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Remarks:

A request for correction of the title has been filed pursuant to Rule 139 EPC. A decision on the request will be taken during the proceedings before the Examining Division (Guidelines for Examination in the EPO, A-V, 3.).

(54) **IMPROVED PALLATIZER FOR TILES OF LARGE DIMENSIONS**

(57) It is disclosed a palletizer for stacking items on a pallet, comprising

at least one gripping head, whose movement is controlled in the Cartesian space for picking a plurality of items (4a, 4b) from a production line and for placing them on a loading station (3) with vertical attitude, and also a strapping unit (1), arranged to wrap at least a strapping loop around at least two of said items (4a, 4b) ar-

ranged on said station (3), comprising at least one movable pressing member (10, 10'), integral to said strapping unit (1), provided with a pressing end (11) movable between a home position, outside the deposition area of said items, and an operative position, in which it exerts a pressure in the direction of a vertical side of said items (4a, 4b).

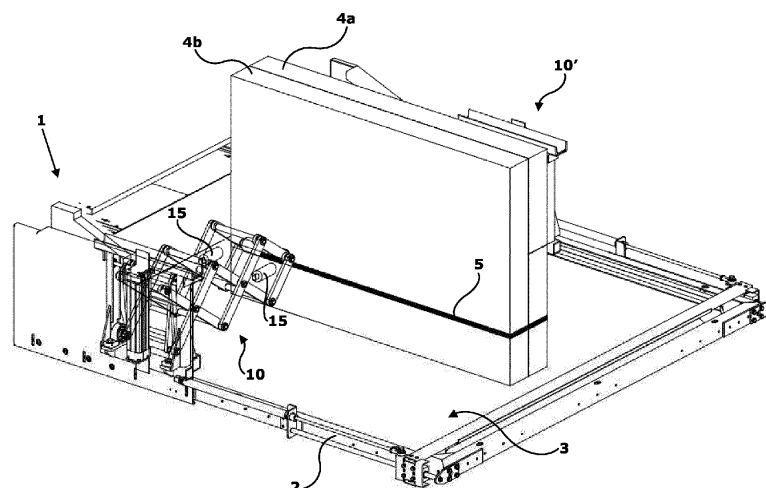


Fig. 1

Description

Field of the invention

[0001] The present invention relates to an enhanced palletizer apparatus, in particular an apparatus designated to consolidate large tiles on a pallet in view of the subsequent packaging and/or use on building sites.

Prior state of the art

[0002] As is known, a palletizer is an apparatus that serves to stack in an automatic way on a pallet, a series of products for the subsequent packaging. The transfer operation of a plurality of products from a production line to one or more pallets, with an accurate and orderly stacking, can be very tiring and burdensome when carried out manually. In fact, each of the products - in particular, in the context of the present application, boxes each containing a plurality of tiles - must be picked up individually and transferred to one of a plurality of loading pallet, the pallet being chosen (preferably in an automatic way) for example depending on the batch or to the dimensions of the product. Inter alia, so as not to hinder the operations, the various pallet waiting to be loaded are distributed along a line located in an area next to the end of the production line, which implies considerable displacements.

[0003] In the art, there are thus available palletizer equipment, which comprise one or more gripping heads movable on suitable raised guides, suitable to pick up the individual products and transfer them quickly on the pallets to be loaded, arranging the individual products into the appropriate position in the stack on the pallet. Once a certain pallet is fully loaded, the system provides an appropriate signal (acoustic and/or visual) to the operator, who can thus remove the loaded pallet, replacing it with an empty one, and send it on to the next step of packaging (typically performed by heat-shrink or stretch plastic film).

[0004] An very particular application for packaging on pallets can be found in the tile industry. In fact, currently there is an increasing demand for tiles in the form of slabs of very large format, for example 1200x600 and beyond: a stable stacking, with the larger surface lying horizontally, would easily cause breakage of these tiles (due to their flexibility and under the weight of the stack).

[0005] It was therefore already proposed to stack the tiles with their major surfaces placed vertically, i.e. by resting them on the pallet with their larger edge. To this end, IT1408944, in the name of the same Applicant, suggests to lay progressively the packaging boxes in the upright position, one next to the other, by applying strapping loops between the already arranged material and the new load gradually added. This work mode - that can be similarly applied to boxes comprising few tiles or to individual products - has a series of advantages and has resulted therefore in a remarkable success.

[0006] A challenging aspect of this process, relates to the step of deposition of the products, prior to the strapping. In fact, when there is a need to place on the pallet a plurality of per se unstable objects (as the tiles in a vertical attitude), because equipped with a very small footprint with respect to their total volume, it arises the need to keep them balanced as long as they have not been consolidated to a body with a wider and more stable support. Let's consider, for example, that a box typically containing three tiles having dimensions of 600 x 1200 mm and a thickness of 12 mm, will have a standing edge 36 mm wide, which certainly makes it susceptible to a reversal. The problem is even worse when supposing to place the single tiles on the pallet.

[0007] In IT1408944 it is proposed to use catches in the lower part of the pallet, to keep the tiles or their containers balanced at least at the initial operating step. However it has been found that this arrangement - despite being suitable in not interfering either with the moving members of the palletizer nor with portions of the strapping machine - is not completely sufficient.

[0008] In the field of automatic industrial systems, there are several devices that utilize pushing and pressing mechanisms suitable to act on the products in formation, e.g. see US2015/175283. However these known members are intended to apply a slight pressure on the products, for example to guide them in their movement or to keep away some parts during processing. Therefore they are not applicable in palletizing stations of large tiles, because they would be ineffective to support the heavy tiles, or excessively bulky and expensive if repeated on the various stations of a palletizer.

Summary of the invention

[0009] The underlying problem of the present invention is therefore to provide an apparatus which overcomes the above drawbacks, i.e. to provide a palletizer for large-format tiles capable to complete the entire operation of deposition and consolidation on pallets, in a fully automatic manner, without the risk for some tile to laterally reverse.

[0010] This objects are achieved by the features mentioned in the main appended claim. The dependent claims describe preferred features of the present invention.

Brief description of the drawings

[0011] Further features and advantages of the invention will anyhow become more evident from the following detailed description, given by mere way of non-limiting example and illustrated in the accompanying drawings, wherein:

Figure 1 is a schematic, perspective view of an embodiment of the invention;

Figure 2 is a schematic, perspective view of an ex-

emplary embodiment of a pressing member, in working position; and

Figure 3 is a similar view to that of fig. 2, with pressing member in resting position.

Detailed description of an embodiment

[0012] A palletizer comprises, in a per se known manner, a manipulator (not shown) designed to transfer a plurality of items (such as for example individual large surface tiles or boxes containing some tiles) in sequence to a single or a plurality of deposition stations, wherein the items are arranged in a vertical position (i.e. with the larger surface on the vertical plane) on a pallet.

[0013] According to the teaching of IT 1408944, at the pallet it is also provided a strapping unit globally indicated with 1, of which in fig. 1 it is shown a quadrilateral frame 2 guiding the strapping, which embraces the plane area 3 of a pallet.

[0014] On the pallet it is provided that a plurality of tiles or of the respective boxes 4a, 4b, ... of large format, for example 1200 x 600 mm are placed next to each other in vertical position.

[0015] Each object that is deposited, therefore has a variable footprint width from 12 mm (the single tile) to, for example, approximately 48 mm (a box with four tiles), which constitutes a very narrow standing edge on the pallet. As it can easily be understood, this edge has a size that - due to the effect of the other dimensions of the box and the weight contained in itself - is not able to ensure the stability needed, that otherwise it is possible to reach only when the footprint width is in the order of 130-150 mm. There is therefore the need to artificially keep individual items balanced, at least in the initial phase of deposition, but also subsequently as other items are added.

[0016] According to the packaging procedure, known per se, other than the first item that is alone on the pallet, after each following item which is brought up to the previous one, a strapping operation is carried out on the group of items, i.e. a strapping ring is applied - represented by the line 5 in bold in figure 1 - which has the function of tighten together the last deposited item 4a with already existing ones 4b; in this way the group of adjacent items becomes practically a single body that, having globally a much wider footprint, is certainly more stable on the pallet.

[0017] At least in the initial step of loading of the pallet, the single item deposited on the pallet is highly unstable and, on the other hand, any further item that is added on the pallet, before initiating any strapping, is still unstable.

[0018] According to the present invention, to ensure the stability of the load on the pallet throughout the step of deposition on the pallet, it is provided that the strapping unit 1 is equipped with a movable pressure member, globally indicated as 10. The movable pressing member is integral to the strapping unit, in particular to the guiding frame 2, so as to not interfere either with the pallet displacement, nor with the palletizer movement. The press-

ing member, mounted integral to the strapping unit, does not occupy any fixed bulk in the deposition station. For the purposes of the invention, it is not so essential that the presser member is attached to the guiding frame 2, but it is relevant that it is integral in motion with the strapping guiding track, i.e. that part of the strapping unit that defines the launch and recall path of the strap.

[0019] According to a preferred embodiment, the pressing member comprises two extendable arms 10 and 10' (one of them is only partially visible in fig. 1) laterally arranged by two opposite parts of the pallet area, i.e. so as to face the opposed major surfaces of the tiles laid vertically on the pallet.

[0020] In particular, each extendable arm has (figures 2 and 3) a horizontal roller 11, carried at the distal end of a pantograph system 12, whose other proximal end is attached to a supporting frame 13 integral to the guiding frame 2 of the strapping machine. The roller with a horizontal axis 11 is preferably mounted to idly rotate.

[0021] On the frame 13 is also arranged a drive assembly 14 that - in a manner known per se and therefore not described in detail - controls the opening and closing of the pantograph system 12, to let it pass from the open working position, shown in fig. 2, the closed home position, shown in fig. 3. The drive assembly 14 may preferably be of the pneumatic or mechanical type.

[0022] When the drive assembly 14 is in the home position, the pantograph is completely closed against the frame 13, as shown in fig. 3. In this way it does not interfere with the space above the pallet.

[0023] When the drive assembly 14 is located in the working position, the pantograph 12 is extracted to a sufficient extent to bring the pressing roller 11 in contact with the side of the last of the items 4a present on the pallet. The drive assembly is arranged in such a way as to push with a certain force, for example less than 1 kg, the pressing roller 11 against the items, so as to ensure that the last deposited item is maintained against the other.

[0024] The same type of action occurs with the two opposing arms 10 and 10', therefore even a single item can be maintained stably upright between the two opposite pressing actions acting on the two opposite faces of the item.

[0025] At the distal end of each arm there is also provided proximity detection means, such as control photo-cells 15, that feedback control the drive 14. With this construction it is possible to detect when an item is approaching the distal end of the pantograph arm from the top, so as to produce a slight backward movement of the roller 11 and to allow the introduction of a new item between the ones already deposited and the pressing roller 11.

[0026] The operation of the palletizer according to the invention is as follows.

[0027] At beginning, the first item 4a is deposited on the pallet, holding it with a gripping head of the palletizer. The two pantograph systems of the pressing members are closed.

[0028] Before releasing the grip, the two opposing

pressing members 10 and 10' are extended, so as to bring the respective rollers 11 in working position against the lateral surfaces of the item, with the stroke of the drive also determined by detecting means 15. Therefore, when the gripping head (not shown) of the palletizer moves away, the first item 4a remains perfectly balanced.

[0029] After that, the second item 4b is brought above the pallet, causing it to descend downwards close to the side of the first item 4a.

[0030] During the descent, the photocell 15 of the pressing member 10 on the side of the second item 4b, detects the insertion of the item and controls the drive 14 to withdraw for a short distance the pantograph system: the retraction of the roller 11 - for a predetermined stroke depending on the thickness of the items - leaves space for the insertion of the second item 4b. The step of vertical descent of the gripping head preferably stops at the time in which the added item partially overlaps the previous one of a few centimetres: in a short period of time, the pantograph on the same side wherein the added item is deposited detaches, while on the opposite side, the other pressing member remains in position, so that the product cannot fall. Also the free rotation of the roller 11 cooperates to the downwards slipping of the added item 4b. Before the gripping head moves away again, the drive 14 again pushes the roller 11 under pressure against the added item 4b so that it is held against the previous item 4a and cannot overturn laterally.

[0031] In this condition, while the gripping head starts a new gripping cycle, a strapping ring 5 is applied consolidating together the two items 4a and 4b. Because - as shown - the launching track 2 of the strap is placed below the pressing members 10 and 10', there is no interference.

[0032] Said operation is repeated as long as items tied each other generally have not a supporting base wide enough (for example with a width of 150 mm) as to be able to remain autonomously stable. Thereafter the pressing members can also be disabled if the strapping of the new items is performed while the gripping head is still engaged on the pallet; vice versa, if reasons of working cycle optimization suggest to rapidly release the gripping head, it is possible to continue to use the pressing members for all the subsequent items that have to be deposited on the pallet.

[0033] To accommodate various items on the pallet it is possible to proceed alternatively or in sequence. To proceed alternatively, action is alternated on the opposite pressing members 10 and 10', supporting an item after another alternately on one side and the other of the preceding items (which are necessarily positioned starting from the centre of the pallet, as shown in fig. 1). To proceed in sequence, the operation is applied always from only one side of the first item 4a, arranging the additional items always along said side: in this case the first item must be positioned in proximity of one of the edges of the pallet.

[0034] According to an alternative embodiment, the

palletizer is provided with only one pressing member on one of the sides of the strapping unit. In this case a contrast element integral to the pallet can be provided, apt to define an abutment support for the side of items which is opposite to the pressing member. The contrast element is preferably a rib or wall that projects perpendicularly to the plane of the pallet, arranged on one side (thereby forming a pallet with L shaped vertical section) or centreline (thus forming a pallet with reversed T shaped vertical section). The contrast element can be made of the same material as the pallet (typically made of wood or plastic), or may be manufactured separately from other materials.

[0035] As can be seen from the above description, the device according to the invention perfectly solves the objects set forth in the premise. The pressing members are integral to the strapping track and allows to stabilize the load while waiting for the strapping to be completed and, at the same time, do not interfere with any member intended to complete the palletizing process, nor causing an unwanted bulk in the area of the loading station.

[0036] It is understood, in any case, that the invention is not to be considered as limited by the particular embodiment illustrated above, which represent only one possible exemplary embodiment of the same, but different variants are possible, all within the reach of a person skilled in the art, without departing from the scope of the invention itself, as defined by the following claims.

[0037] In particular, although it has always been described a pressing member in the form of a roller carried by a pantograph system, it is not excluded to be possible to use any other pressing member, also constructively simpler than a pantograph.

[0038] Further, the pressing members were shown opposite at the two lateral parts of the items, but it is not ruled out that the pressing arms can be installed on a front end area of the items, for example in proximity of the strapping head. In this way, the arms would be mounted in rotation (with vertical axis) on a rotating system, so they can be opened and closed on the load with a swinging movement on the horizontal layer. In this variant, the lateral stroke of the pressing members would not be limited by the need to attach them to the structure of the guiding track 2: mounting in rotation would result in fact in spacing them apart each other to the point of bringing them completely outside of the area of the side projection of the items. The advantage of this configuration lies in the fact that an accidental overturning of the items - obviously on their side - cannot cause significant damage to the pressing arms, that would simply be pushed away from their operating position.

[0039] Furthermore, the end roller 11 can be replaced by any other element that represents an effective guide for the item coming from above so as to prevent jam operation: for example a flare connected flap, of self-lubricating material (Teflon type), can perform an equivalent function. The same means for proximity detection could take the shape of a feeler instead of a photocell.

Claims

1. A palletizer for stacking items on a pallet, comprising at least one gripping head, whose movement is controlled in the Cartesian space for picking a plurality of items (4a, 4b) from a production line and for placing them on a loading station (3) with vertical attitude, and also
a strapping unit (1), arranged to wrap at least a strapping loop around at least two of said items (4a, 4b) arranged on said station (3), **characterized in that** it further comprises at least a movable pressing member (10, 10'), integral to said strapping unit (1), provided with a pressing end (11) movable between a home position, outside the footprint of said items, and an operative position, in which it exerts a pressure in the direction of a vertical side of said items (4a, 4b). 5 10 15
2. The palletizer as in claim 1, wherein said pressing member (10, 10') is provided with an drive (14) controlled in feedback by means of proximity detection means (15) apt to determine the approaching of an item from above. 20 25
3. The palletizer as in claim 1 or 2, wherein the end of said pressing member (10, 15) has an idle rotatably mounted roller (11). 30
4. The palletizer as in claim 3, wherein said pressing end (11) of said pressing member (10, 10') is linearly movable. 35
5. The palletizer as in claim 4, wherein said pressing member (10, 10') is in the shape of a pantograph system (12). 40
6. The palletizer as in any one of the preceding claims, wherein said pressing member is integral to the respective frame (13) fixed to the side part of a guide frame (2) of the strap being part of said strapping unit (1) 45
7. The palletizer as in any one of the preceding claims, wherein there are provided two pressing members (10, 10') arranged on two opposite sides of a vertical centreline plane. 50
8. The palletizer as in any one of the preceding claims, wherein it is also provided a pallet supporting said items, provided with a vertical supporting rib arranged on one side (determining a vertical L shaped section) or on the centreline (determining a vertical reverse-T shaped section) 55
9. The palletizer as in any one of the preceding claims, wherein said items are tiles or tile groups arranged with the major surface along a vertical plane.

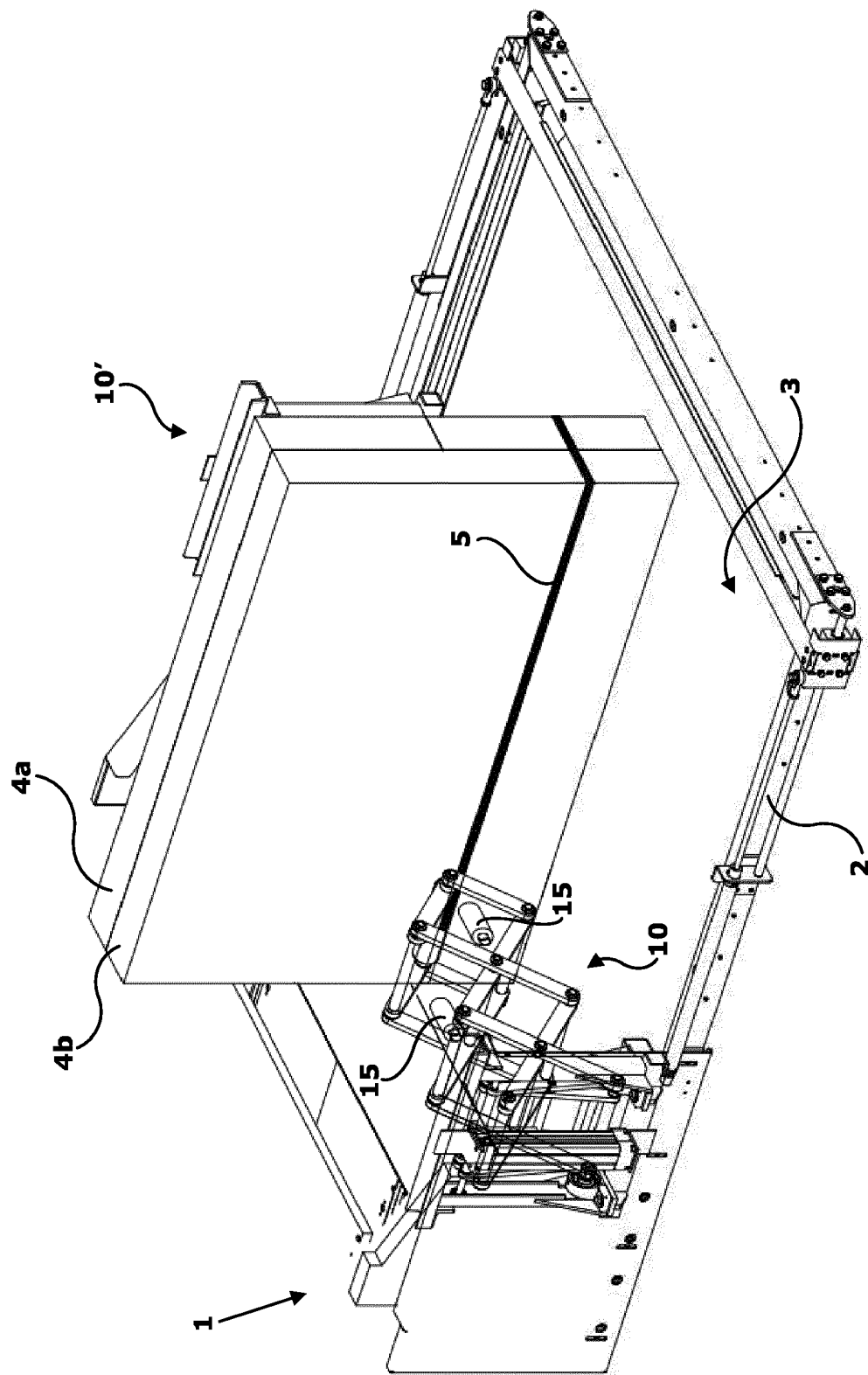


Fig. 1

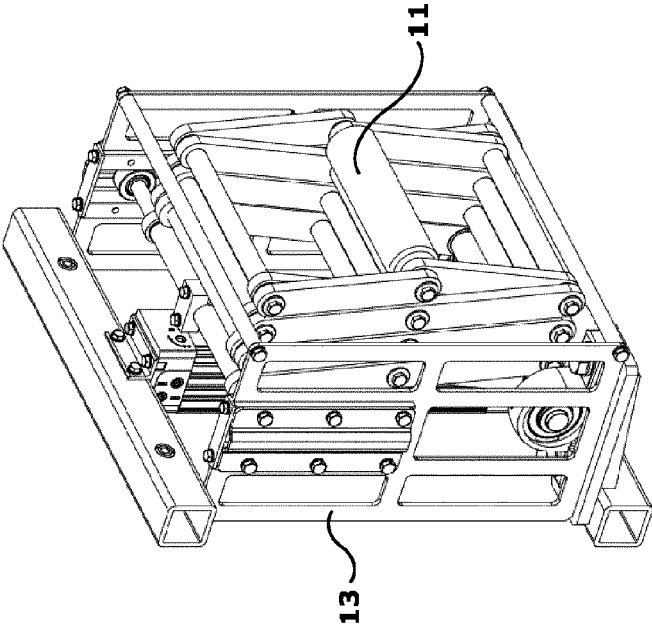


Fig. 3

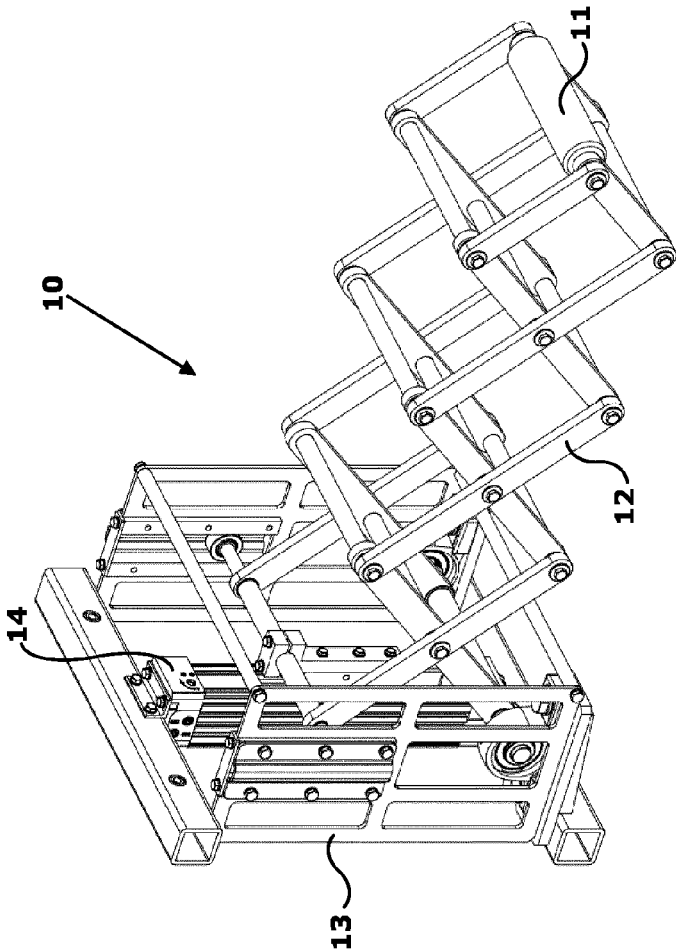


Fig. 2



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A	* paragraph [0029]; figure 5B *		
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		14 March 2018	Yazici, Baris
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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