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(72) Inventors:  
• Belloli, Gianpaolo  
40067 Rastignano (IT)  
• Gamberini, Ernesto  
40067 Rastignano (IT)

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(74) Representative:  
Franzolin, Luigi et al  
STUDIO TORTA S.r.l.,  
Via Viotti, 9  
10121 Torino (IT)

(71) Applicant: MG2 S.P.A.  
40065 Pian di Macina (Pianoro) (IT)

(54) Method of packing articles inside respective cartons, machine for implementing the method, and relative carton

(57) A method and relative machine for packing articles (10), fed in a given direction ( $V_1$ ), inside respective cartons (40); the method being characterized in that, at a folding station (60), at least one of the articles (10) is fed in a direction ( $V_5$ ) perpendicular to the feed direction ( $V_2$ ) of a blank (20); a front side wall (25), a rear side wall (28) and a first pair of end flaps (27) of the blank (20) are folded simultaneously about at least one of the articles (10); and a second pair of end flaps (26) is folded and gummed onto the first pair of end flaps (27) at a gumming station (70).

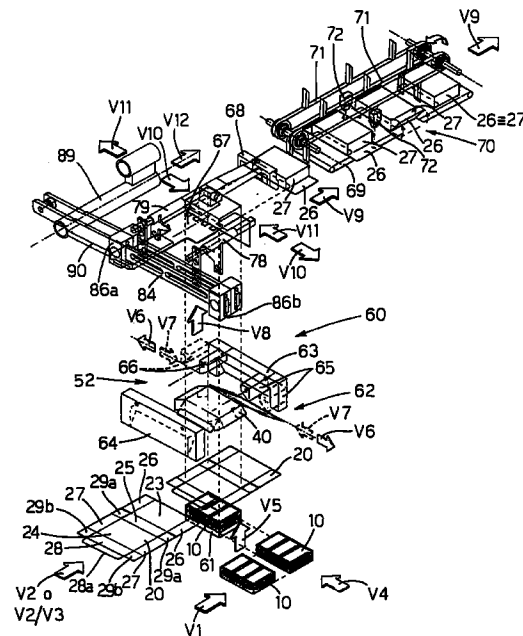


Fig.6

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## Description

[0001] The present invention relates to a method of packing articles inside respective cartons, to a machine for implementing the method, and to the relative carton.

[0002] Packing machines are known which provide for automatically packing articles of various types inside respective cartons or boxes normally formed from a blank of cardboard or similar.

[0003] Currently used blanks normally define a bottom wall and a top wall joined to each other along one side by a side wall; a portion comprising an outer tongue, which is eventually gummed to the bottom wall, extends from the side of the top wall opposite that joined to the side wall; and the top wall also comprises a pair of opposite end flaps which are eventually inserted or gummed to close the carton.

[0004] Such blanks are formed from a sheet of packing material on which, to minimize waste, the blanks are so arranged that the projecting portions, e.g. the end flaps, of one blank are inserted between the cavities of the adjacent blanks.

[0005] Some known packing machines also employ pregummed tubular blanks, which are stacked flat inside a store on the machine, with the top wall folded onto the bottom wall; and, as before, a tongued portion, which is eventually gummed to the front wall, extends from the top wall.

[0006] In the course of the actual packing process, appropriate members on the machine successively withdraw the blanks from the store, restore the blanks to their tubular shape, insert the articles for packing, and, finally, close the end flaps.

[0007] The continuous operating time of machines of the above type, however, is seriously limited by the considerable thickness of the flattened tubular blanks, which, being three times the thickness of the cardboard sheet from which the blanks are formed, therefore limits accordingly the number of blanks that can be loaded into a store of given size.

[0008] Moreover, such machines employ good-quality, high-substance packing material to make up for the poor structural resistance of the cartons and so ensure a good degree of reliability and high output of the machine.

[0009] Consequently, packages produced on machines of the above type are of relatively high cost, at times out of all proportion to the type of article being packed.

[0010] Alternative packing machines have been proposed which employ flat blanks stacked inside a store, and which fold the flat blanks into cartons along preweakened bend lines by means of appropriate folding members, insert the articles, and then close the cartons by applying gum to the lateral and end portions.

[0011] It is an object of the present invention to provide a method of automatically packing articles inside respective cartons, and which provides for long-term

continuous operation and low production cost.

[0012] It is a further object of the present invention to provide a machine for packing articles inside respective cartons, which is of straightforward, versatile design.

[0013] Yet a further object of the present invention is to provide a carton formed from a blank enabling optimum use of the packing material to reduce production cost. Formed according to the teachings of the present invention, the carton is strong enough, especially as regards the lateral walls, for numerous applications, and may conveniently be used in particular for pharmaceutical products.

[0014] According to the present invention, therefore, there is provided a method of packing articles inside respective cartons, the method comprising the steps of:

(a) subjecting a portion of packing material to at least one preweakening operation and at least one cutting operation at a preweakening station and a cutting station respectively, to obtain an appropriately shaped blank;

(b) feeding the blank in a given direction to a folding station where the blank is at least partly folded and at least one of the articles is inserted inside the blank to form a respective at least partly closed carton; and

(c) possibly feeding the at least partly closed carton in a given direction to a gumming station where parts of the carton are gummed;

the method being characterized in that, at the folding station, at least one of the articles is fed in a direction perpendicular to the feed direction of the blank, and a front wall, a front side wall, a rear side wall and a first pair of end flaps of the blank are folded simultaneously about at least one of the articles; and in that, at the gumming station, a second pair of end flaps is folded and gummed onto the first pair of end flaps.

[0015] The present invention also relates to a machine for implementing the above method, and to a carton formed by such a method.

[0016] As the article is almost completely enclosed in a single operation at the folding station, thus eliminating any dimensional tolerances between the carton and the article contained inside, the blank may be of minimum size, thus resulting in a practically negligible amount of waste cardboard, and a reduction in the amount of packing material for disposal.

[0017] A number of preferred, non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a plan view of a blank in accordance with the present invention;

Figure 2 shows an axonometric view of a carton formed by folding the Figure 1 blank;

Figure 3 shows a schematic side view of a first

embodiment of a packing machine for packing articles inside respective cartons as shown in Figure 2; Figure 4 shows a plan view of the Figure 3 machine;

Figure 5 shows a plan view of a second embodiment of the machine according to the present invention;

Figure 6 shows an exploded view of a folding device forming part of the machine in Figures 3, 4 or Figure 5;

Figure 7 shows a detail of a packing spindle forming part of the Figure 6 folding device;

Figure 8 shows a device for moving two supporting elements supporting the carton in transit.

**[0018]** Blank 20 in Figure 1 is formed from a rectangular portion 30 of a strip 21 (Figures 3, 4, 5); portions  $A_1$  and  $A_2$  are cut and removed from portion 30 to obtain the outer contour shown in Figure 1; and cuts  $L_1$ ,  $L_2$ ,  $L_3$ ,  $L_4$  and deep preweakened bend lines (shown by the dash lines) are formed on blank 20 by devices described in detail later on. Figure 1 also shows the portions  $G_1$ ,  $G_2$ ,  $G_3$ ,  $G_4$  of blank 20 to which gum is applied by a gumming device (described later on) to gum certain mating parts of blank 20.

**[0019]** More specifically, blank 20 comprises a front wall 23 and a rear wall 24 joined to each other along one side by a front side wall 25, and in turn comprising respective pairs of end flaps 26, 27, which are eventually superimposed in the assembled configuration of carton 40 (Figure 2). Parts of end flaps 26, 27, i.e. portions  $G_1$ ,  $G_2$ ,  $G_3$ ,  $G_4$ , are coated with adhesive material in the course of the packing process so as to adhere to each other; portions  $G_1$  and  $G_2$  being located on the underside, and portions  $G_3$  and  $G_4$  on the topside of blank 20. On the opposite side to front side wall 25, a rear side wall 28 extends from rear wall 24, and comprises a foldable outer tongue 28a by which to open the fully closed carton 40; and end flaps 27 comprise respective pairs of transverse fold-in flaps 29a, 29b defined by cuts  $L_1$ ,  $L_2$ ,  $L_3$ ,  $L_4$ .

**[0020]** Figure 2 shows blank 20 folded to form a half-open carton 40, which is substantially the configuration of carton 40 produced by a folding station forming part of the packing machine according to the present invention.

**[0021]** Number 50 in Figures 3 and 4 indicates a first embodiment of the packing machine according to the present invention, wherein articles 10 for packaging are fed in a direction  $V_1$  parallel to the feed direction  $V_2$  of blanks 20.

**[0022]** Cartons 40 are formed by folding blanks 20, which, by means of preweakening and cutting operations as described with reference to Figure 1, are in turn formed from a strip 21 of appropriately preprinted packing material, e.g. cardboard or similar. Strip 21 is fed continuously off a reel 22 fitted to machine 50 about an axis 4 crosswise to the traveling direction of articles 10,

and is fed through a preweakening station 5, a print centering station 6, and a cutting station 7, all located in line and comprising members for forming, in known manner, a continuous succession of flat, substantially rectangular blanks 20 of a width equal to that of strip 21.

**[0023]** Downstream from cutting station 7, machine 50 comprises flexible conveying means 8, e.g. belts, for transferring blanks 20 to a folding station 60 for forming respective cartons 40 in time with the insertion of respective articles 10 inside cartons 40.

**[0024]** It should be stressed that, herein, the term carton 40 is intended to mean both an empty carton and a carton containing at least one article 10.

**[0025]** Figure 5 shows a second embodiment of packing machine 50 according to the present invention, wherein strip 21 of packing material is fed to blank cutting station 7 in a first direction  $V_2$  perpendicular to the feed direction  $V_1$  of articles 10. Blanks 20 are also fed in a second direction  $V_3$  parallel to direction  $V_1$ .

**[0026]** Whether the Figure 3, 4 or the Figure 5 solution is adopted depends on the floor space available for the machine at the production plant, and also on which solution provides for making the best use, economically speaking, of the work reels 22 from which the blanks are formed. That is to say, as the work reels are cut transversely from a much wider reel, the width of the work reel is determined according to whether the blank is best formed, economically speaking, crosswise or lengthwise of the strip, which in turn determines the adoption of the Figure 3, 4 or the Figure 5 solution. Obviously, the spacing of the blanks is selected according to the chosen width of the work reel 22.

**[0027]** Figure 6 shows a more detailed view of folding station 60. Article 10 is fed in directions  $V_1$ ,  $V_4$  to a lifting device 61, the upper face of which is moved into a position flush with the incoming blank 20 fed in direction  $V_2$  (Figure 4) or direction  $V_3$  (Figure 5) by conventional conveying means shown in Figures 3, 4 and 5.

**[0028]** As blank 20 partially enclosing article 10 is pushed upwards by lifting device 61 (direction  $V_5$ ), the upper face of blank 20 encounters a packing spindle 62 comprising a pair of parallel bars 63, 64 crosswise to the feed direction  $V_2$  (or  $V_3$ , Figure 5) of blank 20, and a pair of parallel bars 65, 66 perpendicular to bars 63, 64.

**[0029]** Packing spindle 62 is basically characterized by bars 63, 64 being fixed with respect to the frame of machine 50, and by bars 65, 66 being movable in directions  $V_6$ ,  $V_7$  perpendicular to the feed direction  $V_2$  (or  $V_3$ , Figure 5) of blank 20. In the rest position, bars 65, 66 are positioned as shown by the continuous line in Figure 6, and, when activated by means not shown in Figure 6, are moved in direction  $V_6$ , for the reason explained later on, into the positions shown by the dash line.

**[0030]** The devices for moving bars 65, 66 are shown in more detail in Figure 7.

**[0031]** With reference to Figure 7, bars 65, 66 are moved in directions  $V_6$ ,  $V_7$  by means of respective actu-

ators (not shown), and by means of respective rods 73, 74 integral with bars 65, 66 and sliding inside respective guides 75, 76 fitted to a supporting plate 77. To slide horizontally, bars 65, 66 comprise respective slots 65a, 66a, which may assume any position between two limit positions defined by respective pins 65b, 66b fixed with respect to supporting plate 77.

[0032] As the upper surface of blank 20 contacts packing spindle 62 (Figure 6), front wall 23, front side wall 25, rear side wall 28 and a first pair of end flaps 27 - all elements forming part of blank 20 as shown in Figures 1 and 2 - are simultaneously folded downwards; and article 10 is pushed by lifting device 61 against the still-horizontal rear wall 24 of blank 20, and is partly enclosed by the various component elements of blank 20 to commence the formation of carton 40.

[0033] The possibility of moving bars 65, 66 in direction  $V_6$  from the continuous-line to the dash-line positions in Figure 6 represents an important innovation, by permitting lifting device 61 to be raised fully without end flaps 26 colliding with bars 65, 66 and so damaging blank 20.

[0034] In other words, the outward movement of bars 65, 66 in direction  $V_6$ , as effected by the means shown in Figure 7, enables blank 20 to be fed upwards already partly enclosing article 10.

[0035] Once blank 20 and respective article 10 have been fed through, bars 65, 66 move back, in the opposite direction  $V_7$  to direction  $V_6$ , into the positions shown by the continuous line, ready to commence the next cycle on another blank 20 and another article 10 fed respectively in direction  $V_2$  (or  $V_2, V_3$ ) and directions  $V_1, V_4, V_5$ .

[0036] Following the folding operation by packing spindle 62, a comb-shaped element 67, operated by conventional actuating means, pushes foldable tongue 28a between the upper surface of lifting device 61 and the lower surface of article 10. As stated with reference to Figures 1 and 2, foldable tongue 28a is employed by the user to open carton 40 to extract article 10, and is therefore not normally gummed to other parts of blank 20 during the formation of carton 40. Provision may be made, however, for a spraying device (not shown) for applying gum to front wall 23, prior to operation of lifting device 61, so that foldable tongue 28a adheres to front wall 23.

[0037] Once foldable tongue 28a is inserted beneath carton 40, carton 40 is pushed, by rear side wall 28, to a gumming station 70 (Figures 3, 4, 5) by a push device 68 activated by mechanical cam means (not shown), and which performs a "hoeing" up-and-back movement to avoid colliding with the next carton 40 coming up in direction  $V_8$ . The forceful thrust exerted by push device 68 towards a conveyor belt 69 (Figures 3-6), traveling in a direction  $V_9$  between folding station 60 and gumming station 70, folds front wall 23 beneath carton 40 and into a position parallel to the overlying rear wall 24; the gap between the parallel front and rear walls 23 and 24 by

now being occupied by article 10.

[0038] In the course of the folding operation by packing spindle 62, the pairs of fold-in flaps 29a and 29b are drawn respectively by respective end flaps 27 onto front side wall 25 and rear side wall 28, but inside carton 40.

[0039] At this stage, the two end flaps 26 are still free and, on leaving folding station 60, are perpendicular to the other two end flaps 27.

[0040] Gumming station 70 downstream from folding station 60 (Figure 6) is a conventional type comprising a bottom conveyor 69, a pair of top conveyors 71, and a number of spraying devices 72 for applying gum to end flaps 26, 27.

[0041] Two commonly used folding devices (not shown in Figure 6) finally fold respective end flaps 26 onto corresponding end flaps 27.

[0042] By this time, therefore, all the component elements of blank 20 have been folded and end flaps 26 gummed onto corresponding end flaps 27 to form a complete carton 40 containing article 10.

[0043] Finally, packing machine 50 comprises two supporting elements 78, 79 (Figures 6 and 8) located at packing spindle 62 and for supporting carton 40 during operation of comb-shaped element 67 and push device 68.

[0044] Supporting elements 78, 79 (Figure 8) are moved by a grooved cam 80, which in turn is moved by means not shown in Figure 8, and is connected to at least two connecting rods 81, of which only one is shown for the sake of simplicity. Connecting rod 81 is connected to supporting means 82, may assume any of the positions between those indicated by the normal and thin lines in Figure 8, and is connected by a hinge pin 83 to a substantially horizontal rod 84 movable in directions  $V_{10}, V_{11}$  parallel to directions  $V_6, V_7$ .

[0045] Rod 84 comprises two inclined slots 84a, 84b engaged by respective guide pins 85a, 85b integral with respective supports 86a, 86b.

[0046] Rod 84 also comprises two horizontal slots 87a, 87b engaged by respective pins 88a, 88b of respective supporting elements 79, 78.

[0047] Consequently, when rod 84 is moved in direction  $V_{10}$  by grooved cam 80 and connecting rod 81, guide pins 85a, 85b engaging slots 84a, 84b raise rod 84, so that pins 88a, 88b engaging horizontal slots 87a, 87b rotate supporting elements 78, 79 about respective pins 78a, 79a.

[0048] By appropriately timing the movements of packing spindle 62 and supporting elements 78, 79, therefore, carton 40 is pushed up by device 61 into a position slightly higher than supporting elements 78, 79, which, moving in direction  $V_{11}$ , are positioned beneath carton 40 to support it as required.

[0049] Comb-shaped element 67 may be moved using a device (not shown) comprising a cam fitted to the same shaft as grooved cam 80, and which, by means of a connecting rod, provides for moving in direction  $V_{12}$  a sleeve 89 integral with an L-shaped element 90 in turn

integral with comb-shaped element 67. The movements of comb-shaped element 67 are thus timed with those of supporting elements 78, 79, while push device 68, as stated, performs a "hoeing" movement produced by a device (not shown), and which is also appropriately timed with the other movements.

**[0050]** The method according to the present invention therefore provides for automatically packing articles 10 inside respective cartons 40, while at the same time ensuring long-term continuous operation and low production cost. In particular, the production cost of cartons 40 has been estimated at roughly 50% that of conventional cartons.

**[0051]** Moreover, the transverse side walls of carton 40 according to the present invention are formed by superimposing and gumming end flaps 26, 27, so that the thickness of the resisting walls of carton 40 is practically doubled, thus enabling the use of cheaper lower-substance packing material, while at the same time ensuring greater strength of carton 40 as a whole.

**[0052]** Needless to say, blanks 20 formed using the method described may be fed to packing machine 50 from conventional stores.

**[0053]** Clearly, changes may be made to the method, machine and carton as described and illustrated herein without, however, departing from the scope of the present invention.

## Claims

1. A method of packing articles (10), fed in a given direction ( $V_1$ ), inside respective cartons (40), the method comprising the steps of:

- subjecting a portion (30) of packing material to at least one preweakening operation and at least one cutting operation at a preweakening station (5) and a cutting station (7) respectively, to obtain an appropriately shaped blank (20);
- feeding said blank (20) in a given direction ( $V_2$ ;  $V_2$  and  $V_3$ ) to a folding station (60) where said blank (20) is at least partly folded and at least one of said articles (10) is inserted inside said blank (20) to form a respective at least partly closed carton (40); and
- possibly feeding said at least partly closed carton (40) in a given direction ( $V_9$ ) to a gumming station (70) where parts of said carton (40) are gummed;

the method being characterized in that, at said folding station (60), at least one of said articles (10) is fed in a direction ( $V_5$ ) perpendicular to said feed direction ( $V_2$ ;  $V_2$  and  $V_3$ ) of said blank (20); at said folding station (60), a front wall (23), a front side wall (25), a rear side wall (28) and a first pair of end flaps (27) of said blank (20) are folded simultaneously about at least one of said articles (10); and, at

the gumming station (70), a second pair of end flaps (26) is folded and gummed onto said first pair of end flaps (27).

2. A method as claimed in Claim 1, wherein, at said folding station (60), a tongue (28a) is also folded beneath said carton (40) by comb-shaped means (67) operated by appropriate mechanical means.
3. A method as claimed in any one of the foregoing Claims, wherein, at said folding station (60), push means (68) push said carton (40) in a given direction ( $V_9$ ) onto conveying means (69), so as to simultaneously fold a front wall (23) of said carton (40) beneath the carton (40) itself.
4. A packing machine (50) comprising:
  - at least a preweakening station (5) and at least a cutting station (7) for obtaining an appropriately shaped blank (20);
  - means for feeding said blank (20) in a given direction ( $V_2$ ;  $V_2$ ,  $V_3$ ) to at least a folding station (60) where said blank (20) is at least partly folded and at least one of said articles (10) is inserted inside said blank (20) to form a respective at least partly closed carton (40); and
  - means for feeding said at least partly closed carton (40) in a given direction ( $V_9$ ) to at least a gumming station (70) where parts of said carton (40) are gummed;

characterized by comprising means for feeding at least one of said articles (10) to said folding station (60) in a direction ( $V_5$ ) perpendicular to said feed direction ( $V_2$ ;  $V_2$ ,  $V_3$ ) of said blank (20); means for simultaneously folding, at said folding station (60), a front wall (23), a front side wall (25), a rear side wall (28) and a first pair of end flaps (27) of said blank (20) about at least one of said articles (10); and at least a gumming station (70) where a second pair of end flaps (26) is folded and gummed onto said first pair of end flaps (27).

5. A packing machine (50) as claimed in Claim 4, wherein said folding station (60) comprises a packing spindle (62) in turn comprising two first elongated elements (63, 64) crosswise to the feed direction ( $V_2$ ;  $V_2$ ,  $V_3$ ) of said blank (20), and two second elongated elements (65, 66) perpendicular to said two first elongated elements (63, 64); and wherein said two second elongated elements (65, 66) are parted by appropriate mechanical means in a given parting direction ( $V_6$ ) as said carton (40) is raised by a lifting device (61) in a direction ( $V_5$ ) perpendicular to said parting direction ( $V_6$ ).

6. A packing machine (50) as claimed in Claim 5, wherein said two second elongated elements (65, 66) are moved towards each other by appropriate mechanical means in a given approach direction ( $V_7$ ) as soon as said carton (40) has been fully raised by said lifting device (61). 5
7. A packing machine (50) as claimed in any one of the foregoing Claims from 4 to 6, wherein said folding station (60) also comprises a comb-shaped element (67) moved by appropriate mechanical means to fold a tongue (28a) beneath said carton (40). 10
8. A packing machine (50) as claimed in any one of the foregoing Claims from 4 to 7, wherein said folding station (60) also comprises a push device (68) for pushing a rear side wall (28) of said carton (40) in a given direction ( $V_9$ ) to feed said carton (40) to conveying means (69, 71) in such a manner as to simultaneously fold a front wall (23) beneath said carton (40). 15 20
9. A packing machine (50) as claimed in any one of the foregoing Claims from 4 to 8, wherein two supporting elements (78, 79) for supporting the carton (40) in transit are moved by a first grooved cam device (80). 25
10. A packing machine (50) as claimed in Claim 9, wherein said comb-shaped element (67) is moved by a second grooved cam device timed with respect to said first grooved cam device (80). 30
11. A packing machine (50) as claimed in any one of the foregoing Claims from 4 to 10, wherein said blanks (20) are fed to the folding station (60) in a direction ( $V_2$ ) substantially parallel to the feed direction ( $V_1$ ) of said articles (10). 35
12. A packing machine (50) as claimed in any one of the foregoing Claims from 4 to 10, wherein said blanks (20) are fed to the folding station (60) in directions ( $V_2$ ,  $V_3$ ) at least partly perpendicular to the feed direction ( $V_1$ ) of said articles (10). 40 45
13. A carton (40) formed from a blank (20), characterized in that said blank (20) comprises a front wall (23) and a rear wall (24) connected to each other along one side by a front side wall (25) and comprising respective pairs of end flaps (26, 27) which are superimposed in the assembled configuration of said carton (40). 50
14. A carton (40) as claimed in Claim 13, wherein a rear side wall (28) extends on the opposite side to said front side wall (25) of said blank (20), i.e. from said rear wall (24), and comprises an outer foldable tongue (28a) by which to open the fully closed said carton (40); said end flaps (26, 27) also comprising respective pairs of transverse fold-in flaps (29a, 29b). 55
15. A carton (40) as claimed in Claim 13 or 14, wherein said blank (20) is formed from a rectangular portion (30) of packing material, from which portions ( $A_1$ ,  $A_2$ ) are cut and removed, and in which cuts ( $L_1$ ,  $L_2$ ,  $L_3$ ,  $L_4$ ) and deep preweakened bend lines are formed.

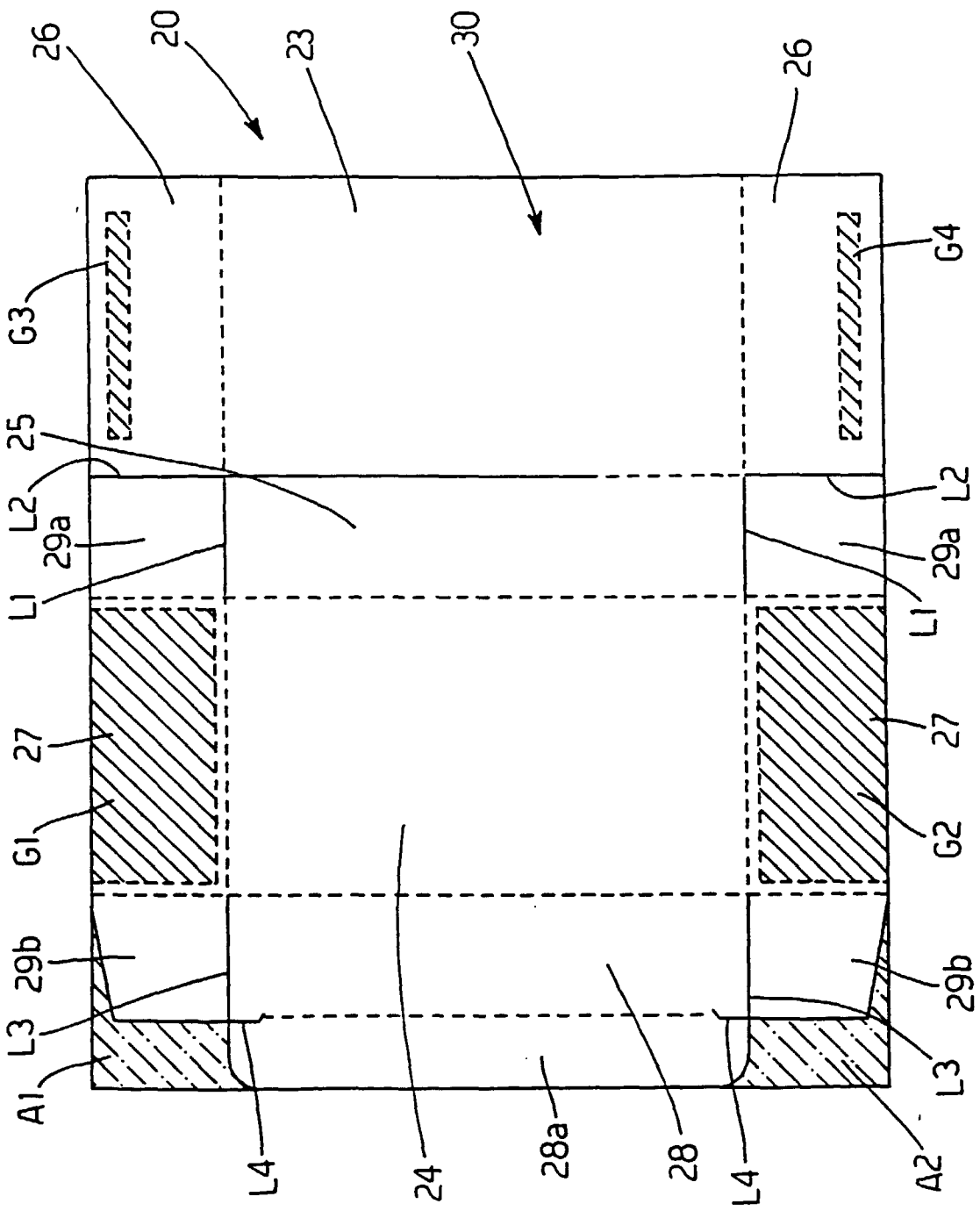


Fig.1

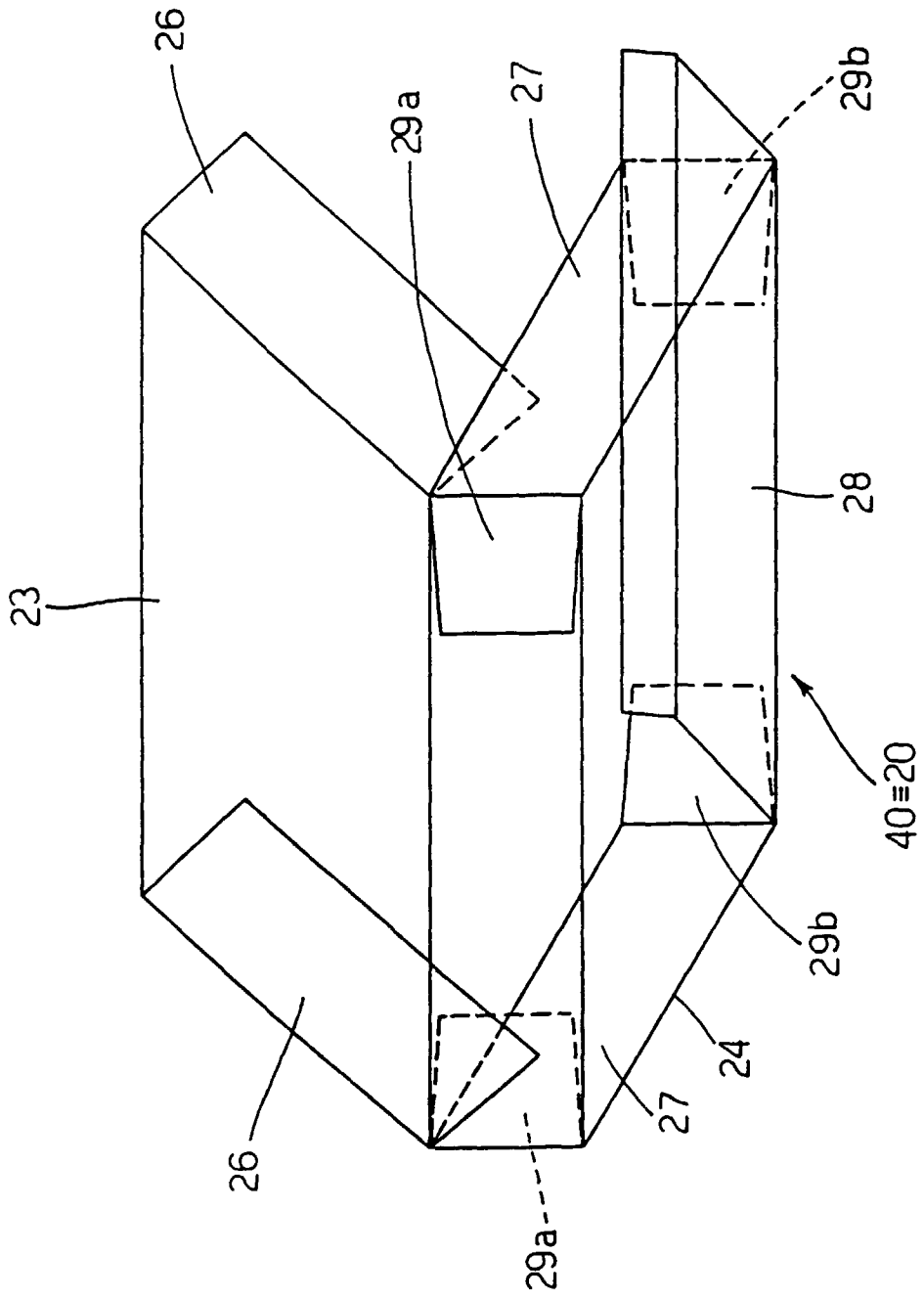


Fig.2

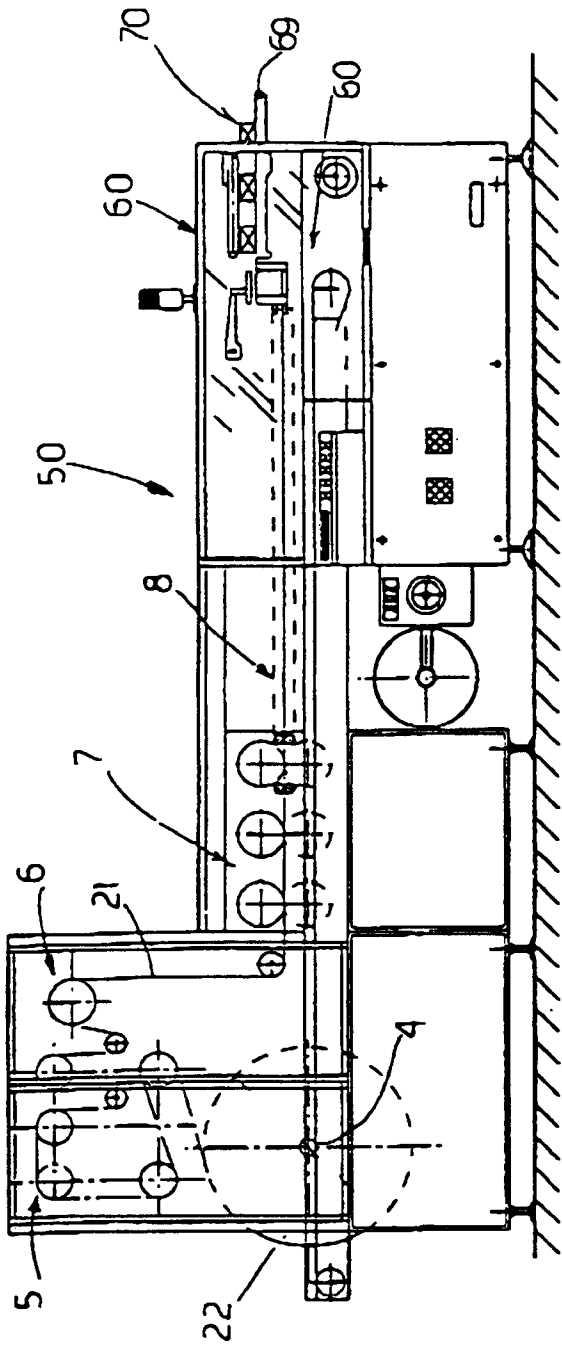


Fig.3

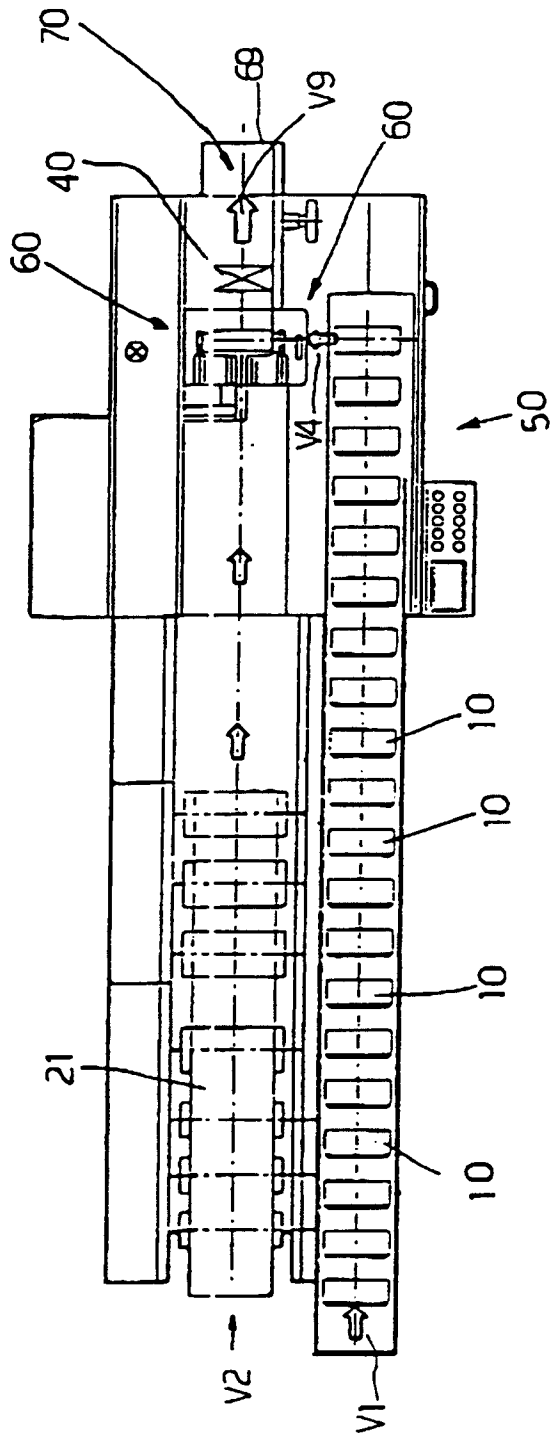


Fig.4



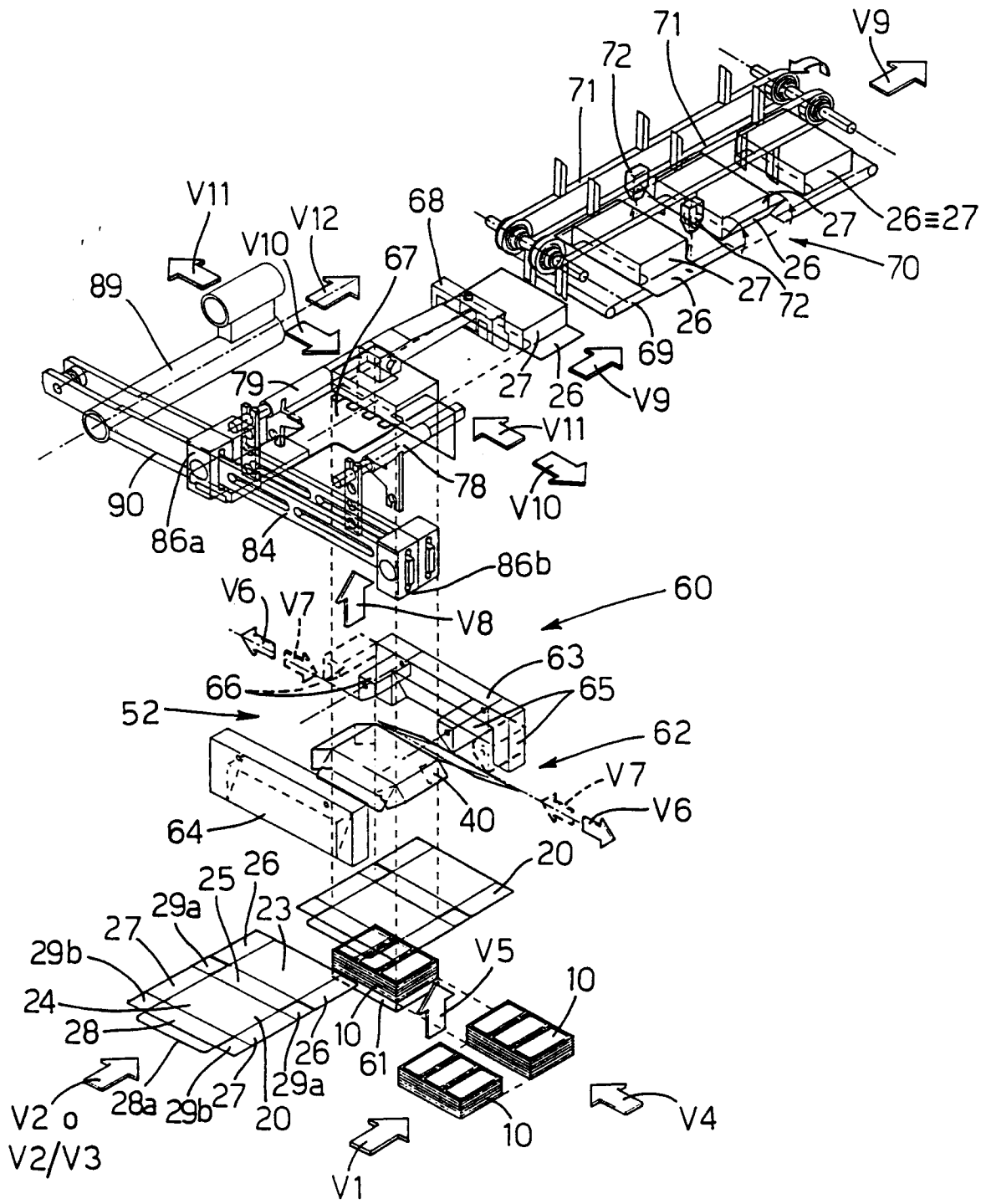


Fig.6

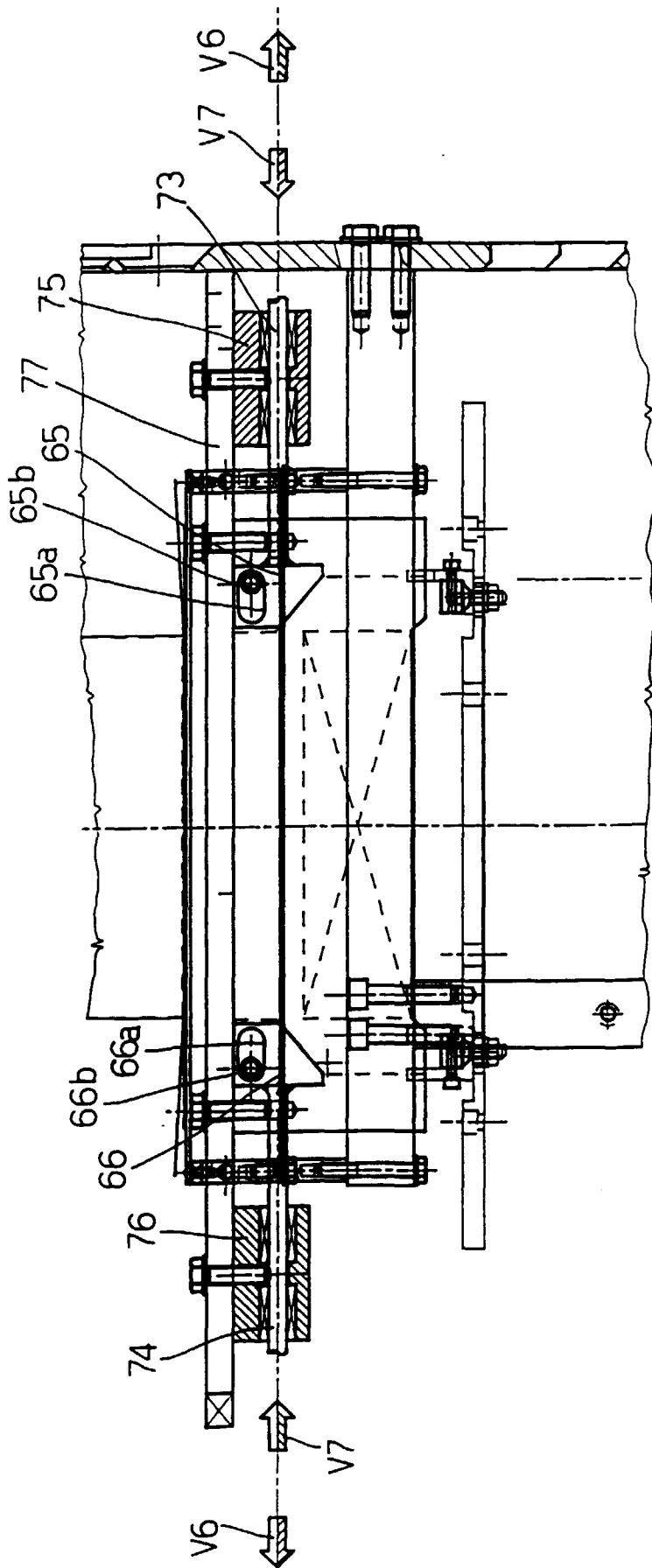


Fig.7

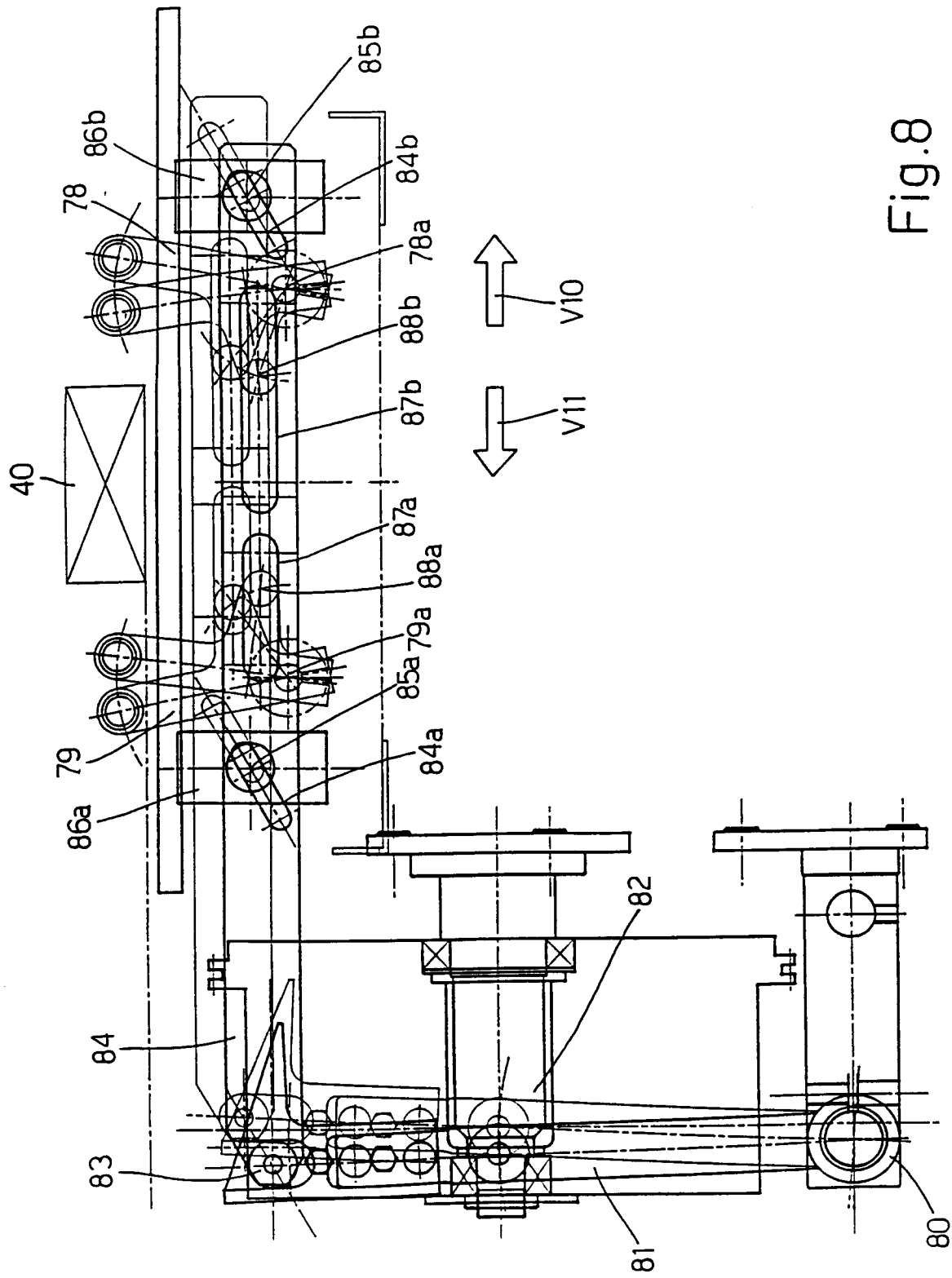


Fig.8



European Patent  
Office

EUROPEAN SEARCH REPORT

Application Number  
EP 98 11 8597

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			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
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The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 7 January 1999	Examiner Bridault, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 98 11 8597

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