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(71) Applicant: **Lamina System Aktiebolag**
504 94 Boras (SE)

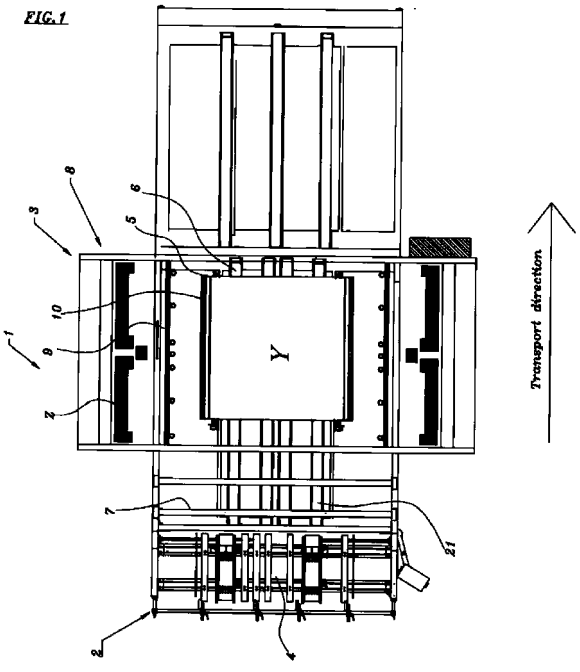
(72) Inventor: **Carlsson, Jan-Erik**
504 67 Borås (SE)

(74) Representative: **Bergquist, Kjell Gunnar**
Hynell & Partners
Göteborg AB
Göteborgsvägen 3
443 30 Lerum (SE)

(54) **Manufacturing of a packaging box**

(57) The invention relates to an apparatus and a method for manufacturing of a folded product, e.g. a packaging box. The apparatus (1) comprises a feeding portion (2) and a folding portion (3). The feeding portion (2) is adapted to receive a carton blank (Y) for making of the folded product (X) and being provided with a feeder (4) for feeding the blank (Y) to the folding portion (3). The folding portion (3) comprises a first kind of folder (5) for folding the blank (Y). The apparatus (1) is further provided with indicators (6) for aligning and positioning the blank (Y) when it is fed to the folding portion (3) such that the blank (Y) is stopped and placed at a desired location. The apparatus (1) is arranged to activate the first kind of folder (5) and folding the blank (Y) while it is located at standstill in the folding portion (3).The apparatus is also provided with at least one glue applicator (7). The apparatus further comprises an insert feeder (8) connected to the folding portion (3) which is adapted to place at least one insert (Z) on the blank (Y). The first kind of folder is adapted to perform a folding operation such that the starting material (Y) will at least partly wraparound the insert (Z). The glue applicator (7) is adapted to add glue to a surface of the insert (Z) and/or a surface of said blank (Y) which will make contact during the folding operation.

FIG. 1



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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to an apparatus and a method for manufacturing of a folded product, e.g. a packaging box. The folded product may be made from a carton blank which may be provided with weakenings or compressed lines which serves as folding lines.

BACKGROUND OF THE INVENTION

[0002] Folding of an essentially flat starting material or precursor, e.g. a carton blank, in order to make a box or another folded product has been made since long ago. Depending on the use of the box or folded blank, and thus the degree of complexity of the box or product, may the folding operation be more or less sophisticated. Boxes for products tend to be more and more sophisticated and specified for the products intended to fit in the boxes and there is today a demand for a wide variety of boxes for different uses and products. In many cases is the box only intended to serve as a package for a product and the box will be discarded when the product is taken out of the box by the end user. The box thus serves the purpose of protecting the product inside when stored and during transport.

[0003] There is always a desire to produce the boxes serving as packages for a product at low costs. In order to keep the costs low the production shall be made in an efficient way and using a relatively cheap material. In addition, there has been an increased demand for producing packages which have low impact on the environment and it is thus desired to use material which may be easily recycled without the need to divide the package into pieces which shall be sorted and classified in different categories for recycling of the material. The use of cardboard blanks, made from natural wood fibres or recycled paper, is therefore highly desired today.

[0004] In some cases there is a demand to provide boxes having an additional rigidity or comprising compartments or dividing walls in order to stabilize the box and protect the product inside the box. Such a box may for example be made from a carton blank being preshaped and provided with weakening lines which when folded may be designed to include partition walls or reinforcing structures made by folding in order to adapt the box to a specific product. A product having such a demand is for example a television apparatus of the flat screen kind. The box for such a TV should preferably be reinforced in order to protect the TV and also include aligning elements for keeping the TV steady in a predefined position in the box.

[0005] To fold and prepare a carton blank in order to provide these properties for the folded product is in many cases hard and it is rather time consuming while it is also difficult to provide a box having the desired rigidity. Hence, there is a need for an improved method and apparatus in order to make a folded product from a carton blank or the like material in an efficient way having a desired stiffness and internal design adapted to the product to be located inside.

DESCRIPTION OF THE INVENTION

[0006] The invention is directed to an apparatus and a method for the folding of a precursor or starting material in order to make a folded product, e.g. a box. The precursor or starting material is usually a flat blank which may be made from cardboard or other fibrous material. However, the starting material must not necessarily be a flat blank but may be prefolded or doubled if desired. The material in the precursor could of course also vary, e.g. a plastic polymer or any suitable material for folding. The blank is usually provided with weakened or compressed portions or lines which serve as folding indications and function to control the folding to be performed at the right locations. The blank may also be precut or provided with cut-outs such that the starting material is prepared before entering the machine to be folded to a desired product. However, the apparatus could also be provided with cutters and/or presses which may cut out material and/or form folding indications.

[0007] The apparatus comprises a feeding portion and a folding portion. The feeding portion is adapted to receive a carton blank or another precursor as starting material which is suitable to be folded to make the folded product. e.g a box or a display. The feeding portion comprises a feeder which is designed to feed the starting material to the folding portion. The folding portion comprises at least one folder adapted to fold the starting material, e.g a carton blank.

[0008] The apparatus is further provided with indicators or positioners for aligning and positioning the precursor when it is fed to the folding portion. The indicators or positioners may be a part of the feeding portion and/or the folding portion of the apparatus. The specific construction of the arrangement which is used for positioning the starting material is not of particular interest and it may be used some kind of physical directors or stops, sensor arrangements or a combination of these elements. The starting material will thus be moved from the feeder to the folding portion such that the starting material is stopped and placed at a desired location. The apparatus is arranged to activate the at least one folder and fold the starting material while it is located at standstill in the folding portion.

[0009] The apparatus is further being provided with at least one glue applicator for adding glue to the blank. The glue applicator may be located in the folding portion or in another part of the apparatus and may be stationary or movable. The glue applicators shall be positioned such that they may add glue to the starting material before the starting material has been completely folded into the end product.

[0010] The apparatus further comprises an insert feed-

er connected to the folding portion. The insert feeder is adapted to feed and place one or several inserts on a respective selected portion of the starting material. The insert feeder may be controlled to place the insert, or inserts, at a specific distance from an edge of the starting material, e.g. a longitudinal edge extending essentially parallel to the machine direction. The folder is adapted to perform a folding operation such that the folded part will be in contact with at least one insert. The folded portion may comprise a longitudinal edge, i.e. an edge stretching in the machine direction, of the starting material and one or several inserts may have been located in relation to the edge such that the folded portion, comprising the edge, will be in contact with the insert or inserts. The folding could be made such that the folded portion at least partly is enclosing and wrapped around one or several inserts. In case the insert is of an rectangular shape the folding may be made such that the starting material is folded to make contact with two or three sides of the insert.

[0011] The glue applicator or applicators are adapted to add glue to a surface area of one or several inserts and/or a surface area of the starting material which will make contact during the folding operation. Hence, the applicator is positioned and controlled such that glue may be applied in order to form an attachment between the starting material and the insert. The apparatus is for example suitable for folding a part comprising an edge around an insert such that the insert is partly wrapped around.

[0012] One advantageous embodiment of the invention is to use the apparatus for providing boxes with reinforcing inserts along one or several edges of the boxes. The inserts may be in the form of oblong, rectangular blocks which are placed on the starting material rather close to the edge and the edge portions may be folded around the inserts such that the starting material is covering three sides of the insert. The insert will thus provide a reinforced box which may better withstand external forces during storage and transport. The box may be shaped such that two essentially similar portions will form the box to have a shape reminding of a hard side attache briefcase In case of flat screen TVs it may thus be possible to stack several boxes on top of each other with a reduced risk of damaging of the content.

[0013] The apparatus may be provided with one or several insert holders adapted to keep one or several inserts at the desired location while the folder is folding the starting material. If the inserts not are kept in place by some kind of holding device, they may easily be out of their desired position when the folder start to operate. The holders may for example form part of the insert feeding device.

[0014] The folder may be provided with a press for pressing the folded part of the starting material against the insert while they are in contact with each other. The pressing action will improve the attachment formed by the glue between the insert and the starting material.

[0015] The press for pressing of the folded part against an insert may be provided with a low friction pressure applicator. The low friction pressure applicator is located on the surface of the press facing the starting material. The press may thus apply a pressure on the folded portion of the starting material, which is in contact with the insert, and allow the starting material to be moved while said press is applying a pressure onto said the starting material. The folder may extend along a side parallel to the machine direction and the folder may apply a pressure to a folded edge portion of the starting material.

[0016] The low friction pressure applicator may be in the form of an endless belt, wheels or rollers. Other arrangement could of course also be possible, e.g. a surface made of a low friction material.

[0017] The folder may be constructed to comprise a first folder arm and a second folder arm. In this case, the first folder arm is pivotally connected at its base to a rigid support structure by a first connection. The first folder arm is further pivotally connected at its distal end to a second folder arm by a second connection. The first and second connections are able to pivot independently of each other and the folder arms are adapted to provide two folds of an edge portion of a starting material, e.g. a carton blank.

[0018] If a folder comprising two folder arms as described above is used, the folder may be controlled to make a first fold of the starting material by the first folder arm such that a part of the folded edge essentially follows a first surface of an insert. The second folder arm may fold the starting material at another location such that a second fold is created and the part of the starting material folded secondly may follow a second surface of the insert. The starting material may thus enclose three sides, the first and second sides which are adjacent to the folded part of the starting material and an unfolded, third side of the starting material onto which the insert was placed originally.

[0019] An apparatus comprising a folder provided with two folder arms may be controlled to finish the first folding operation performed by the first folder arm before the second folding operation performed by the second folder arm is finished. In particular when the folding operations are intended to fold the staring material to partially enclose or wrap around an insert could it be advantageous to finish the first fold before the second fold is finished. However, the folding operations may be performed essentially simultaneously and could for example start at the same time.

[0020] The folder comprising a first and second folder arm could be controlled to fold the starting material about 90 degrees each. The folder will thus fold the material, e.g. an edge portion of a carton blank or another thin material, about 180 degrees. Such a folding operation is useful for partly enclosing a rectangular insert such that three sides of the insert will be wrapped around.

[0021] If the folder arm is provided with a first and second folder arm, a press may be provided on the second

folder arm. As described above, the press is useful for applying a pressure on parts which are glued to attach to eachother.

[0022] The folders described may be located to fold an edge of a starting material extending in the machine direction. When the edge portion has been folded, the starting material may travel in the machine direction while the folders still are raised and the folders may even be used for applying a pressure on the folded portion while the starting material is moving. However, the folding portion may be provided with further folders for folding of an edge stretching essentially perpendicular to the machine direction. In this case must the folders be lowered or otherwise removed before the starting material may continue to travel in the machine direction.

[0023] If the apparatus is provided with folders for folding of edges parallel as well as perpendicular to the machine direction, the apparatus may be controlled to perform the folding operation by the folders folding the edge portion perpendicular to the machine direction before the folding operation by the folders folding the edge portion parallel to the machine direction is performed. The folders folding the edge portion parallel to the machine direction may be provided with a press adapted to press down the edge portion parallel to the machine direction and the ends of the folded edge portion extending perpendicular to the machine direction. Hence, the press may be used to keep both the edge portions parallel and perpendicular to the machine direction under pressure while the folded starting material is at standstill or moving The insert feeder may be constructed to feed a multitude of inserts to the starting material. The insert feeder may be designed to lay out a multitude of inserts in the correct relative relationship on a lay out platform, i.e. to locate the inserts on the platform as they shall be located on the starting material. The inserts may thereafter be moved by the insert feeder and translated to the desired position on the starting material.

[0024] The insert feeder may move the inserts from the lay out platform to the starting material by means of suction cups.

[0025] The invention also relates to a method for manufacturing of a folded product, e.g. a packaging box, from a starting material, e.g a carton blank or another essentially flat material suitable to be folded, by the use of an apparatus comprising a feeding portion and a folding portion (3). The method comprises the steps of:

- Inserting or placing at least one starting material in the feeder. The feeding portion may be provided with some kind of cassette which may comprise several starting materials.

- Feeding the starting material, e.g. a carton blank, from the feeding portion by a feeder to the folding portion,

- Stopping the starting material in the folding portion such that the starting material is aligned and positioned by the use of indicators. The indicators may be positioned in the feeding portion, e.g. may a cassette comprising the starting materials be designed to keep the staring materials in a desired position already when they are fed from the feeding portion to the folding portion. The indicators may also be located in the folding portion and may be a physical stop, an aligning device and/or some kind of sensor arrangement for detecting the position of the starting material and stop the transport of the starting material at a desired location. It could of course be possible to use a combination of the described devices, e.g. a cassette performing a desired positioning and aligning of the starting material in the feeding portion and using sensors for stopping the starting material at the desired location in the folding portion.

- Activating a folder and folding the starting material while it is located at standstill in the folding portion.

- Adding glue by at least one glue applicator to the starting material in a step performed before the starting material has been completely folded in the folding portion. The addition of glue may be performed in the folding portion or in the feeding portion and may be performed while the starting material is moving or when it is at standstill.

[0026] The method further comprises the steps of:

- adding at least one insert onto a selected portion of the starting material by an insert feeder connected to the folding portion while the starting material is at standstill in the folding portion. To perform this operation at standstill has the advantage the inserts may easier be positioned on the starting material in an accurate manner.

- Performing at least one folding operation by the folder such that the folded part of the starting material will be in contact with, and at least partly wraparound, said at least one insert. By the expression at least partly wrap around the insert is meant the the starting material will be folded such that at least two sides of the insert will be in contact with the starting material. The starting material may also be folded twice such that it encloses three sides, the first and second sides which are adjacent to the folded part of the starting material and an unfolded, third side of the starting material onto which the insert was placed originally.

- Adding glue by a glue applicator to a surface area of the insert and/or a surface area of the starting material which will make contact during said folding operation. Glue shall thus have been added such that glue will be present in between surfaces of the insert and the starting material which after folding

will be in contact with each other.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

Fig. 1 is view of a folding apparatus from above

Fig. 2 is a cross sectional view of the folding apparatus in figure 1 along the line 2---2

Fig. 3 Figure 3 is a detailed view of a folder showing steps of a folding operation

DETAILED DESCRIPTION OF THE DRAWINGS

[0028] In figure 1 is an overview of a folding apparatus 1 shown. The folding apparatus comprises a feeding portion 2 and a folding portion 3. The feeding portion 3 comprises a feeder 4 for feeding of carton blanks Y to the folding portion 3. The feeder may include a cassette or be connected to main supply comprising the carton blanks. The feeder 4 will feed the carton blank Y to a transport band 21 for further movement of the carton blank Y in the folding portion 3. The folding portion 3 is provided with indicators 6 which are used to stop the carton blank Y at the desired location for performing a folding operation. The folding apparatus 1 is further provided with a pair of folders 5 extending in the machine direction of the apparatus 1 and located at the edges of the carton blank Y extending in the machine direction of the apparatus 1. The apparatus also comprises a glue applicator 7 which may be controlled by a electronic control unit to apply glue at desired location on the carton blank Y. The apparatus 1 further comprises an insert feeder 8 connected to the folding portion 3 for feeding of inserts Z to the carton blank Y. The insert feeder 8 is provided with insert holders 9 which are able to move the inserts Z to a desired location in a desired configuration to the carton blank Y and keep them in the right position while performing a folding operation. The folder 5 is provided with a press 10 in order to put a pressure on the carton blank Y when it is folded and glued to an insert Z.

[0029] In figure 2 is shown a cross sectional view of the folding portion 3 of the folding apparatus 1. From this figure it may be understood how the insert feeder 8 functions. A multitude of inserts Z are placed in a cassette 22. The lowermost insert will be pushed forward by a pusher 23 and placed on a lay out platform 24. The feeding of the inserts z from the cassettes 22 to the lay out platform 24 may be controlled such that the inserts Z are laid out in the configuration which they shall have when they are positioned on the carton blank. In other words, the relative positions on the lay out platform 24 is the same as they are intended to have when they are laid out and positioned on the carton blank Y. The inserts Z are moved by the insert feeder 8 by insert holders 9. The insert holders 9 may be suction cups for example. If the inserts Z have been positioned on the lay out platform 24 in the correct relative relationship, they may be translated to the carton board Y with the same movement. The apparatus 1 is preferably synchronized such that the inserts Z are transferred from the lay out platform 24 to the carton blank Y by a straight forward motion as indicated by the arrows in figure 2. The insert holders 9 are preferably kept still in a position for holding the inserts Z at least for a while during the folding of the carton blank Y by the folder 5. The folder may keep the inserts Z in the desired position until the folder 5 has finished its folding operation and the press 10 has started to effectuate a pressure on the folded blank Y and the insert 8.

[0030] In figures 3a-3c is the folder 5 showed in detail while performing different steps of a folding operation.

[0031] In figure 3a is the folder 5 shown when it is in its lowered position before it has been actuated. The folder 5 comprises a first folder arm 12 and a second folder arm 17. The first folder arm 12 is connected at its base 13 to a rigid support structure 14 by a first connection 15. The first connection 15 is made such that the first folder arm 12 may pivot or turn in relation to the support structure 14. The first folder arm 12 is further connected at its distal end 16 to a second folder arm 17 by a second pivotal connection 18. The second folder arm 17 comprises a press 10 which is provided with a low friction surface 11. The low friction surface comprises a multitude of wheels or rollers adapted to be able to rotate in the machine direction. The figure further shows a carton blank Y which has been provided with inserts Z and shows the carton blank before the folder 5 has started its folding operation.

[0032] In figure 3b is the folder 5 shown when it has started its folding operation. The first fold performed by the first folder arm 12 is already finished and the carton blank Y has been folded about 90 degrees such that a portion of the folded carton blank Y now is positioned adjacent to a side of the rectangular insert Z. This folding has been performed by rotating the first connection 15 between the support structure 14 and the base 13 of the first folder arm 12 about 90 degrees. The second connection 18 between the distal end 16 of the first folder arm 12 and the second folder arm 17 now has been rotated slightly and the carton blank has started to bend at a second fold.

[0033] In figure 3c has the folding operation been completed. The second connection 18 between the distal end 16 of the first folder arm 12 and the second folder arm 17 has been pivoted such that the carton blank Y has been folded about 90 degrees at the second fold. The second folder arm 17 is applying a pressure on the folded blank Y and the insert Z via a press 10 provided with a low friction surface 11. The carton blank Y may now be transported in the machine direction (in this figure, a direction into the figure) while a pressure is applied to the folded carton blank Y by the press 10.

Claims

1. An apparatus (1) for manufacturing of a folded product (X), e.g. a packaging box, the apparatus (1) comprising a feeding portion (2) and a folding portion (3), said feeding portion (2) being adapted to receive a carton blank (Y) for making of the folded product (X) and being provided with a feeder (4) for feeding the blank (Y) to said folding portion (3), said folding portion (3) comprising a first kind of folder (5) for folding the blank (Y), said apparatus (1) further being provided with indicators (6) for aligning and positioning the blank (Y) when it is fed to the folding portion (3) such that the blank (Y) is stopped and placed at a desired location, said apparatus (1) being arranged to activate the first kind of folder (5) and folding the blank (Y) while it is located at standstill in the folding portion (3), said apparatus further being provided with at least one glue applicator (7) for adding glue to the blank (Y)
characterized in that
said apparatus further comprises an insert feeder (8) connected to the folding portion (3) and adapted to feed and place at least one insert (Z) on a selected portion of the blank (Y), said first kind of folder being adapted to perform a folding operation such that the folded part of the starting material (Y) will be in contact with, and at least partly wraparound, said insert (Z), said at least one glue applicator (7) adapted to add glue to a surface area of said insert (Z) and/or a surface area of said blank (Y) which will make contact during said folding operation.

2. An apparatus (1) according to claim 1 **characterized in that** said apparatus (1) is provided with at least one insert holder (9) adapted to keep the at least one insert (Z) at the desired location when the first kind of folders (5) are folding the blank (Y)

3. An apparatus (1) according to claim 1 or 2 **characterized in that** said first kind of folder (5) is further provided with a press (10) for pressing said folded part of the blank (Y) against said insert (Z) while they are in contact with each other.

4. An apparatus (1) according to claim 3 **characterized in that** said press (10) for pressing of said folded part against said at least one insert is provided with a low friction pressure applicator (11) on its surface used for pressing on the folded blank (Y) in order to allow said folded blank (Y) to be moved while said press (10) is applying a pressure onto said folded blank (Y).

5. An apparatus (1) according to claim 4 **characterized in that** said low friction pressure applicator (11) is in the form of wheels or rollers.

6. An apparatus (1) according to claim 4 **characterized in that** said low friction pressure applicator (11) is in the form of an endless belt.

7. An apparatus (1) according to any previous claim **characterized in that** said first kind of folder (5) comprises a first folder arm (12) pivotally connected at its base (13) to a rigid support structure (14) by a first connection (15), said first folder arm (12) pivotally connected at its distal end (16) to a second folder arm (17) by a second connection (18), said first and second connections (15, 18) being able to pivot independently of each other and adapted to provide two foldings of the same edge of a blank (Y).

8. An apparatus (1) according to claim 7 **characterized in that** said first kind of folder (5) is controlled to make a first fold of the blank (Y) by the first folder arm (12) such that a part of the folded edge essentially follows a first surface of an insert and make a second fold of the starting material by the second folder arm (17) such that the second fold will make the remaining part of the edge follow a second surface of the insert.

9. An apparatus (1) according to claim 8 **characterized in that** said apparatus is adapted to be able to finish the first folding operation performed by the first folder arm (12) before the second folding operation performed by the second folder arm (17) is finished.

10. An apparatus (1) according to claim 8 or 9 **characterized in that** said first and second folder arms (12, 17) are controlled to fold the starting material about 90 degrees each such that the first kind of folder (5) will provide a fold of the edge of about 180 degrees.

11. An apparatus according to any of claims 7 to 10 and any of claims 3 to 6 **characterized in that** said second folder arm (17) is provided with said press (10).

12. An apparatus (1) according to any previous claim **characterized in that** the folding portion (3) is provided with a second kind of folders (19) for folding of an edge stretching essentially perpendicular to the machine direction while said first kind of folders (5) will fold an edge stretching essentially parallel to the machine direction.

13. An apparatus (1) according to claim 12 **characterized in that** the apparatus is controlled to perform the folding operation of a blank (Y) by the second kind of folders (19) before the folding operation of the first kind of folders (5) is performed, said first kind of folder (5) provided with a press (10) which is adapted to press down the edges folded by the first kind of folders (5) stretching in the machine direction and the ends of the edges folded by the second kind of

folders (19) .

14. An apparatus (1) according to any previous claim **characterized in that** said insert feeder (8) is adapted to lay out said a multitude of inserts (Z) in the correct relative relationship on a lay out platform (20) where after the inserts (Z) are moved by the insert feeder (8) and translated to the desired position on the blank (Y).

15. An apparatus according to claim 14 wherein the inserts (Z) are moved by the insert feeder (8) from the lay out platform (20) by means of suction cups (21) to be placed on the starting material (Y) .

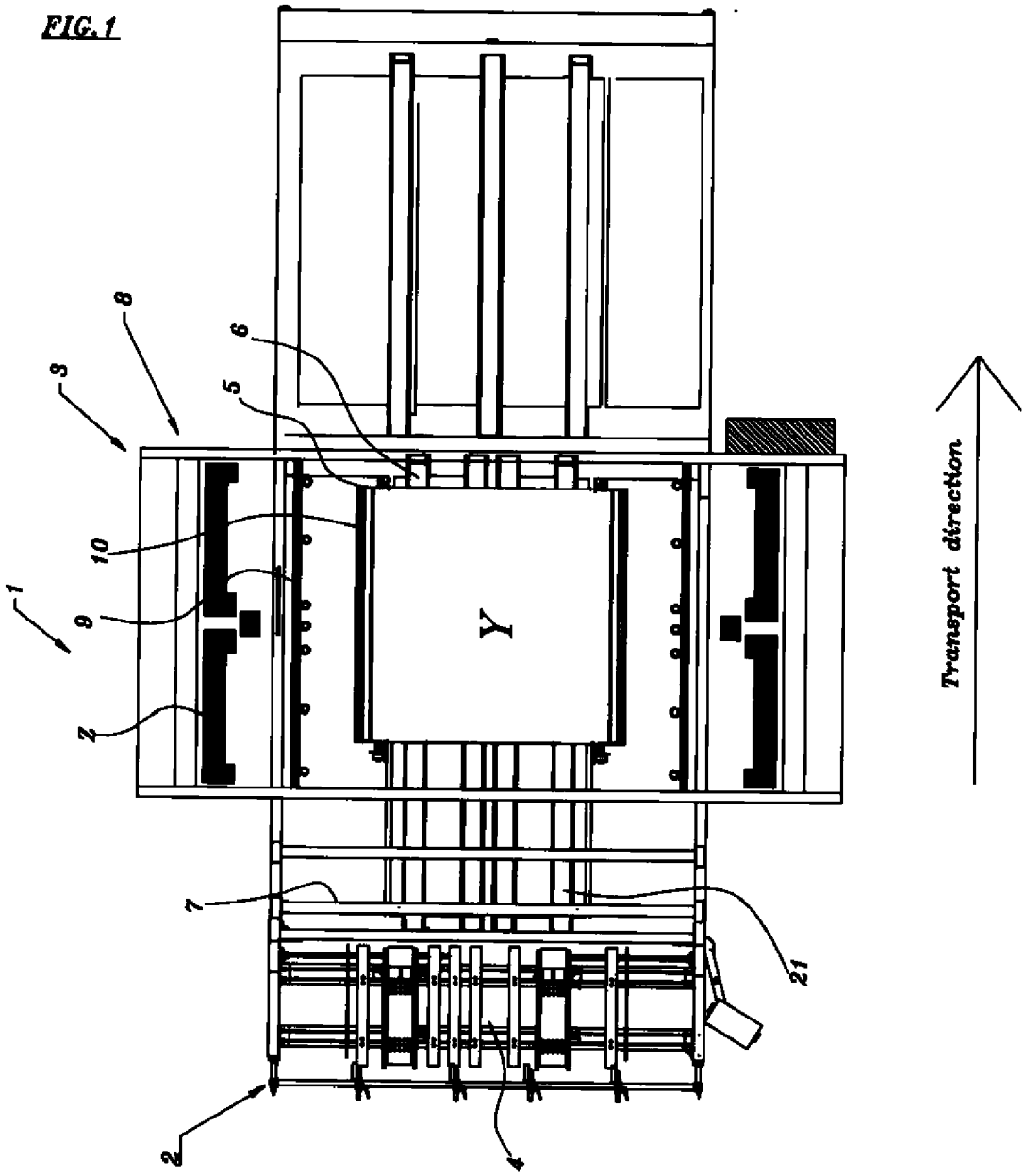
16. A method for manufacturing of a folded product (X), e.g. a packaging box, from a starting material, e.g a carton blank (Y), by the use of an apparatus (1) comprising a feeding portion (2) and a folding portion (3), said method comprising the steps of:

- Inserting at least one starting material into the feeder
- Feeding said starting material, e.g. a carton blank (Y), from said feeding portion (2) by a feeder to said folding portion (3),
- Stopping the starting material in the folding portion (3) such that the starting material is aligned and positioned by the use of indicators (6)
- activating a first kind of folder (5) and folding the starting material while it is located at standstill in the folding portion (3)
- adding glue by at least one glue applicator (7) to the starting material in a step performed before the starting material has been completely folded in the folding portion **characterized in that**

said method further comprises the steps of:

- adding at least one insert (Z) onto a selected portion of the starting material by an insert feeder (8) connected to the folding portion (3) while the starting material is at standstill in the folding portion.
- Performing at least one folding operation by said first kind of folder (5) such that the folded part of the starting material will be in contact with, and at least partly wraparound, said at least one insert (Z)
- Adding glue by said at least one glue applicator (7) to a surface area of said at least one insert (Z) and/or a surface area of said starting material which will make contact during said folding operation.

FIG. 1



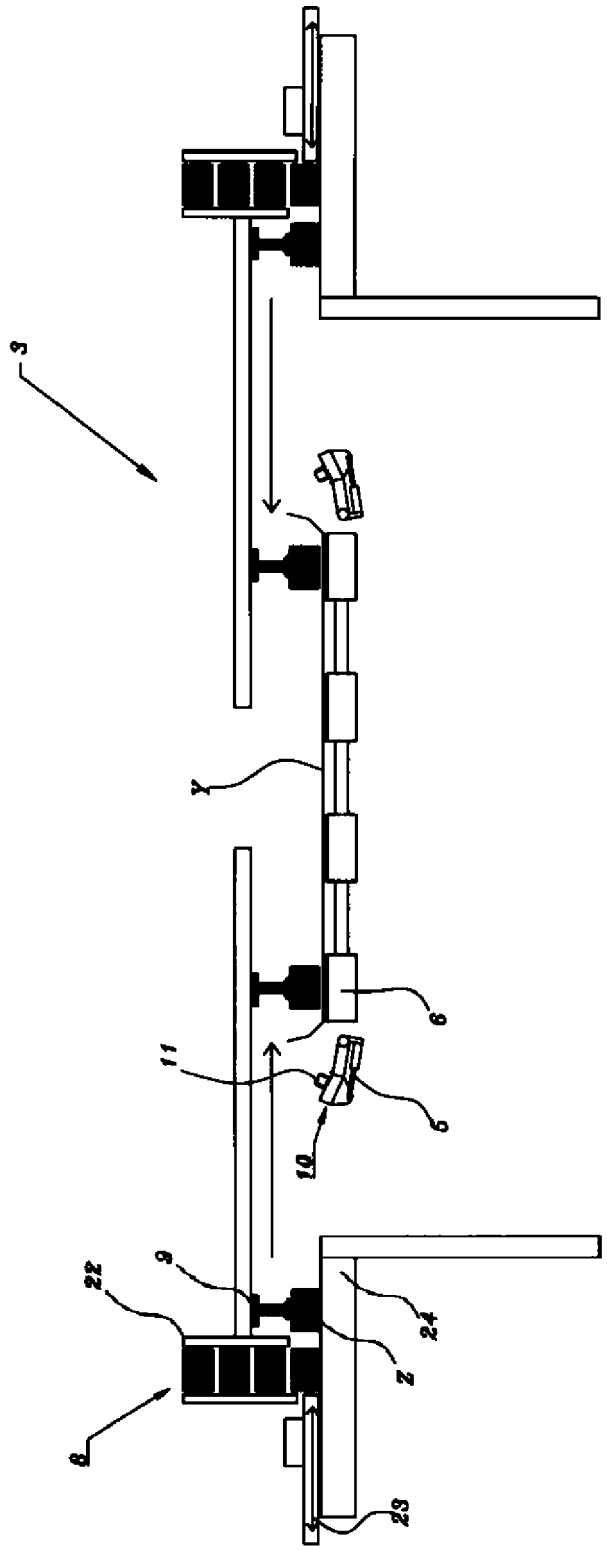


FIG.2

FIG.3a

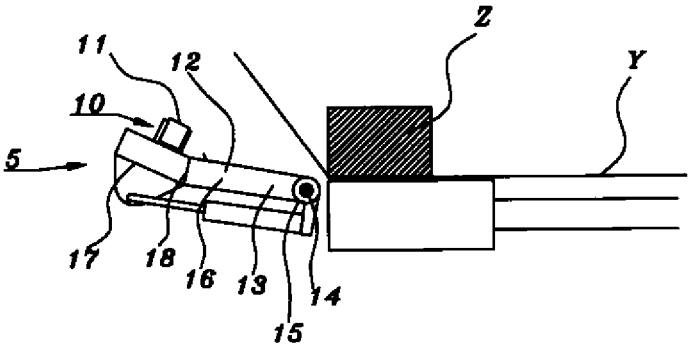


FIG.3b

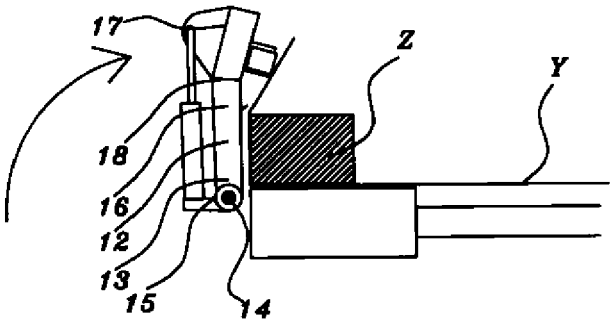
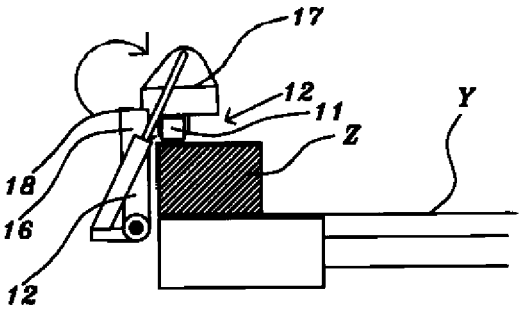


FIG.3c



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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 1697

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2010/236968 A1 (DE JESUS LOUIS [US]) 23 September 2010 (2010-09-23) * claims 1-9; figures 1,8,9 *	1-16	INV. B31D5/00 B65D81/127
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Place of search	Date of completion of the search	Examiner
Munich	10 November 2011	Bevilacqua, Vincenzo

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