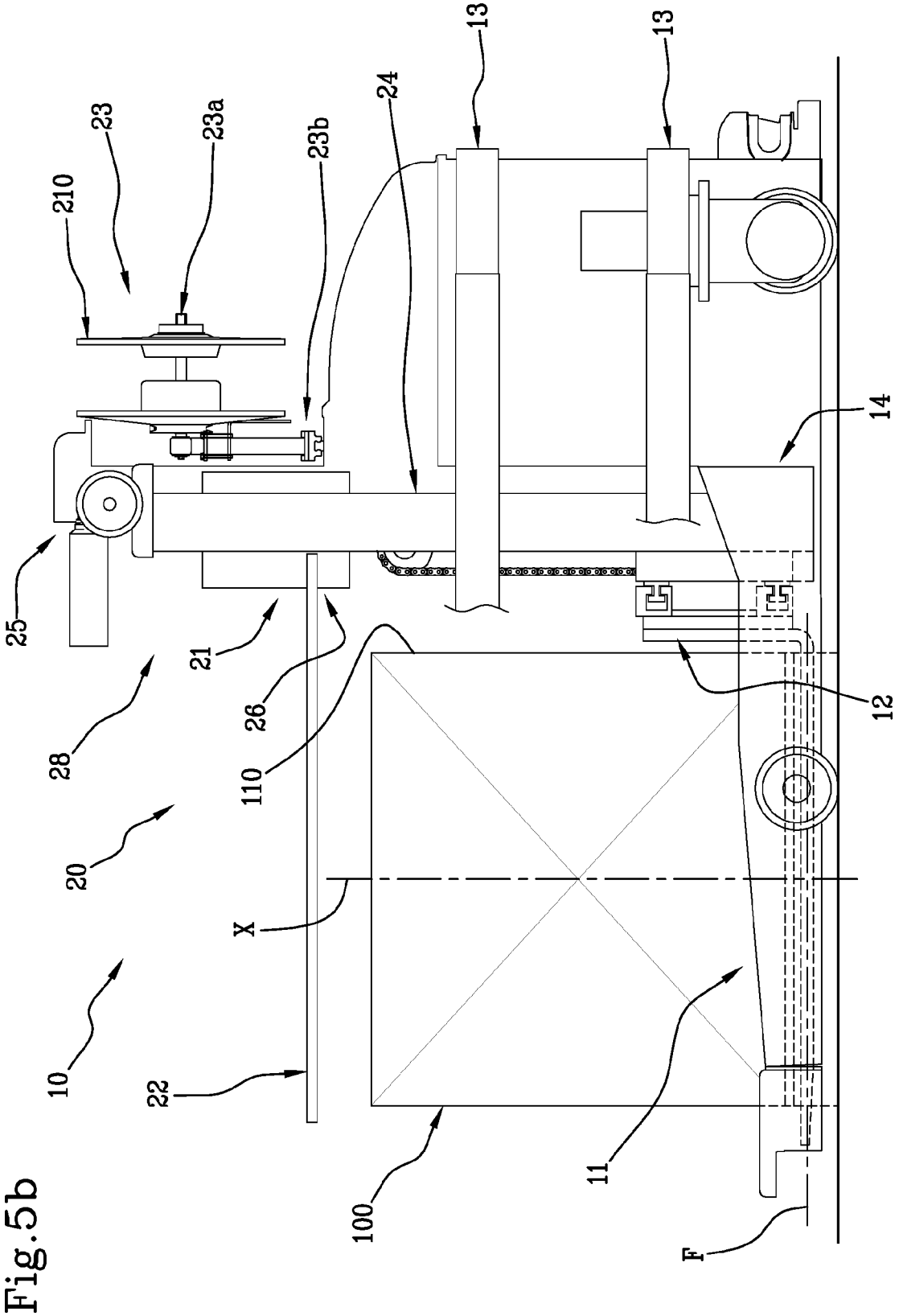


Fig.5b

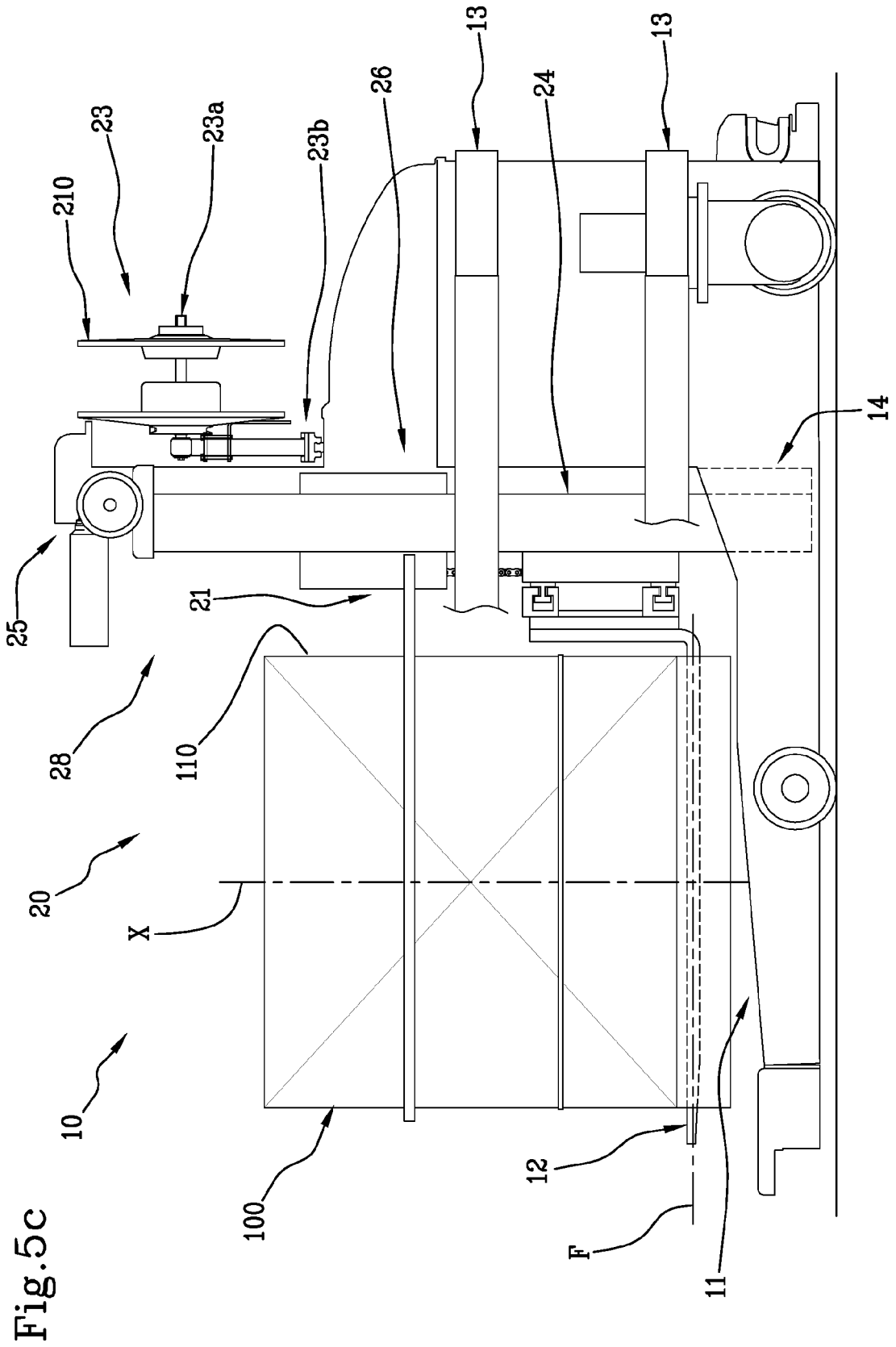


Fig.5c

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EUROPEAN SEARCH REPORT

Application Number
EP 15 16 2737

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 June 2015	Philippon, Daniel

CATEGORY OF CITED DOCUMENTS

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