(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 654 405 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **94116543.3**

(22) Date of filing: **20.10.94**

(51) Int. Cl.[6]: **B65B 5/02**, B65B 51/02, B65B 59/00, B65D 5/24

(30) Priority: **24.11.93 IT GE930099**

(43) Date of publication of application:
24.05.95 Bulletin 95/21

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

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(54) Method and machine for the semi-automatic packaging of rod-shaped objects in cardboard boxes starting from pre-cut cardboard blanks.

(57) Method of semi-automatic packaging of rod-shaped objects in cardboard boxes and machine for its application, the method comprising the phases of: folding into channel form a pre-cut cardboard blank (8), comprising a base (108), two side walls (208), one of which is provided with a cover flap (228) while the other is provided with a foldable tab (218), and two end walls (308,308') provided with foldable tabs (318); insertion of the material to be packaged; folding of the end walls of the blank; folding of the tab of the side wall and of the tabs of the end walls of the blank; deposition of a strip of adhesive material (606) on these tabs; closing of the cover flap on the said tabs and removal of the package thus formed.

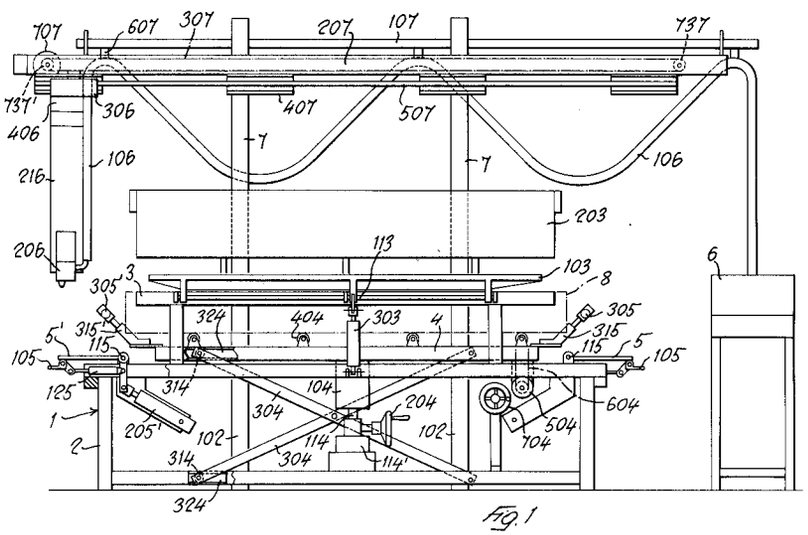

FIG. 1

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The present invention relates to a method of semi-automatic packaging of rod-shaped objects in cardboard boxes, the machine for its application and a special pre-cut cardboard blank used in the said method.

The packaging of rod-shaped objects, such as extruded plastic sections, for example conduits for electrical cables or similar, is at present carried out by an essentially manual procedure, with a considerable waste of space, owing to the pre-folding necessary to prepare the packages for containing the material, and of time by the operators employed on the task in question.

The object of the present invention is to provide a method enabling the operations of forming and closing the package to be automated as much as possible, thus yielding a considerable saving of space and time.

A further object is to provide a machine with which this method can be applied, together with a pre-cut cardboard packaging blank suitable for use in the method according to the present invention.

These objects are achieved by using an automatic packaging method comprising the phases of: folding into channel form the cardboard blank with the raising of the side walls; insertion of the material to be packaged; folding of the end walls of the blank; folding of the side tab and of the tabs of the end walls of the blank; deposition of a strip of adhesive material on these tabs; closing of the cover flap on the said tabs and removal of the package thus formed from the operating surface.

Another object of the present invention is a pre-cut cardboard blank shaped so that it can be used in the application of the method according to the present invention, comprising: a base surface of essentially rectangular shape, two side walls connected to the longer sides of the base surface, a tab connected to one side wall and a cover flap connected to the opposite side wall; two end walls connected to the shorter sides of the base surface and two tabs on the further side of the end walls, characterized in that it has four connecting flaps located between the side walls and the end walls, the said connecting flaps being provided with facilitated folding lines along the diagonals connecting the free corner of each flap to that nearest the base of the blank.

A further object of the present invention is a machine for the application of the method according to the present invention, comprising a frame for containing the cardboard blank, consisting of a support base and two side guards, the ends of the said containing frame being connected to means of folding the end walls of the blank and means of folding the tabs of the said end walls, and the side guards of the said frame being connected to means of folding the tab of the side wall of the blank and of the covering flap of the blank, these folding means being automatically operated; this machine also comprising means of automatic supply of adhesive material, moved automatically along an appropriate path.

Advantageously, the said support base of the containing frame of this machine is adjustable in height by suitable adjustment means.

These adjustment means may be of the hinged parallelogram type with a nut engaged with a threaded rod which is rotated manually with a crank.

Similarly, the distance between the side guards of the said containing frame of the said machine is adjustable by suitable adjustment means.

Advantageously, one of the two guards is movable, while the opposite guard is fixed, preferably by means of an adjustment system comprising two nuts engaged with two threaded rods and a chain which connects both the said rods to a manual adjustment crank.

Advantageously, suitably positioned pressing means are provided in the machine according to the invention to act on the lines of weakness of the connecting flaps, enabling the end walls of the blank to be folded.

Further advantages and characteristics will be more clearly understood from the following description of an embodiment of the present invention, written, by way of example and without restriction, with reference to the attached drawings, in which

Figure 1 is a front elevation of the machine for the application of the method according to the present invention;

Figure 2 is a plan view of the machine illustrated in Figure 1;

Figure 3 is a transverse sectional view of the machine shown in Figure 1;

Figure 4 is a plan view of a cardboard blank used in the method according to the invention; and

Figures 5 to 11 show the successive phases of formation of the box-shaped package according to the method of the invention applied to a cardboard blank such as that shown in Fig. 4.

In Figure 1, the number 1 indicates the machine for the application of the method according to the presett invention. This machine consists essentially of a supporting frame 2 having two lateral containing guards 3, 3' opposed to each other (see Fig. 3) and a support surface 4, together with two folders 5 at the ends of the said guards 3, 3'. The guard 3 is fixed to the frame 2 and the folder 103 is hinged at 113 to the said guard. This folder is connected through the crank 123 to an actuator, in this case the rod of a pneumatic jack 303, whose cylinder is fixed to the frame 2. The guard 3' which is movable faces the guard 3; the said guard 3'

(see Figs. 2 and 3) has two nuts 103' welded to the lower ends of the said guard. The said nuts 103' are engaged with two threaded rods 734 which are driven, one directly and the other through a belt or chain transmission 754, by a crank 704, with which the position of the guard 3' with respect to the guard 3 is adjusted. Above the guard 3' there is the folder 203 which is hinged at 213 to the uprights 102 of the frame 2 (see Figs. 2 and 3), moved by a pneumatic jack 403 connected to the said folder by the crank-shaped member 223.

The support surface 4 is disposed in the space between the fixed guard 3 and the uprights 102 of the supporting frame 2. This support surface 4 is vertically adjustable. For this purpose the surface 4 is supported by a central column 104 provided with an axial threaded hole engaged with a threaded shaft 114 supported freely on a base 114'. A crank 204 controls the rotation of the shaft 114 through a suitable transmission, for example a conical pair. A hinged parallelogram 304 which is fixed at 334 and free to run on the rollers 314 in the C-shaped guide 324 controls its stability. The support surface 4 is also provided with a conveyor 404 consisting of rollers moved by a chain 424 which transmits the motion from a motor 504 to the pulleys 414 keyed on the axles of the said rollers 404, the purpose of which will be indicated subsequently.

At the ends of the support surface 4 are arranged, on inclined supports 315 and 315', the pressing fingers 305 and 305', two at each end of the said base, the operation of which will be indicated subsequently. These fingers are adjustable according to the distance between the guards. Two folders 5 and 5', each operated by a pneumatic jack 205, are hinged at 115 to each end of the frame 2 at the ends of the said surface 4. Smaller folders 105 operated by the pneumatic jacks 125 are fixed to the upper edges of the said folders 5 and 5'.

Behind the part of the frame 2 to which the folder 203 is hinged, a pair of bars 27 (see Fig. 3) connects the uprights 102 of the said frame 2 to two supporting beams 7 which hold the projecting device for applying the adhesive material. This device comprises a longitudinal member 207 suspended from the said beams 7. At one end of the longitudinal member 207 there is fixed a motor 707 on whose shaft is keyed a pulley 737'. At the other end of the longitudinal member 270 there is mounted an idle return pulley 737, a belt 307 for moving the carriage 406 of the adhesive applicator 206 being run around the two pulleys 737 and 737'.

With particular reference to Figures 1 and 3, sections 407 of an I-beam (four in the case illustrated) are connected to the longitudinal member 207 at regular intervals by one side, for example by welding. On the two upward-facing sides of the two flanges on the opposite sides of the said sections of I-beam 407, two rails of circular section 507, extending over the whole length of the longitudinal member 207, are fixed by suitable upright supports. The carriage 406 is provided on its upper side with two slide blocks 306 provided with semicircular channels whose section is complementary to that of the rails 507 and which engage slidably with the said rails. The carriage 406 is moved by the belt 307 through a connecting link 307'. The rod of a guide 226, on which is slidably mounted a tubular collar 216' carrying the vertical arm 216 which supports the adhesive applicator 206, is suspended transversely with respect to the carriage 406 and on its lower side. A threaded rod 436, with its axis parallel to that of the guide 22, and with an operating crank 416 keyed to one end, is supported on the lower side of the carriage 406 so that it is freely rotatable. A threaded bush 426 carries a radial appendage on which is pivoted one end of the cylinder of a pneumatic jack 506, the piston rod of this jack being connected to the arm 216. The number 6 indicates a melting and pumping station for the hot-melt adhesive from which the flexible tube 106 leads to the adhesive applicator. This tube is held by a series of supports 607, provided with a base plate guided slidably between a C-shaped guide carried by the uprights 107 extending parallel to the longitudinal member 207.

With reference to Fig. 4, a cardboard packaging blank 8 used in the method according to the invention is illustrated. This blank 8 is divided by facilitated folding lines into a plurality of elements, and in particular has an essentially rectangular base 108 to whose longer sides are connected two side walls 208, while two end walls 308 and 308' are connected to the shorter sides. A side tab 218 is connected to one of the said side walls 208, while a cover flap 228 is connected to the opposite wall. Each of the end walls 308 and 308' has a tab 318. In the space between the shorter sides of the side walls 208 and the end walls 308 there are four square connecting flaps 408, each of which has a diagonal line of weakness 418 and 418' and a cut-out 428 and 428' at the free corner, the purpose of which will be indicated subsequently.

Before using the machine 1 described previously in the packaging method according to the present invention, the operator must make suitable adjustments, as required in each case, of the height of the base surface 4 and of the distance between the guards 3 and 3', by using the adjustment means described previously; additionally, the pneumatic jack 506 coupled to the arm 216 of the applicator 206 must then be positioned as described previously in accordance with these adjustments. When these adjustments have been made, a cardboard blank 8 is introduced into the open

compartment formed by the guards 3, 3' and the support surface 4, by pushing its base 108 towards the said support surface 4, with the folders 103, 203, 5 in the open position, so that the said blank 8 takes on the open channel configuration shown in Fig. 6.

At this point, the phase of closing of the end walls 308 commences. The jack 205 starts to raise the end walls 308 of the blank 8. Simultaneously, the pressing fingers 305 which were previously adjusted suitably by their supports 315 are operated in such a way that they exert a pressure on the lines of weakness 418 of the connecting flaps 408; these lines of weakness 418, together with the cut-outs 428 formed at the free corners of the said flaps, assist the folding of the flaps 408 along the diagonal by the pressing fingers 305. In this way the end wall 308 is brought towards the package, which assumes the configuration shown in Fig. 8. The end wall 308 is then completely folded by the folder 5 operated by the pneumatic jack 205 (see Fig. 8).

The flaps 408 have the function of providing solidity to the structure, but in a different way from the solutions commonly used in packaging in the present state of the art in which this function is performed by simple free tabs which would not facilitate, but rather complicate the development of the automatic packaging process.

At this point, the side walls 208 and the end walls 308 and 308' are raised and retained by the guards 3, 3' and the folders 5 and 5' respectively; it is then necessary to fold the side tab 218 and the end tabs 318. The side tab 218 is folded by the folder 103 operated by the pneumatic jack 303; subsequently, the smaller folders 105 operated by the jacks 125 and hinged to the tops of the folders 5 fold the tabs 318 (see Figures 9 and 10).

With the side tab 218 and end tabs 318 folded, the adhesive can be applied in the form of a strip 606 applied to the said tabs (see Fig. 10) by the applicator 206. For this purpose, the path of the arm 216 on which the applicator 206 is fixed had been adjusted previously (see Fig. 3), as described above. The applicator 206 first deposits the adhesive on one tab 318, then on the side tab 218 and then on the other end tab 318; the carriage 406 which transports it then returns to the starting position at one end of the package.

When the strip 606 of adhesive has been deposited on the folded tabs, all that needs to be done is to close the cover flap 228 by the operation of the folder 203 operated by the pneumatic piston 403. On completion of the packaging, the package thus made is removed from the machine by the operation of the rollers 404 present on the support surface 4, driven by the motor 604 which transmits its motion to them by means of the pulleys 414 and the belt 424.

The method and machine according to the present invention can be used for packaging rod-shaped elements, particularly plastic sections such as cable conduits or similar, by a rapid process which is automatic for a large part of the operation, requiring the intervention of the operator only for the positioning of the cardboard blank and for the filling of the blank. Additionally, the cardboard blank used in the application of the method according to the invention permits the correct development of the method in question, and in particular guarantees high stability combined with practicality of application on closure of the package.

Claims

1. Method of semi-automatic packaging of rod-shaped objects in cardboard boxes comprising the phases of: folding into channel form a pre-cut cardboard blank (8), comprising a base (108), two side walls (208), one of which is provided with a cover flap (228) while the other is provided with a foldable tab (218), and two end walls (308 and 308') provided with foldable tabs (318); insertion into this channel of the material to be packaged; folding of the end walls (308 and 308') of the blank; folding of the tab (218) of the side wall (208) and of the tabs (318) of the end walls (308 and 308') of the blank; deposition of the strip of adhesive material (606) on these tabs; closing of the cover flap (228) on the said tabs (218, 318) and removal of the package thus formed.

2. Pre-cut cardboard blank (8) shaped for use in the application of the method according to Claim 1, comprising: a base (108) of essentially rectangular shape, two side walls (208) connected to the longer sides of the base surface, a side tab (218) connected to one side wall (208) and a cover flap (228) connected to the opposite side wall; two end walls (308 and 308') connected to the shorter sides of the base surface (108) and two tabs (318) on the farther side of the end walls, characterized in that it has four square connecting flaps (408 and 408') located between the side walls and the end walls, the said connecting flaps (408 and 408') being provided with facilitated folding lines (418 and 418') respectively along the diagonals connecting the free corner of each flap (408 and 408') to that nearest the base of the blank, and provided with cut-outs (428 and 428') at the free corners.

3. Machine for the application of the method according to Claim 1, comprising a supporting

frame (2), a support base (4) for the cardboard blank (8) and two side guards (3, 3'), the ends of the said frame (2) being connected to means (5, 5') of folding the end walls (308 and 308') of the blank and means (105) of folding the tabs of the said end walls, and the side guards (3, 3') being connected to means (103) of folding the tab (218) of the side wall (208) of the blank and means (203) of folding the cover flap of the blank, these folding means (5, 5', 105, 103, 203) being automatically operated; this machine (1) also comprising means (206) of automatic application of adhesive material, moved automatically along an appropriate path.

4. Machine according to Claim 3, in which the height of the said support base (4) is adjustable by suitable adjustment means.

5. Machine according to Claims 3 and 4, in which the said adjustment means (104, 204, 304) may be of the hinged parallelogram type (304) with a nut (104) which is engaged with a threaded rod (114) which is manually rotated with a crank (204) by suitable means of transmission.

6. Machine according to Claims 3 to 5, in which the distance between the side guards (3, 3') is adjustable by suitable adjustment means.

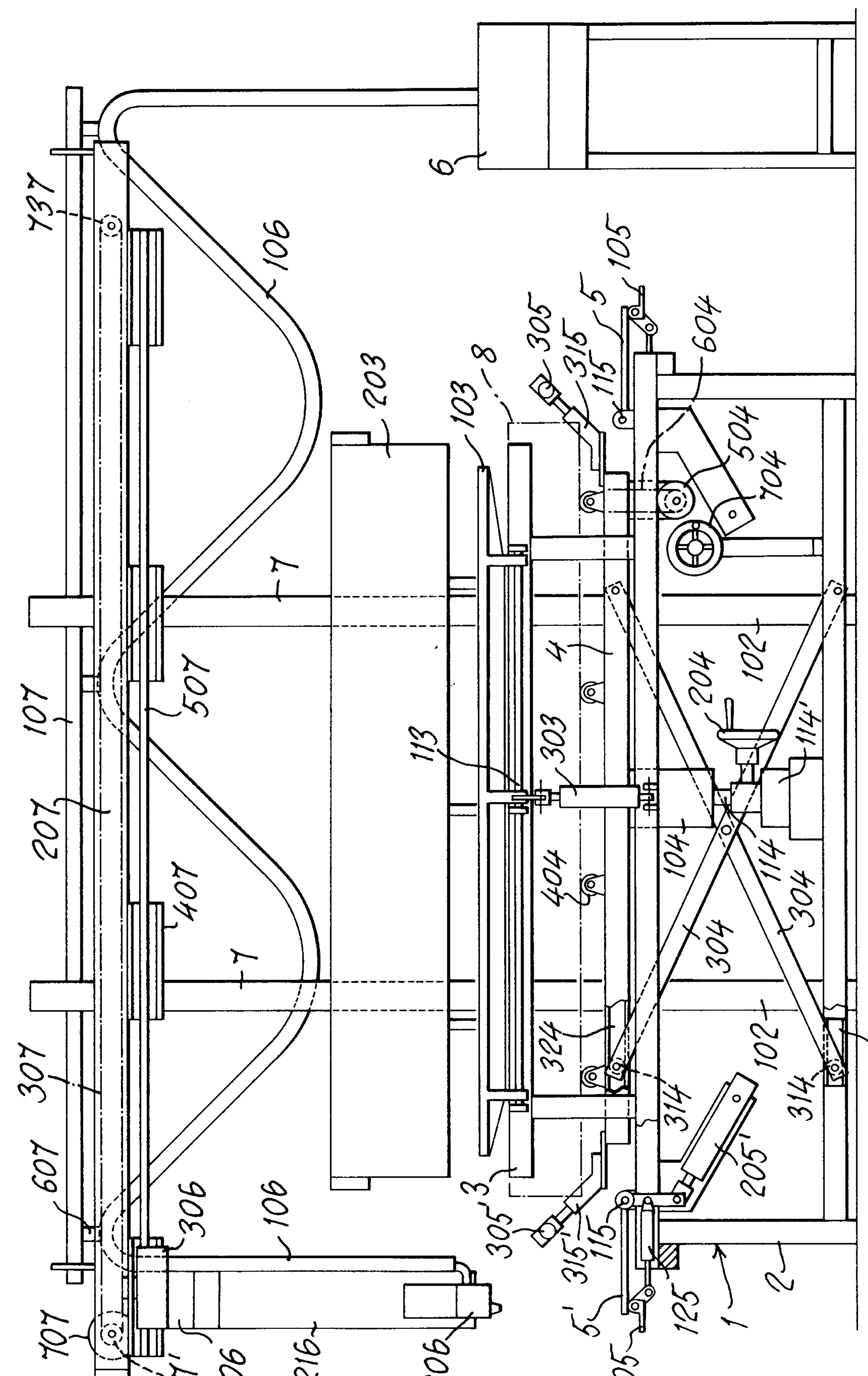
7. Machine according to Claims 3 to 6, in which one (3') of the two guards is movable, while the opposite guard (3) is fixed, the said movable guard (3') being adjustable by an adjustment system comprising two threaded rods (734) which are engaged with two nuts (103') welded to the lower ends of the said guard (3') and a belt or chain (754) which connects both the said threaded rods to an adjusting crank (704).

8. Machine according to Claims 3 to 7, in which the said support base (4) has at each end two pressing means (305 and 305') which act on the lines of weakness (418) of the connecting flaps (408), enabling the end walls (308 and 308') of the blank (8) to be folded.

9. Machine according to Claims 3 to 8, in which the said closing means (5, 105, 103, 203) are essentially folders operated by pneumatic jacks (205, 125, 303, 403).

10. Machine according to Claims 3 to 8, in which the said means of application of the adhesive material comprise an applicator (206) mounted on a vertical arm fixed on a carriage (406) mounted movably on a longitudinal member (207) located above the frame (2) and supported by two beams (7) made integral with the said frame, by means of rails (507) connected to the said longitudinal member (207), and moved on these rails with suitable means of movement (707, 307, 737, 737').

11. Machine according to Claim 10, in which the said arm is movable, in a direction perpendicular to the movement of the carriage (406), by suitable adjustable operating means such as a pneumatic jack (506).



737
106
6
105
5
604
305
315
115
8
103
203
504
704
7
4
102
204
114'
107
507
113
303
207
104
114
304
404
407
324
314
307
205'
3
607
106
305'
315'
115'
125
2
1
306
5'
105
707
737'
406
216
206

Fig. 1

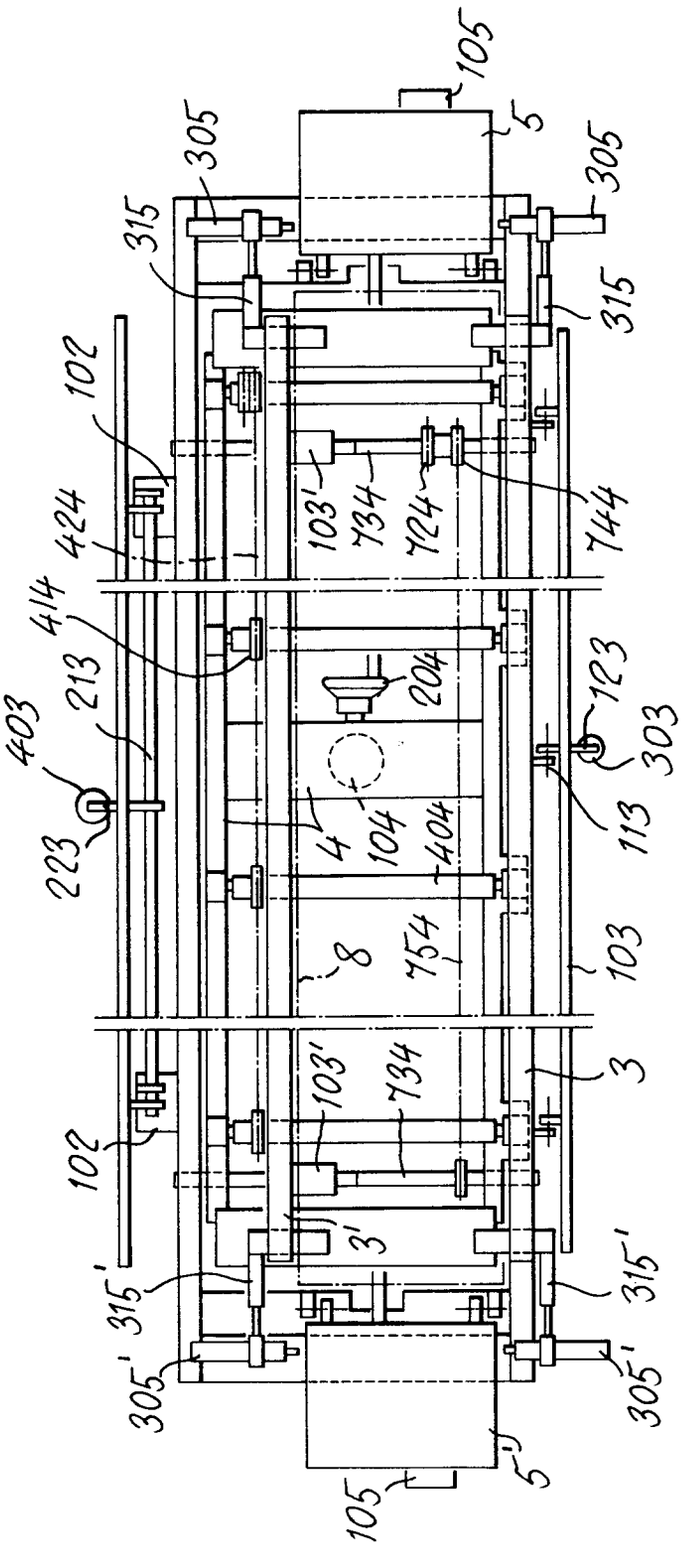

105
5
305
315
102
424
414
213
403
223
103'
734
724
744
204
123
303
113
4
104
404
8
754
103
3
3'
315'
305'
5'
105

Fig. 2

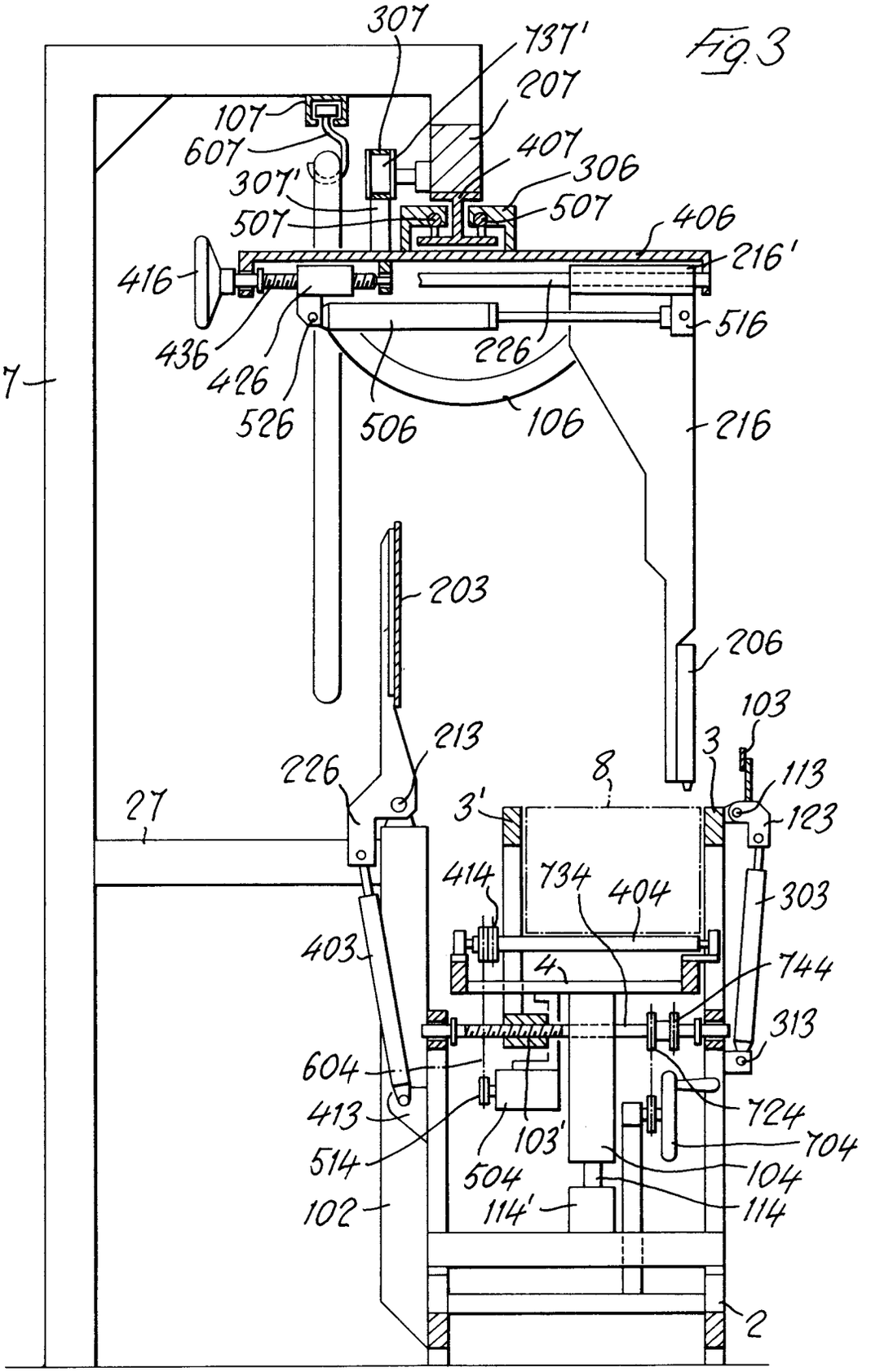

307
737'
207
107
607
407
306
307'
507
507
406
216'
416
516
436
426
226'
526
506
106
216
7
203
206
103
213
226
3
113
8
27
3'
123
414
734
404
303
403
4
744
313
604
724
413
103'
704
514
504
104
102
114'
114
2

Fig. 3

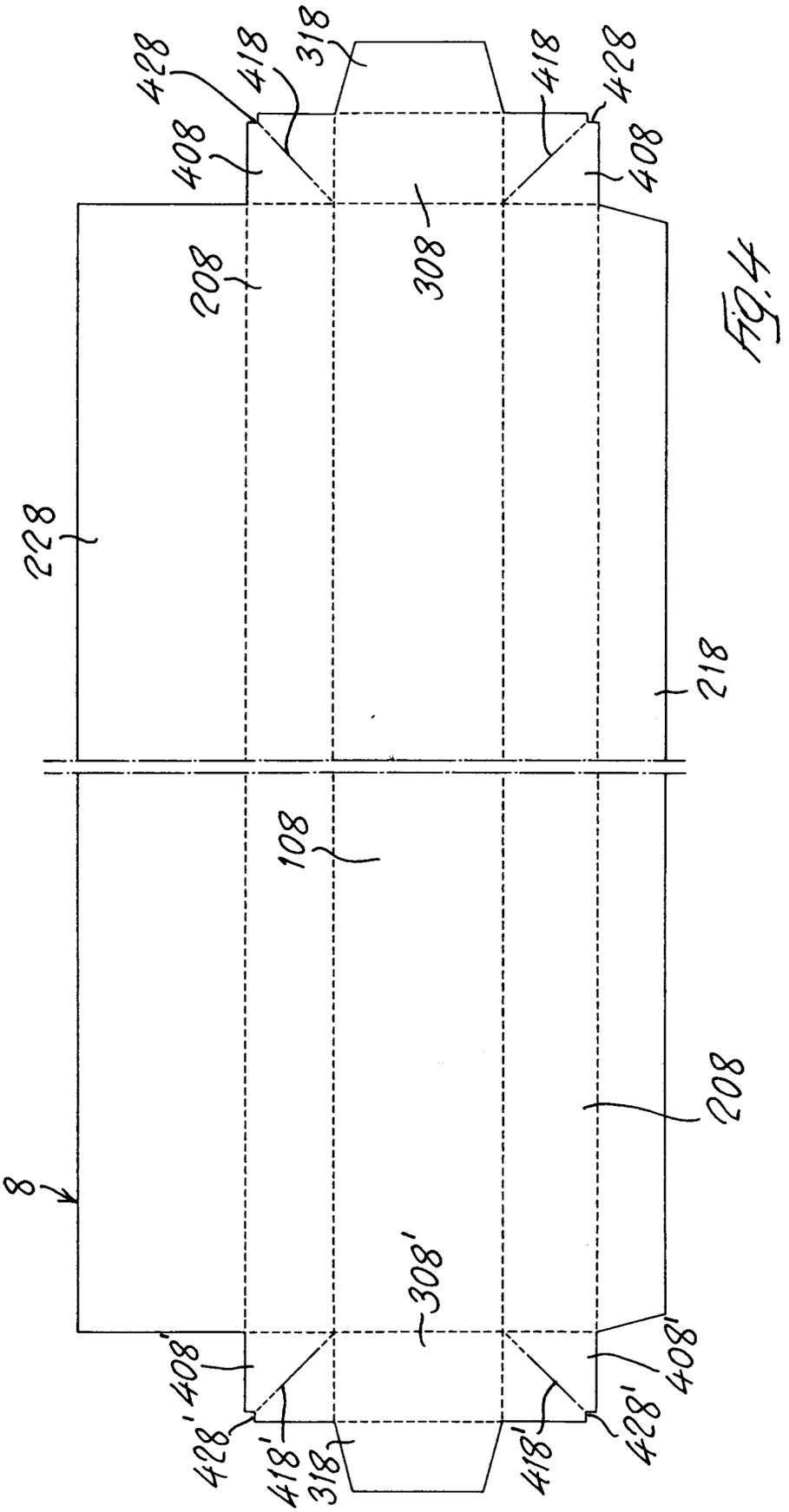

428
418
318
418
428
408
408
308
208
228
218
108
208
8
308'
408'
428'
418'
318
418'
428'
408'

Fig.4

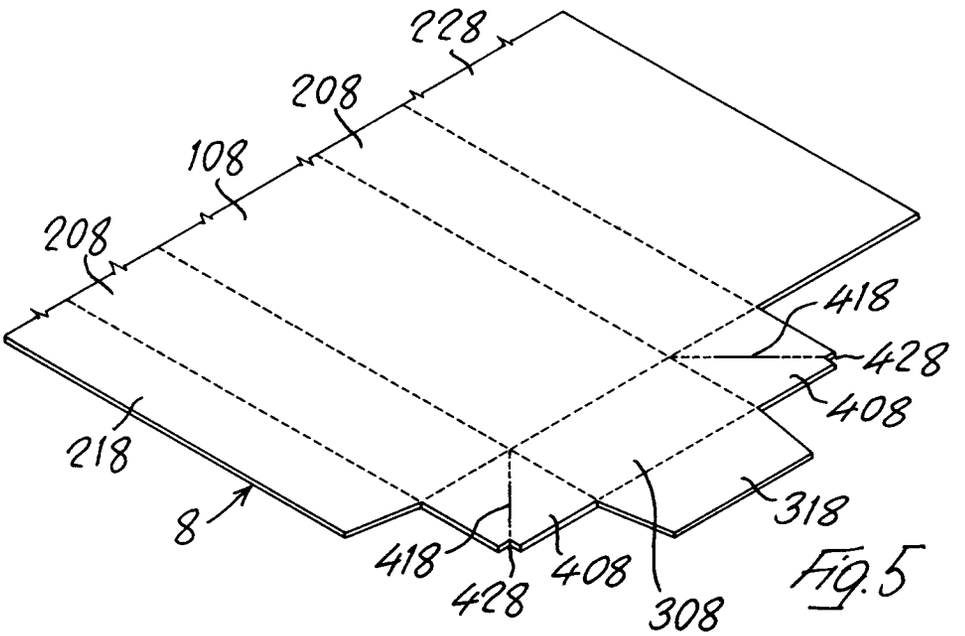


Fig. 5

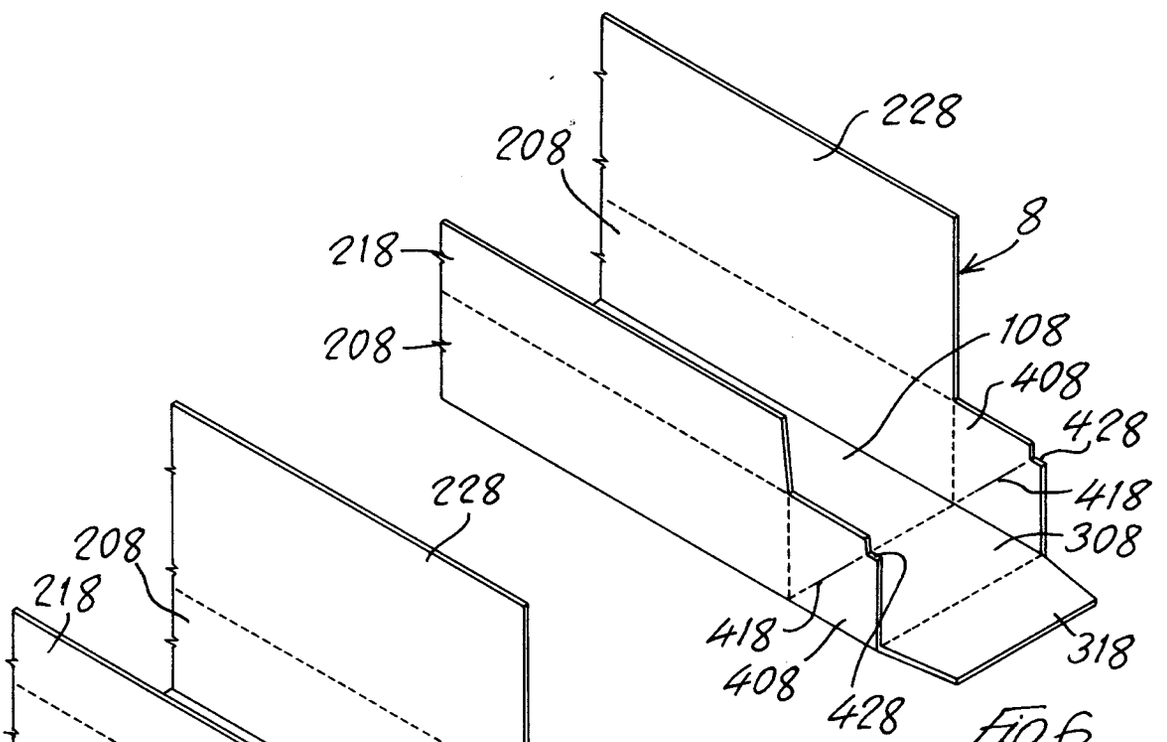


Fig. 6

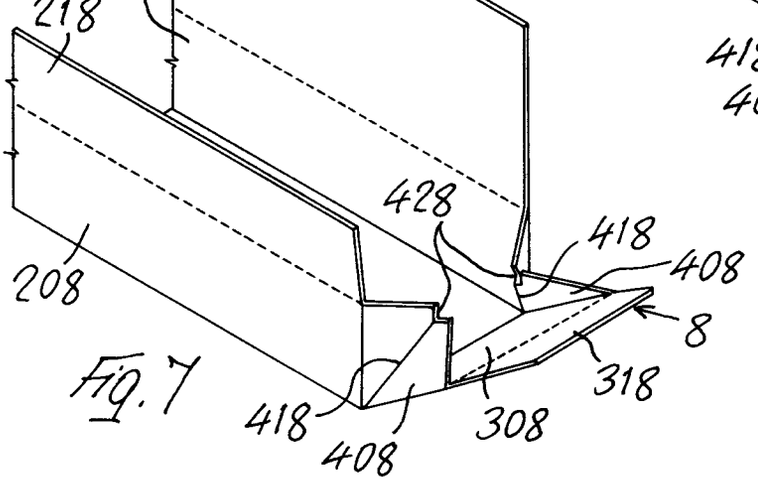


Fig. 7

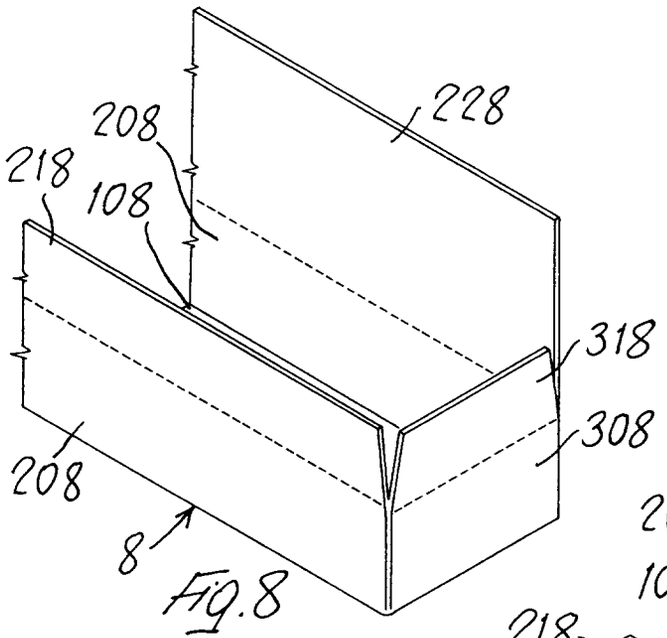


Fig.8

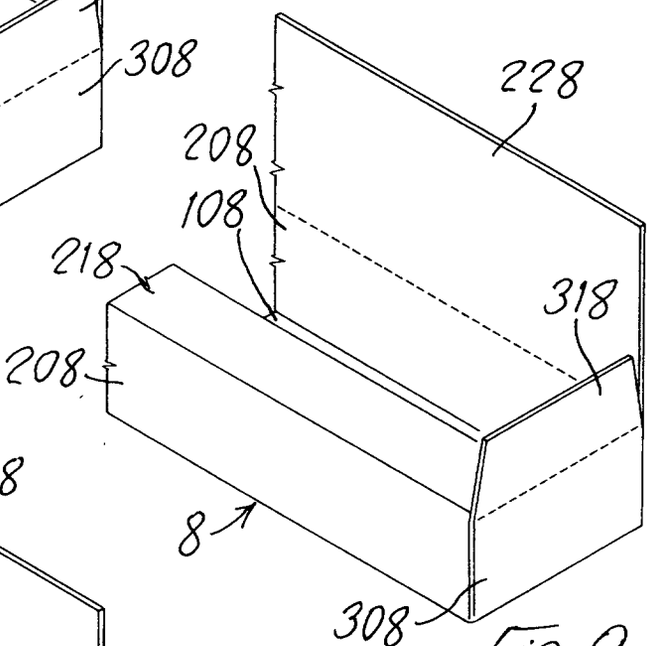


Fig.9

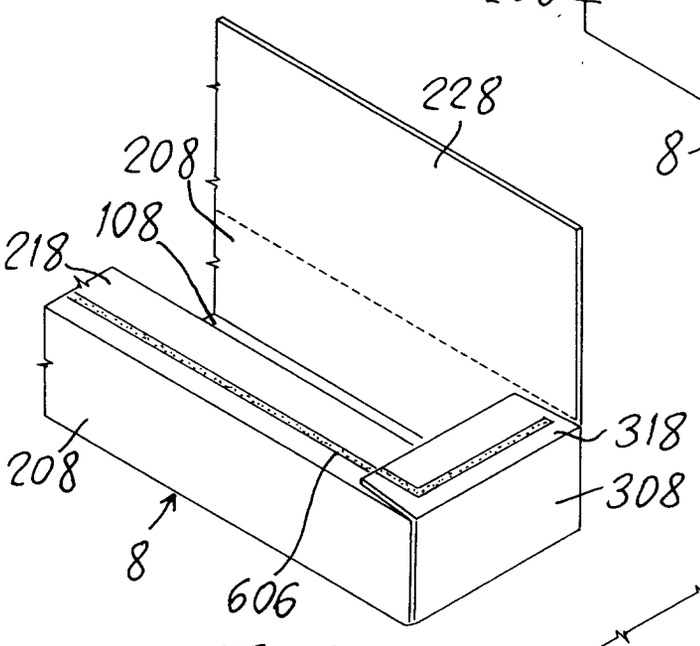


Fig.10

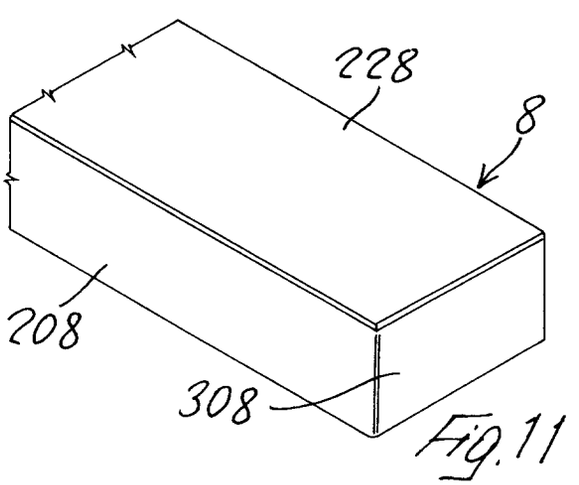


Fig.11

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 11 6543

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.6)
X A	US-A-3 572 576 (T.W. FOSTER) * column 2, line 8-73; figures 1,2 *	2 1	B65B5/02 B65B51/02 B65B59/00
A	US-A-5 131 208 (J.A. PAUL ET AL) * the whole document *	1-3,9,10	B65D5/24
A	US-A-4 727 708 (P.M. CONFORTO ET AL) * column 3, line 51-62; figures 1,2 *	2,3,8	
A	US-A-3 078 027 (C.H. KEITH) * column 1, line 60-65; figure 3 *	2	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65B
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 February 1995	Grentzius, W

CATEGORY OF CITED DOCUMENTS

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