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(11)

EP 1 346 916 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

24.09.2003 Bulletin 2003/39

(51) Int Cl.7: **B65B 19/22, B65B 61/20**

(21) Application number: **03425075.3**

(22) Date of filing: **10.02.2003**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT SE SI SK TR**

Designated Extension States:

AL LT LV MK RO

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(30) Priority: **27.02.2002 IT BO20020096**

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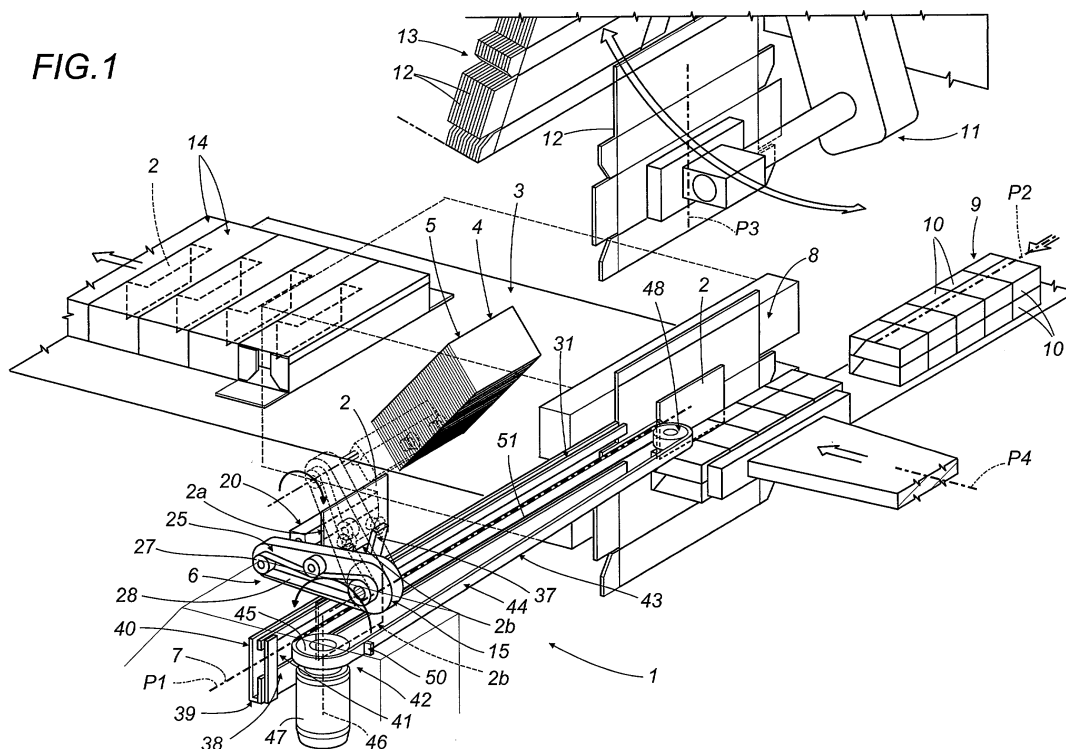
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(54) **A method and a unit for feeding elements of sheet material to a product wrapping line**

(57) Coupons (2) are fed from a supply station (4) to an assembly station (8) forming part of a wrapping line (3), where they are associated each with a relative product (9). The coupons (2) are engaged along one vertical edge (2a) by the lugs (50) of a looped conveyor

belt (44), pushed a set distance along a transfer line (7) sliding internally of a guide channel (31), and released by the belt only after entering the assembly station (8), where the single coupon (2) comes to rest interposed between a product (9) and a relative wrapper blank (12).

FIG.1



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Description

[0001] The present invention relates to a method of feeding elements of sheet material to a product wrapping line.

[0002] The invention finds application to advantage in the tobacco industry, where the wrapping line of a packaging machine, typically a cigarette packer or cartoner, is supplied with slips of sheet material consisting in particular of "plain" coupons that appear as a single leaf, or "folded" coupons that present at least two mutually overlapping portions connected along one side; direct reference is made to this same field in the following specification, albeit with no limitation implied.

[0003] It is standard practice in the tobacco industry for single packets or pluralities of packets to be furnished with a respective plain or folded coupon at an assembly station located along the wrapping line aforementioned; the coupons are drawn from a supply which, in view of the size and architecture of the packer or cartoner, is located at a given distance from the assembly station.

[0004] In general, the coupons are directed from the supply to the assembly station along a transfer line by a conveying element that retains the single coupons by suction and feeds them in succession to the station, synchronously with the operation of the wrapping devices.

[0005] Whilst the technology in question is simple and inexpensive to implement, it presents considerable problems in the event that the coupons fed to the wrapping line are folded, as the conveying element engages only one of the folded parts of the coupon by suction, whereas there is no positional control of any kind over the remaining folded portion or portions and these are liable to flutter freely, becoming detached from the portion held by suction.

[0006] To overcome this drawback and develop a conveying technology suitable both for plain coupons and for folded coupons, the prior art embraces conveying elements consisting in mutually opposed rollers or belts by which the coupons are gripped positively and carried thus toward the devices of the wrapping line.

[0007] This type of conveying technology betrays certain drawbacks nonetheless, deriving from the fact that the coupons can lose contact with the rollers or the belts and become incorrectly positioned along the transfer path. In the case of folded coupons moreover, this loss of contact can result in the overlapped portions shifting one in relation to another, so that the correct folded configuration of the actual coupon is disrupted.

[0008] A further drawback stems from the fact that, in order to avoid contact with the wrapping devices, the conveying elements in question must necessarily release the coupons at a given distance short of the aforementioned assembly station; this means that the coupons are effectively pitched into the station and their flight is difficult to control.

[0009] The object of the present invention is to provide

a conveying method that will allow both plain and folded coupons to be transferred with no problems whatsoever.

[0010] The stated object is realized according to the present invention in a method for feeding elements of sheet material to a product wrapping line, whereby elements of sheet material are conveyed from a supply station to an assembly station and united with relative products, characterized in that it comprises at least the step of pushing the elements of sheet material along a predetermined transfer line and through a predetermined distance into the assembly station.

[0011] The present invention relates similarly to a unit by which elements of sheet material are fed to a product wrapping line.

[0012] A unit according to the present invention for feeding elements of sheet material to a product wrapping line, by which elements of sheet material are conveyed from a supply station to an assembly station and united with relative products, is characterized in that it comprises pushing means such as will direct the elements of sheet material along a predetermined transfer line and through a predetermined distance into the assembly station.

[0013] The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figure 1 illustrates a unit embodied in accordance with the present invention for feeding elements of sheet material to a station of a packaging machine at which they are assembled with relative products, viewed schematically in perspective with certain parts omitted;
- figure 2 shows the unit of figure 1 in a schematic plan view, with certain parts omitted;
- figure 3 shows the unit of figure 1 in a schematic side elevation, with certain parts omitted;
- figure 4 shows an enlarged detail of the unit in figure 1 and figure 3, viewed schematically and in perspective;
- figure 5 shows a detail of figure 3, viewed schematically and in perspective;
- figures 6 and 7 show a detail of figure 1, viewed schematically and in perspective and illustrated in two successive operating steps.

[0014] Referring to figure 1 of the drawings, 1 denotes a unit, in its entirety, for feeding elements 2 of sheet material to a packaging machine of which the drawings show a wrapping line 3.

[0015] More exactly, the elements 2 of sheet material present a substantially rectangular outline and consist in coupons of either "plain" or "folded" type, which are drawn from a supply 4 serving as a distribution station and consisting in a stack 5 of the elements 2 of sheet material. The elements 2 are taken up by respective feed means 6 and placed at the infeed end of a transfer line 7 extending along a substantially horizontal first

feed path P1 toward an assembly station 8 located at the entry point of the wrapping line 3.

[0016] This same assembly station 8 is in receipt of substantially parallelepiped products 9, appearing in the example of the drawings as single packets of cigarettes 10 ordered into groups and directed thus along a second feed path P2 substantially parallel to the first feed path P1.

[0017] Also directed into the assembly station 8, along a substantially vertical third path P3 and through the agency of respective feed means 11, are single sheets of wrapping material consisting in diecut blanks 12 taken from a stack 13 and destined each to provide the wrapper for a respective carton 14 emerging from the wrapping line 3, which extends along a substantially horizontal fourth path P4 transverse to the first and second paths P1 and P2. The products 9 and the relative wrapper blanks 12 are brought together at the assembly station 8, positioned one facing another transversely to the wrapping line 3.

[0018] Observing figures 1 to 5 it will be seen that the feed means 6 comprise a rocking arm 15 anchored pivotably at one end to a shaft 16 of which the axis 17 extends parallel to the first feed path P1, mounted to a frame 18 and capable thus of angular movement about the axis 17 through the agency of a first motor 19 connected to the shaft 16 by way of a mechanical linkage 19a (figures 2 and 5), between a first raised position indicated by solid lines in figure 3, and a second lowered position indicated by phantom lines in figure 3.

[0019] The free end of the arm 15 carries a pneumatic holder 20 mounted to a respective shaft 21 of which the axis 22 extends parallel to the axis 17 first mentioned. The holder 20 consists in a block 23 keyed to the free end of the shaft 21 and equipped with a plurality of suction cups 24 able to attract and retain the elements 2 of sheet material.

[0020] Referring to figures 3, 4 and 5 in particular, the rocking arm 15 incorporates a first drive 25 comprising a wheel 26 mounted rotatably to the one shaft 16 and fixed relative to the frame 18, also a pulley 27 (figure 4) keyed to the other shaft 21 and free to rotate relative to the arm 15.

[0021] The same first drive 25 also comprises a belt 28, looped around the wheel 26 and the pulley 27 and tensioned by a jockey roller 29. The arrangement of the drive 25 is such that in operation, when the shaft 16 is made to rotate (clockwise in figure 3) by the first motor 19 about the relative axis 17, which lies remote from the plane occupied by the element 2 of sheet material, the wheel 26 remains stationary whilst the arm 15 is caused to rock, and the resulting movement induced in the belt 28 thus causes the pulley 27 to rotate (anticlockwise in figure 3) about the corresponding axis 22, which lies substantially parallel to the plane occupied by the element 2 of sheet material.

[0022] The function of the wheel 26, accordingly, is to determine the orientation of the block 23 relative to the

corresponding axis 22 whenever the shaft 16 is set in rotation.

[0023] The pulley 27, being keyed to the shaft 21 as mentioned previously, causes the block 23 likewise to rotate in the same anticlockwise direction and to move, as the arm 15 rotates, from the position illustrated by solid lines in figure 3, in which the suction cups 24 actively engage the bottom of the stack 5, to the position illustrated by phantom lines in figure 3 in which the element 2 of sheet material is positioned vertically over the transfer line 7.

[0024] As discernible in figures 2, 3 and 4, the feed means 6 also include take-up and insertion means 30 serving to carry out a final step of transferring the elements 2 of sheet material from the suction cups 24 into a guide channel 31 extending along the feed path P1 followed by the transfer line 7.

[0025] The take-up and insertion means 30 comprise a first pair of rollers 32 mounted to the opposite ends of a shaft 33 extending parallel to the first path P1, carried between a pair of uprights 34 supported on the frame 18, and a second pair of rollers 35 mounted freely to respective pivots 36 carried by the selfsame uprights 34 and operating in conjunction with the first rollers 32 in such a way as to take up the element 2 of sheet material from the suction cups 24, with the aid also of a chute denoted 37, and insert it into an infeed end of the guide channel 31.

[0026] The channel 31 presents a profile substantially of "U" shape when seen in section, composed of a front side wall 38, a bottom track 39 and a rear side wall 40 (figures 1 and 2), extending from the infeed end through a predetermined distance as far as the assembly station 8, of which the front side wall 38 affords a slot 41 disposed parallel to the first feed path P1.

[0027] Following the final transfer step effected by the rollers 32 and 35, the element 2 of sheet material occupies the guide channel 31 with a first edge 2a disposed perpendicular to the bottom track 39 of the selfsame channel, addressing the infeed end, and a second edge 2b in contact with the track 39.

[0028] Observing figures 1 to 4, the unit 1 comprises pushing means 42 positioned alongside the guide channel 31, such as will manoeuvre each element 2 of sheet material along the transfer line 7 from the infeed end of the channel 31 to the assembly station 8.

[0029] The pushing means 42 in question include conveyor means 43, describing and capable of movement along a closed path comprising a forward leg that extends the full length of the channel 31. In particular, the conveyor means 43 incorporate a belt 44 looped around two pulleys of which one, denoted 45, is positioned at the infeed end of the channel 31 and mounted to the vertically disposed shaft 46 of a second motor 47, and the other, denoted 48, is positioned near the assembly station 8 and mounted to a shaft 49 disposed parallel to the shaft 46 of the motor 47.

[0030] The looped belt 44 is furnished with pushing

elements appearing as equispaced projections 50, and disposed with one branch 51, extending along the aforementioned forward leg of the looped path, that runs breasted with and along the slot 41 in such a way that the projections 50 are able to pass internally of the channel 31. The pushing elements afforded by the projections 50 are set in motion cyclically between a position of interception and contact with the aforementioned first edge 2a of an element 2 positioned at the infeed end of the guide channel 31, and a position coinciding substantially with the assembly station 8, at which the element 2 is released when contact between the projection 50 and the first edge 2a of the element 2 ceases.

[0031] It will be observed (referring to figure 2), that the rollers 32 are set in rotation by the first motor 19, independently of the second motor 47, through the agency of a second drive denoted 52, and (referring to figures 1, 6 and 7) that the assembly station 8 is equipped with a push rod 53 reciprocating along the fourth path P4 and serving to advance each product 9 together with a relative wrapper blank 12, between which an element 2 of sheet material is inserted transversely to the wrapping line 3. Entry to the assembly station 8 is afforded by a pair of walls 54 and 55 positioned respectively above and below the wrapping line 3, combining to function as the mouth 56 of a folding tunnel, and consequently as reaction means with which the group of packets 10 and the respective blank 12 are caused to interact after an element 2 of sheet material has been interposed between them. Thereafter, as readily discernible from figure 1, the operation of folding the blank 12 around the packets 10 and the element 2 of sheet material is completed along the wrapping line 3 by conventional folder means not illustrated in the drawings.

[0032] The operation of the unit will be obvious to a person skilled in the art having read the foregoing description.

[0033] It may usefully be reiterated nonetheless that, once the first edge 2a presented by the element 2 of sheet material is engaged by a projection 50 on the belt 44 of the conveyor means 43, a situation of constant contact is established between the first edge 2a of the element 2 and the relative projection 50, resulting in a pushing action that continues along the entire length of the transfer line 7 from the infeed end of the channel 31 to the assembly station 8, terminating only at the release position when contact between the edge 2a and the projection 50 can no longer be maintained.

Claims

1. A method for feeding elements of sheet material to a product wrapping line, whereby the elements (2) of sheet material are conveyed from a supply station (4) to an assembly station (8) and united with relative products (9),

characterized

in that it includes at least a step of pushing the elements (2) of sheet material along a predetermined transfer line (7) and through a predetermined distance into the assembly station (8).

2. A method as in claim 1, wherein the pushing step comprises a step of intercepting and engaging in contact with the element (2) of sheet material along a first edge (2a) substantially perpendicular to the transfer line (7), a pushing step during which contact is maintained with a predetermined area of the first edge (2a), and a release step during which contact with the first edge (2a) ceases.
3. A method as in claim 2, wherein the pushing step is brought about by maintaining contact between the predetermined area of the first edge (2a) of the element (2) of sheet material, and relative pushing means (42).
4. A method as in claim 2, wherein the pushing step, at least, occurs along a guide channel (31) extending along the transfer line (7), presenting a bottom track (39) disposed substantially parallel to the transfer line (7) and offered to a second edge (2b) of the element (2) of sheet material, and two restraining side walls (38, 40).
5. A method as in claim 4, comprising a step of feeding the elements (2) of sheet material from a supply (4), coinciding with the supply station, to the infeed end of the channel (31), wherein the feeding step comprises a final step of taking up the element (3) of sheet material and inserting it into the channel (31), thereby ensuring that each successive element (2) of sheet material can be positioned within the channel (31).
6. A method as in claim 5, wherein the step of feeding elements (2) of sheet material from the supply (4) to the infeed end of the channel (31) involves a first rotational movement about an axis (17) lying remote from the plane occupied by the element (2) of sheet material, and a second rotational movement simultaneous with the first about an axis (22) lying in close proximity to the selfsame plane.
7. A method as in claims 1 to 6, comprising a step, occurring on completion of the pushing step and at a point coinciding with the assembly station (8), of interposing each element (2) of sheet material between a product (9) and a respective wrapper blank (12).
8. A method as in claim 7, comprising a step in which the assembly composed of the product (9), the relative element (2) of sheet material and a relative

wrapper blank (12), is pushed along a path (P4) extending transversely to the predetermined transfer line (7) to the end of bringing about a folding and wrapping operation.

9. A method as in claims 1 to 8, wherein the timing of the pushing step is predetermined and coordinated with that of the steps by which the elements (2) of sheet material are fed, picked up and inserted into the channel (31).

10. A unit for feeding elements of sheet material to a product wrapping line, by which elements (2) of sheet material are conveyed from a supply station (4) to an assembly station (8) and united with relative products (9), **characterized in that** it comprises pushing means (42) such as will direct the elements (2) of sheet material along a predetermined transfer line (7) and through a predetermined distance into the assembly station (8).

11. A unit as in claim 10, wherein pushing means (42) comprise relative pushing elements (50) capable of movement occurring cyclically between a position of interception and contact with a first edge (2a) of the element (2) of sheet material substantially perpendicular to the transfer line (7), and a release position at which contact with the first edge (2a) ceases, along the transfer line (7).

12. A unit as claim 11, wherein pushing means (42) comprise conveyor means (43) capable of movement along forward and return legs of a closed path of which the forward leg extends substantially along the transfer line (7).

13. A unit as in claim 12, wherein conveyor means (43) comprise a belt (44) looped around two pulleys (45, 48), of which one is power driven, and furnished with a plurality of equispaced projections (50) constituting the pushing elements.

14. A unit as in claim 13, wherein conveyor means (43) comprise a guide channel (31) extending along the transfer line (7) and presenting a section of "U" profile composed of two restraining side walls (38, 40) and a bottom track (39) disposed substantially parallel to the transfer line (7), of which the track (39) is offered to a second edge (2b) of the element (2) of sheet material, and at least one of the side walls (38, 40) presents a longitudinal slot (41) affording a passage to the pushing elements (50).

15. A unit as in claims 10 to 14, comprising feed means (11), associated with the assembly station (8), by which successive wrapper blanks (12) are directed along a feed path (P3) transverse to the transfer line (7) and positioned in a plane substantially parallel

to the plane occupied by the element (2) of sheet material, also a pusher device (53), positioned to engage a product (9) occupying the assembly station (8) and capable of reciprocating movement along a path (P4) transverse to the plane occupied by the wrapper blanks (12), wherein the element (2) of sheet material is interposed between a respective product (9) and a respective wrapper blank (12) at the assembly station (8).

16. A unit as in claim 15, comprising reaction means (54, 55) located along the path (P4) followed by the pusher device (53), of which the function is to perform a folding operation.

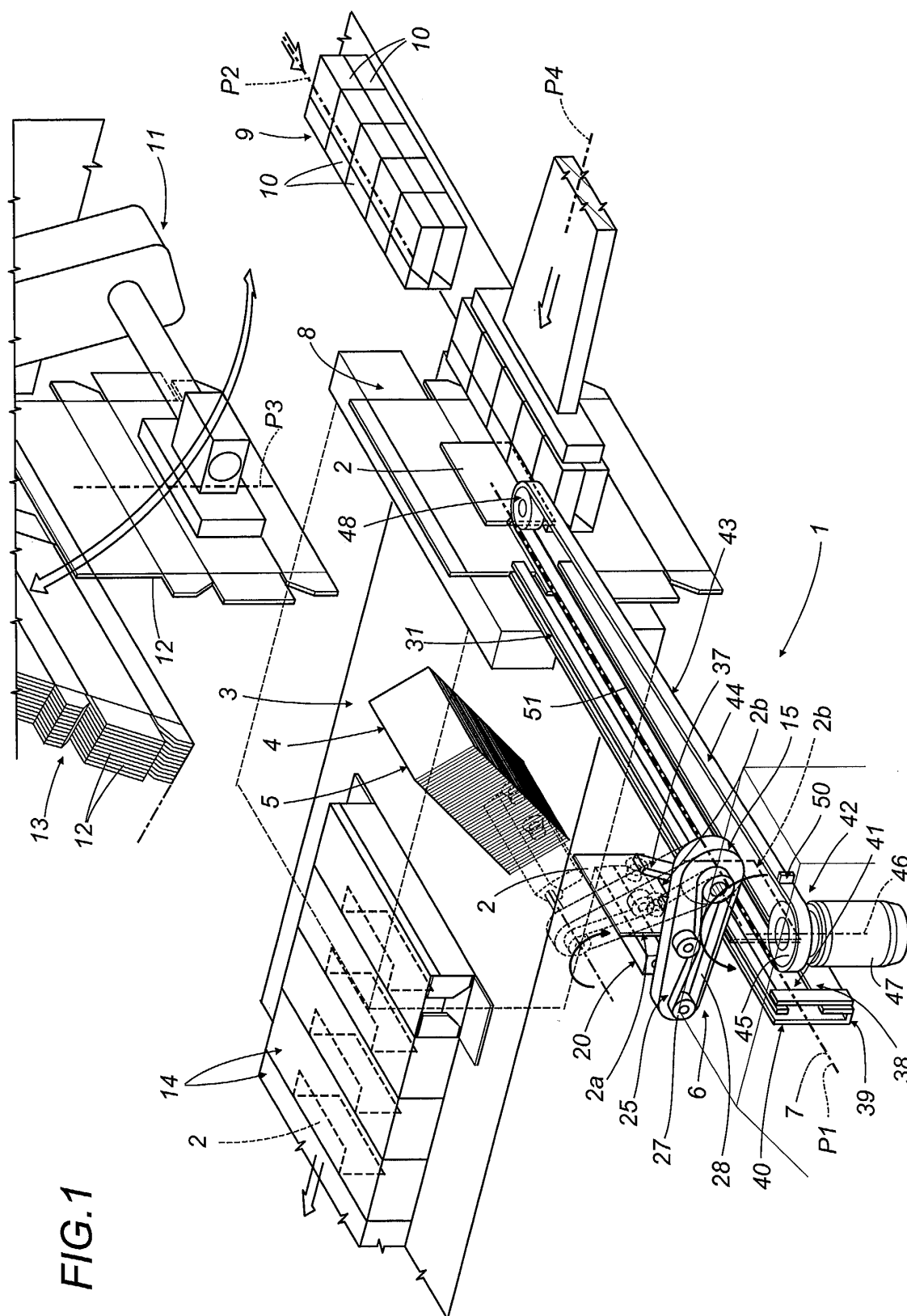
17. A unit as in claim 14, comprising feed means (6) by which the elements (2) of sheet material are conveyed from a supply (4) to the infeed end of the channel (31).

18. A unit as in claim 17, wherein feed means (6) comprise a rocking arm (15) pivotable about a first axis (17) of rotation substantially parallel to the transfer line (7), of which the free end carries holder means (20) pivotable about a second axis (2) of rotation parallel to the first axis (17).

19. A unit as in claim 18, wherein the rocking arm (15) is caused to pivot about the first axis (17) in a direction opposite to the direction in which the holder means (20) are caused to pivot about the second axis (22).

20. A unit as in claim 18, wherein feed means (56) comprise take-up and insertion means (30) by which the element (2) of sheet material is transferred from the holder means (20) into the channel (31).

21. A unit as in claim 20, wherein the take-up and insertion means (30) comprise rollers (32, 35) by which the element (2) of sheet material is gripped and positioned in the channel (31).



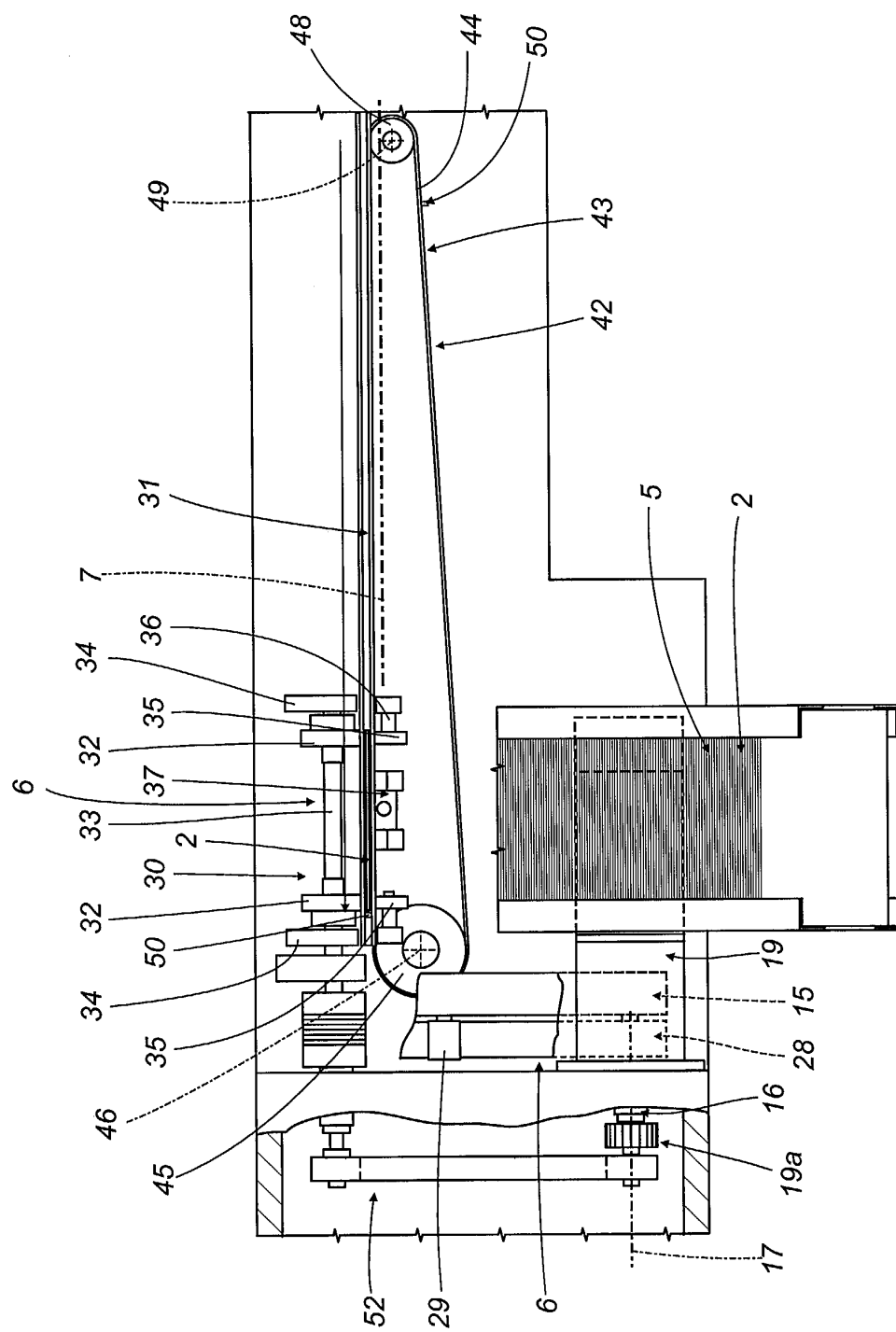


FIG. 2

FIG.3

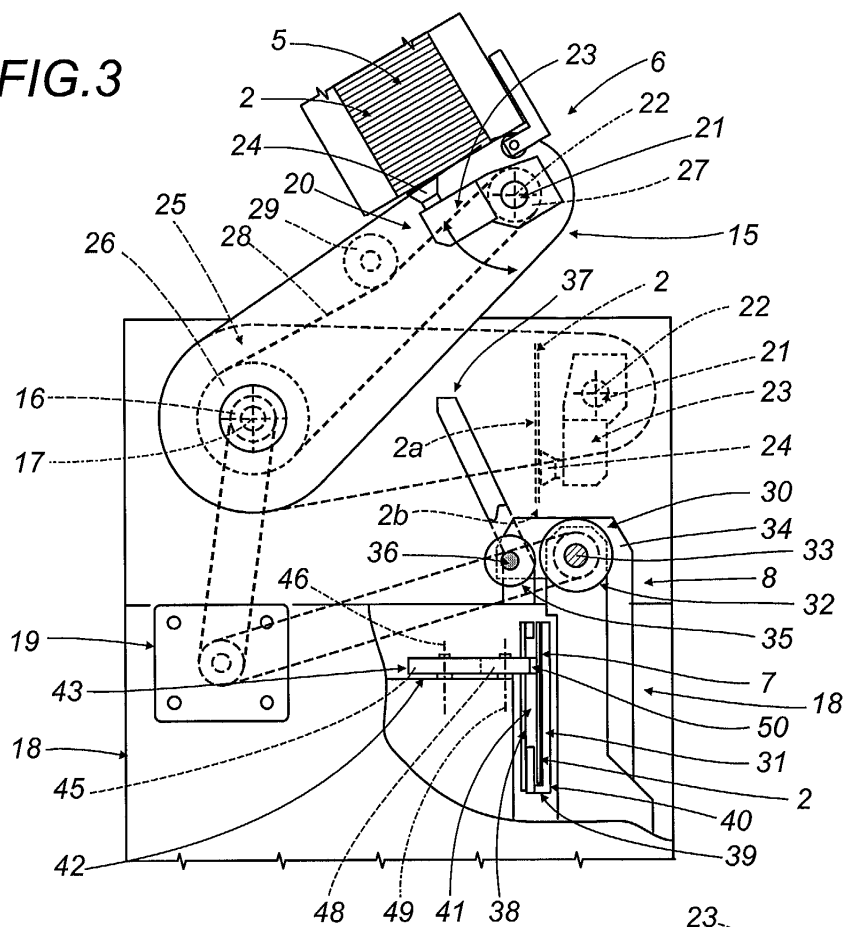


FIG.5

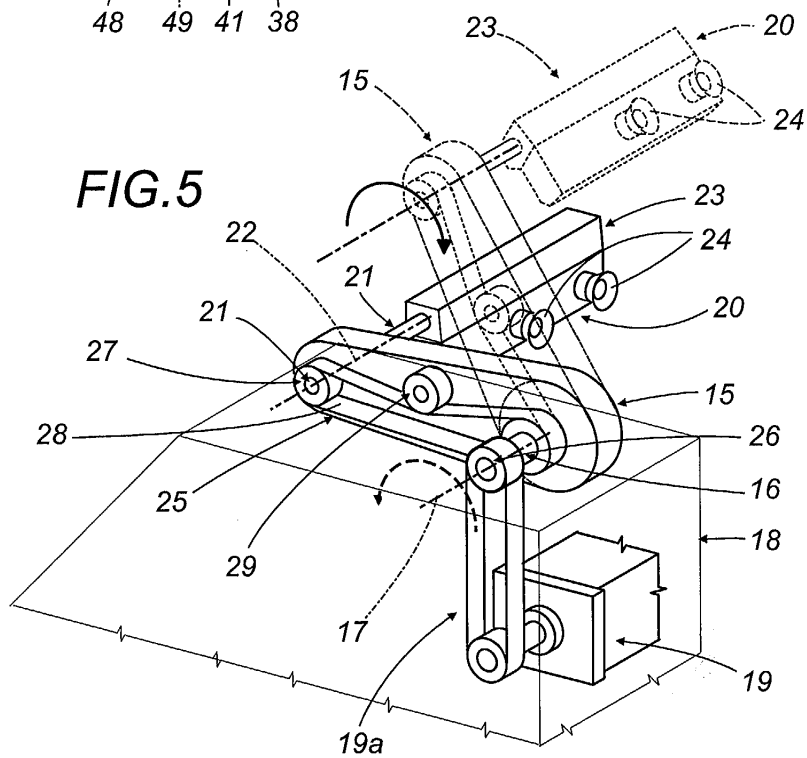


FIG.4

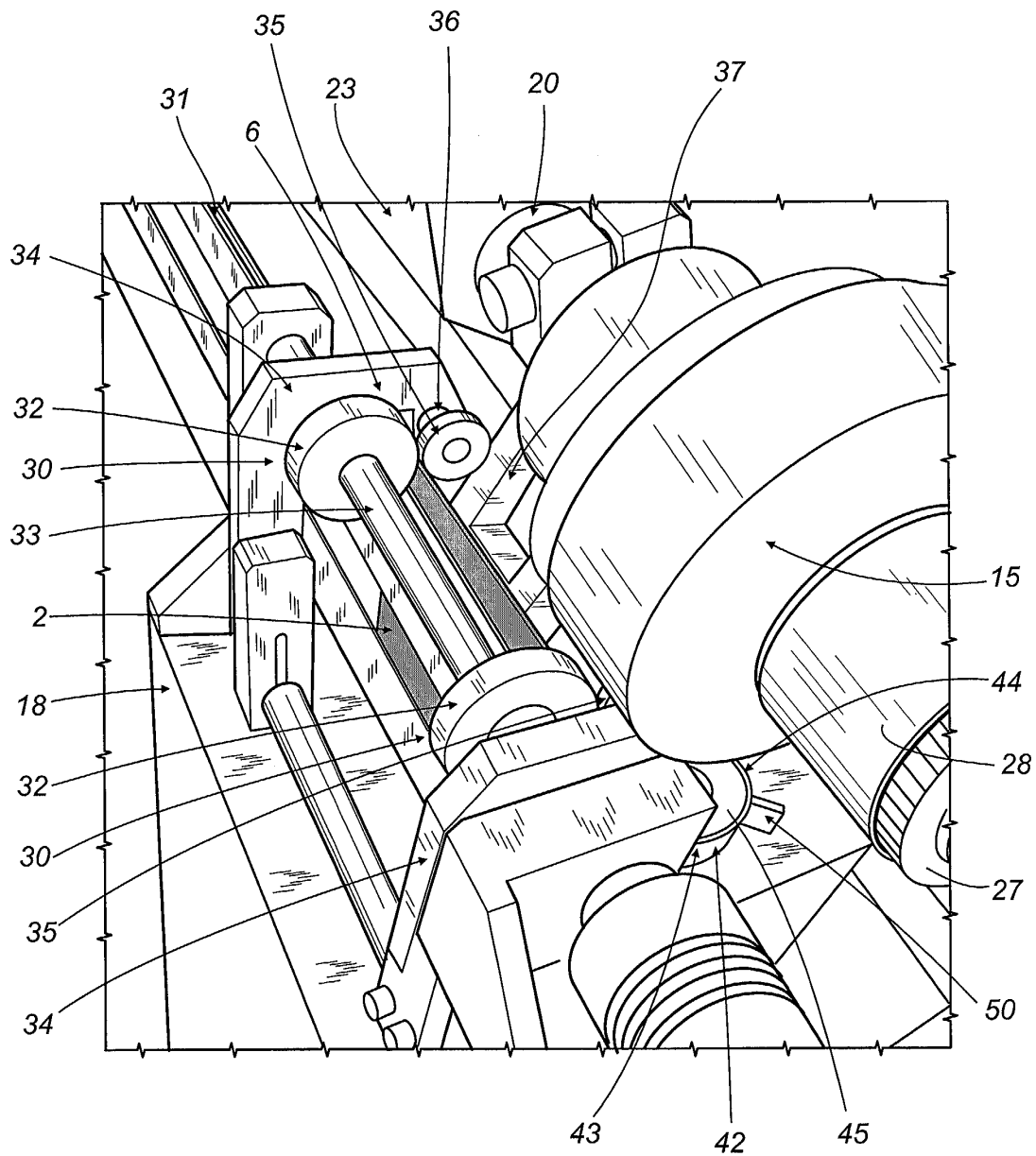


FIG.6

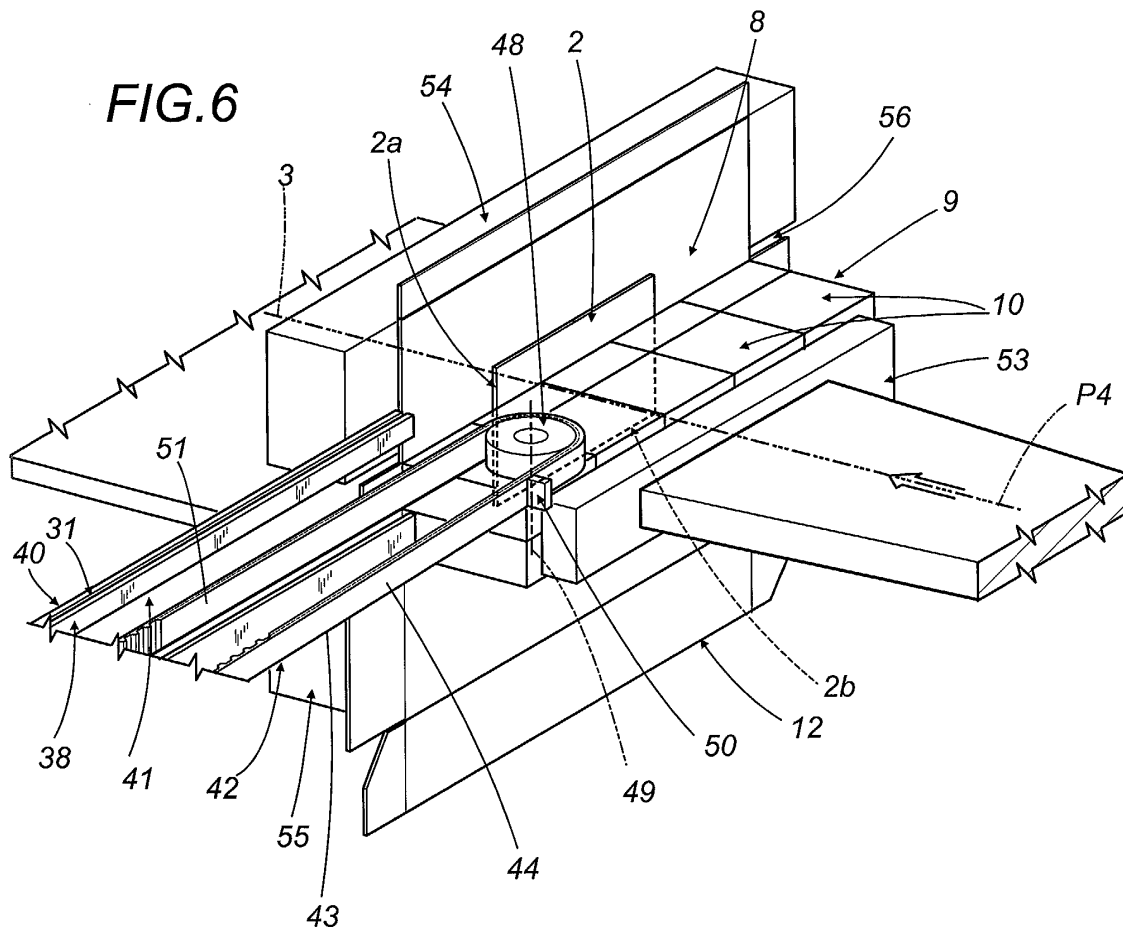
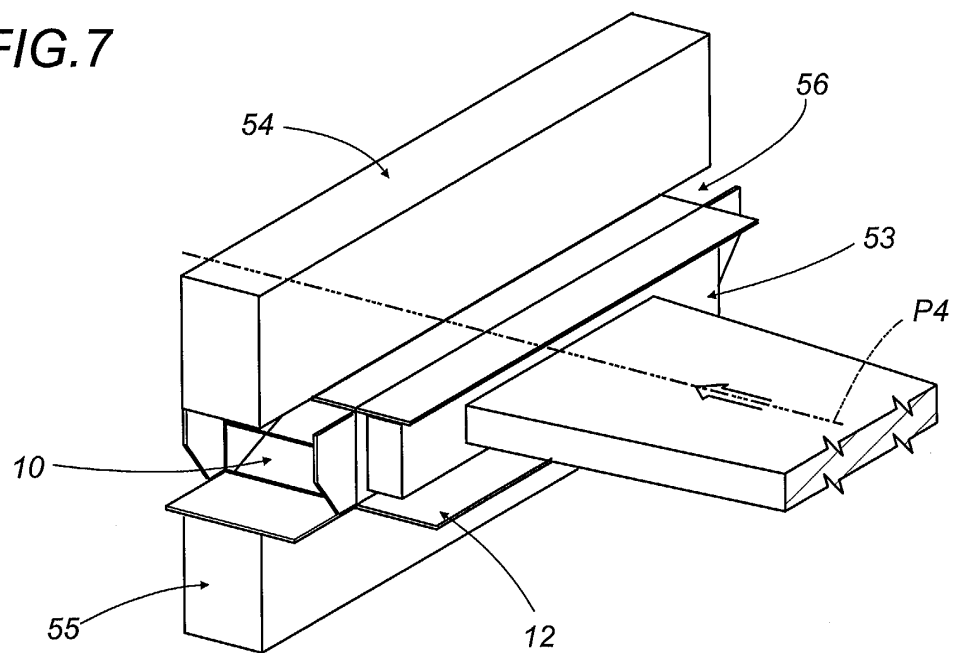


FIG.7





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5075

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X	EP 0 588 772 A (IMA SPA) 23 March 1994 (1994-03-23)	1,10	B65B19/22 B65B61/20
A	* column 3, line 56 - column 6, line 17; figures *	7,8	

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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		30 July 2003	Jagusiak, 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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 03 42 5075

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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