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71 Applicant: **KLIKLOK CORPORATION, 10, Greenwich Plaza P.O. Box 621, Greenwich Connecticut 06836 (US)**

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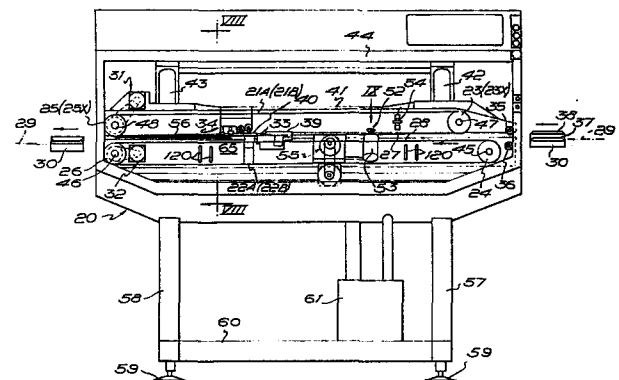
72 Inventor: **Hampton, William Edward, 56 Edward Road, Clevedon Avon BS21 7DX (GB)**
Inventor: **Pike, Brian Charles, 2 Bramley Close Locking, Weston Super Mare Avon (GB)**

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74 Representative: **Hulse, Thomas Arnold et al, Hulse & Co. Cavendish Buildings West Street, Sheffield S1 1ZZ (GB)**

54 **Carton closer.**

57 A carton closer comprises a base (20), upper and lower pairs of endless belts (21A, 21B and 22A, 22B) respectively mounted on leasing and return rollers (23, 24 and 25, 26) respectively on the base with mutually opposed forwarding runs (27, 28) respectively of the belts spaced parallel to each other adjacent a feed path (29) for cartons (30) along the base, the outer surfaces FS of the endless belts having a high coefficient of friction, drive means (31, 32) respectively for the return rollers of the belts and adapted to drive the belts at the same speed, and flap deflecting ploughs (33, 34) adjacent one side of the space between the forwarding runs of the endless belts.



CARTON CLOSER

This invention relates to a carton closer, primarily for closing cartons of the end loading type, for example as described in GB-PS 1 424 035.

5 One object of the invention is to provide a carton closer that does not need a conveyor with lugs to propel the cartons past flap detecting ploughs and possibly also tuckers and/or glueing means.

10 Another object of the invention is to provide a carton closer that does not need any timed in-feed mechanism.

 A further object of the invention is to provide a carton closer that holds each
15 carton firmly and squarely whilst passing flap deflecting ploughs and possibly also tuckers and/or glueing means.

 Yet another object of the invention is to provide a carton closer in which successive
20 cartons can be touching each other or may proceed in very close relationship.

 A still further object of the invention is to provide a carton closer that is very readily adjustable to suit a change in
25 the size of cartons.

According to the present invention, a carton closer comprises a base, at least one pair of endless belts mounted on rollers on the base with mutually opposed forwarding runs of the belts spaced parallel to each other
5 adjacent a feed path for cartons along the base, the outer surfaces of the endless belts having a high coefficient of friction, drive means for at least one roller for each belt
10 and adapted to drive the belts at the same speed, and flap deflecting ploughs adjacent one side of the space between the forwarding runs of the endless belts.

A carton having a width equal to the
15 space between the forwarding runs of the endless belts can be fed without any precise timing into the space, the carton being held firmly and squarely by the friction surfaces of the belts as they move at the same speed
20 past the flap deflecting ploughs, and successive cartons can be fed in close succession to preceding cartons and/or with any spacing therefrom.

The endless belts (with their
25 respective rollers) are preferably adjustable towards and away from each other, for ready

adjustment of the space between the forwarding runs to suit a change in the size (e.g. width) of cartons and adjustable stop means is preferably provided to ensure a minimum
5 adjusted space is maintained throughout the length of the forwarding runs. Each endless belt may be duplicated, on common rollers or on separate rollers on common shafts, to provide one pair of belts adjacent the
10 closed end or bottom of the cartons and one pair of belts adjacent the open end or top (to be closed) of the cartons.

The belts may consist of reinforced rubber (i.e. inextensible belts) with
15 unplasticised polyvinylchloride (PVC) providing the high friction surfaces, the opposite (inner) surfaces being ribbed transversely to form teeth engageable with teeth on the rollers.

20 The axes of the rollers on which the endless belts are mounted may be vertical or horizontal or inclined (e.g. slightly to the horizontal), to suit any disposition of cartons from a product loader, and if
25 horizontal (or slightly inclined thereto) the lower belt may be longer than the upper belt

so as to afford at least a lead-in to the space between the forwarding runs, but a guide rail is - in any case - preferably provided for cartons entering the space, the guide rail
5 being disposed adjacent the side of the space remote from the flap deflecting ploughs. The guide rail or a leading part of it is preferably adjustable towards and away from the side of the space with the flap deflecting
10 ploughs, for ready adjustment to suit a change in the size (e.g. depth) of cartons.

For use with cartons having mechanically closed side flaps (e.g., tucked-in or locked), flap deflecting ploughs may
15 suffice, but tuckers may be required for end flaps (or tabs), and the leading end flaps (or tabs) may have a lesser width than the trailing end flaps (or tabs) or cutouts
therein to afford clearance for tuckers past
20 or through leading end flaps in contact with or close to trailing end flaps (for deflecting of the latter by the tuckers) on closely adjacent successive cartons, the leading end flaps conveniently being deflected by a spear
25 carried by one of the side flap deflecting ploughs.

For use with cartons having adhesively bonded side flaps, glueing means may be provided, which may be an adhesive applicator (of wheel, spray or other type), which may be followed by an adhesive conditioner (of hot air, radiant heat or other type), or which may be an activator for adhesive already applied to on the or each side flap or for actuating suitable carton material to form a bond, the glueing means being followed by flap deflecting ploughs to bring the side flaps into contact with each other for bonding, and possibly followed by a rail or rolls for pressing the flaps together.

The action of tuckers, whether oscillating or rotary (including intermittently rotatable), may be timed by a photocell or other detector of the cartons, which timing means may control a valve or switch for a pneumatic or electrical actuator for the tuckers.

The flap deflecting ploughs and/or tuckers and/or glueing means may be adjustable or interchangeable to suit changes in the size (e.g. width and depth) of cartons, and such adjustments, together with adjustments of the

spacing of the endless belts and/or the position of a guide rail, may be effected by means of handles, wheels or knobs, or by setting motors on the ends of adjusting screws
5 or lead screws, and/or may be computer controlled in accordance with a bar (or other) code on the cartons.

An embodiment of the invention will now be described, by way of example only, with
10 reference to the accompanying drawings, in which:-

Figure 1 is a diagrammatic side elevation of a carton closer in accordance with the invention;

15 Figure 2 is a diagrammatic end elevation of the carton closer from the left-hand end of Figure 1;

Figure 3 is a detailed enlargement of part of the left-hand end of Figure 1;

20 Figure 4 is a fragmentary horizontal section taken generally from the line IV-IV of Figure 3;

Figure 5 is a section corresponding to Figure 4 but at the same level at the right-
25 hand end of Figure 1;

Figure 6 is a fragmentary plan view of

details disposed midway between the upper parts of Figures 4 and 5;

Figure 7 is a fragmentary horizontal section taken generally at a lower level at the right-hand end of Figure 1 and to the same scale as Figure 5;

Figure 8 is a fragmentary detailed enlarged vertical section taken from the line VIII-VIII of Figure 1;

Figure 9 is a fragmentary enlarged plan view of the detail indicated by the arrow XI in Figure 1;

Figure 10 is a detailed enlarged elevation of part of Figure 1 to the left of centre;

Figure 11 is a fragmentary vertical section taken from the line XI-XI of Figure 10; and

Figure 12 is a fragmentary vertical section taken from the line XII-XII of Figure 10.

The carton closer shown in the drawings comprises a base 20, upper and lower pairs of endless belts 21A, 21B and 22A, 22B respectively mounted on leading and return rollers 23, 24 and 25, 26 respectively on the

base with mutually opposed forwarding runs
27, 28 respectively of the belts spaced
parallel to each other adjacent a feed path 29
for cartons 30 along the base, the outer
5 surfaces FS of the endless belts having a high
coefficient of friction, drive means 31, 32
respectively for the return rollers of the
belts and adapted to drive the belts at the
same speed, and flap deflecting ploughs 33, 34
10 adjacent one side of the space between the
forwarding runs of the endless belts.

A carton 30 having a width equal to
the space between the forwarding runs 27, 28
of the endless belts can be fed without any
15 precise timing into the space, the carton
being held firmly and squarely by the friction
surfaces of the belts as they move at the same
speed past the flap deflecting ploughs 33, 34
and successive cartons can be fed in close
20 succession to preceding cartons with spacing
therefrom determined by the relatively slower
peripheral speed of a pair of feed rollers 35,
36, the drives for which will be described
presently. The flap deflecting ploughs 33,
25 34 serve to fold in lower and upper side flaps
37, 38 respectively of each carton 30,

assisted by knife guides 39, 40 respectively.

5 The endless belts 21A, 21B (with their
 respective rollers 23, 25) are adjustable
 towards and away from the endless belts 22A,
 22B, for ready adjustment of the space between
 the forwarding runs 27, 28 to suit a change in
 the width of cartons. For this purpose the
 rollers 23, 25 are carried by a beam structure
 41 which can be raised and lowered by air
10 cylinders 42, 43 carried by an upper frame
 part 44 of the base 20. The lower belts,
 22A, 22B are on common rollers 24, 26 on
 shafts 45, 46 respectively, while the upper
 (and narrower) belts 21A, 21B are on separate
15 rollers 23, 23X and 25, 25X on common shafts
 47, 48 respectively, the rollers 23X, 25X
 being adjustable towards and away from the
 rollers 23, 25 (by means to be described
 presently) to suit a change in the depth of
20 cartons and provide one pair of belts (21A,
 22A) adjacent the the open end of the cartons
 30 and one pair of belts (21B, 22B) adjacent
 the closed end of the cartons.

 The belts (21A, 21B, 22A, 22B) are
25 inextensible being formed of reinforced rubber
 with unplasticised polyvinylchloride (PVC)

providing the friction surfaces FS, the
opposite (inner) surfaces being ribbed
transversely to form teeth 49 engageable with
teeth 50 on the rollers (23, 23X, 24, 25, 25X,
5 26).

The axes of the rollers on which the
endless belts are mounted are inclined
slightly to the horizontal, to suite the
disposition of the cartons 30 as they come
10 from a product loader (not shown), and the
lower belts 22A, 22B are longer than the upper
belts 21A, 21B so as to afford a lead-in to
the space between the forwarding runs 27, 28,
but a guide rail 57 is - in any case -
15 provided for cartons entering the space, the
guide rail being disposed adjacent the side of
the space remote from the flap deflecting
ploughs 33, 34. A leading part (not shown)
of the guide rail 57 is adjustable to suit a
20 change in the depth of cartons.

A tucker 52 is provided for trailing
end flaps (not shown) of the cartons and the
leading end flaps (also not shown) may have a
lesser width than the trailing end flaps, or
25 cutouts therein, to afford clearance for the
tucker part or through leading end flaps in

contact with or close to trailing end flaps on closely adjacent successive cartons, the leading end flaps conveniently being deflected by a spear (also not shown) carried by one of the side flap deflecting ploughs 33, 34. The rotary action of the tucker 52 by a stepping motor 53 is timed by a photocell detector 54 which detects the leading or trailing end flap of each carton.

Glueing means 55, consisting of an adhesive wheel applicator applies adhesive to the lower side flap 37 of each carton 30 before the flap 37 is folded upwardly by the plough 33 (assisted by the knife guide 39), and the plough 34 (assisted by the knife guide 40) folds the upper side flap 38 downwardly into contact with the glued lower flap 37. A rail 56 presses the flaps 37, 38 together over a sufficient period of travel of the carton 30 to ensure that the flaps are securely bonded together by the time the carton leaves the closer.

The base 20 is supported by end frames 57, 58 having feet 59 and extending upwardly to the upper frame part 44, the end frame being tied together by lower longitudinal

members 60 (Figure 1) which support a pump unit 61 (see also Figure 2) providing compressed air for the cylinders 42, 43. The base 20 includes lateral members 62, 63 and side plates 64, 65 (Figures 7 and 8) supporting the rollers 24, 26 for the lower belts 22A, 22B, the upper runs 28 of which are backed by a sheet metal table 66 and guided by the upper edge portion of the front side plate 65 and a rail 67. The lower runs of the belts 22A, 22B are guided along a track formed by further sheet metal 68, the lower edge portion of the side plate 65 and a rail 69. The lower feed roller 36 is mounted on a shaft 70 with a toothed belt-and-pulley drive 71 from the shaft 45 of the roller 24, which is an idler roller, the belts 22A, 22B being driven by the drive means 32, which - as can be seen particularly in Figure 3 - consists of a stepping motor 72 and a toothed belt-and-pulley drive 73 to the shaft 46 of the roller 26.

The beam structure 41 consists essentially of an elongate channel-section 74 (Figures 4 to 6 and 8) with brackets 75, 76 at its ends linked by T-section members 77, 78

to the pistons (not shown) of the air cylinders 42, 43 respectively. Pairs of guide bars 79, 80 and 81, 82 extend forwardly from the brackets 75, 76 to a front side plate 83 to which are secured low friction tracks 84 for the front upper belt 21A, while a rear side plate 85 is slidable on the guide bars and has secured to it low friction tracks 86 for the rear upper belt 21B. The guide rail 51 is also secured to the rear side plate 85. A stepping motor 87 (Figure 6 only) mounted in the channel-section 74 is coupled to shafts 88, 89 which are in turn coupled to gear-boxes 90, 91 respectively adapted to drive lead screws (not visible) of telescopic arms 92, 93, the outer ends of which are secured through universal joints 94, 95 to the upper rear side plate 85, whereby adjustment of the position of the rear upper belt 21B can be effected, which position is monitored by a sensor 96 coupled between the gearbox 90 and the adjacent end of the rear side plate 85. The rollers 23X, 25X are slidable along their respective shafts 47, 48, but the latter has a splined portion (S) and a correspondingly shaped bore in the boss 97 of the roller 25X

transmits the drive from the drive means 31, which consists of a stepping motor 98 (in phase with the motor 72) and a toothed belt-and-pulley drive 99. The lower feed roller
5 35 is mounted on a shaft 100 with a toothed belt-and-pulley drive 101 from the shaft 47 to which only the roller 23 is keyed.

The whole upper belt assembly (74 to 101) is raised and lowered by the air
10 cylinders 42, 43 acting through their pistons and the linking members, 77, 78, to adjust the space between the lower rims 27 of the belts 21A, 21B and the upper rims 28 of the belts 22A, 22B. A torsion bar 102 (Figures 4, 5,
15 and 8) carries pinions 103, 104 mating with racks 105, 106 respectively towards the ends of the channel-section 74, to ensure that both ends of the upper belt assembly move together, even if one of the air cylinders 42, 43 fails
20 to operate. The lower (adjusted) position of the assembly is determined by adjustable stop means 107, and fine adjustment means 108, situated adjacent both air cylinders 42, 43, but only those adjacent the air cylinder 43
25 being shown in Figures 3 and 8. The adjustable stop means comprise frames 109 each

containing two nuts 110, 111 on vertical screws 112, 113 respectively. The screws 112 being rotatable by a stepping motor (not shown) through a shaft 114 and gearboxes 115, 5 while the screws 113 are rotatable by toothed belt-end-pulley drives 116 from the screws 112. The rear end of each frame 109 has an angle bracket 117 with a top stop surface 118, while the front end of the frame 109 has a 10 pair of cheeks 119 extending through slots 120 (see also Figure 1) in the lower side plate 65 and carrying a block 121 with a top stop surface 122. The fine adjustment means 108 each comprises pairs of brackets, one (123) 15 being bolted to the upper front side plate 83 and the other (not shown) being bolted to the bracket 75 or 76 of the upper belt assembly, and the brackets being provided with bolts 124, 125 and lock nuts 126, with the heads of 20 the bolts resting on the stop surfaces 118, 122 respectively.

The air cylinders 42, 43 also enable the belt assembly to be raised rapidly in the event of a carton jamming between the 25 forwarding runs 27, 28.

The tucker 52 shown in Figure 1, 2,

and 9 (and rotated intermittantly by a stepping motor 53) has two tucker arms 127 each operating alternately.

5 The plough 33 shown in Figures 1, 10 and 11 is mounted between pivot blocks 128 bolted to the lower side plate 65 and has a toggle linkage 129 to a bracket 130 and a handle 131 for quick movement into and out of the position shown. The associated knife
10 guide 39 is pivoted on the plough 33 and has a coil spring 132 urging it towards the position shown.

 The plough 34 shown in Figures 1, 10 and 12 consists of two horizontal axis
15 radiused rollers 133, 134 and two vertical axis radiused rollers 135, 136 with successive rollers 134, 135, 136 at slightly lower levels, all the rollers being mounted on a fitting 137 carried by a bracket 138 bolted to
20 the upper front side plate 83, so as to move up and down with the upper belt assembly (74 to 101). The associated knife guide 40 is pivotally mounted on a bracket 139 which is vertically adjustable on the lower side plate
25 65 to suit the adjusted positions of the plough 34.

CLAIMS

1. A carton closer comprising a base (20), at least one pair of endless belts (21A, 21B and 22A, 22B) mounted on rollers (23, 25 and 24, 26) on the base with mutually
5 opposed forwarding runs (27, 28) of the belts spaced parallel to each other adjacent a feed path (29) for cartons (30) along the base, the outer surfaces (FS) of the endless belts having a high coefficient of friction, drive
10 means (31 and 32) for at least one roller for each belt and adapted to drive the belts at the same speed, and flap deflecting ploughs (33, 34) adjacent one side of the space between the forwarding runs of the endless
15 belts.

2. A carton closer as in Claim 1, characterised in that the endless belts (21A, 21B and 22A, 22B) are adjustable towards and away from each other, for ready adjustment of
5 the space between the forwarding runs to suit a change in the size of cartons (30).

3. A carton closer as in Claim 2, characterised in that adjustable stop means (107) is provided to ensure a minimum adjusted space is maintained throughout the length of

5 the forwarding runs (27, 28).

4. A carton closer as in Claim 2, characterised in that each endless belt is duplicated, to provide one pair of belts (21A, 22A) adjacent the closed end of the cartons
5 (30) and one pair of belts (21B, 22B) adjacent the open end of the cartons (30).

5. A carton closer as in Claim 4, characterised in that one set of duplicated endless belts (22A, 22B) are on common rollers (24, 26), and the other set of duplicated
5 endless belts (21A, 21B) are on separate rollers (23, 23X and 25, 25X) on common shafts (47 and 48).

6. A carton closer as in any one of Claims 1 to 5, characterised in that the belts (21A, 21B, 22A 22B) consist of reinforced rubber with unplasticised
5 polyvinylchloride providing the high friction surfaces (FS), the opposite surfaces being ribbed transversely to form teeth (49) engageable with teeth (50) on the rollers (23, 24, 25, 26).

7. A carton closer as in any one of Claims 1 to 6, characterised in that the axes of the rollers (23, 24, 25, 26) on which the

endless belts (21A, 21B, 22A, 22B) are mounted
5 are generally horizontal and the lower belt
(22A, 22B) is longer than the upper belt (21A,
21B) so as to afford at least a lead-in to the
space between the forwarding runs (27, 28).

8. A carton closer as in any one of
Claims 1 to 7, characterised in that a guide
rail (51) is provided for cartons (30)
entering the space, the guide rail being
5 disposed adjacent the side of the space remote
from the flap deflecting ploughs (33, 34), and
wherein at least a leading part of the guide
rail (51) is adjustable towards and away from
the side of the space with the flap deflecting
10 ploughs (33, 34), for ready adjustment to suit
a change in the size of cartons (30).

9. A carton closer as in any one of
Claims 1 to 8, characterised in that a tucker
(52) is provided for end flaps of cartons
(30).

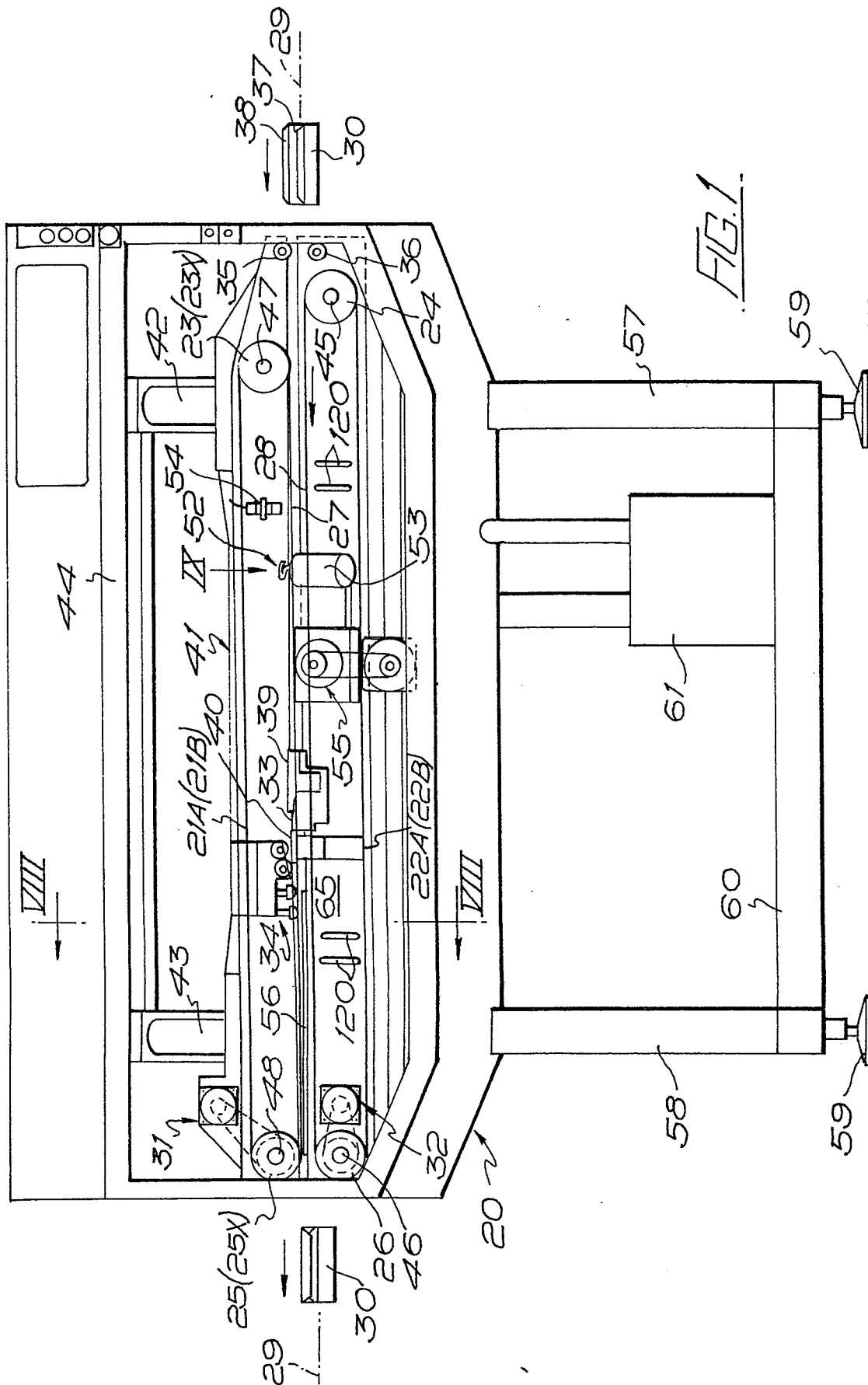
10. A carton closer as in any one of
Claims 1 to 9, characterised in that glueing
means (55) is provided for side flaps (37, 38)
of cartons (30).

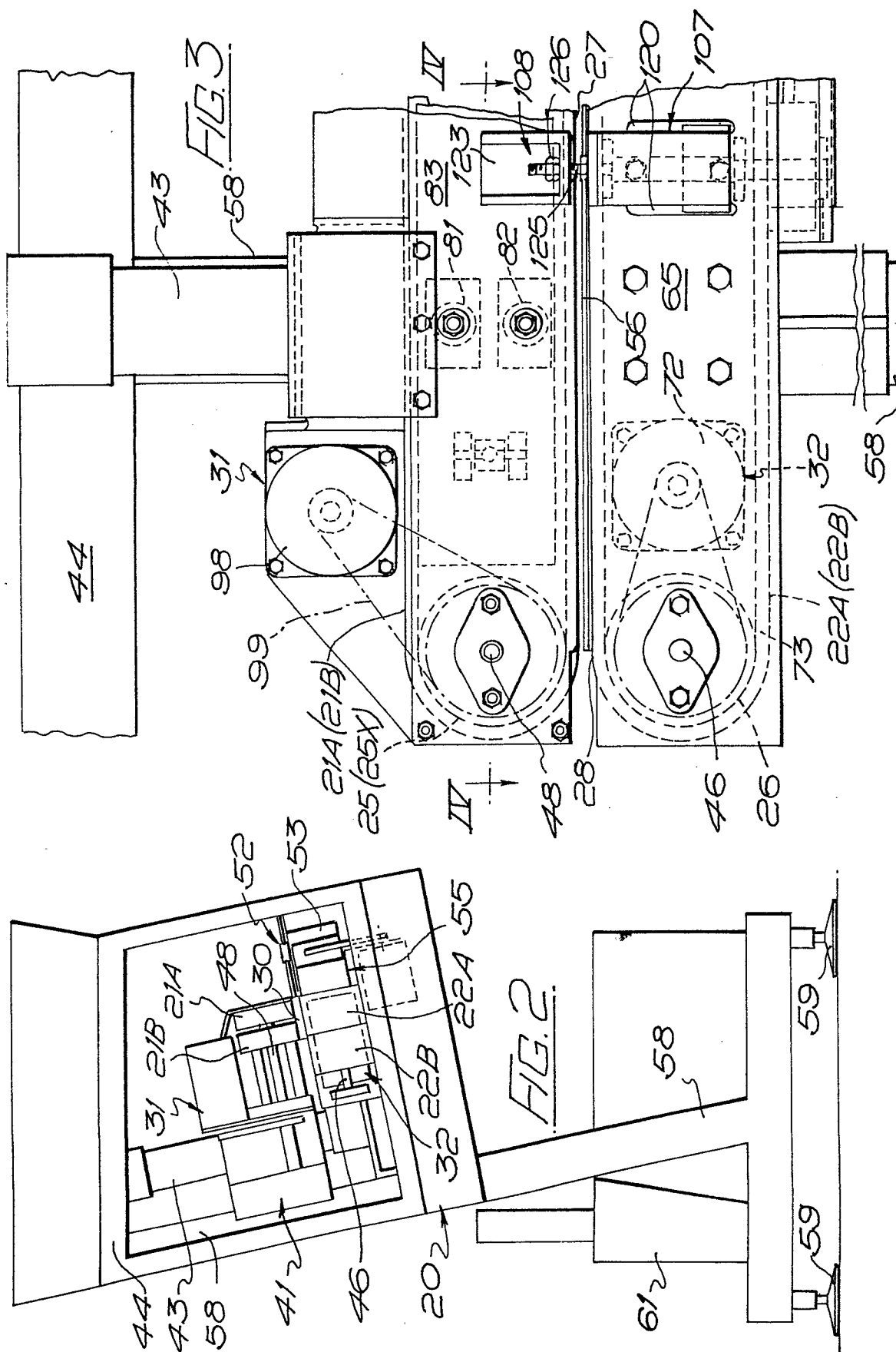
11. A carton closer as in Claim 10,
characterised in that the glueing means (55)

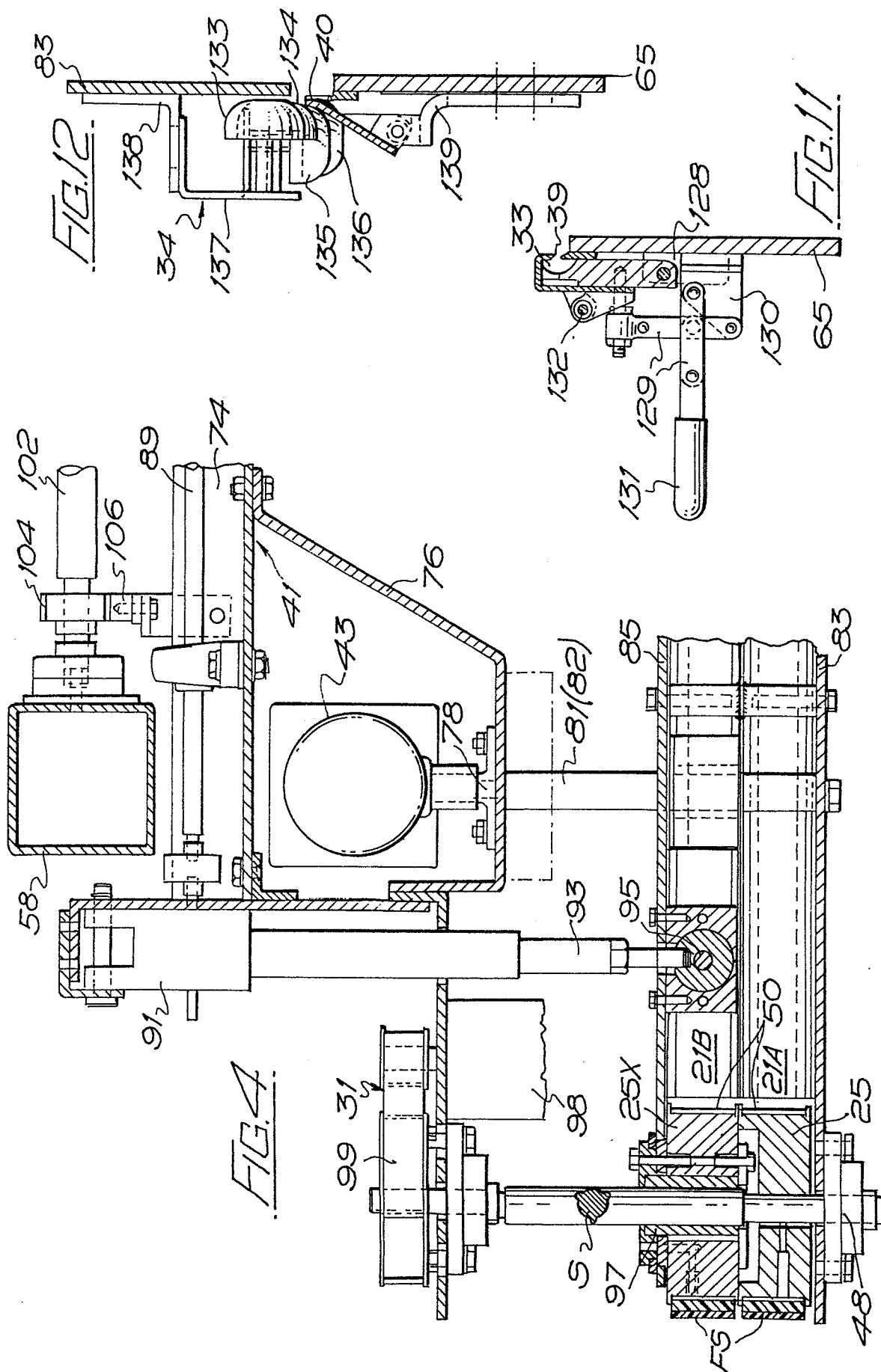
is an adhesive applicator.

12. A carton closer as in Claim 10 or
Claim 11, characterised in that the glueing
means (55) is followed by the flap deflecting
ploughs (33, 34) to bring the side flaps (37,
5 38) into contact with each other for bonding.

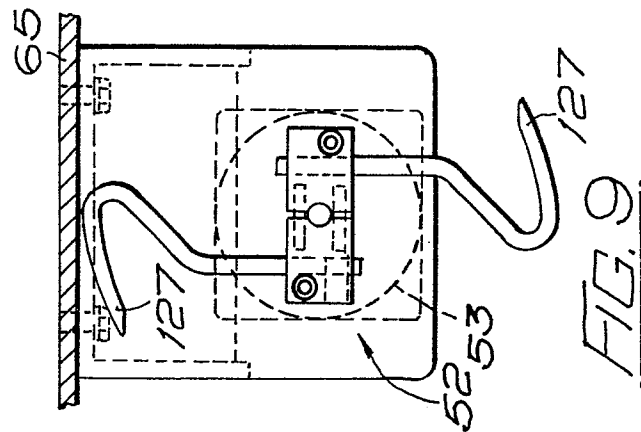
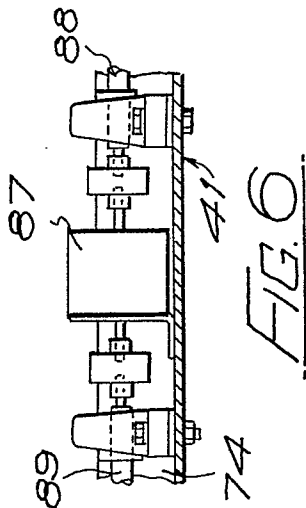
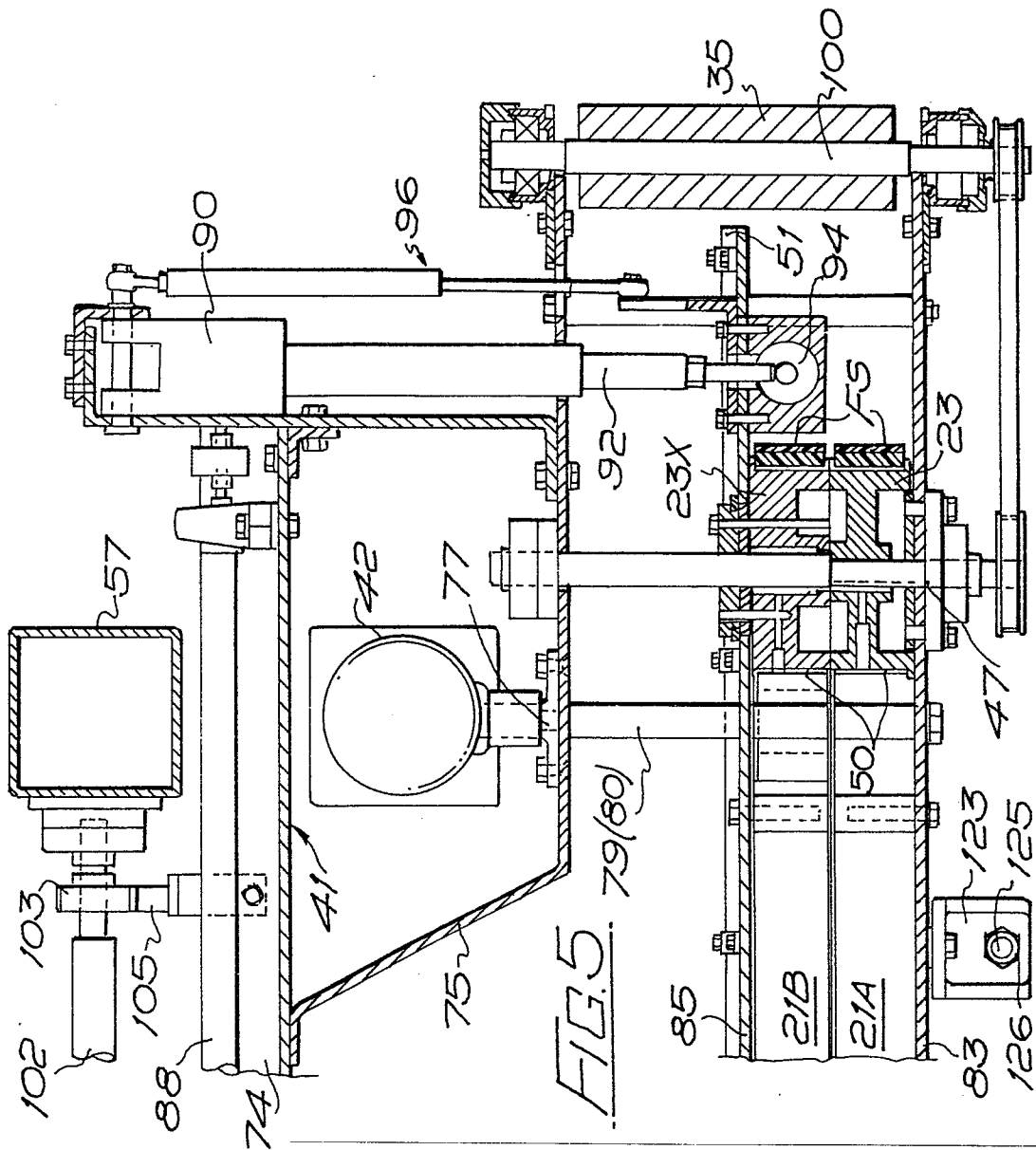
13. A carton closer as claimed in
Claim 12, characterised in that the flap
deflecting ploughs (33, 34) are followed by a
rail (56) or rolls for pressing the flaps (37,
5 38) together.

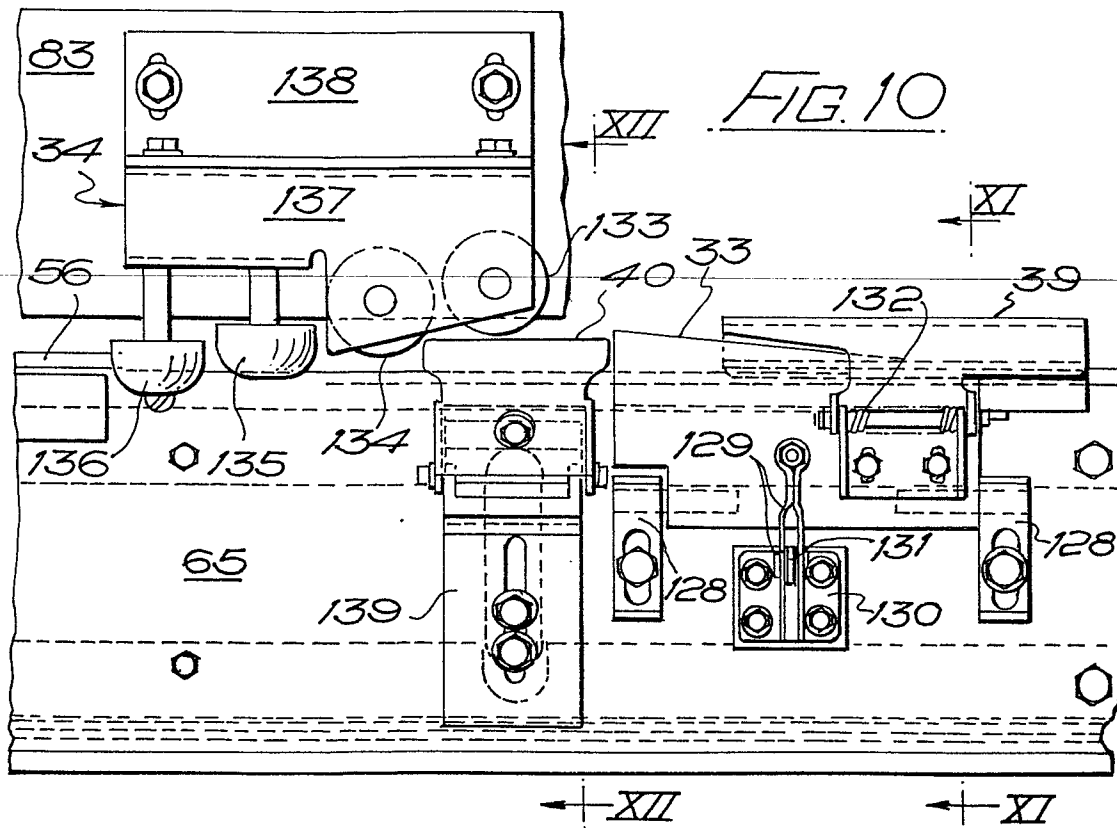
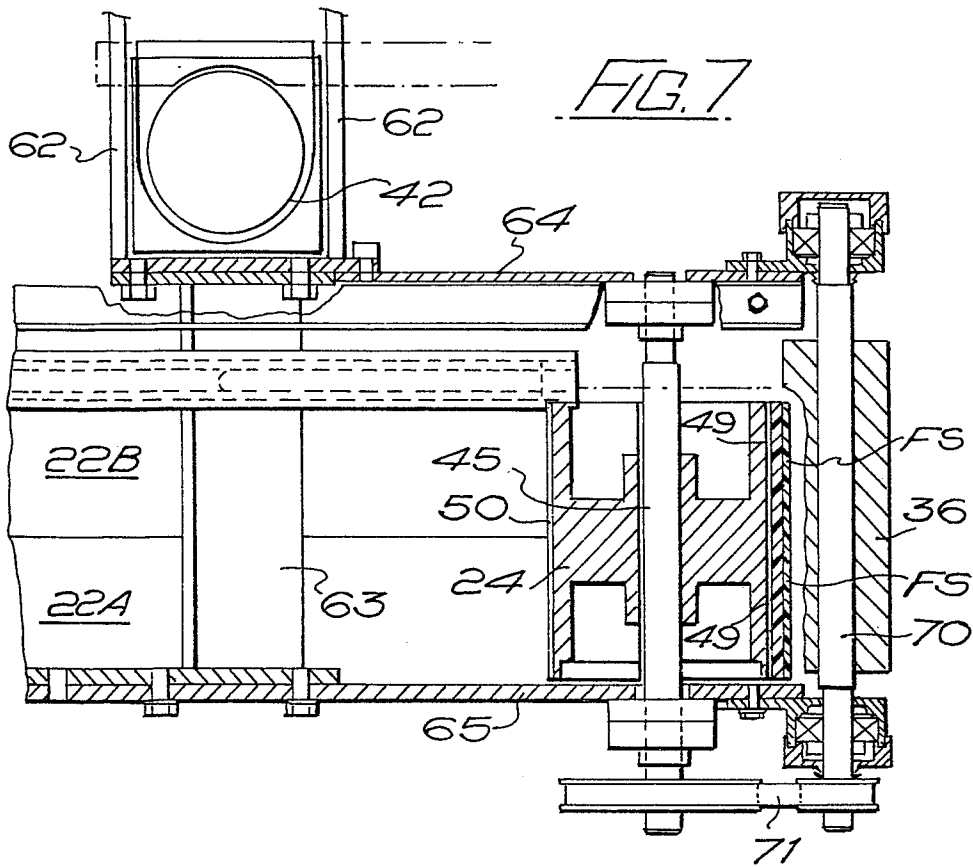






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European Patent
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EUROPEAN SEARCH REPORT

0112689

Application number

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. ³)
X	US-A-3 714 757 (FEIGEL) *Column 5, lines 35-51; column 4, lines 22-44; figures 1-5,14*	1,2,9	B 65 B 7/20
Y	---	4,10,11,12,13	
Y	US-A-1 484 722 (LAWSON) *Page 1, lines 66-80; figure 5*	4	
A	GB-A-1 097 034 (BTR) *Whole document; page 2, lines 21-33*	6	
Y	US-A-2 691 260 (SCHLEMMER) *Column 5, lines 35-45; column 9, lines 30-47; column 12, line 73 - column 13, line 2; figures 11-15*	10,11,12,13	
A	FR-A-2 265 637 (SIPAK) *The whole document*	1	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			B 65 B B 65 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26-03-1984	Examiner CLAEYS H.C.M.
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			