



Europäisches Patentamt
European Patent Office
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Publication number:

**0 378 435
A1**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **90300364.8**

(51) Int. Cl.⁵: **B65B 7/26**

(22) Date of filing: **12.01.90**

(30) Priority: **12.01.89 GB 8900668**

(43) Date of publication of application:
18.07.90 Bulletin 90/29

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IT LI LU NL SE

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(54) **Carton closing apparatus and method.**

(57) A tray-like carton for a food product has a hinged lid held closed by attachment to outturned flange panels carried by the carton side wall. The attachment is effected by means of a fusible polymeric protective coating on the inside surface of the carton. The carton is closed and sealed whilst passing along a conveyor with the lid disposed on one side of the carton path. The lid is ploughed back, after which the leading flange panel of the carton is folded forward under a static hold-down plate, the hold-down plate subsequently serving to fold back and hold the trailing flange panel.

The fold-down plate also serves to fold out the third flange panel by means of a camming member on its undersurface.

After the three flange panels (22) have been turned out the lid (12) is ploughed closed and into engagement with them. Heat sealing of the overlapping surfaces is then effected by heat and pressure, firstly for the third flange panel and then, after the carton has been turned through 90°, for the leading and trailing flange panels simultaneously.

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CARTON CLOSING APPARATUS AND METHOD

This invention relates to the closing of tray-like cartons after filling with a food or other product. The cartons are usually rectangular; they have a body tray with a base and a peripheral side wall upstanding from the base, and a lid which is sealed closed to the top of the side wall by an outturned flange around at least part of the side wall periphery. The lid may be formed integrally with the tray and attached along one panel of the side wall, or it may be separate from the tray and sealed to a flange provided around the whole of the side wall periphery. Typically, the carton is made of an ovenable paperboard material having on one or both of its faces a plastics coating enabling it to be erected and closed by respective heat-sealing operations.

In their granted UK patents 2158392 and 2120161 (Agents refs. E2875 and E2624) Applicants have described the formation of such a flange on a carton tray on erection of the carton, before it is filled with product. Such an arrangement enables the trays to be erected at a different location from the location of the operations to product fill and close them, and gives other benefits such as potentially high filling and closing speeds; moreover, it is particularly suited for cartons having separate lids. For some applications, however, it is advantageous to form the flanges when closing the carton, and the present invention provides a method and apparatus by which this may be achieved.

Aspects and features of the invention will be fully understood from the following description of a carton closing apparatus in accordance with the invention, now to be given by way of example, with reference to the accompanying drawings. In the drawings:-

Fig.1 shows a carton blank of the kind from which cartons to be closed by the apparatus are erected;

Fig.2 shows, to a smaller scale, the carton blank after erection and product filling and as it appears on entry to the apparatus;

Fig.3 is a diagrammatic perspective view of the apparatus.

Fig.4 is an enlarged view of part of Fig.3, showing that part of the apparatus by which a flange is formed around three sides of the carton side wall;

Fig.5 shows a part of the apparatus depicted in Fig.4 in side elevation and at an early stage in the formation of the carton flange; and

Fig.6 again shows part of the apparatus depicted in Fig.4 in side elevation, at a later stage in the formation of the carton flange.

Referring firstly to Fig.1 of the drawings, a

blank 8 for a carton is cut from a suitable paperboard material having a heat-sealable plastics coating on the face shown, which is the face destined to form the interior of the carton.

The blank is generally rectangular, having a base portion 10 adapted to form a product-receiving and tray-like body for the carton, and a lid portion 12 adapted to form a lid by which the tray may be closed after product filling with a food product. The base and lid portions are integrally attached along a fold line 14.

The base portion 10 is internally subdivided by further crease lines to form it with a rectangular base panel 16 adapted to form the base of the carton, two longer rectangular side wall panels 18 and two shorter rectangular side wall panels 19 hinged along the edges of the base panel, internally articulated gusset-folding panels 20 joining the adjacent ends of the side wall panels, and narrow flange-forming panels 22 carried by the two shorter side wall panels 19 and by the longer side wall panels 18 remote from the lid portion 12.

The lid portion 12 is in the form of a single rectangular panel which is attached by the fold line 14 to the second longer side wall panel 18. The lid panel is internally provided with a removable or tear-away central portion 24 by offset score lines 26 and 28 which are formed in the opposite faces of the blank and shaped to provide a tear tab 29.

Figure 2 shows the form of the blank 8 on entry to the apparatus which is to be described below with reference to Figs. 3 to 6. The blank has been erected by conventional means (not shown) to form an open-topped tray in which the side wall panels 18 stand vertically upwards from the base panel 16 to form a continuous tubular side wall of which the flange-forming panels 22 form coplanar upward extensions; the lid 12 also extends vertically upwards at this time. The gusset-folding panels 20 are folded onto themselves and located within the tray interior against the shorter side wall panels 19, to which they are attached by a heat-sealing operation; the panels 20 accordingly act in known manner to hold the side wall panels in their required wall-forming relation.

Reference is now made to Fig.3 which shows the general arrangement of the apparatus as a series of the erected cartons (Fig.2) passes along it. The cartons, which have been charged with metered quantities of the food product to be packed, arrive on a pair of continuously operating belt conveyors 30 on which they are held end-to-end, until required, by a pair of opposed stop rollers 32 engaging the lid of the foremost carton.

The stop rollers 32 operate intermittently to

release the cartons at regular intervals so that they can be collected individually by the flights 34 of a continuously operating chain conveyor (not specifically shown for clarity), which engage behind their trailing ends. A third continuously operating conveyor, again mounted beneath the carton path and again not specifically shown for clarity, has alternate trailing flights 36 and forward flights 38 between which the cartons become securely held on leaving the second conveyor. The third conveyor is continued through the remaining length of the apparatus, and provides motive power and location for the cartons during the closing operations which follow.

Under the control of the third conveyor the cartons pass in turn through the successive stages which are particularly depicted in Fig.4. The carton lid 12 becomes engaged by a plough bar 40 by which it is progressively bent to a backwardly inclined position. During this lid folding operation any restraint required to prevent the carton from tilting is provided by a restraint plate 42 which is mounted to extend along the carton path so that its undersurface can be engaged, if necessary, by the free edge of the flange-forming panel 22 which lies opposite the lid 12.

As is also shown in Fig.5, with the lid 12 held back by the plough bar 40 the carton approaches the upstream edge 44 of a plastics plate 46 which extends horizontally across the width of the carton. Before it passes beneath the edge 44, however, the leading flange-forming panel 22 of the carton is bent in a forward outturned direction in relation to the side wall panel 18 which carries it, with the result that it moves under the hold-down member in a substantially horizontal attitude and is subsequently held in that position by the hold-down member as the carton moves along the latter.

The forward bending of the front panel 22 is achieved by a sheet metal plate 50 supported along one edge by a shaft 52. The shaft extends horizontally across and above the carton path and is driven by a motor 54 to rotate in the direction of the arrow B (Figs.5,6) through one revolution for each carton to pass, its movement being appropriately synchronised with the movement of the second and third conveyors and the stop rollers 32.

To ensure proper movement of the front panel 22 beneath the hold-down member 46, the hold-down member is formed as a comb, having its upstream edge 44 formed by spaced teeth 56; the plate 50 is likewise formed along its free end with teeth 58 which correspond laterally to the spaces between the teeth 56 and which are bent backwardly (in relation to the rotation of the shaft 52) at a radius 60 at which to engage the front flange-forming panel 22.

With the front panel 22 of the carton held down

by the hold-down member 46 as described above, continued movement of the carton subsequently brings the trailing flange-forming panel 22 into contact with the front edge 44 of the hold-down member and causes it to be ploughed backwardly as the carton moves fully under the latter. The situation is then as depicted in Fig.6, with the leading and trailing flange-forming panels 22 outturned and held down by the hold-down member as shown.

A further occurrence at this stage of the closing operation is the ploughing down of the third flange-forming panel 22 of the carton, that is to say, that panel 22 which extends along the side of the carton path. This is achieved by a sheet metal member 62 (shown only in Figs. 5 and 6 for clarity) which is mounted beneath the hold-down plate 46 and has a cam surface 64 positioned to bend the flange-forming panel progressively downwards below the horizontal as the carton passes beneath the hold-down member.

The plough bar 40 is arranged to prevent the lid 12 from impeding the entry of the carton under the hold-down member 46. A further plough bar 70, located further down the carton path, subsequently engages the back of the lid and is shaped so as progressively to plough the lid closed as the carton emerges from beneath the hold-down member. Thus as the carton is released from restraint by the hold-down member, its function to hold the three flange-forming panels 22 in generally horizontal position is taken over by the lid.

Reverting to Fig. 3, after the lid has been closed and is maintained in that position by the plough bar 70, further movement of the carton causes that flange-forming panel 22 and the overlying marginal part of the lid along the side of the carton to enter a slot 82 formed along the side of an elongate hot air nozzle 84 supplied with hot air by a hot air generator 86. In known manner, hot air directed onto the panel and lid margin within the slot softens the opposed plastics coatings on the carton material sufficiently for bonding to occur between them when the panel and lid margin subsequently pass together through the nip of a pair of compression rollers 88. The carton may thereafter, and as illustrated, be rotated through 90° (arrow C) and continue along the same path as before through further hot air nozzles 84A and associated compression rollers 86A, so as to bond the lid to the panels 22 along the shorter sides of the carton and thereby complete the closing operation. Alternatively, the same result may be achieved by hot air nozzles and compression rollers associated with a further conveyor (not shown) disposed at right angles to the carton path and onto which the cartons pass from the third conveyor.

Although specifically described in relation to the closing of cartons with integral lids, the inven-

tion may be applied to the closing of cartons having separate lids which are to be attached by flanges around the whole of the body tray periphery. In a modification of the described apparatus separate lids are placed on erected carton body trays as the latter emerge from beneath the hold-down member 46, suitable means being provided for subsequently holding the lids down and in proper location on the flange-forming panels of the trays while pairs of opposed hot air nozzles and associated compression rollers operate to bond the flange-forming panels and lid margins together generally in the manner described with reference to the drawings.

The invention is not limited in application to cartons having vertical side walls as particularly described, but may be applied to cartons of which the side walls are inclined over at least part of their periphery.

Claims

1. A method of closing onto a product a tray-type carton which is made from a board material having a heat-sealable coating on its interior surface, the carton having a rectangular base, a side wall upstanding peripherally from the base and formed of side wall panels, and, attached along the upper edge of the side wall, a lid hingedly carried by one of the side wall panels and flange panels hingedly carried by respective ones of the other side wall panels, the lid and the flange panels being initially in generally coplanar relation with their respective side wall panels, the method being characterised by:-

(a) moving the carton along a generally horizontal path with the lid (12) disposed initially at one side of the path and while performing the steps of:

(b) moving the lid to an outwardly inclined position and maintaining an outturned condition the lid for of at least steps (c) to (e) below;

(c) moving to a forwardly inclined, outturned position the flange panel (22) which is leading in relation to the movement of the carton along the path;

(d) holding the said leading flange panel in an outturned condition until step (g) below;

(e) moving the trailing flange panel (22) to a backwardly inclined, outturned position and maintaining it in an outturned condition until step (g) below;

(f) moving the third of the flange panels (22) to an outwardly inclined position and maintaining it in an outturned condition until step (g) below;

(g) moving the lid inwardly into superposed and generally horizontal relation with the flange panels, so as by engaging the flange panels to

maintain their outturned conditions for steps (h) and (i) below; and

by application of heat and pressure

(h) bonding together the outturned third flange panel and the superposed marginal part of the lid by means of the coating thereon; and

(i) bonding together the leading and trailing flange panels and the respective superposed marginal parts of the lid by means of the coating thereon.

2. A method in accordance with claim 1, wherein step (f) is performed after steps (c), (d) and (e) and whilst the lid is maintained in an outturned condition as recited in step (b).

3. A method in accordance with claim 1 or claim 2, wherein the flange panels and the respective superposed marginal parts of the lid are heated for steps (h) and (i) when disposed in face-to-face relationship.

4. Apparatus for closing onto a product a tray-type carton which is made from a board material having a heat-sealable coating on its interior surface, the carton having a rectangular base, a side wall upstanding peripherally from the base and formed of side wall panels, and, attached along the upper edge of the side wall, a lid hingedly carried by one of the side wall panels and flange panels hingedly carried by respective ones of the other side wall panels, the lid and the flange panels being initially in generally coplanar relation with their respective side wall panels, the apparatus being characterised by:-

(a) conveyor means (36,38) to advance the carton along a generally horizontal path with the lid disposed initially at one side of the path;

(b) a first folding and holding means (40) effective upon the lid (12) of the advancing carton to fold the lid outwardly of the carton and to hold it temporarily in an outturned condition;

(c) a pivoted member (50) mounted on an axis (52) directed transversely of the carton path and pivotable in the forward direction of the advancing carton to engage and fold the leading flange panel (22) forwardly to an outturned position;

(d) a horizontally disposed hold-down plate (46) mounted above the carton path and arranged to be engaged by the folded leading flange panel as the carton advances and subsequently effective to hold the leading flange panel temporarily in an outturned condition, subsequently to its engagement with the leading flange panel the hold-down plate being engaged by the trailing flange panel (22) and effective to fold the same backwardly and to hold it temporarily in an outturned condition;

(e) a second folding and holding means (62) effective upon the third flange panel (22) of the advancing carton to fold the third flange panel outwardly and to hold it temporarily in an outturned

condition;

(f) a lid folding means (70) operable upon the lid subsequently to the first folding and holding means as the carton advances along the path to fold the lid inwardly of the carton and into superposed relation at marginal parts thereof with the outturned flange panels;

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(g) first heating and compression means (84, 88) effective upon the third flange panel and the superposed marginal part of the inturned lid to bond them together by means of the coating thereon; and

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(h) a pair of second heating and compression means (84A, 88A) effective upon the leading and trailing flange panels and the respective superposed marginal parts of the inturned lid to bond them together by means of the coating thereon.

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5. Apparatus in accordance with claim 4, wherein the second folding and holding means is an elongate camming member (62) carried by, and substantially coextensive with, the hold-down plate.

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6. Apparatus in accordance with claim 4 or claim 5, wherein each heating and compression means comprises an elongate chamber to which hot air is supplied and along which the flange panel and the respective marginal part of the lid are caused to pass in face-to-face relationship, and a pair of opposed compression rollers between which those carton parts are moved after heating in the said chamber.

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7. Apparatus in accordance with any claim of claims 4, 5 and 6, which includes carton turning means effective upon the carton between the first and second heating and compression means to turn the carton through 90°.

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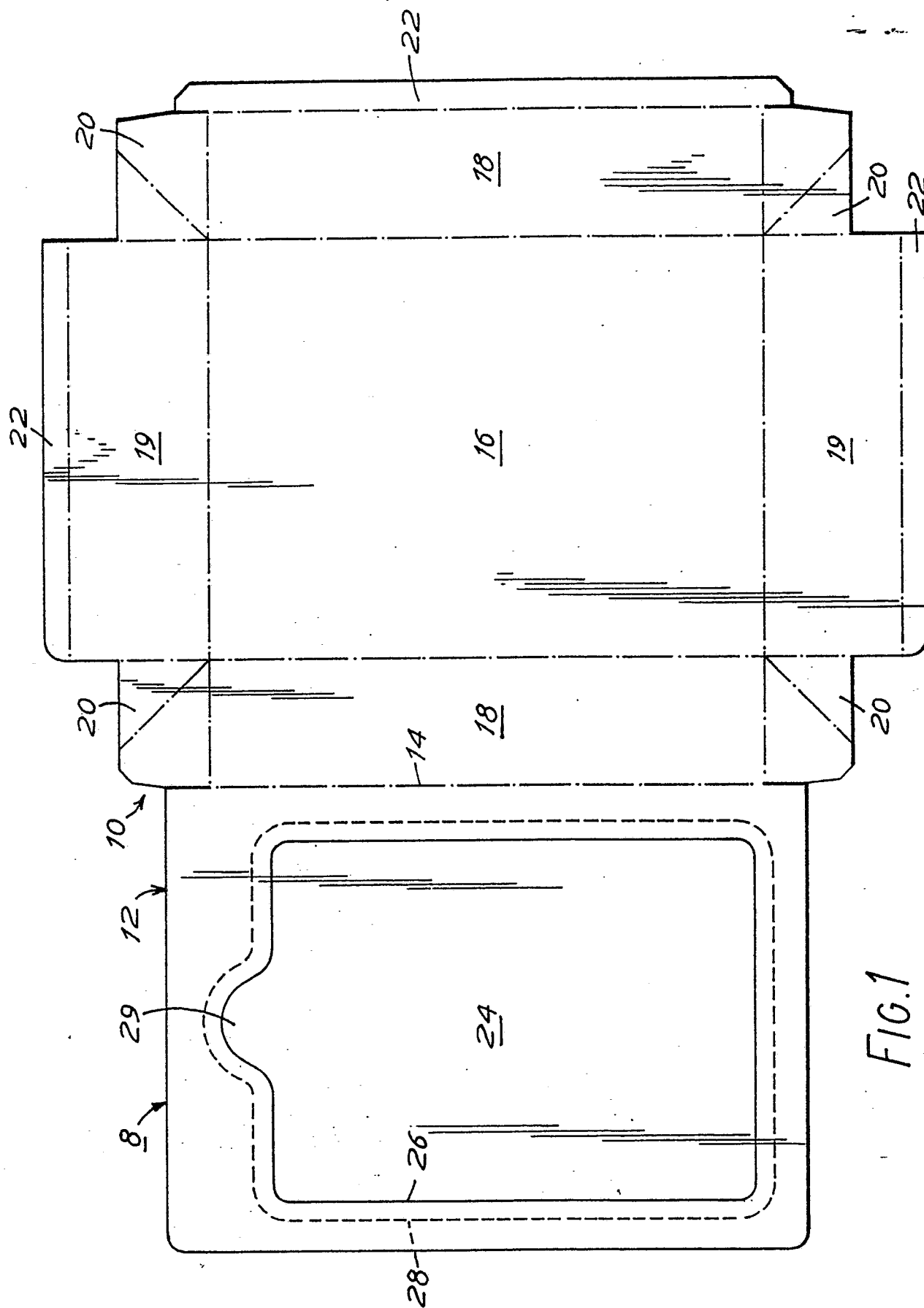
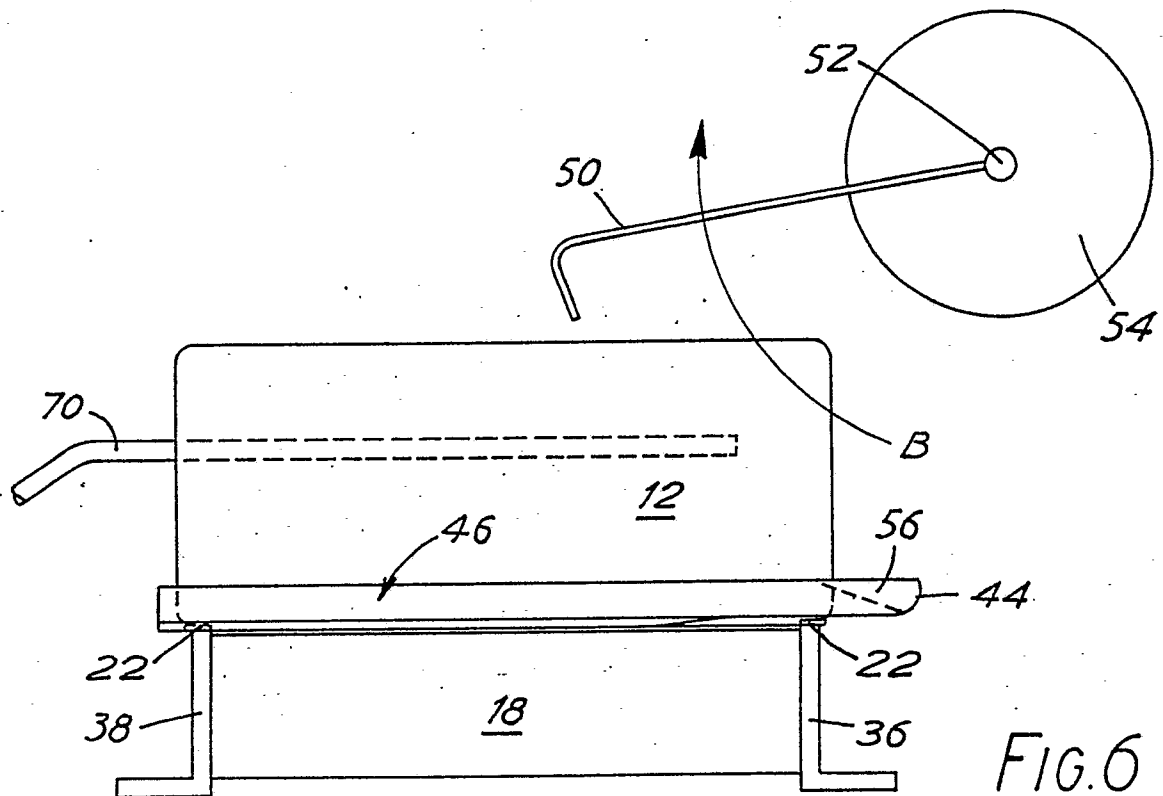
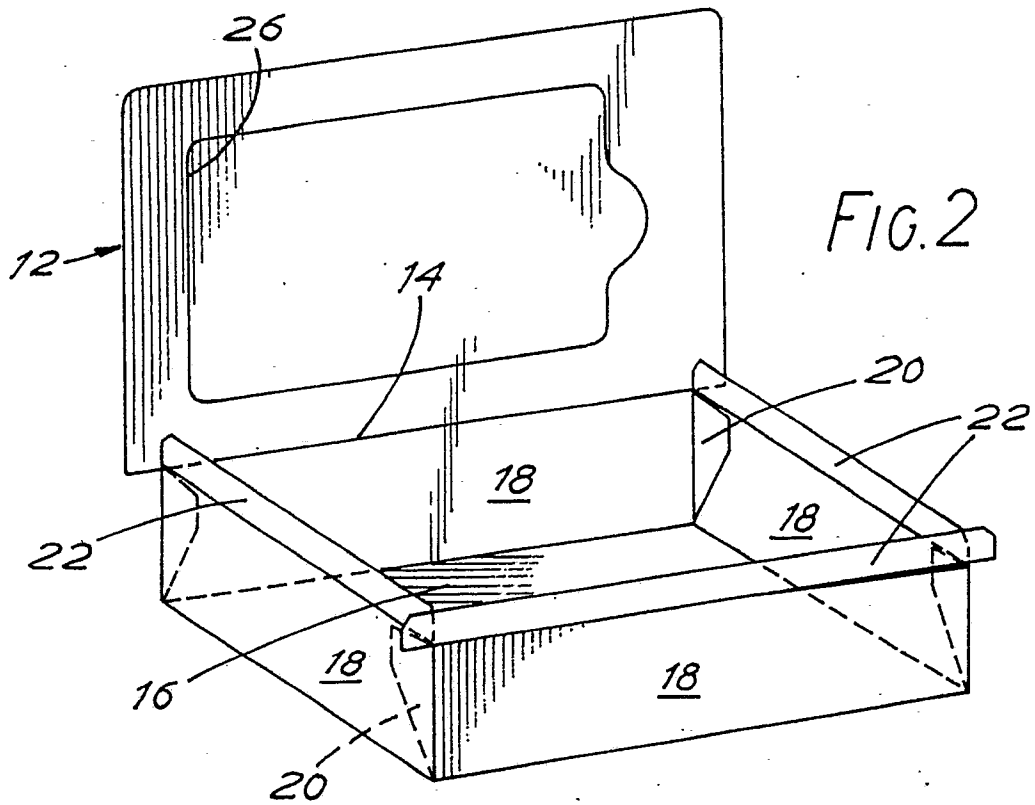
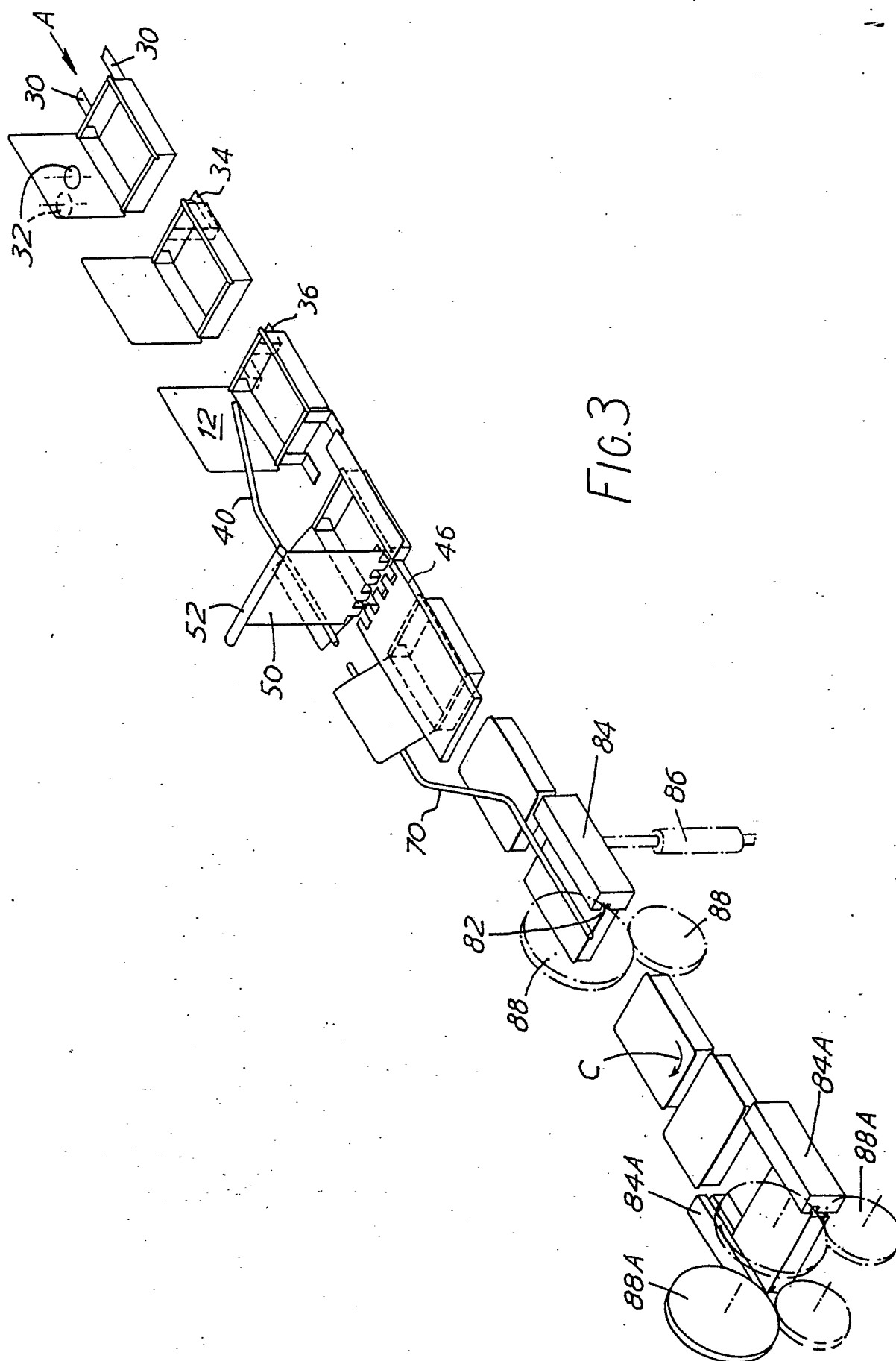
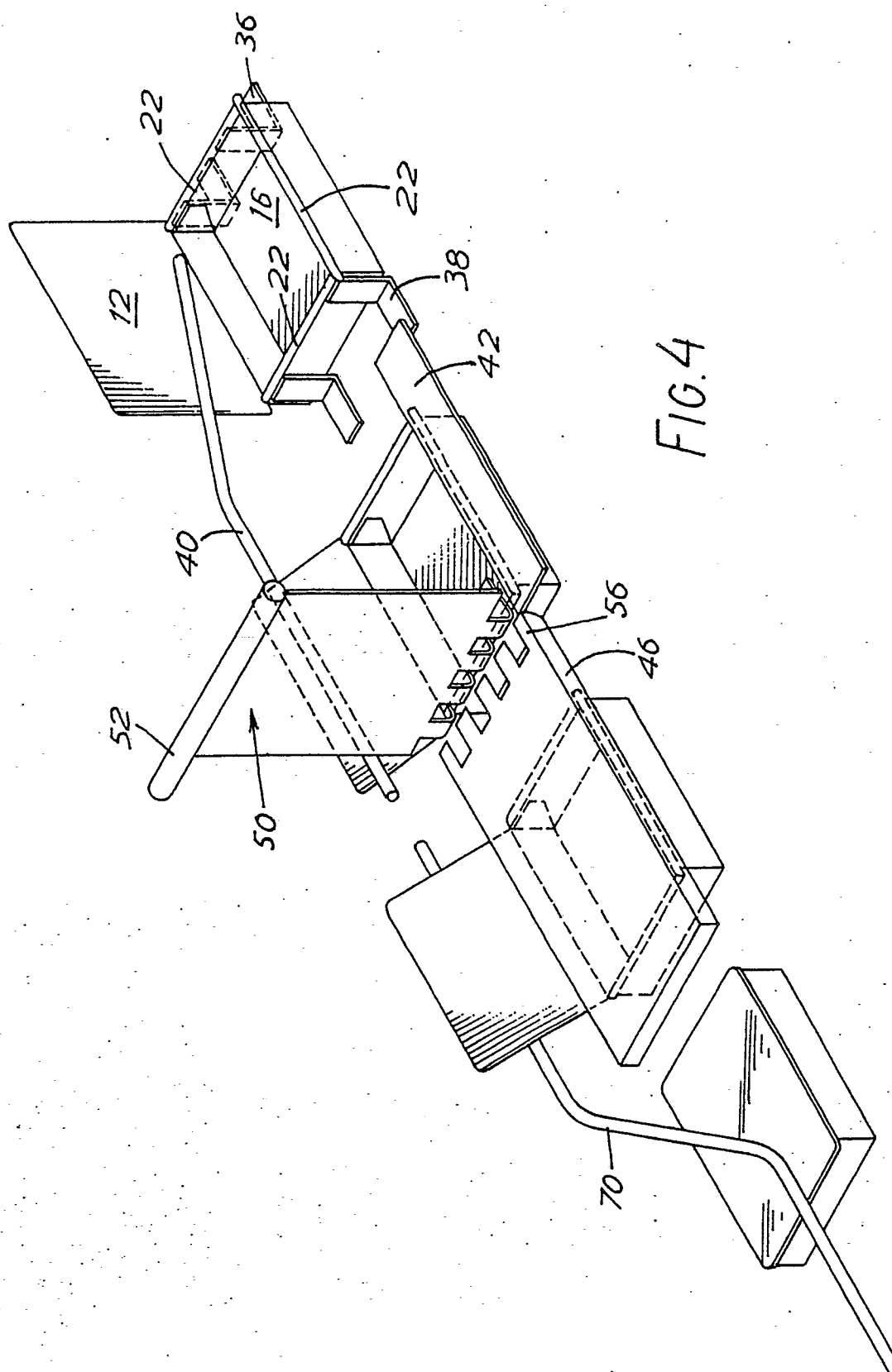


FIG. 1







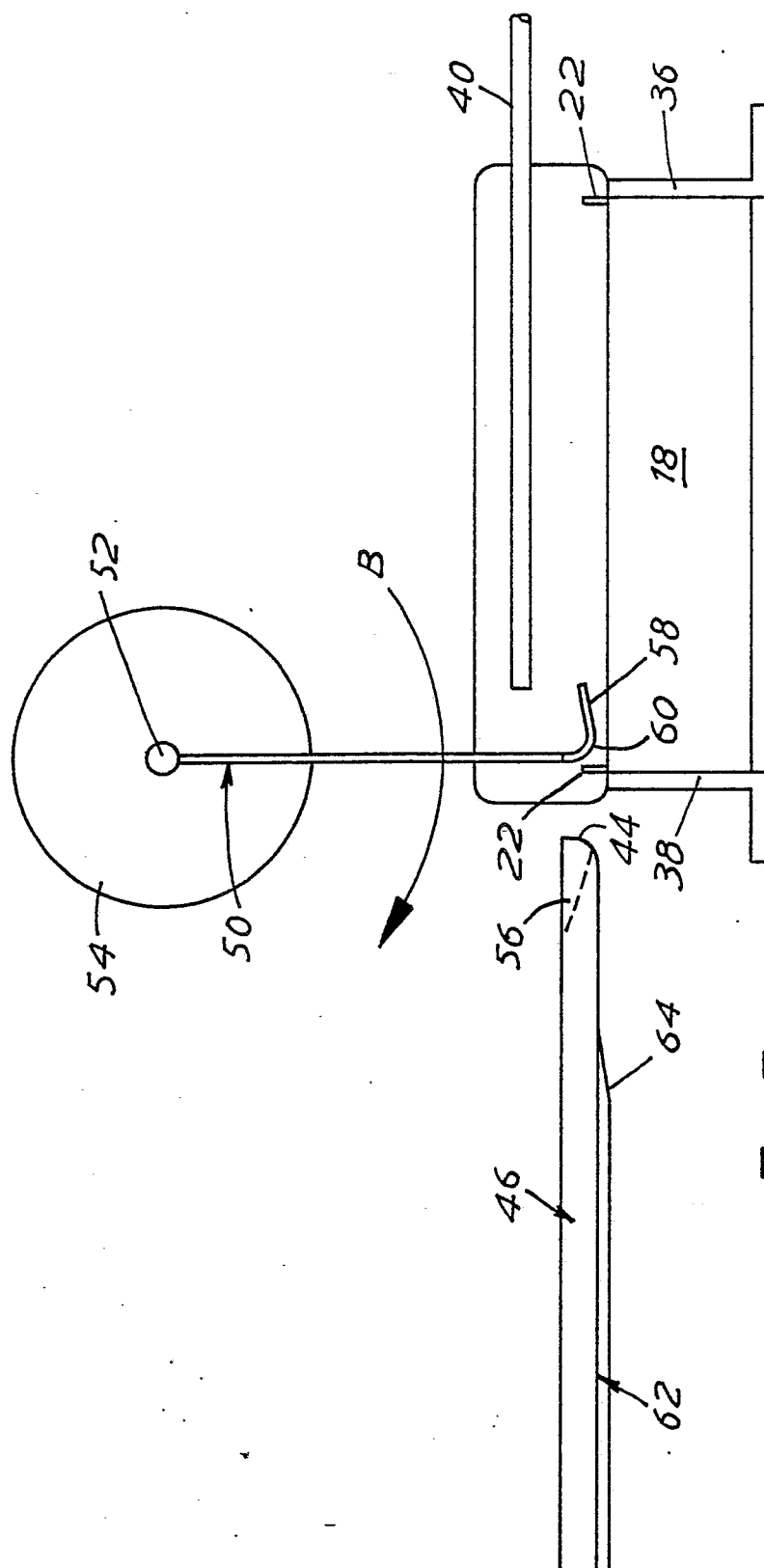


FIG. 5



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	US-A-3 045 408 (M. RASMUSSEN) * Claims 1,2 * ---	1,4	B 65 B 7/26
Y	DE-A-1 479 370 (KALLE AG) * Pages 6-8 * ---	1,4	
A	US-A-3 716 962 (J. LANGEN) ---		
A	US-A-3 619 977 (E. THEYS) ---		
A	US-A-3 267 637 (Th. BAKER) ---		
A	US-A-3 587 411 (E. THEYS) ---		
A	US-A-3 618 480 (E. THEYS) ---		
A	FR-A-2 329 517 (NOLEX) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09-04-1990	Examiner KORTH C-F.F.A.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			