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(54) **A device for adjusting height of a package box and for closing the box**

Vorrichtung zum Anpassen der Höhe einer Verpackungsbox und zum Verschließen der Box

Dispositif de réglage de hauteur d'une boîte d'emballage et de fermeture de la boîte

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Description

[0001] The invention relates to a device for adjusting height of a prefabricated package box based on ware filling therein and for closing the box, wherein the box comprises a forehand made goods filling to a certain height and the box comprises a wall, the thickness of which is not less than 2 mm, wherein the device comprises:

- a measuring device for detecting the filling height in the box,
- a supporting means placeable inside the box and mounted against the box wall and being adjustable of its height position,
- a work tool mounted outside the box said box having a bottom, wherein said work piece being arranged to make horizontally directed folding tracks with regard to the bottom of the box in the outer surface of the box,
- cutting means for cutting open the corners of the box, and
- devices for turning the flaps formed in the upper edge of the box and for mounting a cover onto the box.

[0002] Earlier is known a device according to the preamble above from publication EP 1832413 where the adjustment of the box height is presented according to the height of the goods filling. For adjusting the box height fold line markings, like pressings or scorings round the box are made on the box walls on their both sides at the height defined by the ware filling, after which in the next station the box wall portions of each sides of the box above these height lines are folded as flaps closing the box. The pressing lines are steering the foldings in desired points and are also facilitating the folding.

[0003] The disadvantage for this known solution is that after their foldings the flaps are trying to return back up, and therefore the flaps are needed to keep folded until a cover can be mounted onto the box In the known solutions the flaps are glued together for securing that they keep folded. If the box wall is made of normal box cardboard, like corrugated board thickness 3 - 4 mm, may the foldings break uncontrolled the folding lines. Also one can meet difficulties when mounting cover, when in the folding line level the folding line of the flap can locate either on the inner or outer surface of the box.

[0004] The patent application publication US 2009/0031676 discloses method and combined machine for cutting and closing boxes with inserted void-filling bags. The invention relates to the making of boxes of a variable volume adapted in each case to the height of the packed products, including cutting the box along its vertical edges and forming fold lines at a suitable height around the sides of the box to define top flaps, and the folding these flaps onto contents of the prefilled box.

[0005] For eliminating these disadvantages a new device has been developed for adjusting the box height according to the filling volume and a device for closing the box using flaps and cover. Characteristics for the device according to the invention is that the work tool for making folding tracks in the outer surface of the box is a cutting work tool, which can cut from the outer surface of the box to an adjusted depth resulting in penetrating continuous cutting lines.

[0006] Advantageous for the invention is that the inner surface of the box stays unbroken. The film of the inner surface in the box functions as a hinge for the folded flaps, the folding does not comprise any binding which would turn the flaps back up. The folding lines of the flaps become accuracy i.e. the flaps will fold according straight lines and locating on correct levels. It is very easy to make outside the box cuttings on adjusted level so, that the inner surface of the wall stays uncut. The filling height of the boxes transported to the device can be automatically detected by means of a scanner device or by means of a mechanical inside the box lowered measuring device, which measures the highest location of the filling in the box and all in this way of their fillings measured boxes can be manufactured so that their heights are minimized for saving space.

[0007] In the following the invention is detailed described by referring to the enclosed drawings where

Fig. 1 presents a prefabricated box when its filling level is measured.
Fig. 2 presents a mounting of inside the box placed supporting device as a side view.
Fig. 3 presents a supporting device in the box seen from top.
Fig. 4 presents a supporting device when supporting box walls seen from top.
Fig. 5 presents a cutting of the folding lines as a side view.
Fig. 6 presents a cutting of the box wall in folding point by means of a rotating disc
Fig. 7 presents a cutting open of the box corners above the foldings line by a knife.
Fig. 8 presents flaps being folded to close the box and mounting of a cover.

[0008] In figure 1 there is measured by means of a scanning device 2, like inclined scanning or distance-meter the highest height level of the goods or filling 4 in the box 1 which comes via a conveyor 3. This obtained measuring result adjusts immediately the steering of a supporting device 5, 6, 7 presented next in the figure 2 to a correct height level when it is lowered inside the box or the measuring result is led to a control unit belonging to the device, in which unit the result is added to data of the box in question, if the box 1 will go further on the conveyor 3 for later proceeded closing function of said box 1. The supporting device 5, 6, 7 is placed inside the box 1 for supporting the walls of the box 1 from inside, when cuttings are made in the outer surface of the box 1 (Figs 4 and 5).

[0009] In figure 3 the supporting device 5, 6, 7 is moved by means of a bar 5 inside the box 1 a little above the goods filling 4. The supporting device comprises counterparts 6 and 7 for each side wall of the box 1, said counterparts being moved against each other when mounted inside the box 1 for facilitating the mounting and they are inside the box 1 brought farther away from each other so, that they support the box 1 walls, as described in figure 4. In the figures 3 and 4 there have been schematically presented an articulated mechanism, by means of which the counterparts 6 and 7 of the supporting device are brought closer and farther away from each other.

[0010] In figure 4 there is shown seen from top a partial cutting of the box 1 wall by means of discs which function as a work piece 8. This example shows discs on each side wall of the box and they are arranged to cut simultaneously their own side wall. It is possible to arrange common driving for the discs by means of a pulling means, which is circulating via all discs or each discs has own driving arrangement producing motion. The discs are freely rotating or rotation motion is arranged for them either separately for each or common rotation motion for all, for example by means of the pulling means 15 (Fig. 6) which circulates via all discs. Very advantageous way to move discs is that each disc will move whole the time on the same wall side and will return until is cutting the next box. For securing that the folding of the flaps will happen successful it will be advantageous that some of the cutting lines L for example two opposite lines are lifted to higher height level, wherein the height difference is the same as thickness of the wall, wherein the folding of the flaps overlapped with each other when closing the box does not cause any disturbance, like for example no force which tries to open flaps or to turn them up does not exists.

[0011] The cutting discs locate in figure 5 on the line L and carry out cutting from outside the box 1 according to the figure 6, wherein the outer surface of the box 1 wall is cut and in this case also a portion from the corrugated board, which locates between the inner and outer surfaces. The cutting is not extended to the inner wall surface. The minimum wall thickness will be at least 2 mm, in order that the cutting blade can be kept inside the wall without damaging the inner surface. It is used in connection with the cutting work piece 8 in the figure 6 presented runners 16, which are pressing the wall from outside against the counter parts 6. Also support rolls can be used. The desired cutting depth can be got then accurately. In figure 6 there is shown also pulling means 15, which circulates via the cutting work pieces 8, wherein the work pieces 8 are moved simultaneously by means of said pulling means.

[0012] The figure 7 shows an example of the cutting open the comers locating above the cutting line 9. It can be done according to the figure 7 by means of a knife blade 10, which is only pushed through the corner. Preferably all corners are cut simultaneously, wherein the box 1 keeps its form. Also different kinds of cutting arrangements and blades are possible, like rotating blades or scissors. The flaps 13, 14 which are got when the corners are cut, are folded to close the box 1 and a cover 11 is placed and glued onto the box 1, the edges of the cover are folded and glued to the wall sides of the box said walls having covered by glue 12.

Claims

1. A device for adjusting height of a prefabricated package box (1) based on ware filling therein and for closing the box, wherein the box (1) comprises a forehand made ware filling (4) to a certain height (L) and the box (1) comprises a wall, the thickness of which is not less than 2 mm, wherein the device comprises:

   - a supporting means (5),(6),(7) placeable inside the box (1) and mountable against the box (1) wall and being adjustable of its height position,
   - a work tool (8) mounted outside the box (1) said box having a bottom, wherein said work piece being arranged to make horizontally directed folding tracks with regard to the bottom of the box in the outer surface of the box (1),
   - cutting means (10) for cutting open the corners of the box (1), and
   - devices for turning the flaps (13, 14) formed in the upper edge of the box (1) and for mounting a cover onto the box (1),

   characterized in that the device further comprises a measuring device (2) for detecting the filling height (L) of the box (1), and that the work tool (8) for making folding tracks in the outer surface of the box (1) is a cutting work tool (8), which can cut from the outer surface of the box (1) to an adjusted depth resulting in penetrating continuous cutting lines.

2. A device according to claim 1 **characterized in that** said device comprises a control unit for adjusting the height level of the in adjusted depth cutting work tool (8) to be at least the filling height level (L).

3. A device according to claim 1 **characterized in that** the supporting means (5, 6, 7) placeable inside the box (1) and adjusted to support the wall of the box (1) on the level of the filling height (L) or close above it.

4. A device according to claim 1 **characterized in that** there are multiple of cutting work tools (8) one tool provided for each side of the box (1).

5. A device according to claim 1 **characterized in that** the cutting work tools (8) are connected to carry out the cutting motion together by means of the same driving means, like a pulling means which is led via

the work tools (8).

6. A device according to claim 1 **characterized in that** the cutting work tools (8) are adjustable to leave the inner surface of the box (1) uncut.

7. A device according to claim 4 **characterized in that** the cutting work tools (8) are free rotatable discs, rotated discs or incising knives.

8. A device according to claim 1 **characterized in that** there are several cutting means (10) suitable for cutting open the corners of the box (1) and they are arrangeable inside the box (1) to cut open opposite corners simultaneously or to cut out simultaneously adjacent corners, wherein the cutting means have opposite cutting motion directions.

9. A device according to claim 2 **characterized in that** at least in one side of the box (1) the cutting height level of the work tool (8) is steerable to deviate from the height levels (L) of the cutting lines of the other side walls a distance correspondable to the wall thickness of the box (1).

Patentansprüche

1. Vorrichtung zum Anpassen der Höhe einer vorgefertigten Verpackungsbox (1), die auf der Befüllung von Ware dort hinein beruht, wobei die Box (1) eine Warenbefüllung (4) bis zu einer bestimmten Höhe (L) umfasst und die Box (1) eine Wand umfasst, deren Dicke nicht kleiner als 2 mm ist, wobei die Vorrichtung umfasst:

    - Tragstützmittel (5), (6), (7), die innerhalb der Box (1) angeordnet und an der Wand der Box (1) befestigt und in ihrer Höhenposition angepasst werden können,
    - ein Arbeitswerkzeug (8), das außerhalb der Box (1) befestigt ist, wobei die Box einen Boden aufweist, wobei das Arbeitsstück angeordnet ist, um horizontal gerichtete Faltbahnen in Bezug auf den Boden der Box in der äußeren Oberfläche der Box (1) herzustellen,
    - Schnittmittel (10), um die Kanten der Box (1) aufzuschneiden, und
    - Vorrichtungen, um die Klappen (13, 14), die in der oberen Kante der Box (1) gebildet sind, zu drehen, und um eine Abdeckung auf der Box (1) zu befestigen,

    dadurch gekennzeichnet, dass die Vorrichtung ferner eine Messvorrichtung (2) umfasst, um die Füllhöhe (L) der Box (1) zu detektieren, und dass das Arbeitswerkzeug (8) zum Herstellen von Faltbahnen in der äußeren Oberfläche der Box (1) ein Schneidwerkzeug (8) ist, das von der äußeren Oberfläche der Box (1) bis zu einer angepassten Tiefe schneiden kann, was zu durchdringenden kontinuierlichen Schnittlinien führt.

2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vorrichtung eine Steuereinheit umfasst, um das Höhenniveau des in angepasster Tiefe schneidenden Arbeitswerkzeugs (8) anzupassen, um mindestens die Füllhöhe (L) zu sein.

3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Tragstützmittel (5, 6, 7) innerhalb der Box (1) angeordnet und angepasst werden können, um die Wand der Box (1) auf dem Niveau der Füllhöhe (L) oder knapp darüber zu stützen.

4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** mehrfache Schneidwerkzeuge (8) vorhanden sind, wobei jeweils ein Werkzeug für jede Seite der Box (1) bereitgestellt ist.

5. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Schneidwerkzeuge (8) verbunden sind, um zusammen die Schnittbewegung durchzuführen mittels derselben Antriebsmittel wie Ziehmittel, die über die Werkzeuge (8) geführt werden.

6. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Schneidwerkzeuge (8) anpassbar sind, um die innere Oberfläche der Box (1) ungeschnitten zu lassen.

7. Vorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Schneidwerkzeuge (8) frei von drehbaren Scheiben, gedrehten Scheiben oder von einschneidenden Messern sind.

8. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** mehrere Schnittmittel (10) vorhanden sind, die geeignet sind, um die Kanten der Box (1) aufzuschneiden, und dass sie innerhalb der Box (1) angeordnet werden können, um gegenüberliegende Kanten gleichzeitig aufzuschneiden oder um benachbarte Kanten gleichzeitig auszuschneiden, wobei die Schnittmittel entgegengesetzte Richtungen der Schnittbewegung aufweisen.

9. Vorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** mindestens an einer Seite der Box (1) das Schnitthöhenniveau des Arbeitswerkzeugs (8) steuerbar ist, um von den Höhenniveaus (L) der Schnittlinien der anderen Seitenwände einen Abstand, der der Wanddicke der Box (1) entspricht, abzuweichen.

Revendications

1. Dispositif de réglage en hauteur d'une boîte d'emballage préfabriquée (1) sur la base des produits qui la remplissent et de fermeture de la boîte, dans lequel la boîte (1) comprend un remplissage de produits (4) effectué préalablement jusqu'à une certaine hauteur (L) et la boîte (1) comprend une paroi dont l'épaisseur n'est pas inférieure à 2 mm, dans lequel le dispositif comprend :

   - un moyen de support (5), (6), (7) qui peut être placé à l'intérieur de la boîte (1) et monté contre la paroi de la boîte (1) et réglable sur sa position en hauteur,
   - un outil de travail (8) monté à l'extérieur de la boîte (1), ladite boîte ayant un fond, dans lequel ladite pièce de travail est aménagée pour effectuer des voies de pliage dirigées horizontalement par rapport au fond de la boîte dans la surface externe de la boîte (1),
   - des moyens de coupe (10) pour ouvrir les coins de la boîte (1), et
   - des dispositifs pour faire tourner les volets (13, 14) formés dans le bord supérieur de la boîte (1) et monter un couvercle sur la boîte (1),

   caractérisé en ce que le dispositif comprend en outre un dispositif de mesure (2) pour détecter la hauteur de remplissage (L) de la boîte (1) et l'outil de travail (8) pour former les voies de pliage dans la surface externe de la boîte (1) est un outil de travail de coupe (8), qui peut couper la surface externe de la boîte (1) à une profondeur réglée entraînant la formation de lignes de coupe pénétrantes continues.

2. Dispositif selon la revendication 1, **caractérisé en ce que** ledit dispositif comprend une unité de commande pour régler le niveau de hauteur de l'outil de travail de coupe (8) en profondeur réglée pour qu'il se situe au moins au niveau de la hauteur de remplissage (L).

3. Dispositif selon la revendication 1, **caractérisé en ce que** le moyen de support (5, 6, 7) est placé dans la boîte (1) et réglé pour supporter la paroi de la boîte (1) au niveau de la hauteur de remplissage (L) ou un peu au-dessus de celle-ci.

4. Dispositif selon la revendication 1, **caractérisé en ce qu'**il y a de multiples outils de travail de coupe (8) à raison d'un outil prévu pour chaque côté de la boîte (1).

5. Dispositif selon la revendication 1, **caractérisé en ce que** les outils de travail de coupe (8) sont raccordés pour effectuer le mouvement de coupe conjointement au moyen du même moyen d'entraînement, tel qu'un moyen de traction qui est guidé via les outils de coupe (8).

6. Dispositif selon la revendication 1, **caractérisé en ce que** les outils de travail de coupe (8) sont réglables pour laisser la surface interne de la boîte (1) non découpée.

7. Dispositif selon la revendication 4, **caractérisé en ce que** les outils de travail de coupe (8) sont des disques rotatifs, des disques alternés ou des couteaux d'incision.

8. Dispositif selon la revendication 1, **caractérisé en ce qu'**il y a plusieurs moyens de coupe (10) convenant pour ouvrir les coins de la boîte (1) et ils peuvent être aménagés à l'intérieur de la boîte (1) pour ouvrir des côtés opposés simultanément ou pour découper simultanément des coins adjacents, dans lequel les moyens de coupe ont des sens de déplacement de coupe opposés.

9. Dispositif selon la revendication 2, **caractérisé en ce que**, au moins sur un côté de la boîte (1), le niveau de hauteur de coupe de l'outil de travail (8) peut être orienté pour dévier des niveaux de hauteur (L) des lignes de coupe des autres parois latérales d'une distance qui peut correspondre à l'épaisseur de paroi de la boîte (1) .

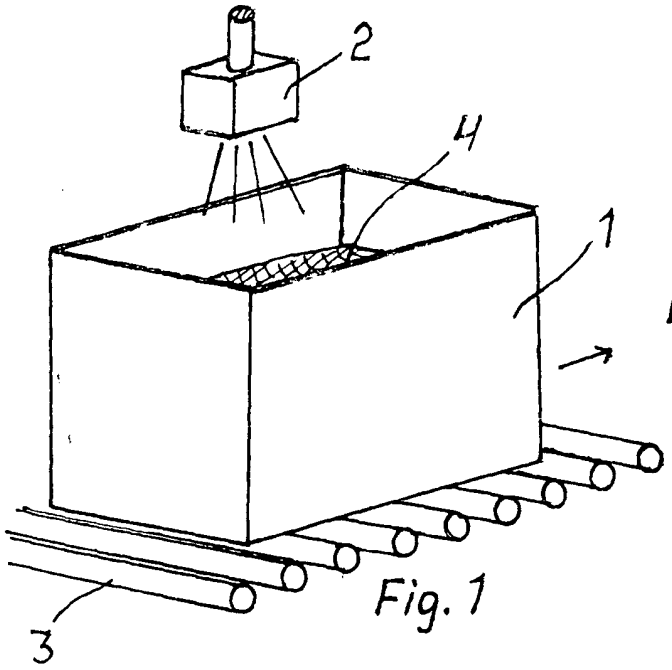

Fig. 1

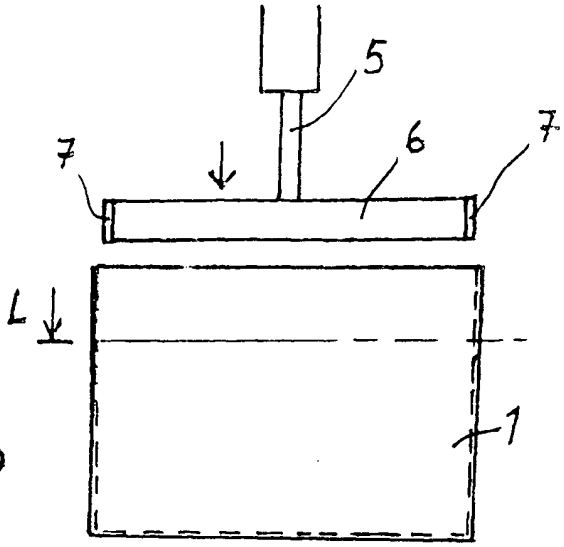

Fig.2

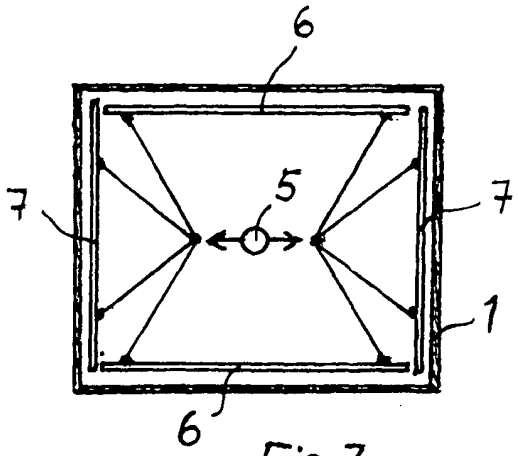

Fig. 3

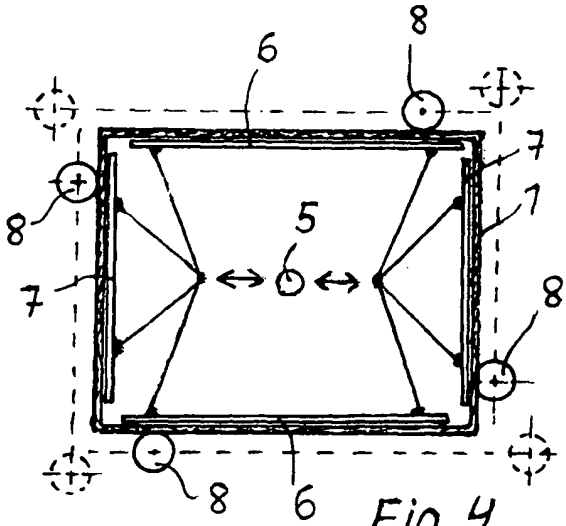

Fig. 4

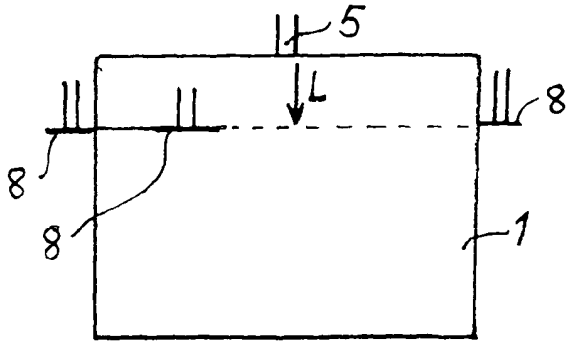

Fig. 5

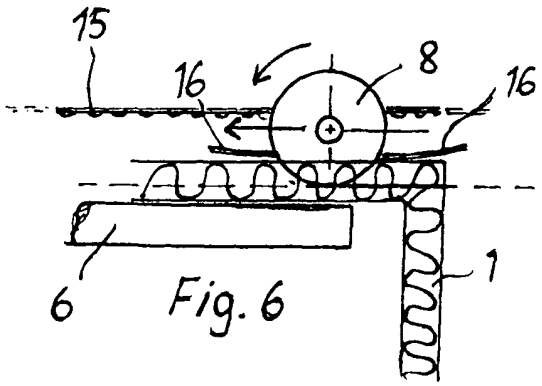

Fig. 6

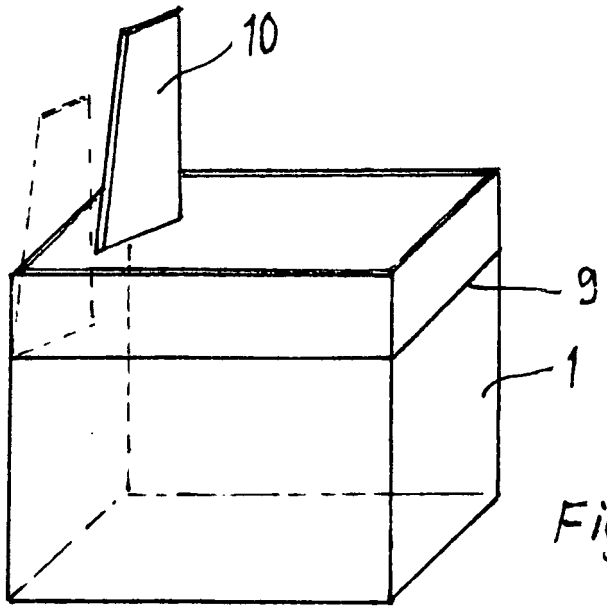

Fig. 7

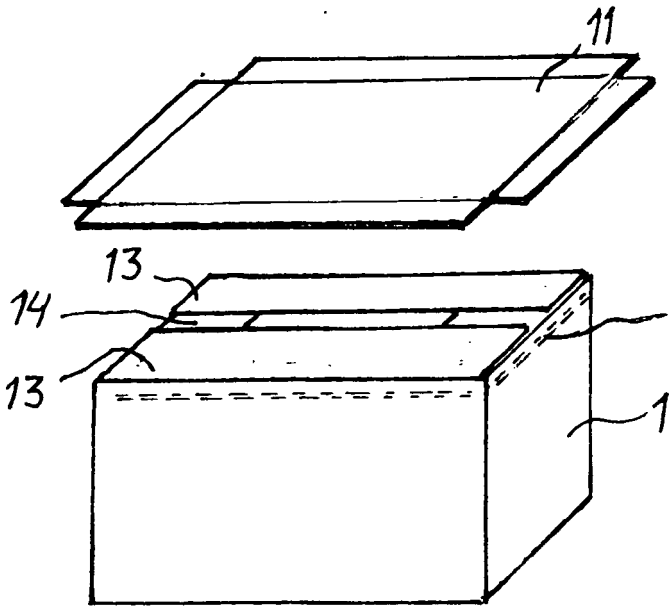

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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