



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.09.2012 Bulletin 2012/36

(51) Int Cl.:
B65H 29/66 (2006.01)

(21) Application number: **12158149.0**

(22) Date of filing: **05.03.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **Casazza, Roberto**
16016 Cogoleto (IT)
• **De Leo, Guido**
16134 Genova (IT)
• **De Poli, Stefano**
16142 Genova (IT)

(30) Priority: **04.03.2011 IT TO20110196**

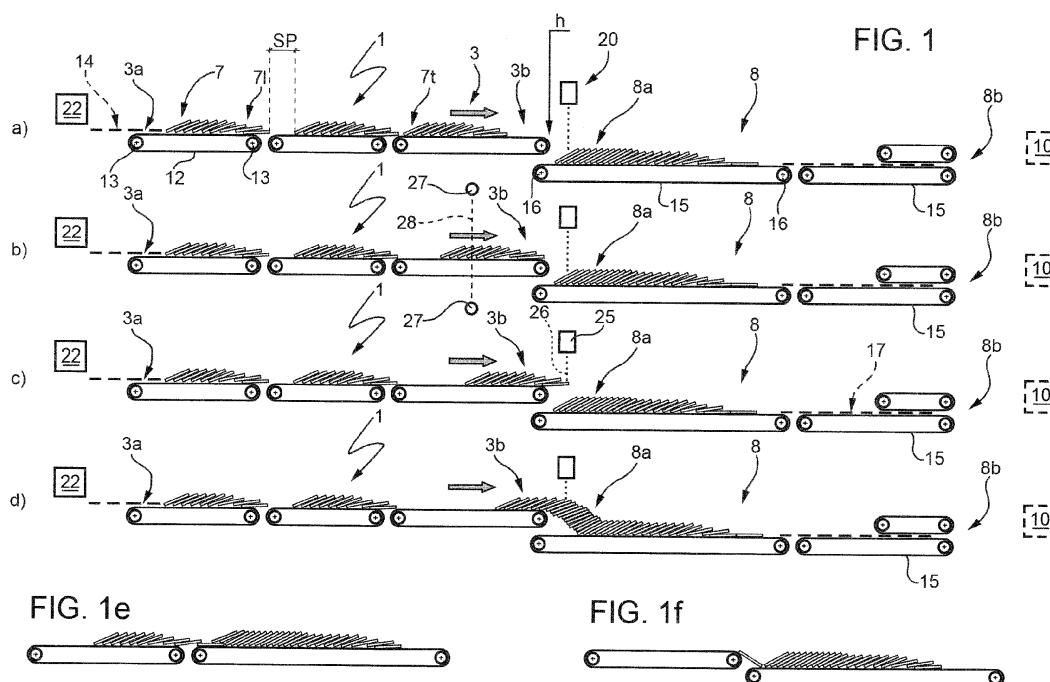
(71) Applicant: **SELEX ELSAG S.P.A.**
Genova (IT)

(74) Representative: **Jorio, Paolo et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(54) **Device for merging two shingled groups of postal items**

(57) A device for merging shingled groups of postal items, wherein a first carrying system (3) receives at its inlet (3a) shingled groups of postal items (7) and has an outlet (3b) which communicates with the inlet (8a) of a second carrying system (8), which moves the postal items towards an outlet (8b) communicating with a final user (10). The inlet (8a) of the second carrying system is at a lower height with respect to the outlet (3b) of the first carrying system so as to obtain a falling area having

a predetermined height h which connects the first carrying system (3) to the second carrying system (8); an electronic unit (22) is provided, which controls the movement of at least the adjacent end portions of the first and second carrying systems (3, 8) close to the falling area (20) to allow a front side (7t) of a shingled group carried by the first carrying system to at least partially overlap a back side of the shingled group carried by the second carrying system by approaching and merging two shingled groups at the interconnection area.



Description

[0001] The present invention relates to a device for merging two shingled groups of postal items.

[0002] It is known to make shingled groups of items, i.e. formed by items aligned along a preferably rectilinear direction, partially overlapping one another and provided with corresponding edges spaced apart from one another at a distance which can be kept either constant or variable.

[0003] These shingled groups are moved using belt carrying systems of either the simple type (i.e. provided with a single lower belt on which the shingled groups rest) or of the double type, i.e. provided with a pair of belts facing each other and adapted to press on the opposite sides of the shingled groups.

[0004] In order to merge two shingled groups, these groups normally pass along two different belt systems (typically of the double type) converging the shingled groups towards a common area where the merging operations occur. Patent EP-2.213.602 discloses a device of the aforesaid type.

[0005] It is the object of the present invention to provide a device and method for merging shingled groups which pass spaced apart from one another along a single carrying system, typically a simple belt type carrying system.

[0006] The aforesaid object is achieved by the present invention as it relates to a device for merging shingled groups of postal items as described in claim 1.

[0007] The invention will now be disclosed with particular reference to the accompanying drawings which show a preferred embodiment, in which:

- figures 1a-1d diagrammatically show a device made according to the dictates of the present invention and arranged according to different operating conditions;
- figures 1e, 1f show two phenomena that the present device intends to avoid;
- figure 2 shows the control method of the device in figure 1;
- figure 3 shows in detail a first embodiment of the control method;
- figure 4 shows in detail a second embodiment of the control method; and
- figure 5 shows a variation of the device in figure 1.

[0008] In figure 1, reference numeral 1 indicates as a whole a device for merging shingled groups of postal items.

[0009] Device 1 comprises a first motorized belt carrying system 3 which receives at the inlet 3a thereof shingled groups of postal items 7 generated by means of known technologies, and has an outlet 3b which communicates with the inlet 8a of a second motorized belt carrying system 8, which moves the postal items towards an outlet 8b communicating with a final user 10, e.g. a separator

[0010] (of known type and diagrammatically shown).

[0011] The first belt carrying system 3 is configured to carry the shingled groups linearly spaced from one another, i.e. achieving a spacing SP between the last item 7t of a group and the first item 71 of the preceding group.

The first carrying system 3 typically consists of a plurality of adjacent, synchronous belts 12 extending between end pulleys 13 arranged side by side to define a common resting surface 14 on which the shingled groups move from inlet 3a towards outlet 3b.

The second carrying system 8 typically consists of a plurality of adjacent, synchronous belts 15 extending between end pulleys 16 arranged side by side to define a common resting surface 17 on which the shingled groups move from inlet 8a towards outlet 3b once the merging operations have occurred.

The inlet 8a of the second carrying system is at a lower height with respect to the outlet 3b of the first carrying system so as to obtain a falling area having a predetermined height h (typically, the values of h may be in the range from 5 to 10 cm) which connects the first carrying system 3 to the second carrying system 8. For description simplicity, the electric motors (of known type) which actuate the belts 12 and 15 by means of transmissions (not shown and of known type) are not shown.

An electronic unit 22 is further provided, which controls the movement of the belts 12, 15 forming the first/second carrying system 3, 8 close to the falling area 20 to allow the first item 7t of a shingled group to fall on the last item of the next shingled group, thus approaching and merging two shingled groups at the interconnection area 20 between the first carrying system 3 with the second carrying system 8.

Figure 2 shows the operations carried out by the electronic control unit 22 for controlling the first/second carrying system 3 and 8 according to the present invention.

First, a block 90 is reached, which verifies whether a shingled group of postal items having a back side arranged close to the inlet 8a, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, e.g. using an optoelectronic sensor 25 defining an optical path 26 which is interrupted by the postal items 7, if any.

If the outcome of the presence verification is positive, block 90 is followed by a block 100 which verifies whether a shingled group of postal items having a front portion arranged at the outlet 3b, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, e.g. using an optoelectronic sensor 27 defining an optical path 28 which is interrupted by the postal items 7, if any.

If not, the arrival of a shingled group of items is waited for, otherwise (block 110 after block 100) the first carrying system 3 is stopped (or its speed is set very low, e.g. 1/10 of the previous speed), so that the front items of a shingled group ("head" of the shingled group) are on the end edge of the carrying system 3 flushed with the falling area 20 (see figure 1b) and cannot however fall in

the short.

[0019] Once a still state has been reached, i.e. after a predetermined time T1 has elapsed from the stop command of block 110 (120 after block 110), the first carrying system 3 is advanced at a maximum working speed Vmax (block 130 after block 120) for a determined interval of time Tmax (of the order of 100-500 milliseconds). Typically, the maximum working speed Vmax may be of the order of 200-1000 millimeters/second.

[0020] The rapid acceleration applied to the shingled group of items which quickly passes from a speed equal to (or slightly higher than) zero to the speed Vmax allows to fling (figure 1c) the front portion of the shingled group of items carried by the first carrying system 3 onto the back portion of the shingled group of postal items carried by the second carrying system 8 (which is stationary), thus merging the two groups of items (figure 1d).

[0021] The presence of the falling area 20 prevents the postal items flung by the first carrying system 3 from being inserted under an edge of the objects on which they overlap if the back portion of the shingled group of items of the second carrying system 8 consists of items not in contact with the resting surface 17 (figure 1e).

[0022] Using high speed allows to adequately support the front side of the shingled group flung onto the back side of the stationary shingled group, and prevents the back side of the shingled group arranged on the second carrying system 8 from being fragmented (figure 1f).

[0023] Furthermore, in order to prevent items of the back side from sliding backwards towards the gap between belts 12 and 15, one or more of various contrivances may be used, such as for example using appropriate guides or guards at the sides or between the belts (not shown), elongating belt 15 to be under belt 12, inclining belt 12 and/or 15 by placing it/them slightly downwards so as to reduce the slope and the gravity sliding displacement, appropriately choosing the shape (e.g. saw tooth) or materials (with high friction) of belt 15.

[0024] The second carrying system 8 is then activated and moved at a working speed Vnorm slower than the maximum working speed Vmax; the advancing speed of the first carrying system 3 is also equalized to the working speed Vnorm so that the two groups of postal items now merged can continuously pass from the first carrying system 3 to the next carrying system 8 (block 140 after block 130). Usual values of the speed Vnorm are 100-700 millimeters/second.

[0025] Once the displacement of the shingled group of postal items from the first carrying system 3 to the second carrying system 8 has been completed (this control operation is diagrammatically shown by block 145 after block 140), the method goes back to block 100.

[0026] Figure 3 shows the operations carried out by the electronic control unit 22 for controlling the first/second carrying system 3/8 according to a first constructional variation of the embodiment shown in figure 2. Such a constructional variation includes checking the thickness of the shingled group carried by the second carrying sys-

tem; the merging operations are only carried out when such a thickness is thinner than a threshold value in order to prevent the area in which the objects of the two different groups are merged to be excessively thick thus complicating the following carrying operations.

[0027] A block 190 is first reached, which verifies whether a shingled group of postal items having a back side arranged close to the inlet 8a, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, e.g. using an optoelectronic sensor 25 defining an optical path 26 which is interrupted by the postal items, if any.

[0028] If the outcome of such a verification is positive, block 190 is followed by a block 200 which verifies whether a shingled group of postal items having a front portion arranged close to the outlet 3b, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, e.g. using an optoelectronic sensor 27 defining an optical path 28 which is interrupted by the postal items, if any.

[0029] If not, the arrival of a shingled group of items is waited for, otherwise (block 210 after block 200) the first carrying system 3 is stopped (or its speed is set very low, e.g. 1/10 of the previous speed), so that the front items of a shingled group ("head" of the shingled group) are on the end edge of the carrying system 3 flushed with the falling area 20.

[0030] Block 210 is followed by a block 215 which verifies (known technologies are used and therefore not described in detail) whether the thickness of the postal items of the back side of the shingled group arranged close to the inlet 8a is thinner than a threshold value Slim; if not, the second carrying system 8 is advanced over a certain length until the thickness value goes under the threshold value. Once such a threshold value has been reached, the second carrying system 8 is stopped. If the outcome of the verification is positive (thickness thinner than the threshold), the second carrying system 8 is kept still.

[0031] After a time T1 elapses from the detection of a thickness thinner than the threshold (block 220 after block 215), the first carrying system 3 is advanced at the maximum working speed Vmax (block 230 after block 220) for a predetermined interval of time Tmax. The rapid acceleration applied to the group of items which rapidly passes from a speed equal to (or slightly higher than) zero to the speed Vmax allows to fling the front portion of the shingled group of items carried by the first carrying system 3 onto the back portion of the shingled group of postal items carried by the second carrying system 8 (which now is stationary - see operations at block 215), thus merging the two groups of items.

[0032] The second carrying system is then activated and moved at a working speed Vnorm slower than the maximum working speed Vmax; the advancing speed of the first carrying system 3 is also equalized to the working speed Vnorm so that the two groups of postal items now merged continuously pass from the first carrying system 3 to the next carrying system 8 (block 240 after block 230).

[0033] Finally, when the back side of the shingled postal items carried by the first carrying system 3 is at a certain distance from the end edge 3b (typically such a distance is of the order of 100-300 millimeters - such a verification is carried out using known technologies indicated by block 250), the first carrying system 3 goes back to the maximum speed V_{max} to prevent the back side of the shingled group of postal items, which is leaving the carrying system 3, from sliding when it passes between the first and second carrying systems (block 260 after block 250).

[0034] Once the displacement of the shingled group of postal items from the first carrying system 3 to the second carrying system 8 has been completed (this control operation is diagrammatically shown at block 265 after block 260), the method goes back to block 200.

[0035] Figure 4 shows the operations carried out by the electronic control unit 22 for controlling the first/second carrying system 3/8 according to a second constructional variation of the embodiment shown in figure 2. Such a constructional variation includes repositioning the shingled group carried by the second carrying system 8; the merging operations are carried out only when such a repositioning has occurred in order to ensure a good overlapping of the shingled group of postal items, thus occupying the minimum overall longitudinal space for the resulting shingled group.

[0036] A block 290 is first reached, which verifies whether a shingled group of postal items having a back side arranged close to the inlet 8a, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, as previously explained. If the outcome of the verification of block 290 is positive, block 290 is followed by a block 300 which verifies whether a shingled group of postal items having a front portion arranged close to the outlet 3b, i.e. close to the falling area 20, is present. Such a presence is verified by means of known technologies, as previously said.

[0037] If not, the arrival of a shingled group of items is waited for, otherwise (block 310 after block 300) the first carrying system 3 is stopped (or its speed is set very low, e.g. 1/10 of the previous speed), so that the front items of a shingled group ("head" of the shingled group) are on the end edge of the carrying system 3 flushed with the falling area 20 (figure 1b).

[0038] The second carrying system (block 315 after block 310) then moves with backward motion, i.e. in the direction opposite to the advancement direction, to take the back side of the shingled group of postal items arranged on the second carrying system 8 exactly at the inlet 8a; such a backward motion (block 320) is carried out by using optoelectronic sensors of known type similar to those described above (and therefore not shown) or by means of a time control based on an estimated retroprocession time T_3 (e.g. 100-500 milliseconds) of the shingled group of postal items carried by the carrying system 8. At the end of these operations, the backward motion ends and the second carrying system is blocked.

[0039] Next (block 330 after block 320), the first carrying system 3 is advanced at the maximum working speed V_{max} for a predetermined interval of time T_{max} . The rapid acceleration applied to the shingled group of items which quickly passes from a speed equal to (or slightly higher than) zero to the speed V_{max} allows to fling the front portion of the shingled group of items carried by the first carrying system 3 onto the back portion of the shingled group of postal items carried by the second carrying system 8 (which is stationary - block 320), which are arranged with the back edge thereof exactly at the inlet 8a. The two groups of items are thus merged.

[0040] Next, the second carrying system 8 is activated and moved at a working speed V_{norm} slower than the maximum working speed V_{max} ; the advancing speed of the first carrying system 3 is also equalized to the working speed V_{norm} , so that the two groups of postal items now merged can continuously pass from the first carrying system 3 to the next carrying system 8 (block 340 after block 330).

[0041] Once the displacement of the shingled group of postal items from the first carrying system 3 to the second carrying system 8 has been completed (this control operation is diagrammatically shown at block 345 after block 340), the method goes back to block 300.

[0042] In the above description, the first carrying system 3 has a fixed position as compared to the second carrying system 8; in other words, the shingled groups are merged between consecutive belts 12 and 15, the respective positions of which are fixed and determined.

[0043] This concept can be applied to more complex systems in which one of the two carrying systems (e.g. the first carrying system 3) has a fixed position with respect to one (or multiple) carrying system(s) (e.g. the second carrying system), which may be positioned with respect to the other carrying system. Thereby, the height h of the falling area may be modified or different outlet carrying systems 8 may be selected by virtue of a single inlet movable carrying system 3, or vice versa various inlet carrying systems 3 may be served by a single movable outlet carrying system 8.

Claims

1. A device for merging shingled groups of postal items, wherein a first carrying system (3) receives at its inlet (3a) shingled groups of postal items (7) and has an outlet (3b) which communicates with the inlet (8a) of a second carrying system (8), which moves the postal items towards an outlet (8a) communicating with a final user (10); the first carrying system (3) is configured to carry the shingled groups linearly spaced from one another, thus achieving a spacing SP between the last item (7t) of a group and the first item (71) of the preceding group, **characterized in that** the inlet (8a) of the second carrying system is at a lower height with respect to

the outlet (3b) of the first carrying system so as to obtain a falling area having a predetermined height h which connects the first carrying system (3) to the second carrying system (8); an electronic unit (22) is provided, which controls the movement of at least the adjacent end portions of the first and second carrying systems (3, 8) close to the falling area (20) to allow a front side (7t) of a shingled group carried by the first carrying system to at least partially overlap a back side of the shingled group carried by the second carrying system by approaching and merging two shingled groups into a single shingled group at the interconnection area; said electronic unit (22) being configured to perform the following control operations of the first and second carrying systems (3/8):

- detecting (90) the presence of a shingled group of postal items having a back side arranged close to the inlet (8a) of the second carrying system (8);
 - verifying (100) the presence of a shingled group of postal items having a front portion arranged close to the outlet (3b) of the first carrying system;
 - after a successful verifying step and after the first carrying system (3) has come to a substantial stop, advancing the first carrying system (3) at a maximum working speed V_{max} (120) by applying an acceleration to the group of items carried by the first carrying system (3), which acceleration allows to fling the front portion of the shingled group of items carried by the first carrying system (3) onto the back portion of the shingled group of postal items carried by the second carrying system (8), thus merging the two shingled groups of items;
 - activating the second carrying system (8) at a working speed V_{norm} slower than the maximum working speed V_{max} ; the advancing speed of the first carrying system (3) is equalized to the working speed V_{norm} so that the two groups of postal items now merged in a single shingled group continuously move from the first carrying system (3) to the next carrying system (8).
2. A device according to claim 1, wherein the first carrying system (3) consists of at least one motorized belt (12) defining a common resting surface (14) on which the shingled groups move from the inlet (3a) to the outlet (3b) of the first carrying system (3).
 3. A device according to claim 1 or 2, wherein the second carrying system (8) consists of at least one motorized belt (15) defining a common resting surface (17) on which the shingled groups move from the inlet (8a) to the outlet (8b) of the second carrying system (8).
 4. A device according to claim 1, wherein said electronic unit (22) is further configured to verify (215) whether the thickness of the postal items of the back side of the shingled group arranged at the inlet (8a) of the second carrying system (8) is thinner than a threshold value S_{lim} ; if the outcome of the verification is negative, the second carrying system (8) is advanced until the thickness value is below the threshold value at which the second carrying system (8) is stopped; if the thickness is thinner than the threshold, the second carrying system (8) is held still.
 5. A device according to claim 1 or 4, wherein said electronic unit (22) is further configured to detect that the position of the back side of the shingled group of postal items is at a certain distance from an end edge (3b) of the first carrying system and to then return the first carrying system to the maximum speed V_{max} to ensure that the back side of the shingled group of postal items which is leaving the first carrying system (3) does not slide when passing between the first and second carrying systems.
 6. A device according to claim 1, wherein said electronic unit (22) is configured to control said second carrying system (315) so that the latter moves with a backward motion to take the back side of the shingled group of postal items arranged on the second carrying system (8) exactly at the inlet (8a) of said second carrying system (8); once a predetermined position has been reached, said backward motion ends and the second carrying system is stopped.
 7. A device according to any one of the preceding claims, wherein the reciprocal position of a first carrying system with respect to the other carrying system may be modified in order to adjust the value of said height h .
 8. A device according to any one of the preceding claims, wherein a first carrying system and a plurality of second carrying systems are included, and wherein the position of the first carrying system may be varied for selecting a second carrying system.
 9. A device according to any one of claims 1 to 7, wherein a plurality of first carrying system and a second carrying system are included, the position of which may be varied for selecting a first carrying system.

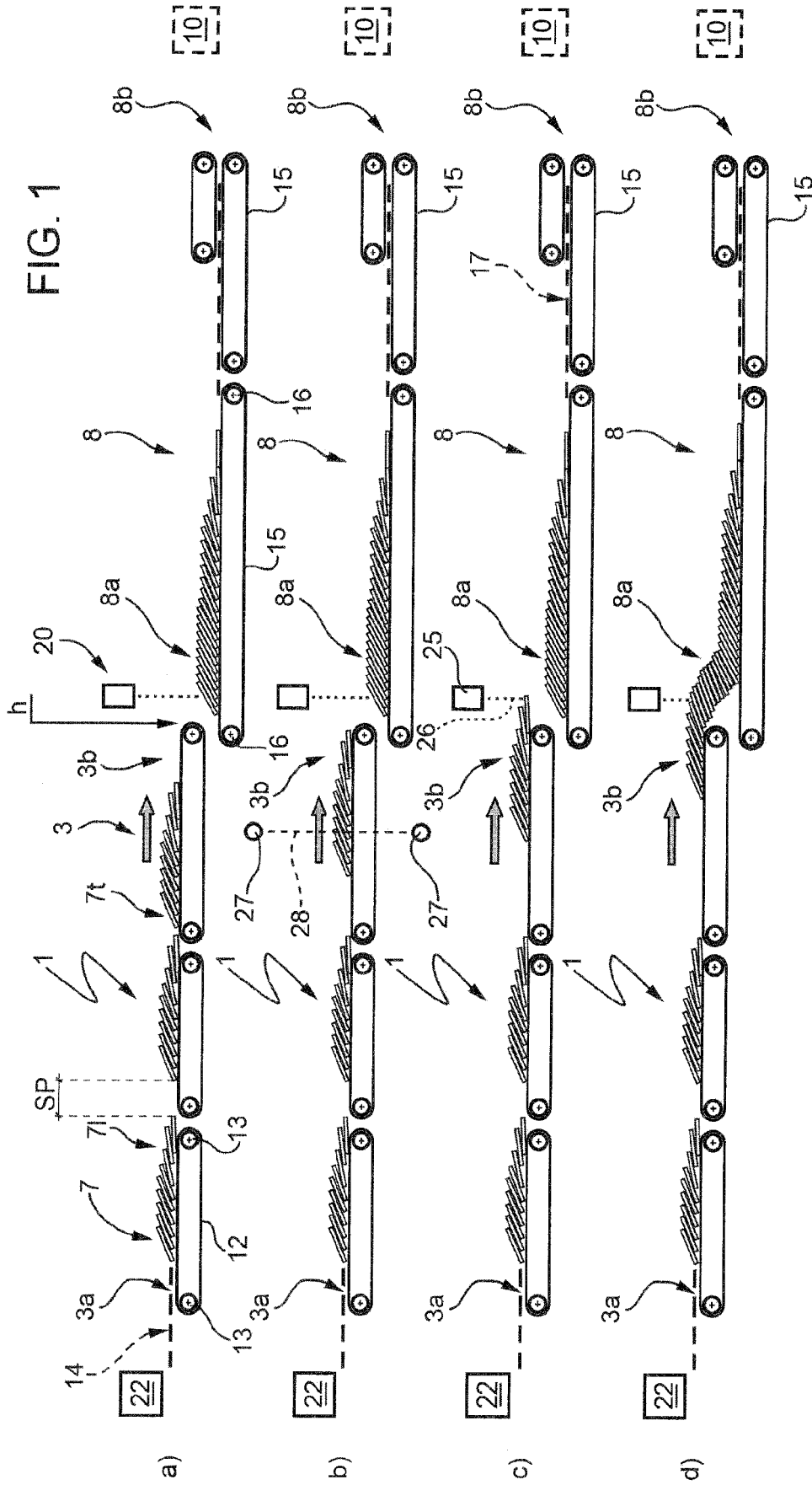


FIG. 1e

FIG. 1f



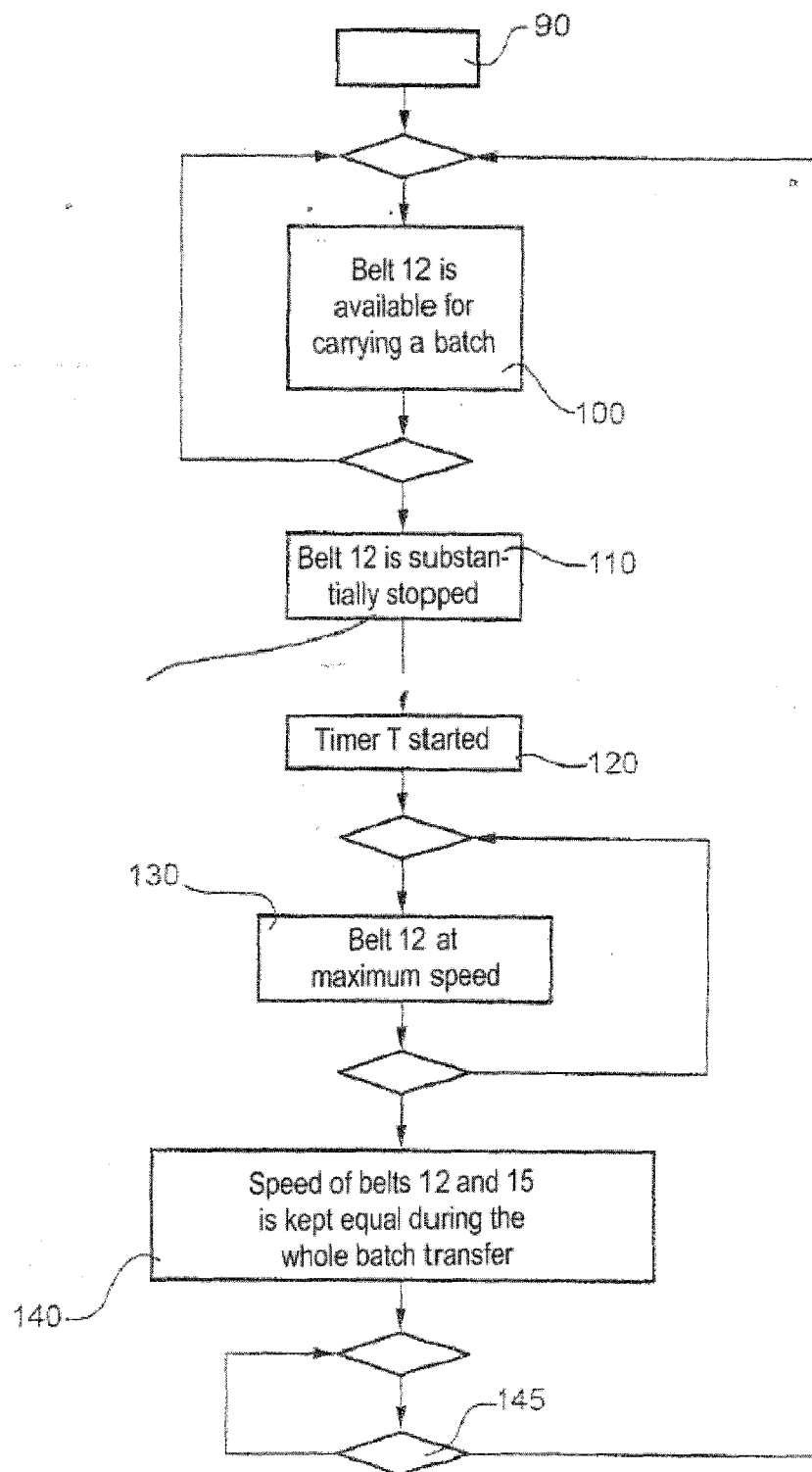


FIG. 2

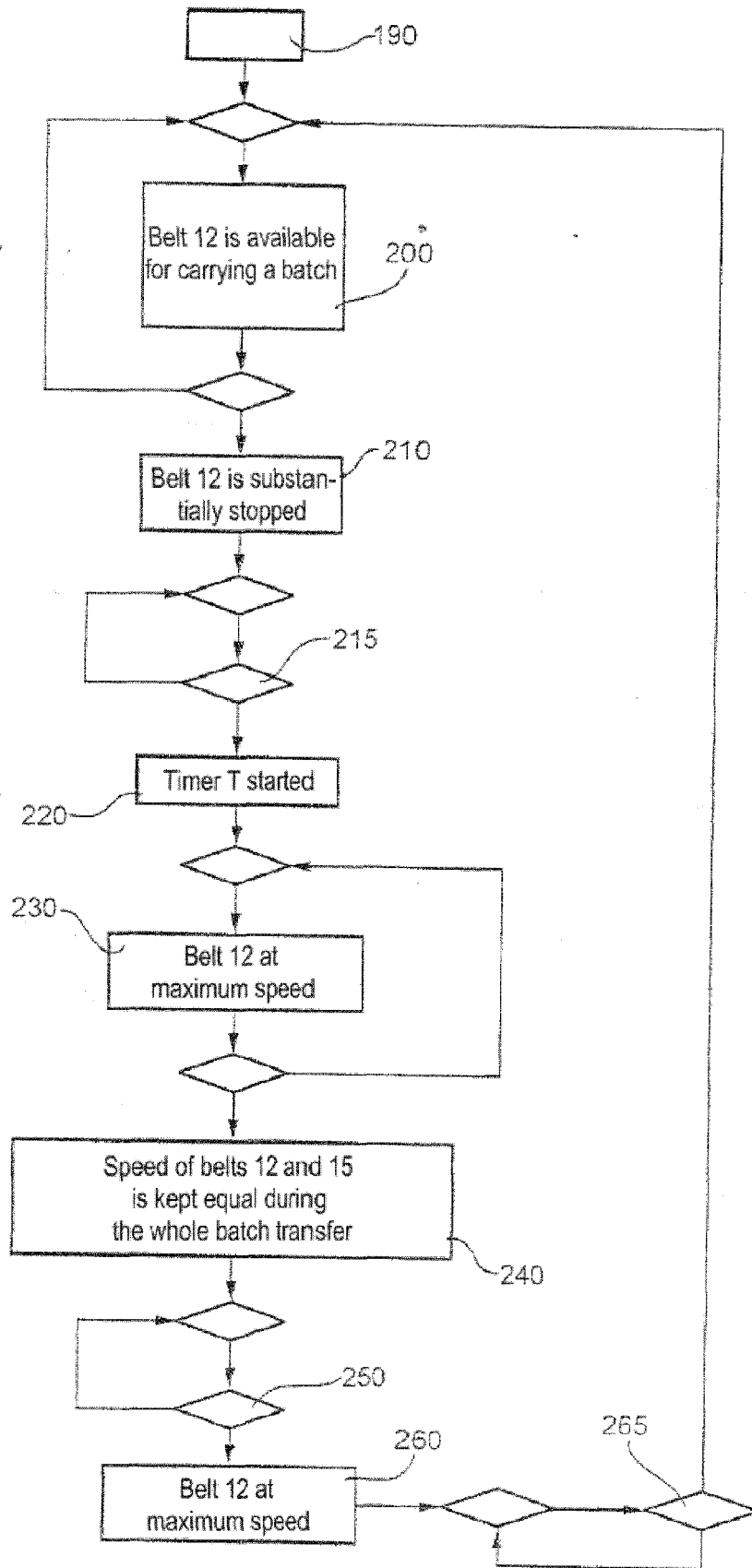


FIG. 3

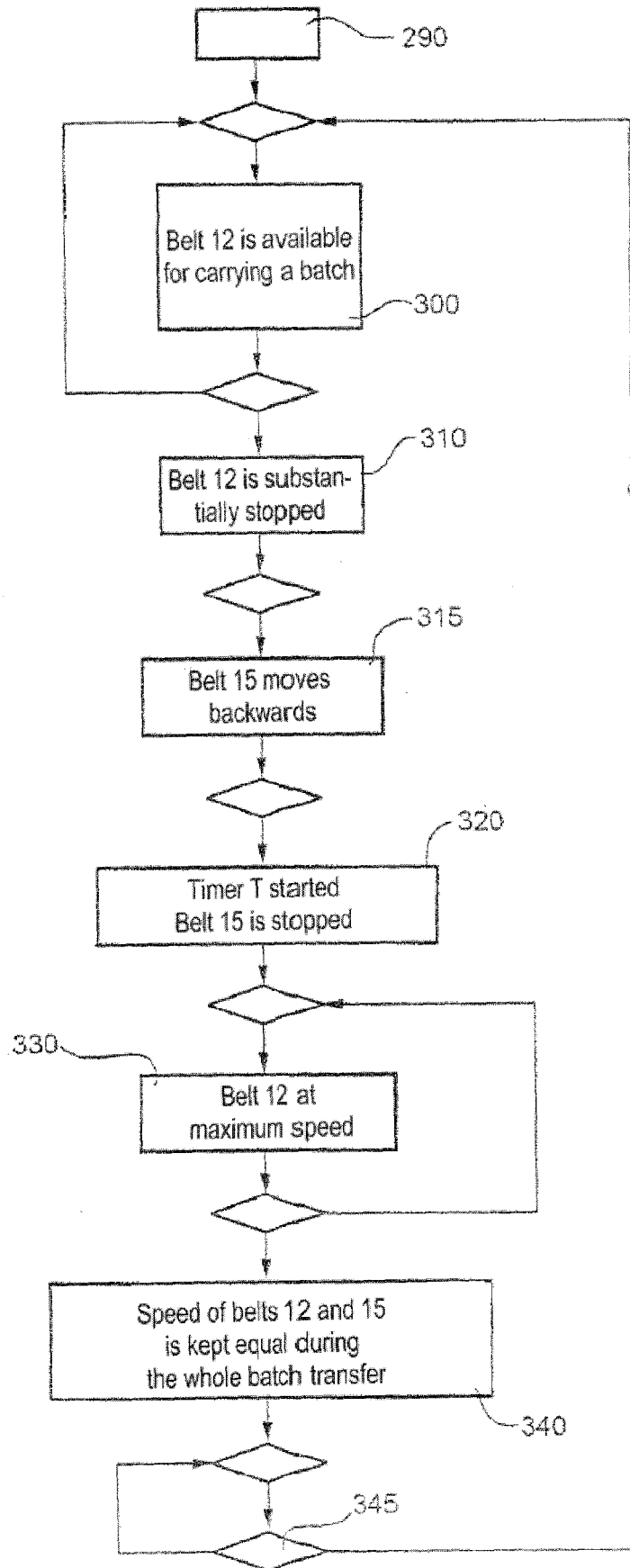
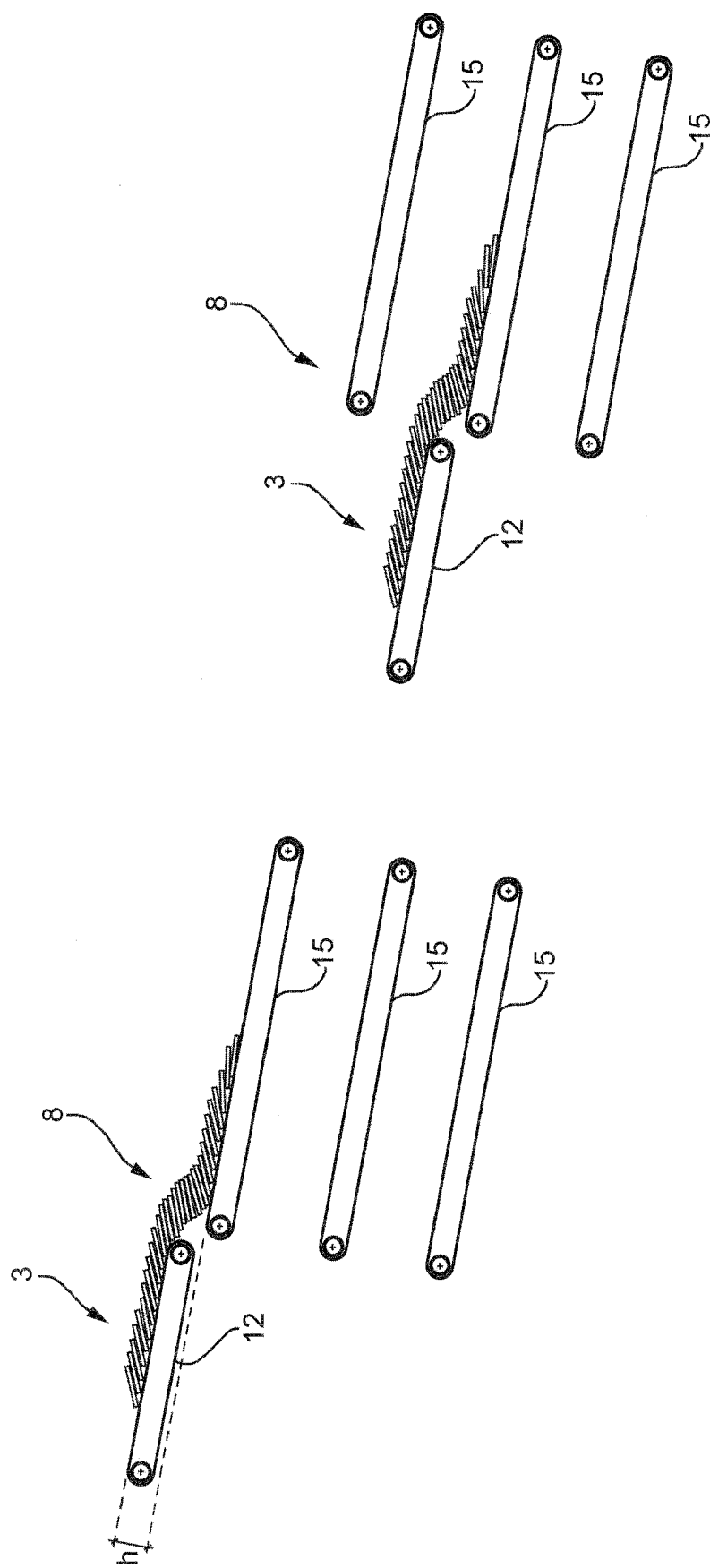


FIG. 4

FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 12 15 8149

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	EP 2 213 602 A2 (PITNEY BOWES INC [US]) 4 August 2010 (2010-08-04) * the whole document *	1-9	INV. B65H29/66
A	EP 0 259 650 A2 (FERAG AG [CH]) 16 March 1988 (1988-03-16) * column 8, line 1 - column 9, line 17; figures 5-8 *	1-9	
A	US 2007/187886 A1 (HALLER MIRKO [CH] ET AL) 16 August 2007 (2007-08-16) * paragraph [0031] - paragraph [0033]; figures 2a-2c *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 June 2012	Examiner Athanasiadis, A
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

1

EPO FORM 1503 03.92 (P04C01)

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

EP 12 15 8149

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

11-06-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2213602 A2	04-08-2010	EP 2213602 A2	04-08-2010
		US 2010276249 A1	04-11-2010

EP 0259650 A2	16-03-1988	AT 68769 T	15-11-1991
		DE 3774048 D1	28-11-1991
		EP 0259650 A2	16-03-1988

US 2007187886 A1	16-08-2007	EP 1816098 A1	08-08-2007
		JP 2007204280 A	16-08-2007
		US 2007187886 A1	16-08-2007

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2213602 A [0004]