



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 129 843 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
15.09.2004 Bulletin 2004/38

(51) Int Cl.7: **B31B 1/74**, B26D 7/18,
B65H 3/32

(21) Application number: **00200767.2**

(22) Date of filing: **03.03.2000**

(54) **Method and machine for separating blanks for cardboard boxes**

Verfahren und Vorrichtung zum Trennen von geschnittenem Material für Pappschachteln

Méthode et appareil de séparation de flans pour boîtes en carton

(84) Designated Contracting States:
DE ES FR GB

(43) Date of publication of application:
05.09.2001 Bulletin 2001/36

(73) Proprietor: **Serco B.V.**
5530 AE Bladel (NL)

(72) Inventor: **Theel, Pieter**
5552 BD Valkenswaard (NL)

(74) Representative: **van Westenbrugge, Andries et al**
Nederlandsch Octrooibureau
P.O. Box 29720
2502 LS The Hague (NL)

(56) References cited:
FR-A- 2 514 296 **GB-A- 2 120 155**
US-A- 4 047 474 **US-A- 5 242 262**

EP 1 129 843 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The invention relates to a method for separating blanks for cardboard boxes, in particular packaging boxes, from unbroken board sheets which each comprise a number of blanks which are connected to one another along breaking lines, in which method:

- in a step c), the unbroken sheets are broken into separated blanks; and
- in a step d) the separated blanks are preferably formed into stacks of blanks; and
- in a step e) these stacks of blanks are packaged, if appropriate.

[0002] For the production of packaging boxes from corrugated board, the procedure is generally as follows. A starting sheet of corrugated board is, where necessary, provided with text and/or pictures (by printing or processing preprinted sheets). Preferably after this, but if appropriate before, a number of blanks, which are still connected to one another along breaking lines, are formed in the starting sheet. Such a sheet having a number of blanks which are connected to one another along breaking lines is known as "an unbroken sheet". In line with this process, each unbroken sheet is broken into separate blanks. This breaking may take place manually or, if appropriate, mechanically. Breaking is extremely easy, since the breaking lines are already such that the blanks can break free along the breaking lines if the unbroken sheet is picked up. The separated blanks are then manually or mechanically formed into stacks of blanks, which stacks of blanks are then generally packaged further, for example by wrapping a sheet around them, by winding a wire around them or by placing the stacks of blanks in an outer box. All this generally takes place at the premises of the supplier, also known as the "packaging producer", of the packaging box. The stacks of blanks are then transported to the location where the blanks are formed into boxes, which are then filled.

[0003] In the case of solid board, the packaging producer operates somewhat differently. In the case of solid board, the blanks are generally formed directly from the starting sheet by punching. In this case, therefore, there is no formation of a so-called unbroken sheet which is broken into separate blanks in a subsequent breaking step (although this method does exist). Therefore, the separation of the blanks takes place directly during punching. Afterwards, the blanks are again formed into stacks of blanks which can be packaged and made available to the purchaser.

[0004] The drawback of the method outlined above is that the packaging producer, as the purchaser's supplier, must have a large production capacity in order to be able to supply blanks sufficiently quickly at all times in particular in the event of highly fluctuating demand from the purchaser. Such a situation arises, for example, with

boxes for packaging seasonal products, such as ice creams. Ice creams are typically products which are produced and therefore also packaged primarily in the summer season and for which, in addition, demand is very strongly influenced by the weather at the time. If the packaging producer, as supplier, then wants to be able to keep up with a high demand, he must either have or have in reserve sufficiently great production capacity or must have sufficient stocks of stacks containing separate blanks. Apart from the fact that these stocks result in a high level of tied-up capital, a relatively high storage capacity is also required. It will be clear that such problems are also very likely for products other than ice creams. The second drawback of the current method is that the process steps may influence one another. For example, a fault during the formation of stacks of blanks may have a direct effect on the stamping and printing process.

[0005] The object of the present invention is to provide a method for separating blanks for cardboard boxes which, inter alia, offers a solution to the above problems.

[0006] According to the invention, this object is achieved by, in a step a) (before step c), stacking the unbroken sheets to form a stack of sheets. As may be clear, in this context a stack of sheets is understood to mean a stack of unbroken sheets. Apart from the above-described problems with being able to quickly satisfy fluctuating demand, this stacking to form a stack of sheets offers the advantage that, if it is desired for the separation or, if appropriate, the use of the blanks to take place in line with the operation of forming blanks from starting sheets, the separation step can be made independent of the preceding forming step, by forming a buffer, i.e. the stack of sheets. This means that, in the event of stagnation in the separation process or a subsequent process, the previous forming process can continue to operate, or in the event of stagnation in the forming process the subsequent separating process or further process can continue.

[0007] It should be clear that the method according to the invention can be used both for boxes, or more correctly blanks, made from corrugated board and for boxes or blanks made from solid board. In the latter case, the punching device will have to be suitable for the production of unbroken board sheets with blanks which are connected to one another via breaking lines. The production of pieces of solid board which are connected to one another via breaking lines is not per se anything special and is already known from the prior art.

[0008] The formation of one or more stacks of sheets not only makes it possible to form a buffer, but also, instead or in addition, also makes it possible to render the separation process more efficient, by, in step c), breaking the stack of sheets or a partial stack of sheets into separated partial stacks of blanks. It is thus possible for the entire stack of sheets to undergo the breaking step all at once, instead of sheet by sheet, which may then result in correspondingly high stacks of separated

blanks, referred to as partial stacks of blanks. It is also conceivable for part, known as a partial stack of sheets, to be removed from the stack of sheets and subjected to the breaking process all at once. In this case too, the breaking of a partial stack of sheets may then result in correspondingly high separated partial stacks of blanks. If the entire stack of sheets is subjected to a breaking step all at once, in line with the forming process which precedes the breaking process, the abovementioned buffer effect will be, at least partially, lost, unless a plurality of successive stacks of blanks are ready. However, partial stacks of blanks are still easier to handle than each blank separately. If in each case a partial stack of sheets from a stack of sheets is subjected to the breaking process (step a)), the remaining stack of sheets will continue to act as a buffer.

[0009] According to the invention, forming stacks of unbroken sheets not only makes it possible, in an in-line situation, to make the operation of step c) less dependent on the preceding forming process, but also makes it possible to provide a solution to the abovementioned problems by decoupling the separation process from the forming process (in which unbroken board sheets are formed from starting sheets) entirely. This is because, in the first instance, it is possible to form stacks of unbroken board sheets (which each in turn comprise a number of blanks connected to one another along breaking lines), and to hold these stacks in stock for a longer or shorter time. Stock stacks of this nature take up less space than stacks of blanks which have already been separated and, moreover, tie up less capital. Then, once the purchaser has requested stacks of separated blanks, one or more stacks of unbroken board sheets which have previously been held in stock can be removed from storage and converted into stacks of blanks containing separated blanks. This essentially means that, according to a further embodiment of the method according to the invention, after step a) and before step e), in a step b), an unbroken sheet or preferably a partial stack of unbroken sheets is removed from the stack of sheets and subjected to step c). In this case, step b) can, according to the invention, be carried out in an advantageous manner, preferably automatically, by firstly inserting a lip beneath the sheet which is to be removed or the bottom sheet of the partial stack of sheets which is to be removed, preferably approximately in the centre of a longitudinal or transverse side of the stack of sheets, and by lifting the said sheet or the said bottom sheet of the partial stack of sheets, in such a manner that a gap is formed on either side of the lip, and by inserting a first tooth into the said gap on either side of the lip and using these first teeth to increase the length of the gap, measured from the lip, on either side of the lip, by inserting in each case a second tooth into the gap on the outer sides, remote from one another, of the first teeth, which has been enlarged in this way, and by fitting the teeth all the way through beneath the said sheet or the said partial stack of sheets. In this way, the unbroken sheets

can be carefully removed from the stack of sheets without prematurely breaking along the breaking line. This has the advantage that it is consequently possible to feed the unbroken board sheets accurately and in a predetermined manner to a breaking process, preferably an automated breaking process. This is of benefit to the reliability and speed of the entire process.

[0010] According to an advantageous embodiment of the invention, the board sheets may comprise blanks of two or more different types and, after step c) and before any step d), the blanks are sorted according to type and, in any such step d), stacks of blanks are formed for each type containing blanks of the said type, and if appropriate these stacks of blanks are packaged. It thus becomes possible for the unbroken sheets, with regard to the space which they take up, to be divided as efficiently as possible and, if various types of blanks are arranged on these sheets, for these various types of blanks still to be stacked and delivered in separate stacks for each type.

[0011] According to the invention, the breaking operation can advantageously be brought about if, in step c), the following partial steps are carried out:

c1) the unbroken sheets are conveyed in a first direction with respect to the said sheets, and the breaking lines which are at right angles to the said first direction are broken in order to form unbroken subsheets each containing a single row, which extends transversely to the first direction, of blanks which are connected to one another along breaking lines; and

c2) the subsheets obtained in step c1) are conveyed in a second direction with respect to the said sheets, which second direction forms an angle with the first direction, and the breaking lines which are at right angles to this second direction are broken in order to form the separated blanks.

[0012] A breaking method of this nature can in particular be automated very successfully. The unbroken sheets may each be conveyed separately or in so-called partial stacks of sheets or ordinary stacks of sheets in a first direction by means of a first conveyor belt, the breaking lines which are at right angles to this first conveying direction then being relatively easy to break using breaking installations which are known per se, such as a so-called "bundle breaker", which operates according to the principle that bundles which are still connected are broken, the two sides next to the breaking line being clamped and separated from one another by means of a breaking operation, but also by means of other types of breaking installations. After step c1), the subsheets obtained in this way can be rotated with respect to the conveyor belt by means of a turning device, for example, and can then be conveyed onwards, by the same or a different conveyor belt, in line with the original conveying direction in order then to be subjected to a second

breaking operation in which the remaining breaking lines which are at right angles to the second conveying direction are broken. However, it is also conceivable to use a first conveyor belt and a second conveyor belt which is at right angles to the first conveyor belt and to transfer the subsheets obtained in step c1) to the second conveyor belt without changing their orientation (or, if appropriate, while changing their orientation) and to break the remaining breaking lines on this second conveyor belt.

[0013] To obtain stacks of blanks in which all the blanks are oriented in the same direction, according to the invention it is advantageous if, before any step d), the orientation of the separated blanks is determined and if this orientation is adjusted to a predetermined, desired orientation if the determined orientation deviates from the desired orientation. The desired orientation will in this case be the orientation in which the blank is fed to the stacking means or, if appropriate, even the orientation in which the blank is to be stacked on the stack of blanks.

[0014] The invention also relates to a device for carrying out the method according to the invention. The device for carrying out the method according to the invention comprises the features in claim 7.

[0015] The device for carrying out the method according to the invention comprises a gripper for removing an unbroken sheet or a partial stack of unbroken sheets from a stack of unbroken board sheets. This gripper, which independently also forms part of the invention, comprises the features in claim 11. A gripper having a separator comprising a safety pin to the inserted between a pile of sheets and a batch is disclosed in document US-A-5 242 262. Further, for removal of the batch, the gripper cooperates with a conveyor system. The lateral distance between adjacent teeth is preferably adjustable. In order to make the gripper suitable in particular for picking up a partial stack of sheets, a vertical row of tooth ribs which run horizontally transversely with respect to the first and second teeth is provided above the lip. The correct positioning of a partial stack of sheets which is to be picked up can be maintained better by means of tooth ribs of this nature. The tooth ribs advantageously have a horizontal top surface (on which the edge of the bottom surface of a sheet can be supported) and a bottom surface which tapers at an angle towards the free end of the tooth ribs.

[0016] The device for carrying out the method according to the invention furthermore preferably comprises a first conveyor and a second conveyor which is at an angle with respect to the first conveyor, a first breaking device which carries out breaking at right angles to the conveying direction of the first conveyor, and a second breaking device which carries out breaking at right angles to the conveying direction of the second conveyor.

[0017] The invention will be explained in more detail below with reference to an exemplary embodiment which is illustrated in the drawing, in which:

Fig. 1 shows a highly diagrammatic plan view of a device according to the invention for carrying out the method according to the invention;

Fig. 2 shows a diagrammatic side view of a gripper according to the invention;

Fig. 3 shows a highly diagrammatic plan view of the gripper shown in Fig. 2, substantially illustrating its gripper members;

Fig. 4 shows a diagrammatic plan view of an example of a so-called unbroken sheet containing six blanks; and

Fig. 5, divided into Figs. 5a to 5d, diagrammatically depicts the way in which the gripper according to the invention operates.

[0018] Fig. 1 shows a highly diagrammatic plan view of a line for handling so-called unbroken board sheets. From the start (at 3) to the end (at 19), the structure and operation of the line 1 are as follows:

[0019] 3 represents a supply pallet which is loaded with a stack of unbroken sheets (not shown) on a supply track 2. The supply track 2 moves the feed pallet 3 which is loaded with unbroken sheets to an unloading point 23. At the unloading point 23, there is a vertical stop wall 4 which can be placed against the feed pallet 3, or at least the stack of unbroken sheets located thereon, as indicated by double arrow 24. By means of a gripper 5, the unbroken sheets are unloaded from the feed pallet 3 one by one or preferably in partial stacks of sheets, i.e. smaller stacks containing a number of unbroken sheets are removed from the stack of sheets located on the pallet 3. By means of the gripper 5 (which will be explained in more detail below with reference to Figures 2, 3 and 5), the separate sheets or partial stacks of sheets are transferred to a first conveyor belt 6, known as the first breaking belt. By means of this first breaking belt 6, the separate sheet or the partial stack of sheets is fed to a first breaking device 7. The breaking device 7 (which may be of a type which is known per se from the prior art) breaks the unbroken sheet or the partial stack of sheets along the breaking lines which extend transversely to the breaking belt 6. Downstream of the first breaking device 7, the partially broken, so-called unbroken board sheet or the partially broken partial stack of sheets is transferred, at a corner transfer station 8, without its orientation being changed, to a second conveyor belt, known as the second breaking belt. The second breaking belt 9 guides the partially broken unbroken sheet or the partially broken partial stack of sheets through a second breaking device 10, which may operate in the same way as the first breaking device 7. The second breaking device 10 breaks the partially unbroken sheet or the partially broken partial stack of sheets along the second breaking lines which are at right angles to the first breaking lines. Downstream of the second breaking device 10, this results in fully separated blanks or in fully separated partial stacks of blanks. When they reach station 11, the separated blanks or partial stacks of blanks can

be transferred to a left-hand conveyor system (24) or a right-hand conveyor system (25). This transfer may take place on the basis of the location where the separated blanks or partial stacks of blanks arrive (i.e. anything arriving on the right is transferred to the right-hand conveyor system 25 and anything arriving on the left is transferred to the left-hand conveyor system 24), but may also be effected with the aid of a camera system, in which case the camera system determines the shape and/or colour and, on the basis of this, regulates a control means (to the right or left), or alternatively on the basis of a preset order/direction. To the left and right of station 11 there is a counting unit/system 80, which counts the exact number of separated blanks per partial stack of sheets. The left-hand and right-hand conveyor systems 24 and 25 are both provided with a turning device 13 which, if appropriate as a function of an orientation of the separated blank or partial stack of blanks which is established by a camera system 12 or other type of sensor, places the separated blank or partial stack of blanks in a predetermined, desired orientation. The separated blanks or partial stacks of blanks are conveyed onwards to a so-called layer former, which forms a layer 30 containing a number of stacks of separated blanks, in order to allow this layer then to be transferred, by means of a stacker, to a removal pallet 21 which has been supplied via a pallet feed 16 and onto which a number of layers 30 formed in the layer former 14 are placed. When a removal pallet 21 has been stacked completely full, it is removed to a turning station 18, where the fully stacked removal pallet 22 is oriented in order then to be removed, as a fully stacked removal pallet 22, to a distribution area 19 or elsewhere. Before removal pallet 22 is removed to the distribution area 19 or elsewhere, a top sheet or pallet top can be placed on the fully stacked removal pallet 22 by means of an automatic system 81.

[0020] Figures 2, 3 and 5 diagrammatically depict the gripper 5 according to the invention. The gripper comprises an arm 50, which is arranged on a fixedly positioned manipulator 51 (Fig. 1) in such a manner that it can pivot about a vertical and a horizontal axis. The gripper frame 33 is attached to the end of the arm 50 via a horizontal hinge 31 on which there is an extendable/retractable piston/cylinder unit 32. A pressure-exerting member 34, which can be extended and retracted (cf. double arrow) and, during use, can exert pressure on the top of the top unbroken board sheets to be picked up, is attached to the gripper frame 33. Furthermore, an extendable/retractable unit 37, 38, such as a spring unit or piston-cylinder unit, which is arranged at an angle and can move to and fro in the direction of the inclined double arrow, is attached to the gripper frame 33. A foot 39 is attached to the free end of the extendable/retractable unit 37, 38. The extendable/retractable unit 37, 38 bears a vertical plate-like member 52 with, on its bottom side, a lip 35 which projects to the left (in accordance with Figs. 2 and 5) and, above this lip 35, a series of ribs 36

(each rib of which extends substantially horizontally), as shown in more detail in Fig. 2a. Furthermore, a guide rail 44, on which a block 43 runs, is provided on the gripper support 33. This block 43 is attached to the tooth support 42. Four teeth (cf. in particular Fig. 3), namely two outer teeth 40, the so-called second teeth, and two inner teeth 41, also referred to as first teeth, are attached to the tooth support 42. As indicated by the double arrow, the inner teeth 41 can be adjusted in the transverse direction before or, if appropriate also during or after, insertion beneath a sheet. The outer teeth 40, as indicated by a double arrow, can likewise be displaced transversely to their longitudinal direction, along a guide, before or, if appropriate also during or after, insertion beneath a sheet, in order for it to be possible to adjust the distance between adjacent teeth. For this purpose, the outer teeth 40 are mounted on the tooth carrier 42 by means of a transverse guide 42. For this purpose, the inner teeth 41 are mounted on the tooth support 42 by means of a transverse guide 46. The teeth 40 and 41 can preferably be adjusted independently of one another. If appropriate, the inner teeth 41 can be fixed once they have been adjusted.

[0021] The way in which the gripper 5 operates can be explained as follows with reference in particular to Figs. 5a, 5d:

[0022] When the gripper has been moved into the gripping position (solid lines in Fig. 1), the plate-like member 52 is placed against the stack of unbroken sheets in such a manner that the thin lip 35 pushes in precisely beneath the bottom sheet of the partial stack of sheets to be picked up. Fig. 5a shows the run-up phase of this operation, Fig. 5b shows the phase in which the lip 35 has been pushed just under the said bottom sheet of the said partial stack of sheets to be picked up. In the process, the ribs 36 help to improve the engagement on the partial stack of sheets to be picked up, the effect of which will become clearer still in Fig. 5c. The stop wall 4 (Fig. 1) in the process prevents the partial stack-of sheets which is to be picked up being pushed off the main stack of sheets. Then, the entire support frame 33, with the tooth carrier 42 for the time being held immovably with respect thereto, is displaced to the left (Fig. 5c). The plate-like member 52 above the foot 39 will during this operation, as seen in the horizontal direction, remain in the same place but, as seen in the vertical direction, will move upwards, as a result of the extendable/retractable unit 37/38 being retracted along the top surface, which runs upwards at an angle, of the foot 39. In the process, foot 39 will be able to push into the gap which has been formed as a result of the partial stack of sheets which is to be picked up having been lifted by means of lip 35. The teeth 40, 41 will then arrive at the stack of sheets and will be able to push into the enlarged gap which has formed on either side of the foot 39 as a result of the partial stack of sheets which is to be picked up having been lifted further by means of foot 39. Particularly during the initial lifting by the lip 35,

the ribs 36 play an important role. This is because the ribs 36 provide an additional point of engagement, on which unbroken sheets which are located at a relatively high level are supported when the lip 35 engages beneath the bottom unbroken sheet of the partial stack of sheets which is to be picked up. Consequently, the load on the lip 35 will be partially relieved and the partial stack of sheets which is to be picked up will be prevented from sliding downwards along the lip 35 under its own weight, which would impede or prevent the formation of the initial gap 46. The operation of pushing the teeth 41, 40 through beneath the bottom sheet of the partial stack of sheets is facilitated by means of rollers 47 at least at the front ends of the teeth and, if appropriate, additional rollers 47 (not shown) along the top surfaces of the teeth. As soon as the teeth 41, 40 have been fitted fully beneath the partial stack of sheets which is to be picked up, pressure-exerting member 34 moves downwards and exerts pressure on the top of the partial stack of sheets to be picked up, and the partial stack of sheets to be picked up can be handled by means of the gripper and deposited, for example, on the first breaking belt 6 (Fig. 1).

[0023] In view of the fragility of the unbroken sheets, in the sense that these unbroken sheets can very easily break spontaneously along their breaking lines into separate blanks, the adjustability of the teeth 41, 40 transversely with respect to the longitudinal direction is of great importance. The positioning of the teeth 40, 41 with respect to one another has to be adjusted as a function of the unbroken sheets to be handled in such a manner that there is no significant overhang at the outer sides (i.e. outside the outer teeth 40), and sagging between the outer teeth 40 is also prevented. In practice, the procedure will be for the positioning of the teeth 40, 41 with respect to one another to be stored in a computer or other type of storage medium for a number of types of unbroken sheet which are to be handled and for the correct type of unbroken sheet to be input by means of input means each time the type of unbroken sheet is changed, so that a control unit can ensure that the positioning of the teeth 40, 41 can be adjusted correctly. Should a new type of unbroken sheet to be handled arise, the settings for the teeth 40, 41 will be determined and will also be input and stored in the storage means. All this may be implemented by means of a central control system.

[0024] The central control system can also store data relating, for example, to the colour and shape of the various blanks and unbroken sheets. This data can then be utilized to control the breaking devices 7 and 10 and also to assist the counting member 80 and any camera system provided at 11. This control system can also store data relating to the desired orientation of separated blanks with a view to controlling the turning devices 13. The control system can hold the data for a large number of types of unbroken sheets and blanks produced therefrom, and then all the components of the overall system

can be adjusted to the appropriate type of unbroken sheet to be handled in each case by means of input means.

[0025] Fig. 4 provides further illustration, showing a plan view of an example of an unbroken sheet. The unbroken sheet shown in Fig. 4 contains two different types of blanks, namely three blanks 61 and three blanks 62, from which the bottom part and the lid part, respectively, of a box can be produced. Adjacent blanks 61 are connected via breaking lines 63. Adjacent blanks 62 are connected via breaking lines 64 which are not aligned with the breaking lines 63, although if appropriate this is quite possible. The blanks 61, 62 are in each case connected via short breaking lines 65.

Claims

1. Method for separating blanks for cardboard boxes, in particular packaging boxes, from unbroken board sheets which each comprise a number of blanks which are connected to one another along breaking lines, in which method:

in a step a) the unbroken sheets are stacked to form a stack of sheets;

in a step c), after step a), the unbroken sheets are broken into separated blanks; and

in a step d) the separated blanks are preferably formed into stacks of blanks;

characterized in that:

- after step a) and before step c), in a step b) an unbroken sheet or preferably a partial stack of unbroken sheets is removed from the stack of sheets and subjected to step c), and
- that step b) is carried out by firstly inserting a lip (35) under the sheet which is to be removed respectively the bottom sheet of the partial stack of sheets which is to be removed, preferably approximately in the centre of a longitudinal or transverse side of the stack of sheets, and, by means of the lip (35), lifting the said sheet respectively the said bottom sheet, in such a manner that a gap (46) is formed, by inserting a foot (39) into the said gap (46), the top surface of which foot (39) runs obliquely upwards in order to enlarge the gap (46) when the foot (39) is inserted into the gap (46), and by inserting a first and a second teeth (40, 41), the first tooth (41) lying between the second tooth (40) and the lip (35), into the said enlarged gap (46) on either side of the foot (39); and by fitting the teeth (40, 41) all the way through underneath the said sheet respectively the said partial stack of sheets.

2. Method according to Claim 1, **characterized in that** first 41 and second 40 teeth are fitted into the enlarged gap (46) on either side of the foot (39), and **in that** the distance between adjacent first (41) and second (40) teeth is set in such a manner that an unbroken sheet which is resting on these teeth and is to be handled lies substantially flat.

3. Method according to one of the preceding claims, **characterized in that**, in step c), the stack of sheets respectively partial stack of sheets is broken into separated partial stacks of blanks.

4. Method according to one of the preceding claims, **characterized in that** the board sheets comprise blanks of two or more different types, and **in that**, after step c) and before any step d), the blanks are sorted according to type, and in any such step d), stacks of blanks are formed for each type, containing blanks of the type in question.

5. Method according to one of the preceding claims, **characterized in that** in step c), the following partial steps are carried out:

c1) the unbroken sheets are conveyed in a first direction with respect to the said sheets, and the breaking lines which are at right angles to the said first direction are broken in order to form unbroken subsheets each containing a single row, which extends transversely to the first direction, of blanks which are connected to one another along breaking lines; and
c2) the subsheets obtained in step c1) are conveyed in a second direction with respect to the said sheets, which second direction forms an angle with the first direction, and the breaking lines which are at right angles to this second direction are broken in order to form the separated blanks.

6. Method according to one of the preceding claims, **characterized in that**, before any step d), the orientation of the separated blanks is determined, and **in that** this orientation is changed to a predetermined, desired orientation if the determined orientation deviates from the desired orientation.

7. Device for carrying out the method according to one of the preceding claims, comprising:

- sheet stacking means for stacking unbroken board sheets;
- breaking means (7, 10) for breaking unbroken board sheets into separated blanks; and
- preferably blank-stacking means (15);

characterized in, that the device further comprises

a gripper (5) for removing an unbroken sheet or a partial stack of unbroken sheets from the stack of unbroken board sheets;

in which the gripper (5) comprises gripper control means;

in which the gripper (5) comprises a horizontal lip (35) with, on either side, a second tooth (40) and a first tooth (41) lying between the second tooth (40) and the lip (35), the first (41) and second (40) teeth being displaceable in their longitudinal directions with respect to the lip (35);

in which the gripper (5) further comprises a foot (39), which, in longitudinal direction of the first (41) and second (40) teeth, lies in line with the lip (35), in which the lip is movable upwards and the foot (39) is movable horizontally with respect to the lip (35) to pass beneath the lip; and

in which the gripper control means are designed to insert the lip (35) between two unbroken sheets, to move the lip (35) upwards so as to form a gap (46) between the said two unbroken sheets, then to push the foot (39) into the gap (46) which is formed, and next to insert the teeth (40, 41) into the enlarged gap (46) until they fit through all the way beneath the sheet or the said partial stack of sheets.

8. Device according to Claim 7, in which the first (41) and/or second (40) teeth can be adjusted transversely to their longitudinal directions.

9. Device according to one of Claims 7-8, in which a vertical row of tooth ribs (39) which run horizontally transversely with respect to the first (41) and second (40) teeth is provided above the lip (35).

10. Device according to Claim 9, in which the tooth ribs (39) have a horizontal top surface and a bottom surface which tapers at an angle towards the free end of the tooth ribs.

11. Gripper for removing an unbroken sheet or a partial stack of unbroken sheets from a stack of unbroken sheets;

in which the gripper (5) comprises gripper control means;

in which the gripper (5) comprises a horizontal lip (35) with, on either side, a second tooth (40) and a first tooth (41) lying between the second tooth (40) and the lip (35), the first (41) and second (40) teeth being displaceable in their longitudinal directions with respect to the lip (35);

in which the gripper (5) further comprises a foot (39), which, in longitudinal direction of the first (41) and second (40) teeth, lies in line with the lip (35), in which the lip is movable upwards and the foot (39) is movable horizontally with respect to the lip (35) to pass beneath the lip; and

in which the gripper control means are designed to

insert the lip (35) between two unbroken sheets, to move the lip (35) upwards so as to form a gap (46) between the said two unbroken sheets, then to push the foot (39) into the gap (46) which is formed, and next to insert the teeth (40, 41) into the enlarged gap (46) until they fit through all the way beneath the sheet or the said partial stack of sheets

12. Gripper according to claim 11, in which the first (41) and/or second (40) teeth can be adjusted transversely to their longitudinal directions.
13. Gripper according to claim 10 or 11, in which a vertical row of tooth ribs (39) which run horizontally transversely with respect to the first (41) and second (40) teeth is provided above the lip (35).
14. Gripper according to claim 13, in which the tooth ribs (39) have a horizontal top surface and a bottom surface which tapers at an angle towards the free end of the tooth ribs.

Patentansprüche

1. Verfahren zum Trennen von Vorformen für Pappboxen, insbesondere für Verpackungsboxen, aus unaufgetrennten Pappplatten, von denen jede eine Anzahl von Vorformen aufweist, die miteinander entlang von Trennlinien verbunden sind, wobei bei dem Verfahren:

in einem Schritt a) die unaufgetrennten Platten aufgestapelt werden, um einen Stapel von Platten zu bilden,

in einem Schritt c), nach Schritt a), die unaufgetrennten Platten in separate Vorformen aufgetrennt werden, und

in einem Schritt d) die separierten Vorformen vorzugsweise in Stapel von Vorformen überführt werden,

dadurch gekennzeichnet, dass

- nach Schritt a) und vor Schritt c), in einem Schritt b) eine unaufgetrennte Platte oder vorzugsweise ein Teilstapel von unaufgetrennten Platten von dem Pappenstapel entnommen werden und Schritt c) unterzogen werden, und
- Schritt b) ausgeführt wird, indem erst eine Lippe (35) unter die Platte, die entnommen werden soll bzw. die Bodenplatte des Teilstapels von Platten, der entnommen werden soll, vorzugsweise näherungsweise in der Mitte einer Längs- oder Querseite des Plattenstapels ein-

geführt wird, und, mittels der Lippe (35), diese Platte bzw. die untere Platte in einer solchen Weise angehoben wird, dass ein Zwischenraum (46) gebildet wird, indem ein Fuß (39) in den Zwischenraum (46) eingesetzt wird, wobei die obere Oberfläche des Fußes (39) schräg nach oben verläuft, um den Zwischenraum (46) zu vergrößern, wenn der Fuß (39) in den Zwischenraum (46) eingeführt wird, und indem erste und zweite Zähne (40, 41), wobei der erste Zahn (41) zwischen dem zweiten Zahn (40) und der Lippe (37) liegt, in den vergrößerten Zwischenraum (46) auf beiden Seiten des Fußes (39) eingeführt werden, und indem die Zähne (40, 41) über die ganze Ausdehnung unter die Platte bzw. den Teilstapel von Platten eingeführt werden.

2. Verfahren nach Anspruch 1, **dadurch gekennzeichnet, dass** die ersten (41) und zweiten (42) Zähne in den vergrößerten Zwischenraum (46) auf beiden Seiten des Fußes (39) eingeführt werden und dass der Abstand zwischen dem ersten (41) und zweiten (40) Zahn in der Weise festgesetzt ist, dass eine unaufgetrennte Platte, die auf diesen Zähnen liegt und die zu handhaben ist, im Wesentlichen flach liegt.

3. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in Schritt c) der Plattenstapel bzw. der Teilstapel von Platten in separate Teilstapel von Vorformen getrennt wird.

4. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Pappplatten Vorformen von zwei oder mehr verschiedenen Typen umfassen, und dass, nach Schritt c) und vor Schritt d), die Vorformen nach Typen sortiert werden, und in jedem solchen Schritt d) Stapel von Vorformen für jeden Typ, der Vorformen des fraglichen Typs enthält, gebildet werden.

5. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in Schritt c) die folgenden Teilschritte ausgeführt werden:

c1) die unaufgetrennten Platten werden in eine erste Richtung in Bezug auf die Platten bewegt und die Trennlinien, die im rechten Winkel zu der ersten Richtung verlaufen, werden getrennt, um unaufgetrennte Unterplatten zu bilden, von denen jede eine einzelne, sich quer zu der ersten Richtung erstreckende Reihe von Vorformen enthält, die miteinander entlang von Trennlinien verbunden sind, und

c2) die in Schritt c1) erhaltenen Unterplatten werden in eine zweite Richtung in Bezug auf

die Platten gefördert, wobei die zweite Richtung einen Winkel mit der ersten Richtung bildet und die Trennlinien, die im rechten Winkel zu dieser zweiten Richtung liegen, getrennt werden, um die separierten Vorformen zu bilden.

6. Verfahren nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass**, vor irgendeinem Schritt d), die Orientierung der separierten Vorformen bestimmt wird und dass diese Orientierung in eine vorgegebene, gewünschte Orientierung verändert wird, wenn die bestimmte Orientierung von der gewünschten Orientierung abweicht.

7. Vorrichtung zum Ausführen des Verfahrens nach einem der vorhergehenden Ansprüche, mit:

einer Plattenstapeleinrichtung zum Stapeln unaufgetrennter Pappplatten,

einer Trenneinrichtung (7, 10) zum Trennen unaufgetrennter Pappplatten in separierte Vorformen, und

vorzugsweise mit einer Vorform-Stapeleinrichtung (15),

dadurch gekennzeichnet, dass die Vorrichtung weiter einen Greifer (5) aufweist, um eine unaufgetrennte Platte oder einen Teilstapel von unaufgetrennten Platten von dem Stapel unaufgetrennter Platten aufzunehmen,

wobei der Greifer (5) eine Greifersteuereinrichtung aufweist,

wobei der Greifer (5) eine horizontale Lippe (35) aufweist, wobei auf jeder Seite davon ein zweiter Zahn (40) und ein erster Zahn (41), welcher zwischen dem zweiten Zahn und der Lippe (35) liegt, vorhanden ist, wobei die ersten (41) und zweiten (42) Zähne in ihrer Längsrichtung in Bezug auf die Lippe verschiebbar sind, wobei der Greifer (5) ferner einen Fuß (39) aufweist, der in Längsrichtung der ersten (41) und zweiten (42) Zähne auf einer Linie mit der Lippe (35) liegt, wobei die Lippe nach oben beweglich und der Fuß (39) horizontal in Bezug auf die Lippe (35) beweglich ist, um unter der Lippe hindurchzulaufen, und

wobei die Greifersteuereinrichtung so ausgelegt ist, um die Lippe (35) zwischen zwei unaufgetrennte Platten einzuführen, die Lippe (35) nach oben zu bewegen, um so einen Zwischenraum (46) zwischen den unaufgetrennten Platten zu bilden, und dann den Fuß (39) in den gebildeten Zwischenraum (46) zu schieben und als Nächstes die Zähne (40, 41) in den vergrößerten Zwischenraum (46) einzuführen, bis sie über die ganze Ausdehnung unterhalb der Platte oder des Teilstapels von Platten rei-

chen.

8. Vorrichtung nach Anspruch 7, bei der die ersten (41) und/oder zweiten (40) Zähne in Querrichtung zu ihrer Längsrichtung eingestellt werden können.

9. Vorrichtung nach einem der Ansprüche 7 bis 8, bei der eine vertikale Reihe von Zahnrippen (39), die horizontal quer in Bezug auf die ersten (41) und zweiten (40) Zähne verlaufen, oberhalb der Lippe (35) vorgesehen ist.

10. Vorrichtung nach Anspruch 9, bei der die Zahnrippen (39) eine horizontale obere Oberfläche und eine untere Oberfläche, die sich unter einem Winkel schräg zu dem freien Ende der Zahnrippe verjüngt.

11. Greifer zum Entnehmen einer unaufgetrennten Platte oder eines Teilstapels von unaufgetrennten Platten von einem Stapel von unaufgetrennten Platten, **dadurch gekennzeichnet, dass** die Vorrichtung weiter einen Greifer (5) aufweist, um eine unaufgetrennte Platte oder einen Teilstapel von unaufgetrennten Platten von dem Stapel unaufgetrennter Platten aufzunehmen,

wobei der Greifer (5) eine Greifersteuereinrichtung aufweist,

wobei der Greifer (5) eine horizontale Lippe (35) aufweist, wobei auf jeder Seite davon ein zweiter Zahn (40) und ein erster Zahn (41), welcher zwischen dem zweiten Zahn und der Lippe (35) liegt, vorhanden ist, wobei die ersten (41) und zweiten (42) Zähne in ihrer Längsrichtung in Bezug auf die Lippe verschiebbar sind, wobei der Greifer (5) ferner einen Fuß (39) aufweist, der, in Längsrichtung der ersten (41) und zweiten (42) Zähne auf einer Linie mit der Lippe (35) liegt,

wobei die Lippe nach oben beweglich und der Fuß (39) horizontal in Bezug auf die Lippe (35) beweglich ist, um unter der Lippe hindurchzulaufen, und wobei die Greiferkontrollleinrichtung so ausgelegt ist, um die Lippe (35) zwischen zwei unaufgetrennte Platten einzusetzen, die Lippe (35) nach oben zu bewegen, um so einen Zwischenraum (46) zwischen den unaufgetrennten Platten zu bilden, und dann den Fuß (39) in den gebildeten Zwischenraum (46) zu schieben und als Nächstes die Zähne (40, 41) in den vergrößerten Zwischenraum (46) einzuführen, bis sie über die ganze Ausdehnung unterhalb der Platte oder des Teilstapels von Platten reichen.

12. Greifer nach Anspruch 11, bei dem die ersten (41) und/oder zweiten (40) Zähne quer zu ihrer Längsrichtung einstellbar sind.

13. Greifer nach Anspruch 10 oder 11, bei dem eine vertikale Reihe von Zahnrippen (39), die horizontal

quer in Bezug auf die ersten (41) und zweiten (40) Zähne verlaufen, oberhalb der Lippe vorgesehen ist.

14. Greifer nach Anspruch 13, bei dem die Zahnrippen (39) eine horizontale obere Oberfläche haben und eine untere Oberfläche, die sich unter einem Winkel schräg zu dem freien Ende der Zahnrippen hin verjüngt.

Revendications

1. Méthode de séparation de flans pour boîtes en carton, en particulier pour boîtes d'emballage, de feuilles de carton ininterrompues comprenant, chacune, un certain nombre de flans qui sont connectés l'un à l'autre le long de lignes de cassure, méthode dans laquelle :

dans une étape a), les feuilles ininterrompues sont empilées, pour former une pile des feuilles ;

dans une étape c), après l'étape a), les feuilles ininterrompues sont cassées, pour former des flans séparés ; et

dans une étape d), les flans séparés sont, de préférence, disposés en piles de flans ;

caractérisée en ce que :

- après l'étape a) et avant l'étape c), dans une étape b), une feuille ininterrompue ou, de préférence, une pile partielle de feuilles ininterrompues est enlevée de la pile de feuilles et soumise à l'étape c), et
- cette étape b) est effectuée en introduisant tout d'abord une languette (35) sous la feuille qui doit être enlevée, respectivement la feuille inférieure de la pile partielle de feuilles qui doit être enlevée, de préférence environ au centre d'un côté longitudinal ou transversal de la pile de feuilles, et en soulevant, à l'aide de la languette (35), ladite feuille, respectivement ladite feuille inférieure, de sorte que soit formé un interstice (46), en introduisant une patte (39) dans ledit interstice (46), la surface supérieure de ladite patte (39) s'étendant obliquement vers le haut, afin d'agrandir l'interstice (46) quand la patte (39) est introduite dans l'interstice (46), et en introduisant une première et une deuxième dent (40, 41), la première dent (41) se situant entre la deuxième dent (40) et la languette (35), dans ledit interstice agrandi (46) de part et d'autre de la patte (39) ; et en introduisant les dents (40, 41) totalement sous ladite feuille, respectivement ladite pile partielle de feuilles.

2. Méthode selon la revendication 1, **caractérisée en ce que** les première 41 et deuxième 40 dents sont introduites dans l'interstice agrandi (46) de part et d'autre de la patte (39), et **en ce que** la distance entre des première (41) et deuxième (40) dents adjacentes est réglée de sorte qu'une feuille ininterrompue qui repose sur ces dents et doit être manipulée se trouve substantiellement à plat.

3. Méthode selon l'une des revendications précédentes, **caractérisée en ce que**, à l'étape c), la pile de feuilles, respectivement la pile partielle de feuilles est cassée, pour former des piles partielles de flans séparés.

4. Méthode selon l'une des revendications précédentes, **caractérisée en ce que** les feuilles de carton comprennent des flans de deux types différents ou plus, et **en ce que**, après l'étape c) et avant toute étape d), les flans sont triés par type et dans toute telle étape d) sont formées des piles de flans pour chaque type contenant des flans du type en question.

5. Méthode selon l'une des revendications précédentes, **caractérisée en ce qu'**à l'étape c) sont réalisées les étapes partielles suivantes :

c1) les feuilles ininterrompues sont acheminées dans une première direction par rapport auxdites feuilles, et les lignes de cassure qui sont perpendiculaires à ladite première direction sont cassées pour former des sous-feuilles ininterrompues contenant, chacune, une simple rangée, qui s'étend transversalement à la première direction, de flans qui sont connectés entre eux le long des lignes de rupture ; et
C2) les sous-feuilles obtenues à l'étape c1) sont acheminées dans une deuxième direction par rapport auxdites feuilles, deuxième direction qui forme un angle avec la première direction, et les lignes de cassure qui sont perpendiculaires à cette deuxième direction sont cassées, pour former les flans séparés.

6. Méthode selon l'une des revendications précédentes, **caractérisée en ce qu'**avant toute étape d) est déterminée l'orientation des flans séparés, et **en ce que** cette orientation est modifiée en une orientation désirée prédéterminée si l'orientation déterminée se dévie de l'orientation désirée.

7. Dispositif pour mettre en oeuvre la méthode selon l'une des revendications précédentes, comprenant :

des moyens d'empilement de feuilles destinés à empiler les feuilles de carton ininterrompues ;

- des moyens de cassure (7, 10) destinés à casser les feuilles de carton ininterrompues, pour former des flans séparés ;

de préférence, des moyens d'empilement de flans (15) ;

caractérisé en ce que le dispositif comprend, par ailleurs, une pince (5) pour enlever une feuille ininterrompue ou une pile partielle de feuilles ininterrompues de la pile de feuilles de carton ininterrompues ;

dans lequel la pince (5) comprend des moyens de commande de pince ;

dans lequel la pince (5) comporte une languette horizontale (35) avec, de part et d'autre, une deuxième dent (40) et une première dent (41) située entre la deuxième dent (40) et la languette (35), les première (41) et deuxième (40) dents étant déplaçables dans leurs directions longitudinales par rapport à la languette (35) ;

dans lequel la pince (5) comprend, par ailleurs, une patte (39) qui, dans la direction longitudinale des première (41) et deuxième (40) dents, est alignée sur la languette (35), dans lequel la languette est déplaçable vers le haut et la patte (39) est déplaçable horizontalement par rapport à la languette (35), pour passer sous la languette ; et

dans lequel les moyens de commande de pince sont conçus pour introduire la languette (35) entre deux feuilles ininterrompues, pour déplacer la languette (35) vers le haut, afin de former un interstice (46) entre lesdites deux feuilles ininterrompues, puis pousser la patte (39) dans l'interstice (46) qui est formé et, ensuite, introduire les dents (40, 41) dans l'interstice agrandi (46) jusqu'à ce qu'elles soient introduites totalement sous la feuille ou ladite pile partielle de feuilles.

8. Dispositif selon la revendication 7, dans lequel les première (41) et/ou deuxième (40) dents peuvent être ajustées transversalement par rapport à leurs directions longitudinales.
9. Dispositif selon l'une de revendications 7-8, dans lequel une rangée verticale de nervures dentées (39) qui s'étendent horizontalement transversalement par rapport aux première (41) et seconde (40) dents est prévue au-dessus de la languette (35).
10. Dispositif selon la revendication 9, dans lequel les nervures dentées (39) ont une surface supérieure horizontale et une surface inférieure qui s'effile suivant un angle vers l'extrémité libre des nervures dentées.
11. Pince pour enlever une feuille ininterrompue ou une pile partielle de feuilles ininterrompues d'une pile de

feuilles ininterrompues ;

dans laquelle la pince (5) comprend des moyens de commande de pince ;

dans laquelle la pince (5) comprend une languette horizontale (35) avec, de part et d'autre, une deuxième dent (40) et une première dent (41) située entre la deuxième dent (40) et la languette (35), les première (41) et deuxième (40) dents étant déplaçables dans leurs directions longitudinales par rapport à la languette (35) ;

dans laquelle la pince (5) comprend, par ailleurs, une patte (39) qui, dans la direction longitudinale des première (41) et deuxième (40) dents, est alignée sur la languette (35),

dans laquelle la languette est déplaçable vers le haut et la patte (39) est déplaçable horizontalement par rapport à la languette (35), pour passer sous la languette ; et

dans laquelle les moyens de commande de pince sont conçus pour insérer la languette (35) entre deux feuilles ininterrompues, pour déplacer la languette (35) vers le haut, afin de former un interstice (46) entre lesdites deux feuilles ininterrompues, pour pousser ensuite la patte (39) dans l'interstice (46) qui est formé et, puis, introduire les dents (40, 41) dans l'interstice agrandi (46) jusqu'à ce qu'elles s'introduisent totalement sous la feuille ou ladite pile partielle de feuilles.

12. Pince selon la revendication 11, dans laquelle les première (41) et/ou deuxième (40) dents peuvent être ajustées transversalement à leurs directions longitudinales.

13. Pince selon la revendication 10 ou 11, dans laquelle une rangée verticale des nervures dentées (39) qui s'étendent horizontalement transversalement par rapport aux première (41) et deuxième (40) dents est prévue au-dessus de la languette (35).

14. Pince selon la revendication 13, dans laquelle les nervures dentées (39) ont une surface supérieure horizontale et une surface inférieure qui s'effile suivant un angle vers l'extrémité libre des nervures dentées.

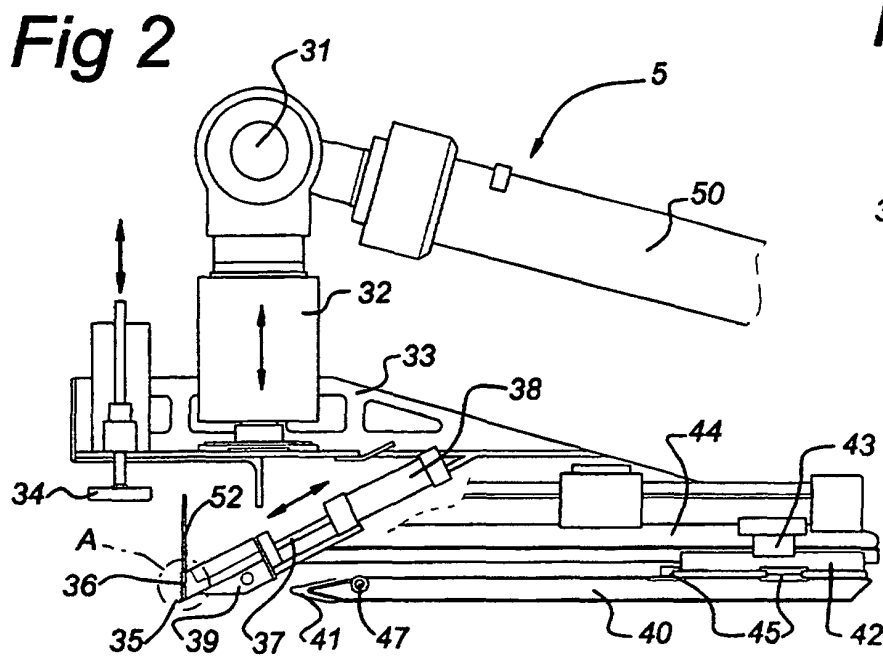
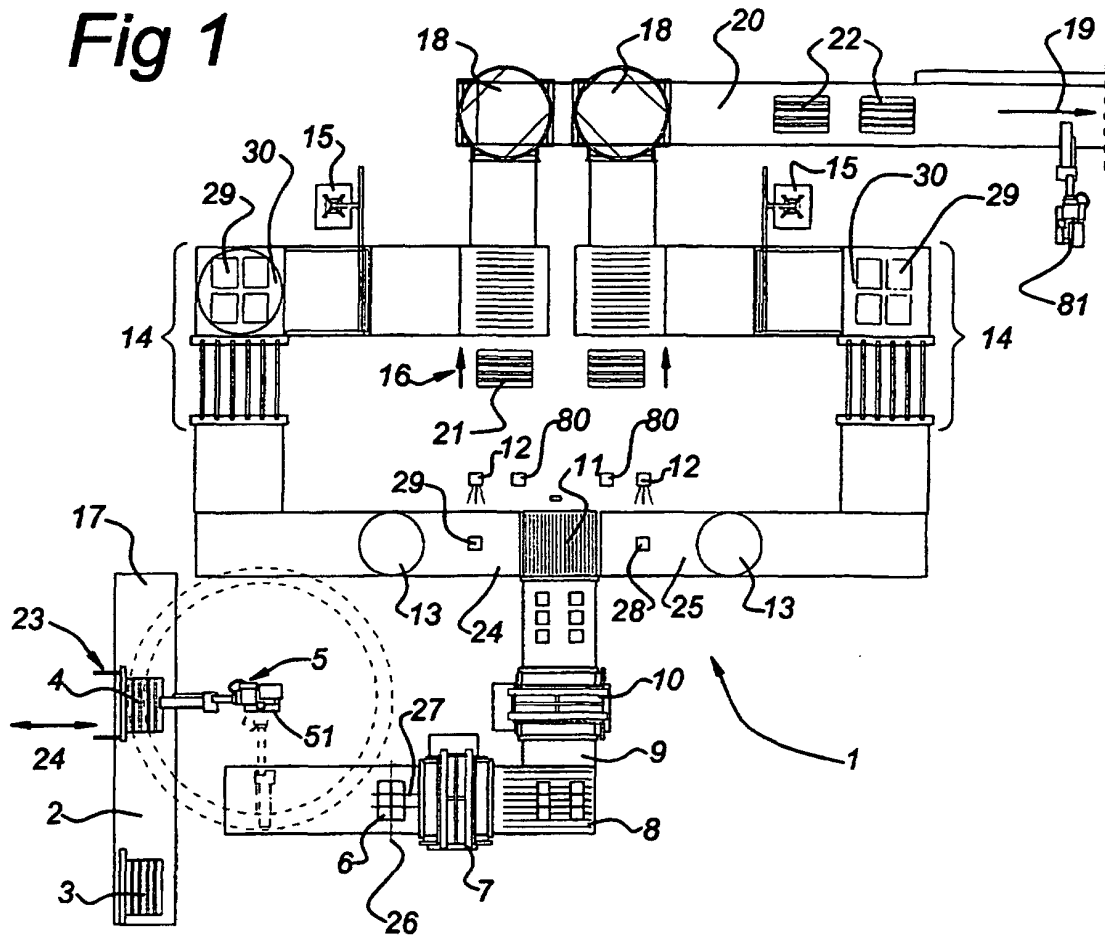


Fig 2a

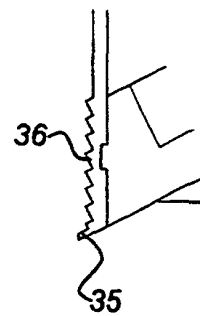


Fig 3

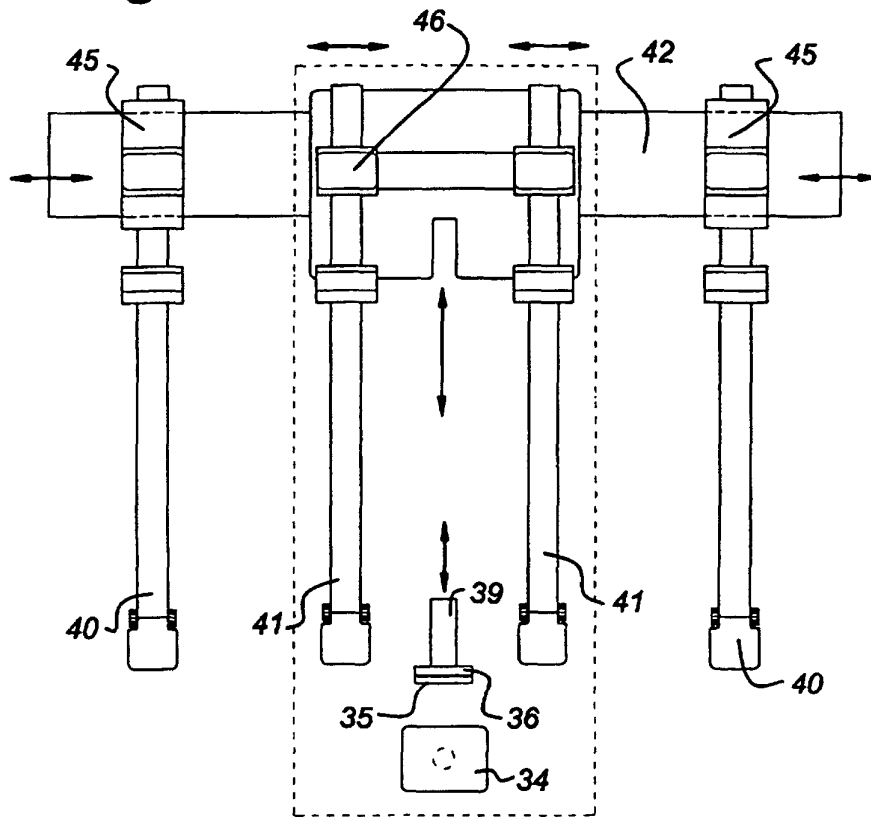


Fig 4

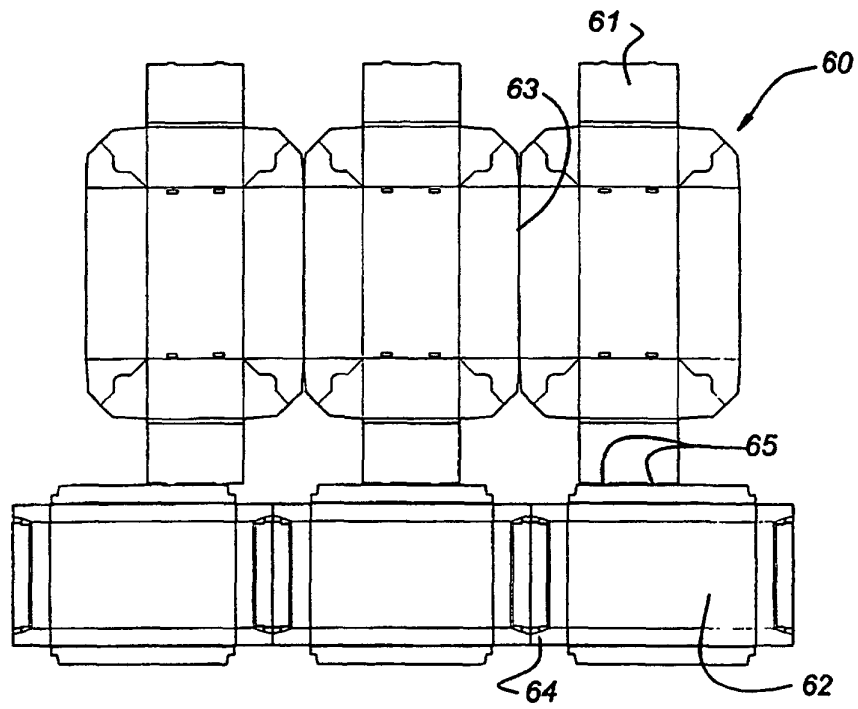


Fig 5a

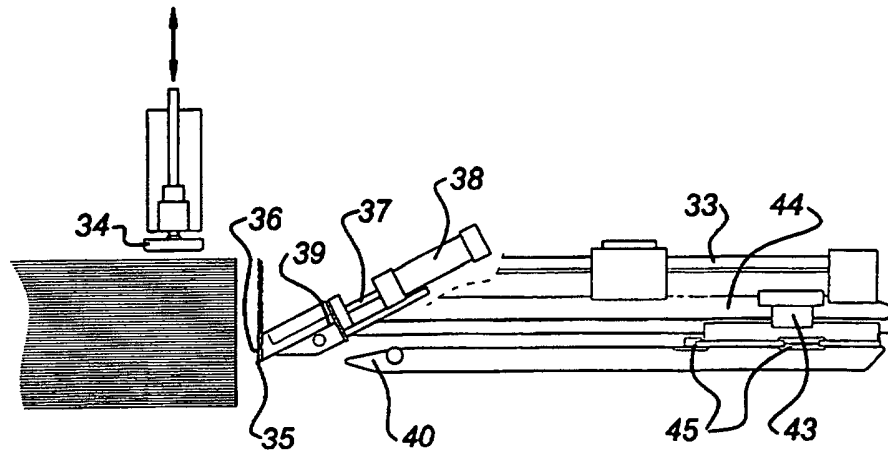


Fig 5b

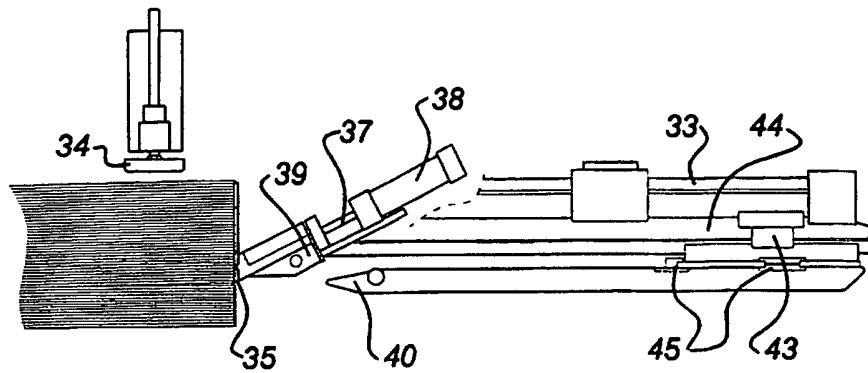


Fig 5c

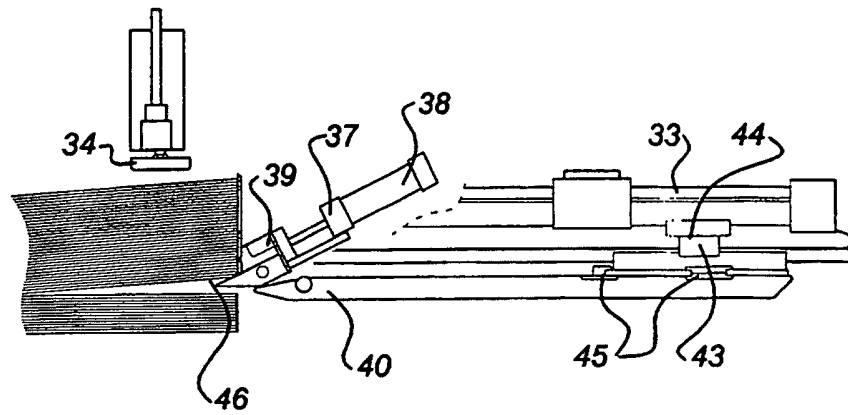


Fig 5d

