

Description

[0001] The present invention relates to a method of forming and picking up packs of sheets.

[0002] In the packaging of packs of sheets, a device is known for forming and picking up packs off a stack of sheets supported on a pallet at a work station. The stack comprises a number of sheets stacked in a given first direction, and can be divided into a first group of sheets defining a number of packs, each defined by a first number of sheets; and into a second group of sheets defined by a second number of sheets smaller than the first number.

[0003] The device, of the type described for example in Patent Application EP-1264792-A1, normally comprises a pack selecting device, in turn comprising a top jaw which is placed on a top face of the stack, and a bottom jaw which is inserted inside the stack at a distance from the top jaw equal to the thickness of a pack, so as to select a pack at each operating cycle of the device.

[0004] The top and bottom jaws cooperate with each other to at least partly raise the selected pack and enable a pickup device to remove the pack from the selecting device and feed it to an input station of an operating device in a second direction substantially perpendicular to said first direction.

[0005] Once the packs are formed and picked up, the second group of sheets is picked up in exactly the same way as described above for the packs, and is transferred by the pickup device in said second direction to at least partly clear the work station and so enable the unloaded pallet to be replaced with a new pallet supporting a new stack of sheets.

[0006] At this point, the second group of sheets is transferred by the pickup device, in a third direction opposite the second direction, onto the new stack, so that the next pack selected by the selecting device comprises the second group and some of the sheets in the new stack.

[0007] A major drawback of known devices of the type described above is that, when transferring the second group in the third direction onto the new stack of sheets, the new stack is only retained at a top edge crosswise to and at the front in the third direction, and is therefore disarranged by the second group.

[0008] It is an object of the present invention to provide a method of forming and picking up packs of sheets, designed to eliminate the aforementioned drawbacks.

[0009] According to the present invention, there is provided a method of forming and picking up packs of sheets, as claimed in the independent Claim 1.

[0010] The present invention also relates to a device for forming and picking up packs of sheets.

[0011] According to the present invention, there is provided a device for forming and picking up packs of sheets, as claimed in the independent Claim 5.

[0012] A non-limiting embodiment of the present invention will be described by way of example with refer-

ence to the accompanying drawings, in which:

Figure 1 shows a schematic view in perspective, with parts in section and parts removed for clarity, of a preferred embodiment of the device according to the present invention;

Figures 2 and 3 show side views of a detail of Figure 1 in two different operating positions;

Figures 4 to 6 show, schematically and with parts removed for clarity, the Figure 1 device in successive operating positions.

[0013] Number 1 in Figure 1 indicates as a whole a device for forming and picking up packs 2 (Figure 3) off a stack 3 of sheets 4 superimposed in a substantially vertical direction 5. Stack 3 is supported on a pallet 6 at a work station 7, and comprises, in the example shown, a first group 8 (Figures 2 and 3) of sheets 4 defining a number of packs 2, each comprising an n number of sheets 4; and a second group 9 (Figures 4 to 6) of sheets 4 comprising an m number of sheets 4 smaller than the n number.

[0014] By means of a known feed device not shown, pallet 6 is fed in steps in direction 5 to enable device 1 to select a pack 2 at each operating cycle, and to feed pack 2, in a substantially horizontal direction 10 perpendicular to direction 5, to an input station 11 of a known operating device not shown.

[0015] In the example shown, station 11 comprises a conveyor belt 12 looped about two pulleys 13 (only one shown in Figure 1) fitted to a fixed frame 1a (Figures 4 to 6) of device 1 to rotate about respective longitudinal axes 14 perpendicular to directions 5 and 10.

[0016] Device 1 comprises a known selecting device 15 for selecting each pack 2 from stack 3, and which comprises a slide 16 fitted in known manner to frame 1a to move linearly in directions 5 and 10 with respect to frame 1a.

[0017] Slide 16 supports a gripping member 17 comprising a top jaw 18 bounded at the bottom by a substantially flat surface 19; and a bottom jaw defined by a flat blade 20 extending parallel to surface 19, and the distance of which from surface 19 is adjustable manually or by means of a known actuating device not shown. Blade 20 is fitted to jaw 18 to slide, with respect to jaw 18 and under the control of two parallel actuating cylinders 21, in a direction parallel to surface 19, so as to penetrate stack 3 (Figure 2).

[0018] Jaw 18 is fitted to slide 16 to rotate, with respect to slide 16 and under the control of a known actuating device 22, about a hinge axis 23 perpendicular to directions 5 and 10, so as to move member 17 between a substantially horizontal position (Figure 2) to select pack 2, and a tilted position (Figure 3) in which a rear portion of the selected pack 2 is raised off stack 3.

[0019] Device 22 comprises a crank 24 rotated about axis 23 by an actuating cylinder 25 hinged to slide 16 and having an output rod 26, the free end of which is

fitted, by the interposition of a pin 27 substantially parallel to axis 23, to slide inside a slot 28 formed through crank 24. Rod 26 is movable between a withdrawn position and an extracted position to enable crank 24 to engage or release a pin 29 projecting, parallel to axis 23, from jaw 18, and so move member 17 between the horizontal and tilted positions.

[0020] Device 1 also comprises a known pressure member 30 defined by a substantially flat plate 31 extending perpendicularly to direction 5 and fitted to the free end of the output rod of an actuating cylinder 32, which moves plate 31 in direction 5 and is fixed to the output rod of an actuating cylinder 33 for moving cylinder 32, and therefore plate 31, in direction 10.

[0021] Finally, device 1 also comprises a grip and transfer device 34, in turn comprising a slide 35 fitted in known manner to frame 1a to move linearly in directions 5 and 10 with respect to frame 1a. Device 34 comprises two grip and transfer members 36 aligned with each other in a direction 37 perpendicular to directions 5 and 10, and located substantially on opposite sides, in direction 37, of the assembly defined by selecting device 15 and pressure member 30.

[0022] Each member 36 comprises a substantially flat bottom jaw 38 perpendicular to direction 5 and extending in direction 10; and a substantially flat top jaw 39 parallel to jaw 38 and movable in direction 5 between a grip position and a release position to grip and release a pack 2 between jaws 38 and 39.

[0023] Operation of device 1 will be described with reference to Figures 1 to 6, and as of the instant in which:

blade 20 is located at a distance from surface 19 of top jaw 18 substantially equal to the thickness of a pack 2;
selecting device 15 is set to the horizontal position;
and
the two grip and transfer members 36 are set to the release position.

[0024] With reference to Figure 2, device 15 is moved by slide 16 in directions 5 and 10 so that surface 19 contacts stack 3, and blade 20 is moved in direction 10 by actuating cylinders 21 so as to penetrate stack 3 and select a first pack 2.

[0025] As shown in Figure 3, device 15 is then moved by actuating device 22 into the tilted position to partly raise the selected pack 2; pressure member 30 is moved in directions 5 and 10 onto and to retain the top sheet 4 of the next pack 2; and the two grip and transfer members 36 are moved in directions 5 and 10 to insert respective bottom jaws 38 beneath the raised pack 2.

[0026] Finally, device 15 is moved back into the horizontal position; top jaws 39 are moved into the grip position; device 15 releases pack 2; and pack 2 is transferred in direction 10 onto conveyor belt 12.

[0027] The above operating sequence is performed a number of times to form and pick up off stack 3 the packs

2 obtainable from first group 8 of sheets 4, and to leave the second group 9 of sheets 4 on pallet 6.

[0028] As shown in Figure 4, the above operating sequence is repeated to enable the two members 36 to grip second group 9 and to cooperate with a supporting device 40 to retain second group 9 inside station 7 and so permit replacement of the unloaded pallet 6 (Figure 5).

[0029] Device 40 comprises a conveyor belt 41 fixed to frame 1a and looped about a number of (in the example shown, four) pulleys 42, which are mounted to rotate about respective longitudinal axes 43 parallel to one another and to direction 37, and are arranged so that belt 41 comprises a horizontal first conveying branch 41a parallel to directions 10 and 37, and a vertical second conveying branch 41b parallel to direction 5.

[0030] More specifically, a first pulley 42 (hereinafter indicated 42a) is fitted in rotary manner to frame 1a; a second pulley 42 (hereinafter indicated 42b) is also fitted in rotary manner to frame 1a; a third pulley 42 (hereinafter indicated 42c) is fitted in rotary manner to a carriage 44, in turn fitted in known manner to frame 1a to move linearly in direction 5 with respect to frame 1a and under the control of a known actuating device not shown; and a fourth pulley 42 (hereinafter indicated 42d) is fitted in rotary manner to a carriage 45, in turn fitted in known manner to frame 1a to move linearly in direction 10 with respect to frame 1a and under the control of belt 41.

[0031] In connection with the above, it should be pointed out that pulleys 42a, 42b, 42c, 42d are all mounted idly, or one of pulleys 42a, 42b, 42c, 42d is powered.

[0032] In actual use, once second group 9 is gripped by the two members 36 (Figure 4), the unloaded pallet 6 is lowered in direction 5, and carriage 44 is moved in direction 5, from a rest position in which belt 41 is completely outside station 7, so as to gradually insert belt 41 inside station 7 and beneath second group 9 (Figure 5).

[0033] Once belt 41 is set to an operating position in which belt 41 is inserted completely beneath second group 9, the unloaded pallet 6 (Figure 5) is replaced by a new pallet 6 supporting a new stack 3 of sheets 4 (Figure 6); the new pallet 6 is raised in direction 5 into a position close to belt 41; and carriage 44 is moved in direction 5 to ease belt 41 out of station 7 and from beneath second group 9.

[0034] Finally, second group 9 is released by the two members 36 onto the new stack 3, and selecting device 15 selects another pack 2 comprising second group 9 and some of the sheets 4 in the new stack 3.

[0035] By inserting belt 41 inside station 7 and between pallet 6 and second group 9, second group 9 is therefore kept inside station 7 when changing pallet 6, thus avoiding moving second group 9 in direction 37 and on top of the new stack 3, and so preventing disarrangement of the new stack 3.

[0036] In connection with the above, it should be

pointed out that, since belt 41 is fixed to frame 1a, the relative speed between belt 41 and sheets 4 of second group 9 is substantially zero when inserting and removing belt 41 in and from station 7.

Claims

1. A method of forming and picking up packs (2) off a stack (3) of sheets (4) supported on a pallet (6) at a work station (7); the stack comprising a first and a second group (8, 9) of sheets (4); said first group (8) defining a number of packs (2), each comprising a first number (n) of sheets (4); said second group (9) comprising a second number (m) of sheets (4) smaller than said first number (n); the method comprising the step of successively forming and picking up said packs (2) off said pallet (6); and being **characterized by** also comprising the steps of inserting supporting means (40), for supporting said second group (9), into the work station (7) and between the pallet (6) and the second group (9); replacing said pallet (6) with a new pallet (6) supporting a new stack (3) of sheets (4); and extracting said supporting means (40) from said work station (7) to release said second group (9) onto said new stack (3). 5
2. A method as claimed in Claim 1, wherein said sheets (4) are superimposed in a given first direction (5); each said pack (2) being removed from said work station (7) in a second direction (10) substantially perpendicular to said first direction (5); and said second group (9) being maintained substantially stationary in said second direction (10) when replacing said pallet (6) with said new pallet (6). 10
3. A method as claimed in Claim 1 or 2, wherein said supporting means (40) are inserted into and extracted from said work station (7), so that the relative speed between the sheets (4) in said second group (9) and the supporting means (40) is substantially zero. 15
4. A method as claimed in any one of the foregoing Claims, and also comprising the step of forming and picking up a further pack (2) comprising said second group (9) and some of the sheets (4) in said new stack (3). 20
5. A device for forming and picking up packs (2) off a stack (3) of sheets (4) supported on a pallet (6) and comprising a first and a second group (8, 9) of sheets (4); said first group (8) defining a number of packs (2), each comprising a first number (n) of sheets (4); said second group (9) comprising a second number (m) of sheets (4) smaller than said first number (n); the device comprising a work station (7) for receiving said stack (3); and gripping means (15, 34) for forming and picking up said packs (2) successively off said pallet (6); and being **characterized by** also comprising supporting means (40), for supporting said second group (9), which are movable to and from a work position in which the supporting means (40) are located inside the work station (7) and between the pallet (6) and the second group (9) to support the second group (9) when replacing said pallet (6) with a new pallet (6). 25
6. A device as claimed in Claim 5, wherein said supporting means (40) are movable between said work position and a rest position in which the supporting means (40) release said second group (9) to release the second group (9) onto a new stack (3) on said new pallet (6). 30
7. A device as claimed in Claim 6, wherein said supporting means (40) comprise a conveyor belt (41) looped about at least two pulleys (42c, 42d) fitted in rotary manner to respective carriages (44, 45); said carriages (44, 45) being movable to move the conveyor belt (41) between said work position and said rest position. 35
8. A device as claimed in Claim 7, and also comprising a fixed frame (1a); the conveyor belt (41) being fixed to the frame (1a) so that the relative speed between the sheets (4) in said second group (9) and the conveyor belt (41) is substantially zero when moving the conveyor belt (41) between said work position and said rest position. 40

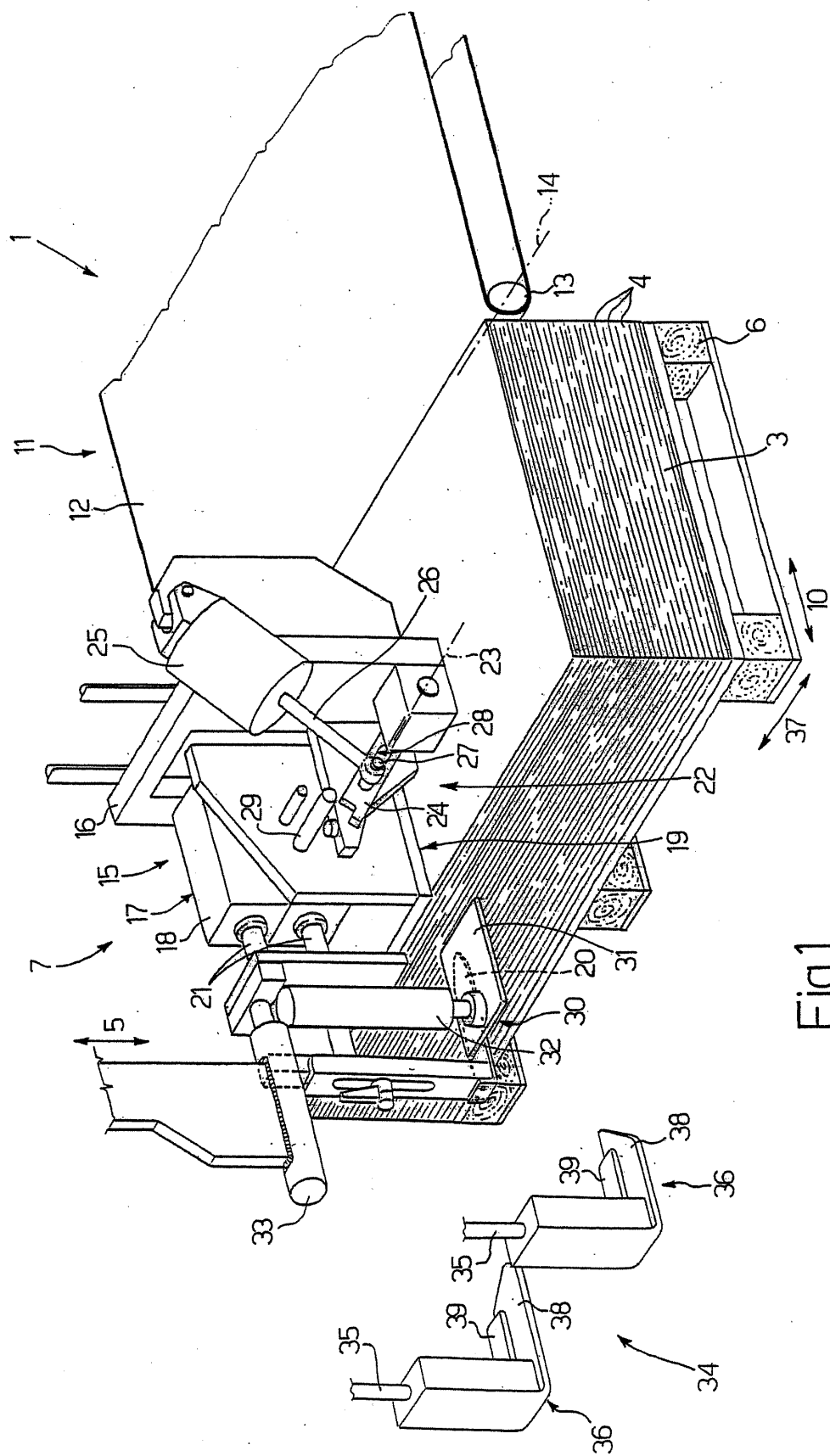


Fig.1

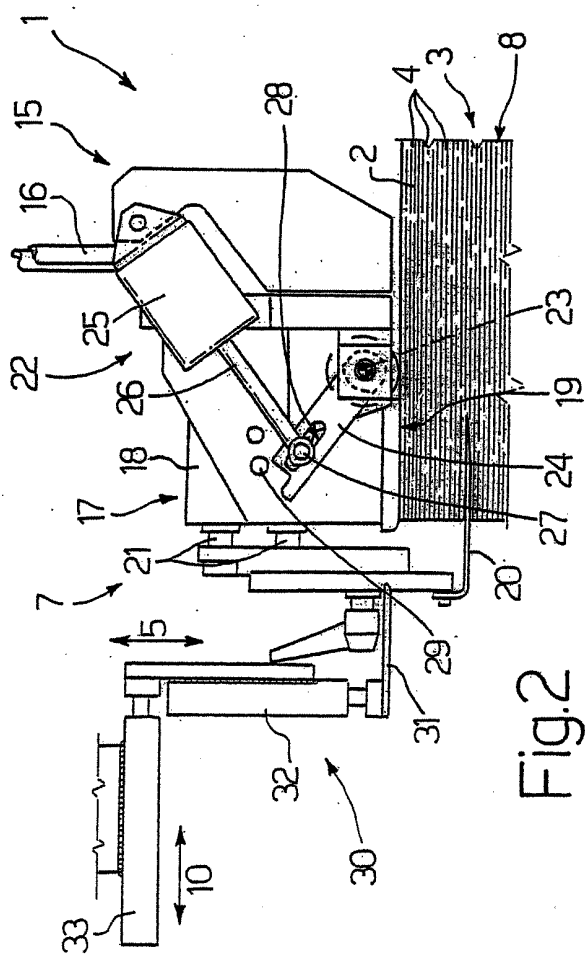


Fig. 2

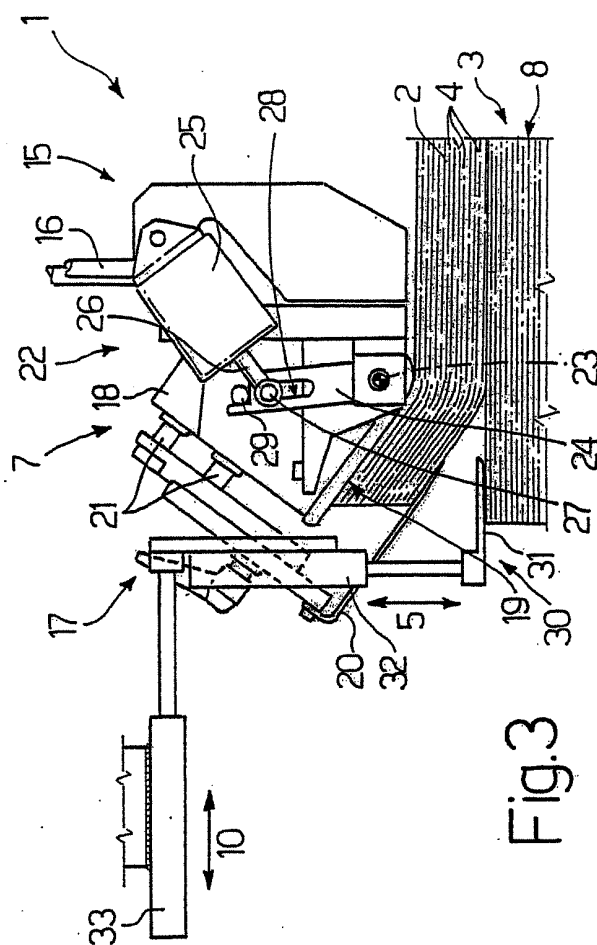


Fig. 3

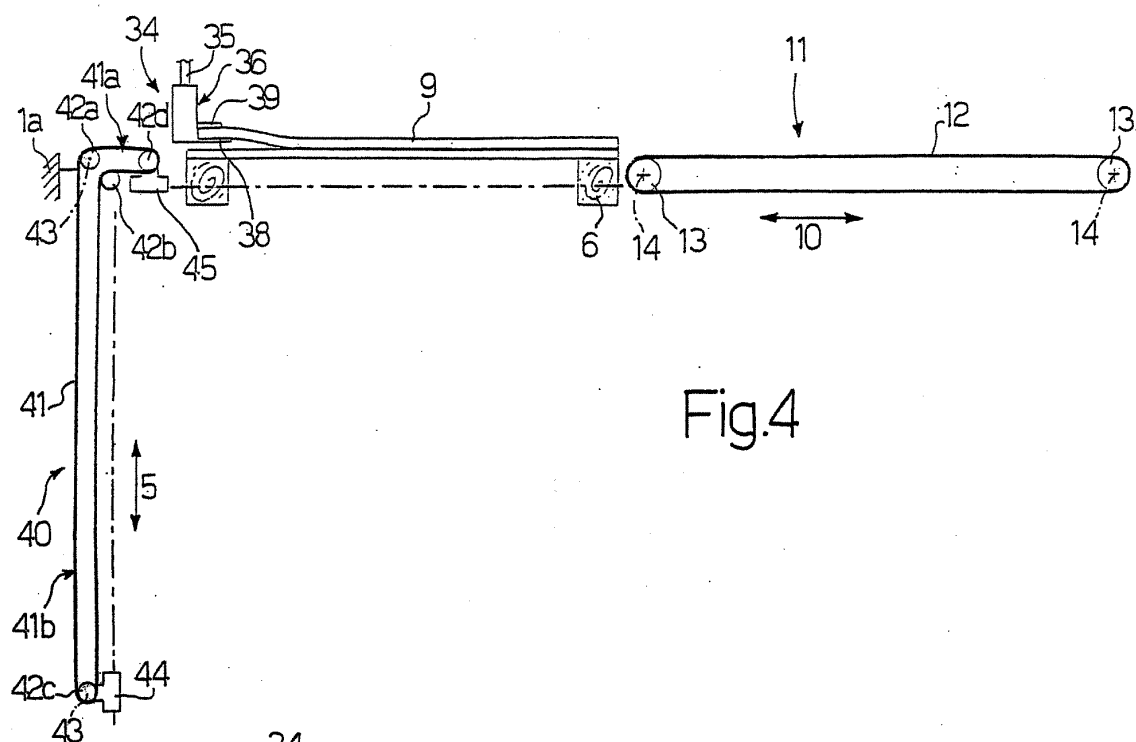


Fig.4

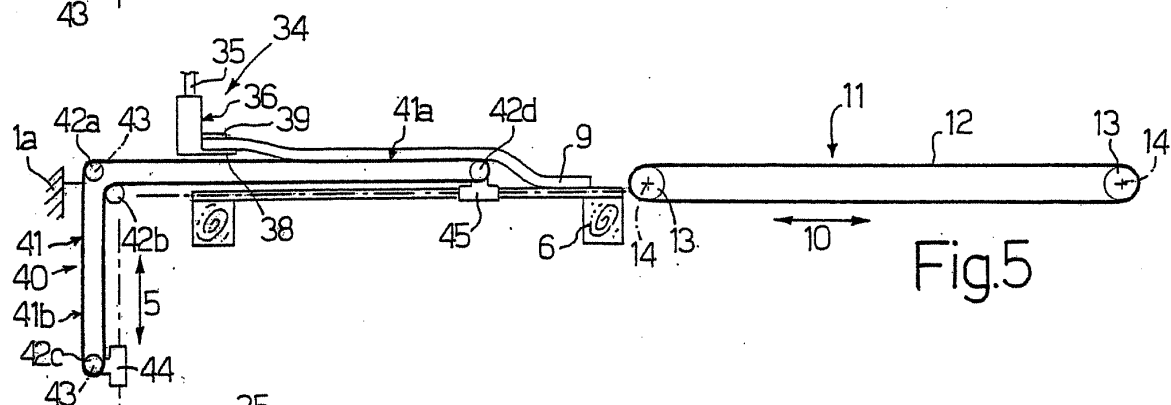


Fig.5

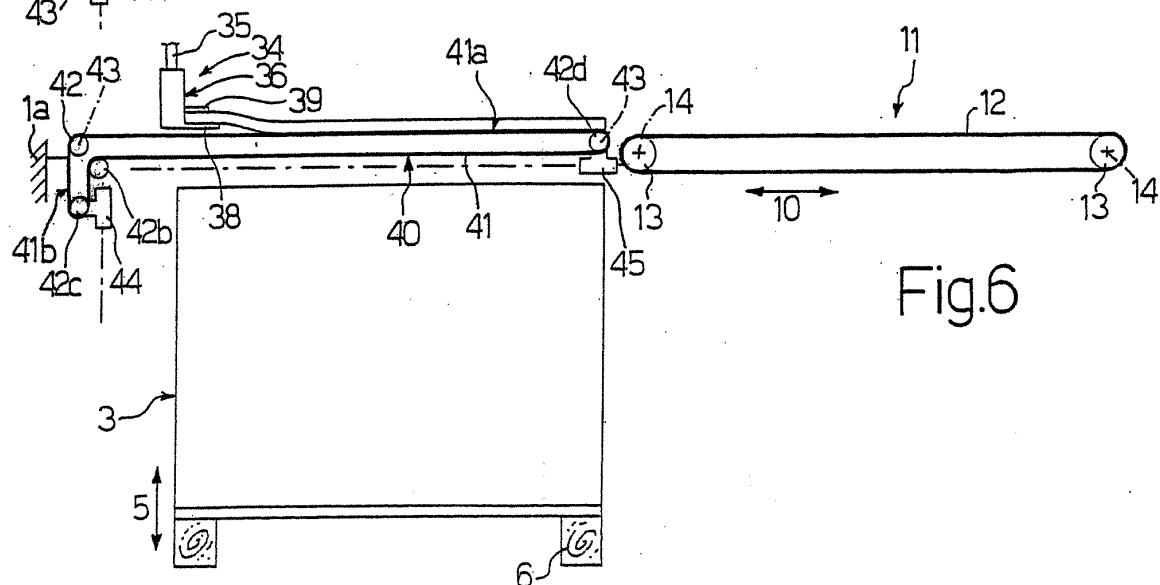


Fig.6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 10 3806

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.7)
X,D	EP 1 264 792 A (BIELOMATIK LEUZE & CO) 11 December 2002 (2002-12-11) * column 12, line 32 - column 17, line 43; figures 7-25 *	1-6	B65H1/26
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 11 November 2004	Examiner Rupprecht, 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			

EPO FORM 1503 03/92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 10 3806

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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11-11-2004

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