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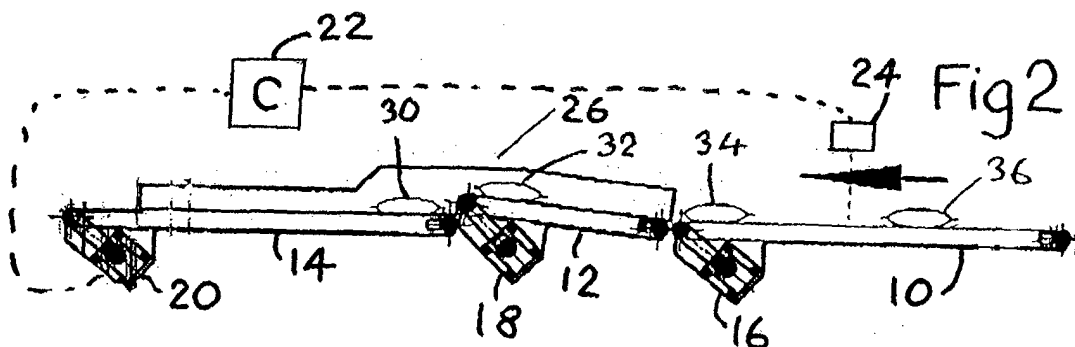
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(54) **Articles collating system**

(57) A feed conveyor (12) discharges successive articles (30, 32, 34, 36) such as packets of snack foods so that they drop, with forward and downward components of motion, onto a collating conveyor (14). The motion of the collating conveyor (14) is cyclically controlled

(using a computer (22) and motor (20)) in synchronism with the arrival of articles (detected by a detector (24)) so that the conveyor is decelerating when an article lands on it. This leads to reliable placement of articles, which can be used to form shingled arrays.



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Description

[0001] The present invention relates to a collating system, typically for small, light articles such as packets of crisps and other snack foods.

[0002] It is known to collate such articles by means of an infeed conveyor which drops articles from a small height onto a collating conveyor. The collating conveyor moves intermittently, such that it is stationary when an article is landing on it, and then moves by a predetermined amount, coming to rest before the next article lands. The amount of movement may be selected to be less than the length of an article, so that a shingled (overlapping) array results.

[0003] Because of the need for high speed operation, articles tend to be emerging from the infeed conveyor with significant velocity. There is thus a tendency for articles to bounce and skid as they land on the collating conveyor. Thus they may end up in incorrect positions and/or configurations, and may disturb the arrangement of articles already on the belt.

[0004] The present invention provides a method of collating articles by means of a collating conveyor and an infeed conveyor which is arranged to drop the articles onto an upstream region of the collating conveyor. The articles leave the infeed conveyor with a downstream component of motion (in addition to a forward component). The motion of the collating conveyor is controlled such that an article lands on the upstream region when it is decelerating. Subsequently, the collating conveyor accelerates and moves to convey the article downstream by a predetermined amount, decelerating again as a subsequent article is landing.

[0005] The amount of displacement in each cycle may be automatically variable. Typically there will be a multiplicity of short displacements, to produce a shingled array, followed by a long displacement to introduce a gap before another shingled array is produced.

[0006] There may be a product detector (e.g. employing a photocell) which detects articles on the infeed conveyor and provides signals to control the operation of the collating conveyor. Detection will generally occur at a location spaced some way upstream of the collating conveyor. Thus there is a (known) time interval between detection and the arrival of an article on the collating conveyor, during which the motion of that conveyor can be adjusted.

[0007] In a second aspect the invention provides apparatus for carrying out the above method, including an infeed conveyor assembly and a collating conveyor, with a control device for controlling the displacement of the collating conveyor.

[0008] An embodiment of the invention will now be described in more detail by way of example with reference to the accompanying drawings:

Fig. 1 is a plan view of a collating system embodying the invention;

Fig. 2 is a side elevation of the assembly; and
Figs. 3 to 6 are partial side elevations showing the apparatus in different phases of operation.

[0009] An infeed conveyor assembly includes a first infeed conveyor 10 which leads to an upwardly-sloping inclined conveyor 12. A collating conveyor 14 commences adjacent the downstream end of the inclined conveyor 12, at a slightly lower level. In this example, all three conveyors are shown as belt conveyors. The conveyors 10, 12 of the infeed assembly may run at constant speed. They generally run at the same speed as each other. Their speeds may be variable. They are shown as driven by respective drive motors 16, 18. The collating conveyor 14 is driven by its own drive motor 20, under the control of a computer 22. A product detector 24 (e.g. employing a photocell) detects the passage of products along the first infeed conveyor 10. When a product is detected, the detector sends a signal to the computer 22.

[0010] As shown, there may be side guides 26 at each lateral side of the collating conveyor 14. In this example they also extend along the inclined conveyor 12.

[0011] In normal operation, the two conveyors 10, 12 of the infeed assembly run at the same, constant speed. Thus when the detector 24 detects a product, that product will be reaching the end of the inclined conveyor 12 a fixed interval later. The computer 22 controls the operation of the motor 20 for the collating conveyor 14 in a cyclic fashion. During the production of a shingled array, one cycle involves a total displacement somewhat less than the length of one article. The cycle includes an acceleration phase and a deceleration phase. The synchronisation by means of the detector 24 is such that an article 30 which comes off the downstream end of the inclined belt 12 contacts the collating conveyor 14 when this is decelerating. This deceleration is selected to provide controlled braking for the article. The first article 30 in an array thus lies flat on the collating belt. Because it has landed in a controlled fashion, there is little risk that it will have skidded and twisted. Thus it should be lying centrally, with its axis parallel to the conveying direction. The succeeding article 32 lands with its leading edge on the first article 30, and its trailing edge on the conveyor 14. A further plurality of articles are added behind to produce a shingled array. In this example, a shingled array consists of four articles. When the fifth article 38 is detected by the detector 24, the computer 22 causes the collating conveyor 14 to perform a long displacement (in the same time as the short displacement, or at least, terminating with its acceleration phase when the product 38 is leaving the inclined conveyor 12 just as is the case after a short stroke). Thus this fifth product 38 is the first product of next shingled array. Fig. 6 shows two completed shingled arrays 40, 42 spaced by a gap 44.

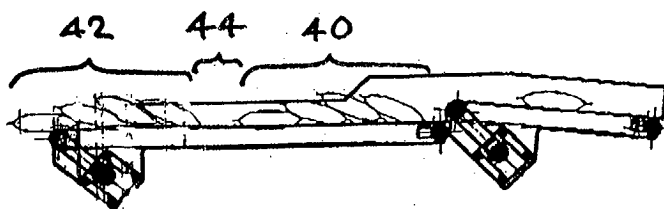
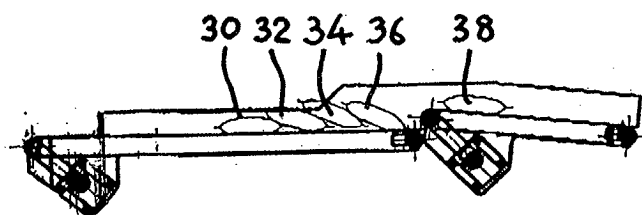
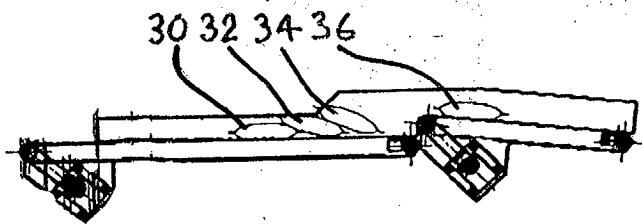
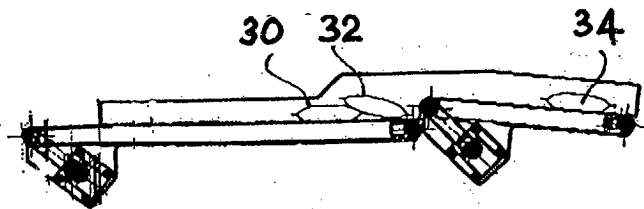
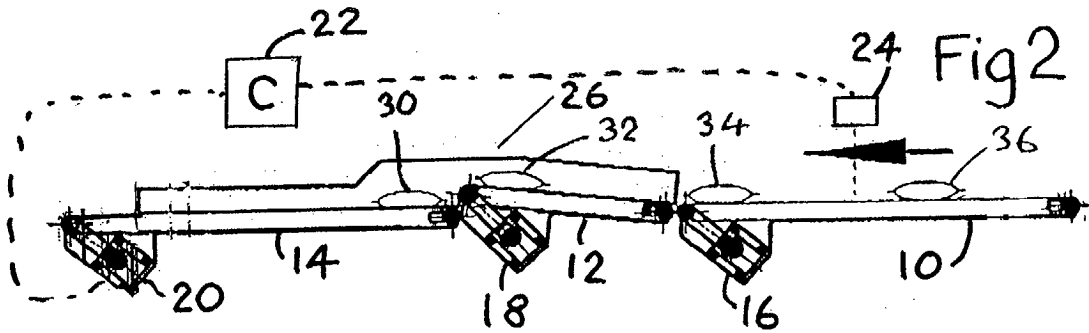
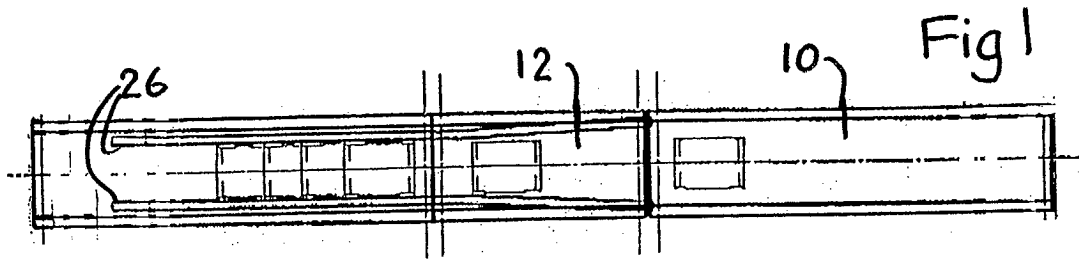
[0012] The speed and position of the collating conveyor 14 can be accurately controlled, so an article can be

accelerated and positioned at any desired point between its ends. The movement of the article can be made to follow a desired speed profile, e.g. cycloidal, trapezoidal or sine or modified sine movement profiles. The use of suitable speed profiles enables precise, stable and controlled movement of the articles in the shortest possible time. 5

Claims

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1. A method of collating articles (30, 32, 34, 36) by means of a collating conveyor (14) and an infeed conveyor (14), wherein the infeed conveyor (10,12) is arranged and operated so that articles (30, 32, 34, 36) leave it with a downstream component of motion and drop onto an upstream region of the collating conveyor (14); and wherein the motion of the collating conveyor (14) is cyclically controlled (22) such that it is decelerating when an article (30) lands on it, and it then accelerates and moves through a predetermined displacement to convey the article downstream by a predetermined amount, decelerating again as a subsequent article (32) is landing. 15 20 25
2. A method according to claim 1 wherein the collating conveyor (14) is controlled (22) so that there are a multiplicity of displacements shorter than the length of an article (30, 32, 34, 36) in the conveying direction to produce a shingled array, followed by a displacement longer than said length to introduce a gap before another shingled array is produced. 30
3. A method according to claim 1 or claim 2 employing a product detector (24) which detects articles (36) on the infeed conveyor (10, 12) and provides signals to control the operation of the collating conveyor (14). 35 40
4. A method according to any preceding claim wherein the motion of the collating conveyor (14) has a speed profile selected from cycloidal, trapezoidal, sine and modified sine movement profiles. 45
5. Apparatus for carrying out the method of any preceding claim including an infeed conveyor assembly (10, 12) and a collating conveyor (14), with a control device (20, 22) for controlling the displacement of the collating conveyor (14). 50
6. Apparatus according to claim 5 including a computer (22) coupled to the collating conveyor (14) and adapted to control its operation. 55





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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 2276

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	US 5 430 994 A (FOCKE HEINZ ET AL) 11 July 1995 (1995-07-11)	1-3,5	B65B35/44
Y	* column 4, line 25 - line 57; figures 3-6 *	4,6	
Y	--- US 4 238 024 A (HIRAKAWA TADASHI ET AL) 9 December 1980 (1980-12-09) * column 4, line 54 - line 58; figures 4-6 *	4,6	
A	--- GB 2 046 711 A (METAL BOX CO LTD) 19 November 1980 (1980-11-19) * the whole document * -----	1-6	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.CI.7) B65B B65G
Place of search THE HAGUE		Date of completion of the search 25 July 2003	Examiner Vigilante, M
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
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 25 2276

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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25-07-2003

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5430994 A	11-07-1995	DE 4215642 A1	18-11-1993
		EP 0569786 A1	18-11-1993
		JP 6122420 A	06-05-1994
US 4238024 A	09-12-1980	JP 1329777 C	30-07-1986
		JP 55016818 A	05-02-1980
		JP 60054217 B	29-11-1985
		AU 534221 B2	12-01-1984
		AU 4834379 A	24-01-1980
		DE 2962230 D1	01-04-1982
		EP 0007231 A1	23-01-1980
GB 2046711 A	19-11-1980	IE 49546 B1	30-10-1985

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82