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(71) Applicant: **DANIELSSON DEVELOPMENT AB**
Polhemsgatan 1
S-392 39 Kalmar (SE)

(72) Inventor: **Karlsson, Ingemar**
Box 35
S-388 00 Ljungbyholm (SE)

(74) Representative: **MacFie, W.R. et al**
Albihn West AB Stora Nygatan 15
S-411 08 Göteborg (SE)

(54) A method and a machine for forming a box-shaped container.

(57) A method and a machine for forming a box-shaped container, from a flat-folded container blank (10) of cardboard or similar material, comprising a four-sided sleeve-shaped middle section (11), a central top tongue (12), two boundary top tongues (13) and a bottom. The machine comprises first hook means (18, 19) for pulling the blank (10) into a turning cradle (21). In this the flat cardboard blank (10) is turned approximately 90° around an imaginary axis, which is coaxial with a folding line (22) for the top tongues (12, 13), so that the central top tongue (12) and one of the boundary top tongues (13) are angled towards one side from the middle section plane, along said folding line (22). Second hook means (28) are arranged to angle the remaining top tongue (13) in the opposite direction away from the plane of the middle section, along said folding line (22). Also, means (29) are arranged to pull the blank sideways out of the turning cradle, as well as press means (30) for erecting the middle section (11) and bottom of the blank by moving the edges of the plane towards each other until a substantially rectangular box has been formed.

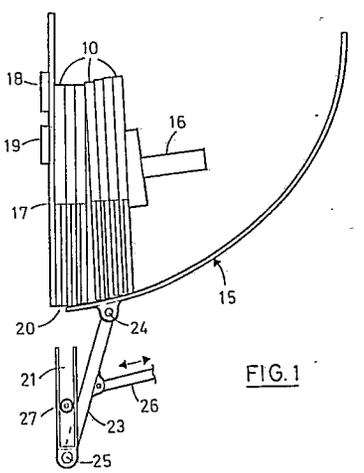


FIG. 1

EP 0 332 595 A2

Description

A METHOD AND A MACHINE FOR FORMING A BOX-SHAPED CONTAINER

The present invention relates to a method and a machine for forming a box-shaped container from a flat-folded container blank of cardboard or similar material, comprising a four-sided sleeve-shaped middle section, a central top tongue, two boundary top tongues and a bottom section.

The main problem forming the basis for the creation of the invention consists in forming box-shaped containers of the kind described above, in a series of different sizes, and in a single machine.

One field in which there is a special demand for machines having the above described capability, exists at machines for sorting counting and packaging coins. These machines are frequent, e.g. in banks, post offices and super markets where large amounts of coins are handled. This involves packaging a certain number of coins of one kind in a tube which is sealed in both ends to form a verified unit of e.g. 100 coins and may be transported between bank vaults and cash desks and between a head office and local branches.

In order to facilitate the handling of said coin tubes, they usually are packed in cardboard boxes which by their turn form verified units, e.g. with 250 SEK in 10-öre coins (50 tubes with 5 SEK in each), 500 SEK in 50-öre coins (20 tubes with 25 SEK in each), 1000 SEK in one krona coins (20 tubes with 50 SEK each) 2000 SEK in five krona coins (10 tubes with 200 in each). Each tube of coins represents a considerable weight and the transport and handling of cardboard boxes has so far involved a laborious manual responsible work. A rationalization by introduction of machinery for automatic packaging of coin tubes would involve very large investments in capital and protected areas, because different cardboard boxes are used for different coin currency. To alter this traditional, worked in system of distribution with various cardboard boxes would on the other hand involve considerable drawbacks.

One object of the present invention, is to provide a method and a device which enables automatic erecting of cardboard blanks of various sizes, in a single machine, without the need for modifications.

For this object, the method according to the invention is characterized in that the flat cardboard blank is turned approximately 90° around an imaginary axis, which is coaxial with a folding line for the top tongues, so that the central top tongue and one of the boundary top tongues are angled towards one side from the middle section plane, along said folding line, that the remaining top tongue is angled in the opposite direction away from the plane of the middle section, along said folding line, and that the middle and the bottom sections are erected by moving the edges of the plane towards each other until a substantially rectangular box has been formed.

According to one preferable embodiment of the invention, the turning of the blank takes place in a cradle which envelops the bottom and middle sections of the blank.

Preferably, the folding line for the top tongues is moved in parallel during the turning of the cradle, for a distance at least corresponding to the linear measure of the central top tongue protruding out of the cradle.

Further, the blank is preferably pulled out of a cardboard blank magazine when it is entered in the cradle and during turning.

According to another embodiment of the invention, the cardboard blank is displaced out of the cradle with the top tongues angled away from the plane of the middle section, before erection of the middle section and the bottom.

A machine for performing the method according to the invention is characterized by first hook means for pulling the blank into a turning cradle, means for simultaneously turning and displacing the turning cradle in parallel, second hook means to angle one of the top tongues of the blank, and means to pull the blank sideways out of the turning cradle, as well as press means to raise the middle section and bottom of the blank.

One embodiment of the invention will be described in the following, with reference to the accompanying drawings, in which:

Fig. 1 in a broken side view shows a magazine for cardboard blanks, at a starting-point for performing an outfeed- and erecting sequence,

Fig. 2 in a plane view shows the starting-point in Fig. 1 for outfeed of the next coming cardboard blank from the magazine,

Fig. 3 and 4 correspondingly show the subsequent step in the outfeed- and erecting sequence,

Fig. 5 and 6 correspondingly show the next subsequent step in the outfeed- and erecting sequence,

Fig. 7 shows the cardboard blank in a plane view, after folding of the remaining top tongue of the cardboard box blank,

Fig. 8 shows the cardboard blank again in a plane view, after a parallel displacement, and

Fig. 9 shows the cardboard box after completed erection.

The cardboard blanks 10 shown in the figures comprise a four-sided, sleeve formed middle section 11, a central top tongue 12, two boundary top tongues 13 and a bottom section 14 (see Fig. 6). In the disclosed embodiment, this bottom section comprises cardboard tongues 14a, which are arranged to automatically cooperate during erecting and lock into each other, in a self-locking way, to form a rigid bottom.

A magazine 15 is arranged to receive a number of flat-folded cardboard blanks 10, as the left part of Fig. 1 shows. In this case the blanks 10 are held vertical, with the top tongues 12, 13 pointing upwards, by means of a tensioner 16, which acts to press the stack of blanks towards a slitted support plate 17. Two down-feed hooks 18, 19 are vertically displacable up and down along the slits. Therein, the

down-feed hooks 18, 19 can grip the cardboard blank being closest to the support plate 17, by hooking the upper edge of the top tongue 13 and middle section 11 of the cardboard blank abutting the plate, and displacing it vertically downward through an out-feed slit 20 in the magazine 15.

The vertical distance between the down-feed hooks 18, 19 correspond to the height of the side top tongues 13, which all have the same height regardless of which coin value the cardboard box is intended for.

During the vertical displacement of the cardboard blank, by the down-feed hooks through the slit 20, the blank is entered in a slot-formed, U-shaped turning cradle 21, down to the level of the folding line 22 of the top tongues. The middle section 11 of the box blanks have different dimensions according to the coin value, which means that the blanks has to be displaced differently far into the cradle 21, depending upon the coin value which the blank 10 is intended for. However, no modifications of the machine has to be made for different types of cardboard blanks, because the height of the boundary top tongues is always the same, and that the stroke of the down-feed hooks is adapted to the cardboard blank having the most prominent middle section height. This results in that the down-feed hooks 18, 19 exhibit a certain idle movement upwards, for cardboard blanks having less middle section height.

The turning cradle 21 can be turned and displaced simultaneously by means of a link mechanism shown in Fig. 1-3. This mechanism comprises a link arm 23, which is connected to a fixed pivot point 24 in the magazine 15 and to a displaceable pivot point 25 in the lower end of the turning cradle 21. The link arm 23 is pivotable forwards and backwards by means of an actuator arm 26. Guiding means 27, e.g. rolls are arranged for guiding the cradle 21 during the pivot movement, so that the folding line 22 is moved in parallel substantially vertically. The combined movement results in that the cradle is turned substantially 90° around the guiding means 27, while the bottom end is pulled in simultaneously.

During the above described movement, the cardboard blank 10 is completely pulled out of the magazine slit 20, while the central top tongue 12 and one of the side top tongues 13 via abutment against folding supports, not shown in the drawings, maintain their longitudinal upwards direction, but now in angle to one side of the plane of the middle section, i.e. folded up along the folding line 22. The remaining top tongue 13 maintains its longitudinal direction in line with the middle section plane, as is shown in Fig. 3.

A tongue folding hook 28 is arranged to fold the remaining top tongue 13 in the opposite direction away from the middle section plane, i.e. down along the folding line 22, as is shown in Fig. 4. Then an eccentrically journalled locking roll 29 is brought sideways in over the last folded top tongue 13, and is made to grip this tongue in the nip between said roll and a support strip which is not shown in the drawings.

In the next step shown in Fig. 5, the cardboard blank 10 is displaced sideways out of the cradle 21 by means of a not shown, reciprocating motion mechanism for manoeuvreing the locking roll 29.

When the cardboard blank has been moved to its position of erection, the locking roll 29 is made to release the top tongue 13. Finally the middle section 11 and the bottom 12 is erected by bringing the edges of the plane towards each other by means of an erecting hook 30 which is displaceable towards the left side in Fig. 6, until a substantially rectangular cardboard box has been formed, having the top tongues folded outward. The erected cardboard box is now ready to be charged with the intended contents and the work cycle may be repeated with the next cardboard blank.

The above described method and the machine for performing this method enables rapid and reliable erection of cardboard blanks of various sizes within a minimal amount of machine space and without the need for modifications for different type of cardboard blanks.

The invention is not limited to the above described embodiment, but several modifications are possible within the scope of the accompanying claims. For example, the means for handling the cardboard blanks may be designed in many other ways. Naturally, the method and the machine is applicable for other types of packing machines, e.g. machines for automatic packaging of different kinds of cartridges.

Claims

1. A method for forming a box-shaped container, from a flat-folded container blank (10) of cardboard or similar material, comprising a four-sided sleeve-shaped middle section (11), a central top tongue (12), two boundary top tongues (13) and a bottom section (14), **characterized** in, that the flat cardboard blank (10) is turned approximately 90° around an imaginary axis, which is coaxial with a folding line (22) for the top tongues (12, 13), so that the central top tongue (12) and one of the boundary top tongues (13) are angled towards one side from the middle section plane, along said folding line (22),
that the remaining top tongue (13) is angled in the opposite direction away from the plane of the middle section, along said folding line (22), and
that the middle and the bottom sections (11, 14) are erected by moving the edges of the plane towards each other until a substantially rectangular box has been formed.

2. A method according to claim 1, **characterized** in, that the turning of the blank (10) takes place in a cradle (21) which envelops the bottom and middle sections (14 and 11) of the blank.

3. A method according to claim 2, **characterized** in, that the folding (22) line for the top tongues (12,13) is moved in parallel during the turning of the cradle (21), for a distance at least

corresponding to the linear measure of the central top tongue (12) protruding out of the cradle.

4. A method according to claim 2 or 3, **characterized** in, that the blank (10) is pulled out of a cardboard blank magazine (15) when it is entered in the cradle (21) and during turning.

5. A method according to any of claims 2-4, **characterized** in, that the cardboard blank (10) is displaced out of the cradle (21) with the top tongues (12, 13) angled away from the plane of the middle section, before erection of the middle section (11) and the bottom (14).

6. A machine for forming a box-shaped container, from a flat-folded container blank (10) of cardboard or similar material, comprising a four-sided sleeve-shaped middle section (11), a central top tongue (12), two boundary top tongues (13) and a bottom section (14), **characterized** by, first hook means (18, 19) for pulling the blank (10) into a turning cradle (21), means (23-27) for simultaneously turning and displacing the turning cradle parallel, second hook means (28) to angle one of the top tongues (13) of the blank, and means (21), as well as press means (30) to raise the middle section (11) and bottom (14) of the blank.

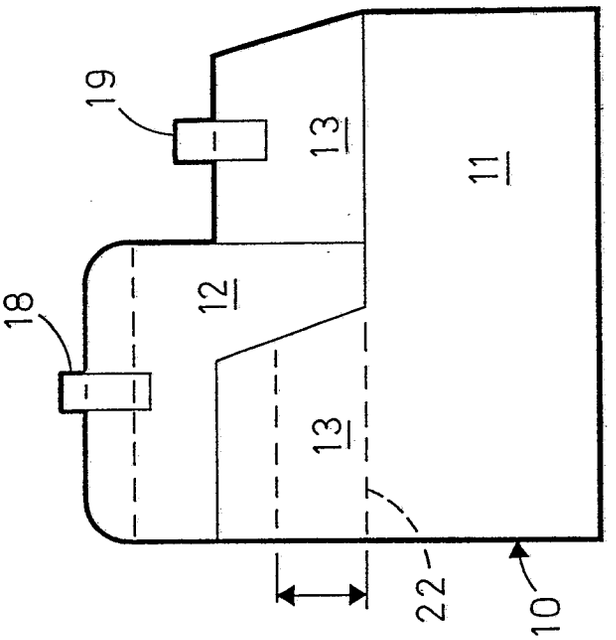


FIG. 2

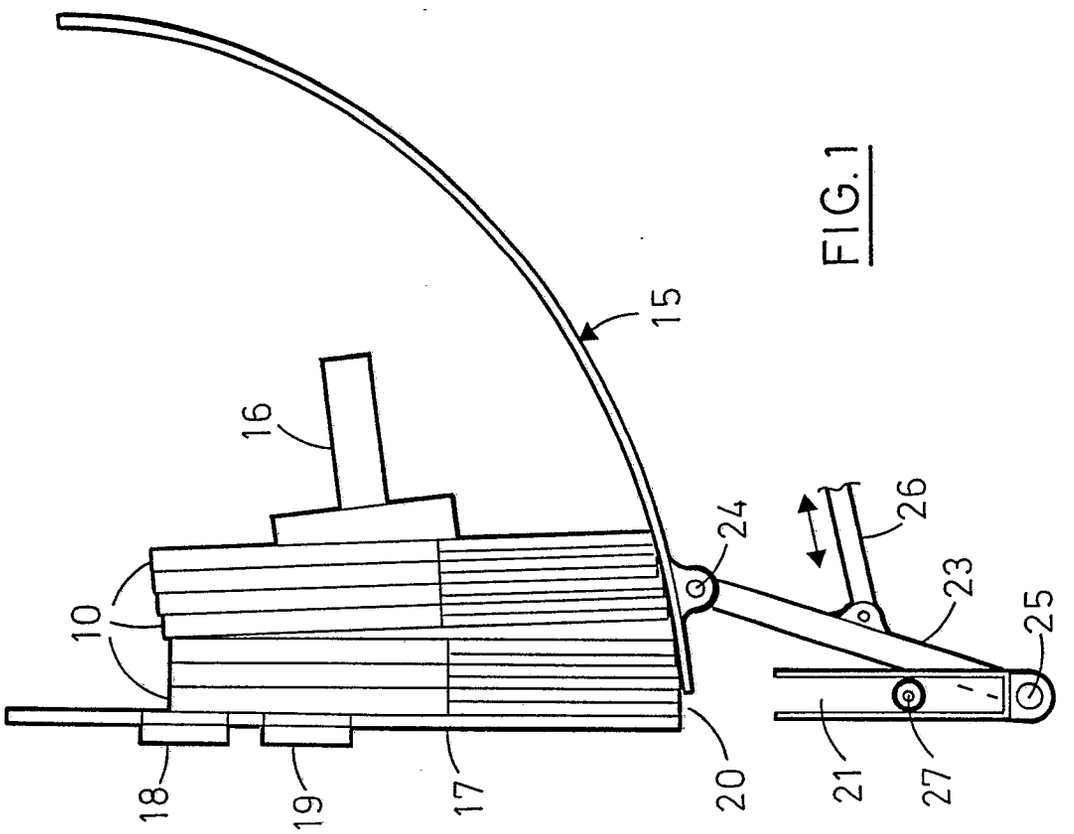


FIG. 1

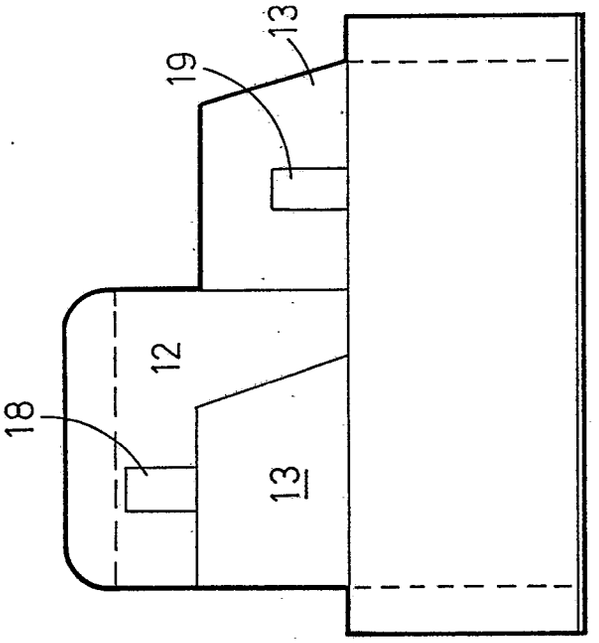


FIG. 4

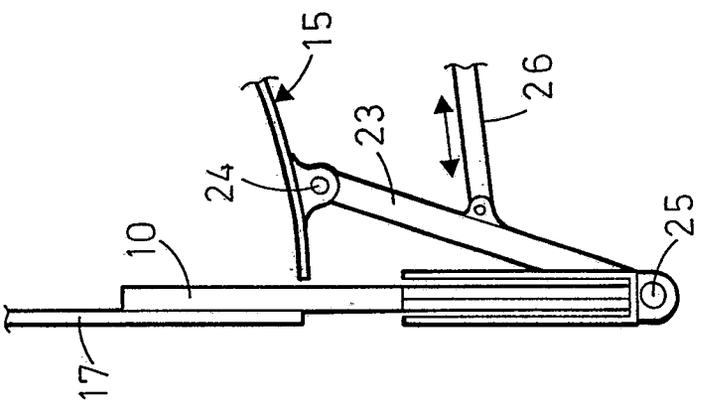


FIG. 3

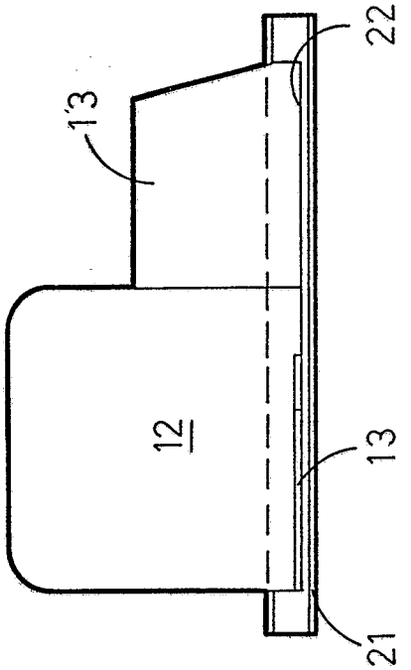


FIG. 6

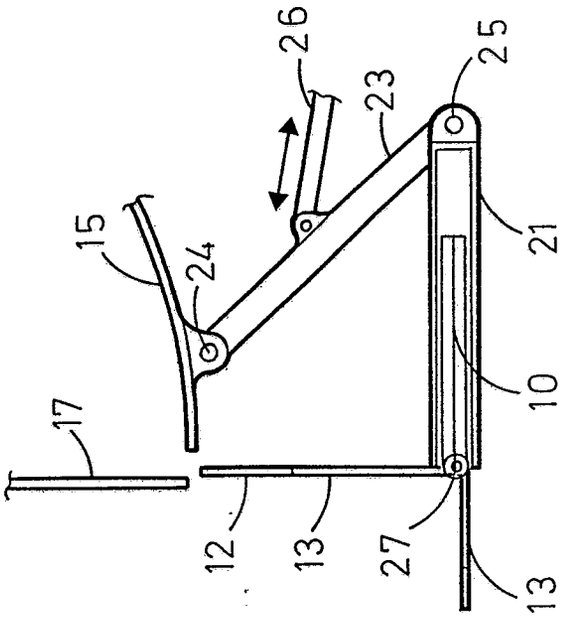


FIG. 5

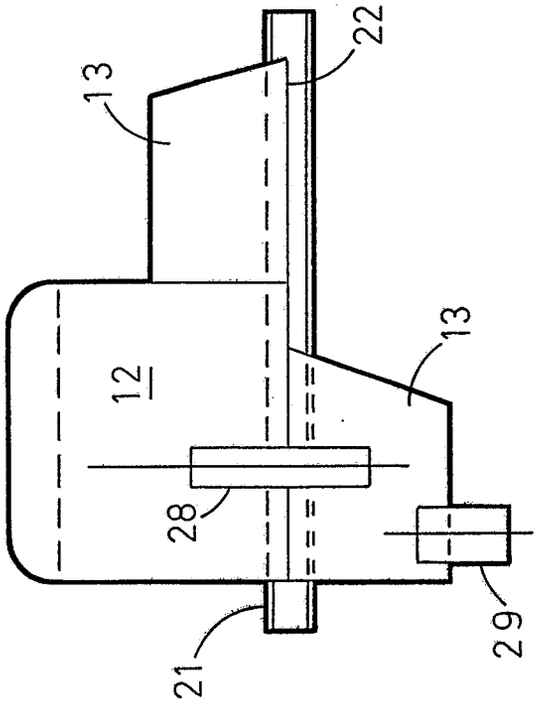
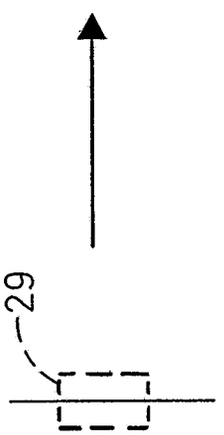


FIG. 7



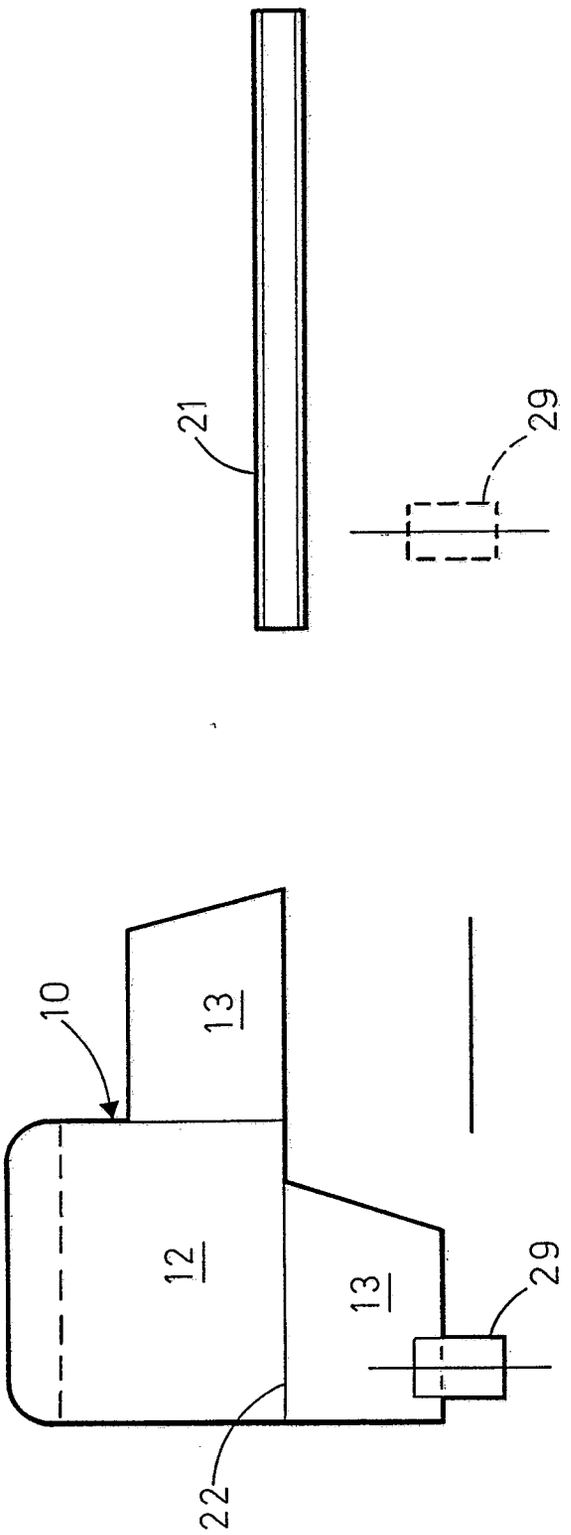


FIG. 8

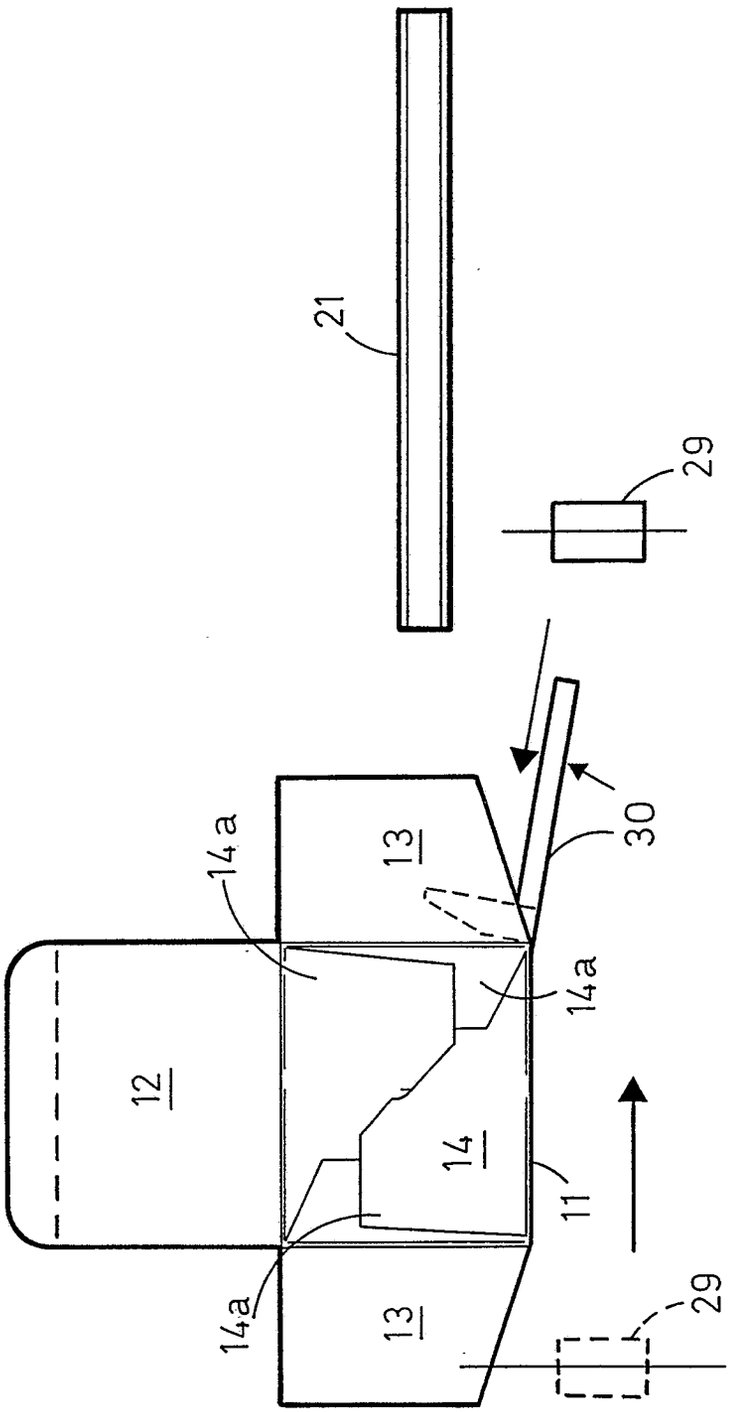


FIG. 9