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(54) **Improvements in and relating to apparatus for automatically reorganising product lines.**

(57) An article reorganiser receives articles from input lines (1) and deposits them in output lines (2). The apparatus comprises an endless conveyor (3) having a plurality of laterally extending article receptor means (4) which are spaced apart in the direction of movement of the conveyor. Each receptor means (4) is provided with several article receptors (5) for receiving articles from the input lines (1) and at least one of these receptor means (4) is laterally movable. Adjacent receptor means (4) are arranged in groups and each group of receptor means (4) is arranged to receive at least one article from each input line (1) and, by movement of one or more of the receptor means (4), to laterally reposition the articles prior to their deposit in the output lines (2).

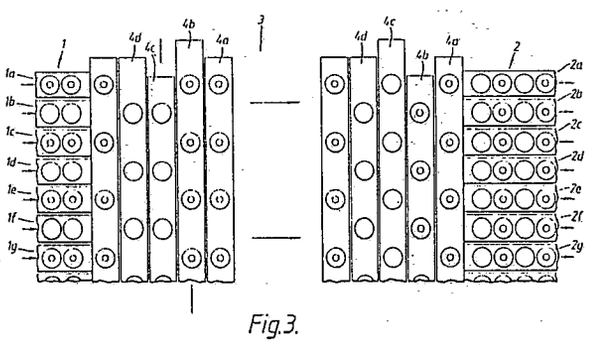

Fig.3.

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Description

Improvements in and relating to Apparatus for Automatically Reorganising Product Lines

The present invention relates to apparatus for automatically reorganising a plurality of article carrying product lines for use, for example, in manufacturing, assembling and/or packaging systems.

In such systems there may be a requirement for changing the number of product lines from one part of the system to another. For example, the manufacturing part of a manufacturing and packaging system may have a plurality of output lines and the packaging part of the system may have a different number of input lines because the rates of throughput of individual components of the manufacturing and packaging parts of the system are different. Alternatively, there may be a requirement for changing the order or arrangement of different parts of a product among the product lines. For example, in the production of multi-layer biscuits, each of which comprises at least two different types of biscuit, the manufacturing part of the system produces a plurality of product lines of each type of biscuit and it is then necessary to combine the two types of biscuit to provide product lines comprising, e.g., alternate ones of the two types of biscuits, which product lines then form the input to the part of the system where the biscuits are combined.

Presently such changes cannot be made simply and automatically.

According to one aspect of the present invention there is provided apparatus for reorganising a plurality of article carrying product lines and which is adapted to receive articles from a plurality of input lines and to deposit the articles in a plurality of output lines, the apparatus comprising an endless conveyor comprising a plurality of article receptor means spaced apart in the direction of movement of the conveyor, each receptor means extending laterally with respect to the direction of movement and being provided with at least one article receptor for receiving articles from the input lines, at least one of said receptor means being provided with a plurality of article receptors, adjacent receptor means being arranged in a group and the or each group of receptor means being arranged to receive at least one article from each input line, wherein at least one of the receptor means in the or each group is laterally movable to laterally reposition the or each article receptor thereof.

The or each group of article receptor means is advantageously arranged to receive the same number of articles from each input line.

The receptor means provided with a plurality of article receptors, may be arranged to receive articles simultaneously from a plurality of the input lines.

A plurality of article receptor means in the or each group of article receptor means may be laterally moveable. The endless conveyor may comprise a plurality of groups of article receptor means.

The article receptor means may be mounted on endless support means for movement in the direction of movement of the conveyor. Cam means may be provided on the or each laterally movable article receptor means and stationary cam means may be provided adjacent these cam means, the cam means being arranged to co-operate to cause and control lateral movement of the or each laterally movable article receptor means during movement of the conveyor.

Each article receptor means preferably comprises a generally planar surface extending laterally across at least two input lines, and the or each article receptor is provided on said generally planar surface.

According to a further aspect of the present invention there is provided a method of reorganising a plurality of article carrying product lines by taking articles from a plurality of input lines and depositing the articles in a plurality of output lines, the method comprising the step of simultaneously taking an article from at least some of the input lines and subsequently depositing the articles in at least some of the output lines, and repeating the step among the input and output lines, such that in any one cycle comprising a plurality of steps at least one article is taken from each input line and, before depositing in the output line the articles taken in at least one of the steps of a cycle, said articles are laterally moved.

Where the number of output lines differs from the number of input lines, by laterally moving articles before their deposit in the output lines, at least one article may be deposited in each output line in any one cycle.

In each cycle the number of articles taken from each input line may be the same for each input line. Furthermore, the number of articles deposited in each output line may be the same for each output line. The number of articles taken from each input line may be equal to that deposited in each output line.

Further features and advantages of the present invention will become apparent from the following description of an embodiment thereof, given by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a diagrammatic side view of part of a system incorporating an embodiment of apparatus according to the present invention;

Figure 2 is a diagrammatic plan view of the part of the system shown in Figure 1;

Figure 3 is a diagrammatic plan view illustrating operation of the apparatus of Figure 1;

Figure 4 is a side elevation showing part of the apparatus of Figure 1;

Figure 5 is a section on the line V-V of Figure 4;

Figure 6 is a section on the line VI-VI of Figure 5;

Figure 7 is a section on the line VII-VII of Figure 6;

Figure 8 is a section corresponding to that of Figure 5 and showing a lateral extremity of the apparatus of Figure 1;

Figure 9 is a plan view of part of the apparatus of Figure 1 to an enlarged scale; and

Figure 10 is a section on the line X-X of Figure 9.

The apparatus shown diagrammatically in Figures 1 and 2 of the drawings forms part of a system for producing a two-layer article from two different types of article, which articles may for example be biscuits, and incorporates an embodiment of apparatus according to the present invention. In the system, the two types of biscuits are made in manufacturing units (not shown) and are supplied to a plurality of input lines 1a, 1b, 1c.. In the illustrated embodiment, alternate input lines comprise the same type of biscuit. It is required to supply these biscuits to a plurality of output lines 2a, 2b, 2c.. which, in the illustrated embodiment, are equal in number to the input lines, but with the arrangement of the types of biscuit reorganised so that the two types of biscuit alternate in each individual output line.

Arranged between the output ends of the input lines and the input ends of the output lines is an endless conveyor 3 for effecting the required reorganisation, the conveyor 3 comprising a plurality of laterally extending article receptor means 4a, 4b, 4c.., spaced apart in the direction of movement of the conveyor. Each article receptor means 4 comprises a plurality of article receptors 5 spaced apart across the width of the conveyor for taking and receiving biscuits from the input lines 1 and depositing them in the output lines 2. In the illustrated embodiment, each article receptor means 4 comprises a generally planar surface extending laterally across all the input lines 1, and on which the article receptors 5 are provided.

As is more clearly shown diagrammatically in the left-hand half of Figure 3, each article receptor means 4 takes a biscuit simultaneously from alternate ones of the input lines so that each receptor means picks up only one type of biscuit. Two adjacent receptor means, e.g. 4a, 4b, take biscuits from the same input lines and the succeeding two receptor means, e.g. 4c, 4d, take biscuits from the other input lines. Thus each group of four adjacent receptor means, e.g. 4a to 4d, takes two biscuits from each input line and this grouping of the receptor means 4 is repeated over the length of the conveyor. In the illustrated embodiment, each group of four receptor means deposits two biscuits in each output line 2 so that each group of receptor means takes the same number of biscuits from each input line and deposits them in each output line. Because there are equal numbers of input and output lines in the illustrated embodiment, the number of biscuits taken from each input line equals the number deposited in each output line.

To obtain the required rearrangement of the biscuits between the input and output lines, two receptor means 4 out of each group of four receptor means are laterally moved, between picking up the biscuits and depositing the biscuits, to re-align the biscuits received in their receptors 5 with receptors in other of the receptor means, so as to interpose one type of biscuit with the other type in each output line. As shown between the left and right-hand halves of Figure 3, the second and third receptor means, 4b, 4c, of each group of four receptor means are laterally moved, one in one direction and the other in the opposite direction. In the left-hand half of Figure 3 the group of four receptor means 4 is shown in its initial position after picking up biscuits and, in the right-hand half, the same group of four receptor means is shown after the required lateral movement of two of the means (4b, 4c).

An embodiment of the conveyor 3 is shown in more detail in Figures 4 to 10. As shown, the receptor means 4 comprises plates 6, each plate 6 having a generally planar surface extending laterally across the lines, on which surface the receptors 5 are provided. The plates 6 are mounted and supported on, and moved in the direction of movement of the conveyor by, endless support means, in the form of a pair of endless chains 7, which extend around sprockets 8 of which one, which is driven, is shown in Figure 4. The pairs of chains 7 are laterally interconnected by rods 9 which are arranged level with the adjacent trailing and leading end edges of adjacent plates 6. The plates 6 are supported on the chains by blocks 10 fixed to the plates and whose end faces are grooved to partly engage two adjacent longitudinally spaced rods 9 (Figures 6 and 7), the end faces of the blocks 10 being shaped to permit pivoting of the blocks on the rods as the conveyor passes around the sprockets 8. The blocks 10 are also laterally slidable on the rods 9 to permit lateral movement of those plates 6 which are required to move laterally.

The plates 6 of those receptor means 4 which are required to move laterally are provided with cam means in the form of cam followers which contact stationary cam means in the form of cam surfaces arranged adjacent the path of movement of the plates 6. As shown, the cam followers comprise rollers 11 of which one or a pair is mounted at each end of a moveable plate 6 and the rollers 11 engage cam surfaces 12 appropriately arranged adjacent the sides of the path of the plates 6. In the illustrated embodiment, where two out of each group of four plates are laterally moved and are moved in different directions, two cam surfaces 12 may be provided (Figure 8), one contacted by rollers 11 of one of each group of plates 6, these rollers 11 being mounted on the undersurface of the plates 6, the other being contacted by the other of each group of plates with the cam follower rollers 11 mounted on the upper surface of the plates 6 (not shown). It will however be appreciated that the lateral movement of the laterally movable plates can be obtained with a variety of different arrangements of cam and cam followers depending on the construction and support of the conveyor.

In this embodiment, the conveyor is arranged with a generally upwardly inclined upper conveying run 3a (Figure 1) during which lateral movement of the receptor means 4 takes place, a lower run 3b, during which the laterally movable receptor means 4 are returned to their initial positions, and generally upward and downward runs 3c, 3d connecting the upper and lower runs 3a, 3b. It will be appreciated

that the arrangement of the input lines and output lines relative to the conveyor 3, together with the form of the article receptors, will depend on the precise articles concerned and the form of the input and output lines. In this embodiment, the input lines are provided by individual conveyors 1, which may for example be in the form described in GB Patent specification No. 2170164 in which the articles, which are biscuits, are arranged at the output ends in a generally forwardly and upwardly inclined condition. As shown the article receptors 5 comprise generally U-shaped elements (Figures 9 and 10) fixed to the surfaces of the plates 6 and which present a shoulder 14 for engaging the lower edge of a biscuit to remove it from the input line. In a modification the elements may be V-shaped or may be replaced by pairs of pins. It will be appreciated that the receptors 5 may take any suitable form depending on the article and its manner of presentation to the conveyor. The output ends of the input lines are, as shown in Figure 1, arranged adjacent the start of the upper run 3a of the conveyor.

The biscuits are removed from the conveyor in any convenient way and at any convenient stage once the rearrangement has taken place. For example, as shown, the biscuits slide out of the receptors 5 at the beginning of the downward movement of the plates 6 onto a downwardly inclined plate 15 which leads the biscuits individually onto an endless belt conveyor on which the output lines 2 are formed, the biscuits lying flat on the belt. In this particular system, it is required that the biscuits on the belt 2 be arranged with like biscuits in each output line 2a, 2b..... laterally aligned, as shown in Figure 3. For this purpose a device 16 (Figure 1) may be arranged at the input end of the output lines which retains biscuits from one receptor means, e.g. 4a or 4c, until the like biscuits from the immediately following receptor means, e.g. 4b or 4d, have also been deposited on the conveyor 2 and then releases them.

In this particular embodiment, the apparatus comprises twelve input lines and twelve output lines, of which some only are shown, but it will be appreciated that the number of input lines and output lines may be varied as required although, for this specific embodiment, an even number of input and output lines is required.

Where rearrangement of articles between the input and the output lines is not required, but merely an increase or reduction of lines between the input and the output, the movable receptor means 4 are arranged to take up articles from the input lines and bring them into alignment with those from other input lines, to reduce the number of lines at the output, or to move them into alignment with new lines, to increase the number of lines at the output.

Although in the illustrated embodiment each receptor means 4 is shown as being provided with a plurality of receptors 5 with each receptor means having the same number of receptors, depending on the reorganisation required, the receptor means of the or each group may have different numbers of receptors and not all may be provided with a plurality of receptors.

It will be appreciated that, with suitably arranged input lines, article receptor means, article receptors, and appropriate lateral movements of the article receptor means, virtually any conceivable reorganisation of articles between the input and output lines can be achieved. Advantageously, for any one group of article receptor means, which may comprise all the receptor means of the conveyor, the same number of articles is taken from each input line and the same number of articles (which may be the same as the number of articles taken from each input line or may be different) is deposited in each output line.

Claims

1. Apparatus for reorganising a plurality of article carrying product lines and which is adapted to receive articles from a plurality of input lines (1) and to deposit the articles in a plurality of output lines (2), the apparatus comprising an endless conveyor (3) comprising a plurality of article receptor means (4) spaced apart in the direction of movement of the conveyor, each receptor means (4) extending laterally with respect to the direction of movement and being provided with at least one article receptor (5) for receiving articles from the input lines (1), at least one of said receptor means (4) being provided with a plurality of article receptors (5), adjacent receptor means (4) being arranged in a group and the or each group of receptor means (4) being arranged to receive at least one article from each input line (1), wherein at least one of the receptor means (4) in the or each group is laterally movable to laterally reposition the or each article receptor (5) thereof.

2. Apparatus as claimed in Claim 1, wherein the or each group of article receptor means (4) is arranged to receive the same number of articles from each input line (1).

3. Apparatus as claimed in Claim 1 or Claim 2, wherein said at least one article receptor means (4) is arranged to receive articles simultaneously from a plurality of the input lines (1).

4. Apparatus as claimed in any of the preceding claims, wherein a plurality of article receptor means (4) in the or each group of article receptor means (4) are laterally movable.

5. Apparatus as claimed in any of the preceding claims, wherein the endless conveyor (3) comprises a plurality of groups of article receptor means (4).

6. Apparatus as claimed in any of the preceding claims, wherein the article receptor means (4) are mounted on endless support means (7) for movement in the direction of movement of the conveyor.

7. Apparatus as claimed in any of the preceding claims, comprising cam means (11) on the or each laterally movable article receptor means (4) and stationary cam means (12), the cam means (11, 12) being arranged to co-operate to cause and control lateral movement of

the or each laterally movable article receptor means (4) during movement of the conveyor.

8. Apparatus as claimed in any of the preceding claims, wherein each article receptor means (4) comprises a generally planar surface extending laterally across at least two input lines (1), and the or each article receptor (5) is provided on said generally planar surface.

9. A method of reorganising a plurality of article carrying product lines by taking articles from a plurality of input lines and depositing the articles in a plurality of output lines, the method comprising the step of simultaneously taking an article from at least some of the input lines and subsequently depositing the articles in at least some of the output lines, and repeating the step among the input and output lines, such that in any one cycle comprising a plurality of steps at least one article is taken from each input line and, before depositing in the output line the articles taken in at least one of the steps of a cycle, said articles are laterally moved.

10. A method as claimed in Claim 9 wherein the number of output lines differs from the number of input lines and, by laterally moving articles before their deposit in the output lines, at least one article is deposited in each output line in any one cycle.

11. A method as claimed in Claim 9 or Claim 10 wherein in each cycle the number of articles taken from each input line is the same for each input line, and the number of articles deposited in each output line is the same for each output line.

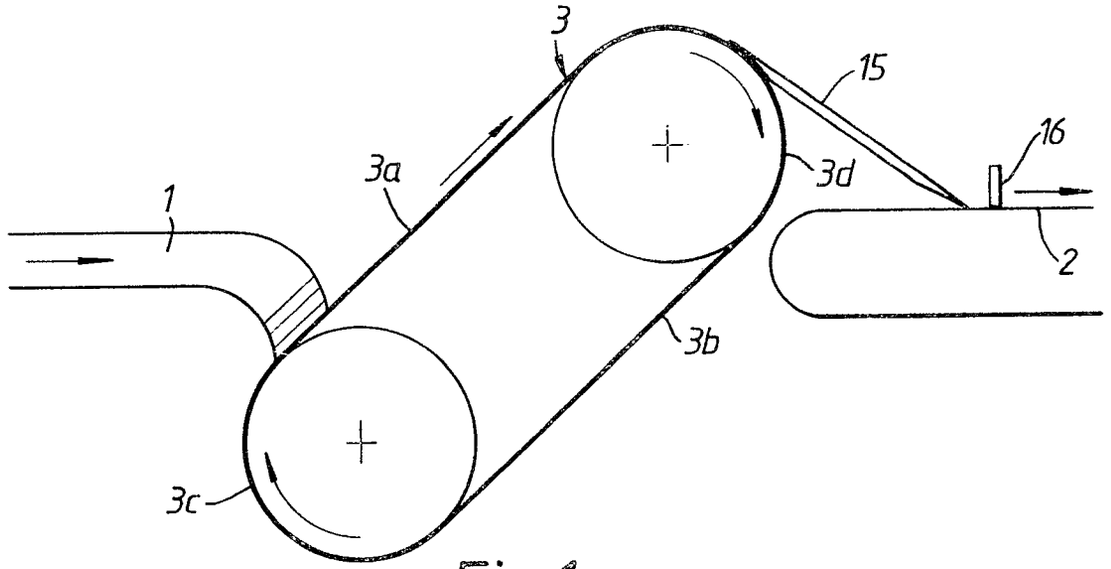
3
15
16
3a
3d
1
2
3b
3c

Fig.1.

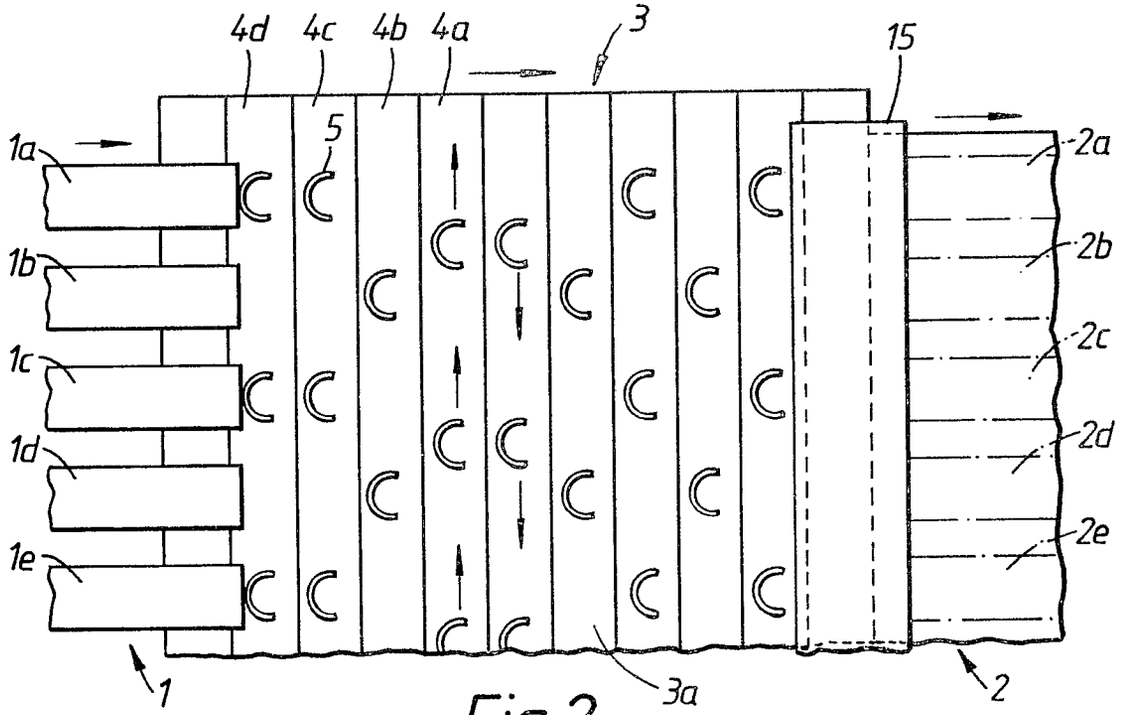
4d
4c
4b
4a
3
15
5
1a
1b
1c
1d
1e
2a
2b
2c
2d
2e
1
3a
2

Fig.2.

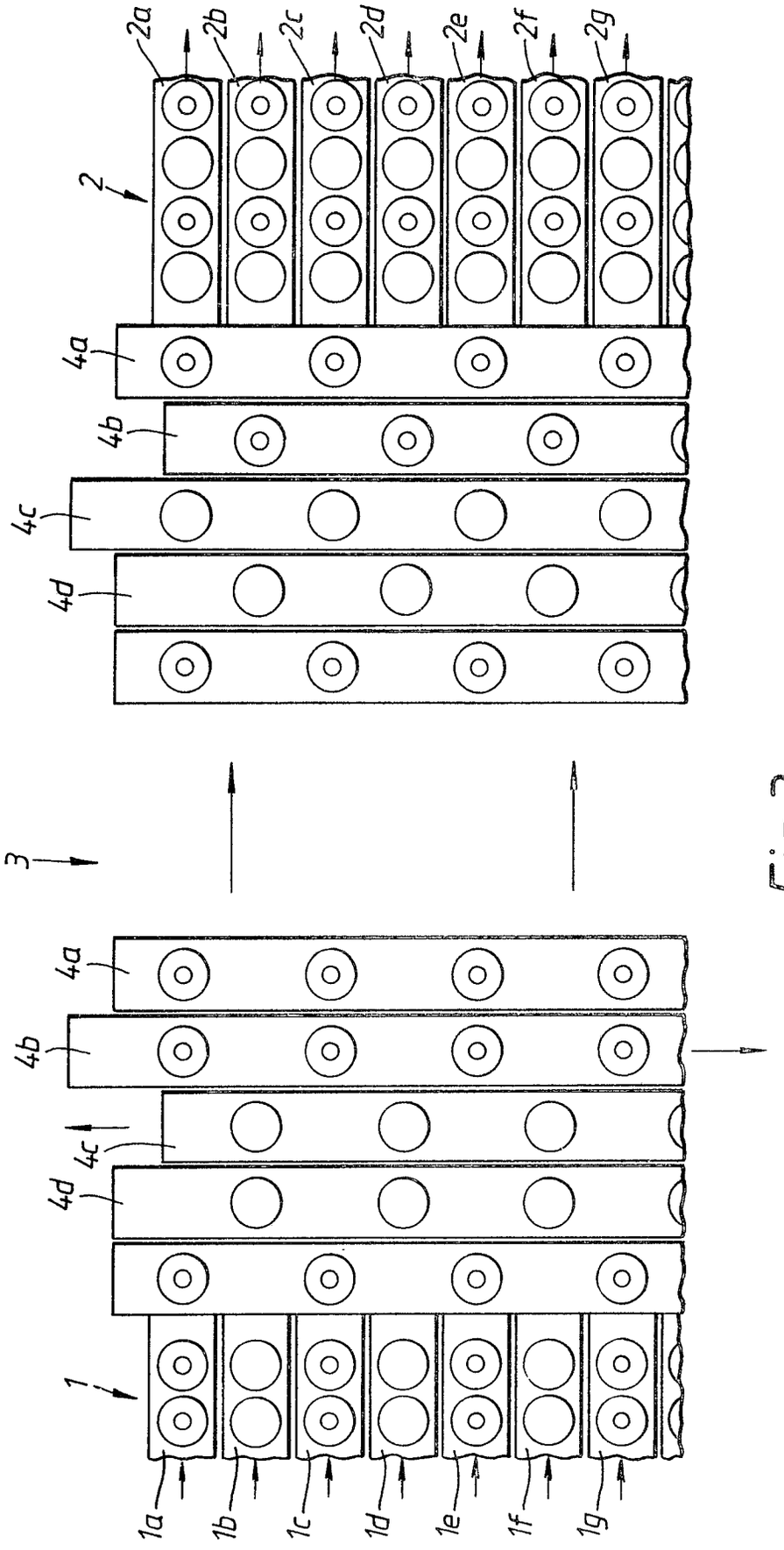

Fig. 3.

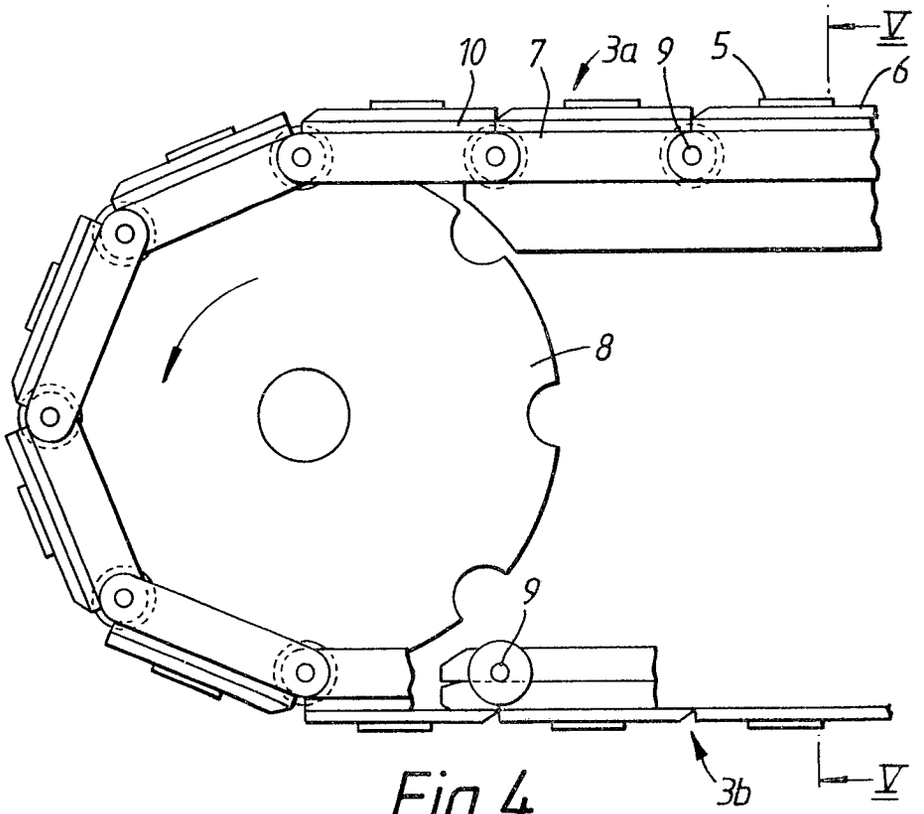

Fig.4.

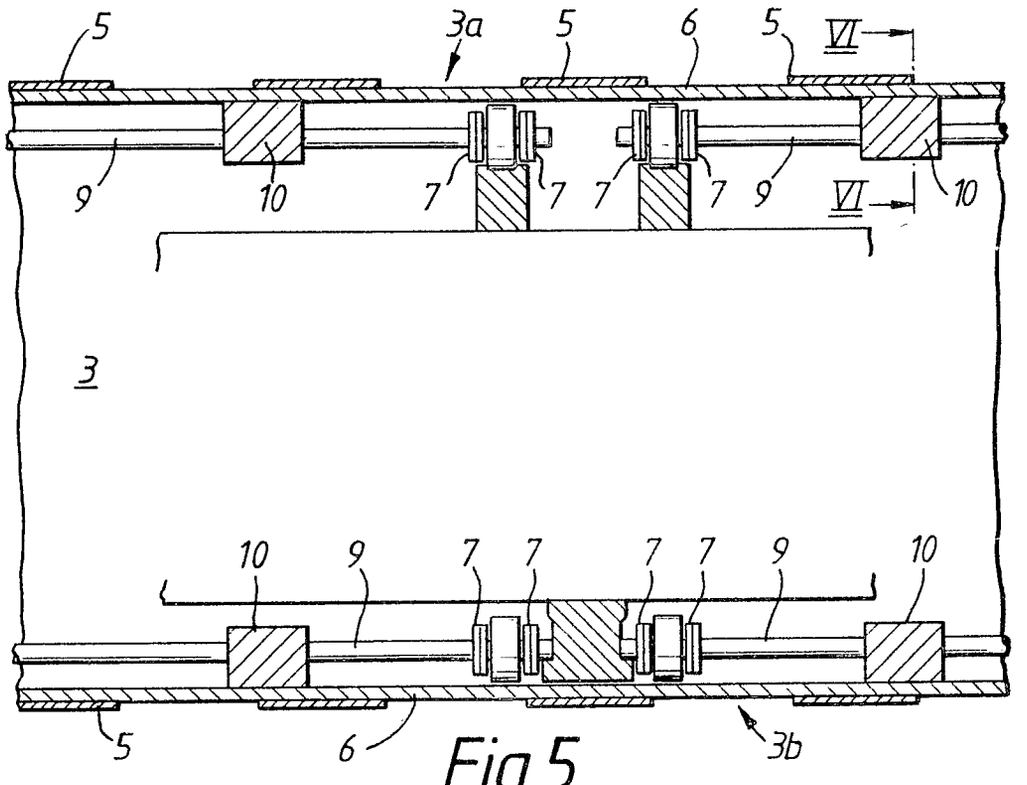

Fig.5.

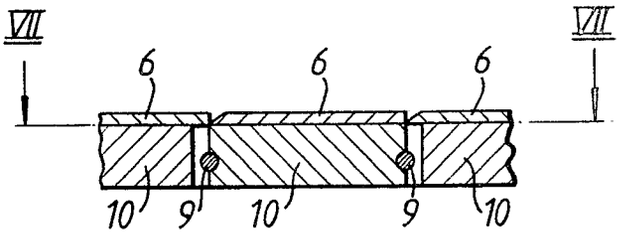

Fig.6.

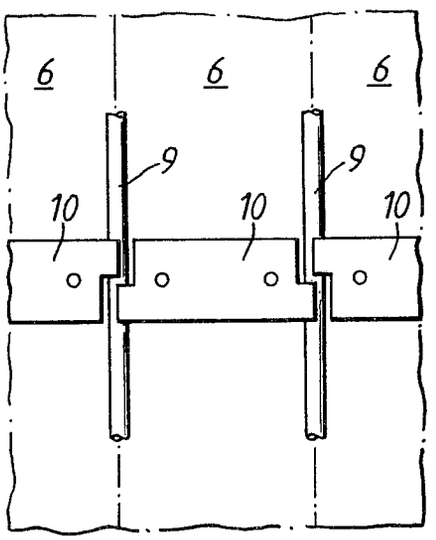

Fig.7.

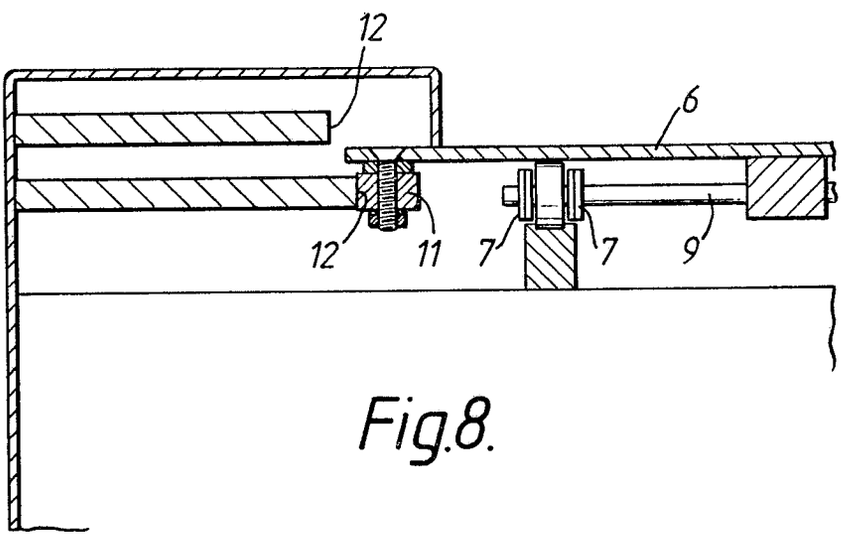

Fig.8.

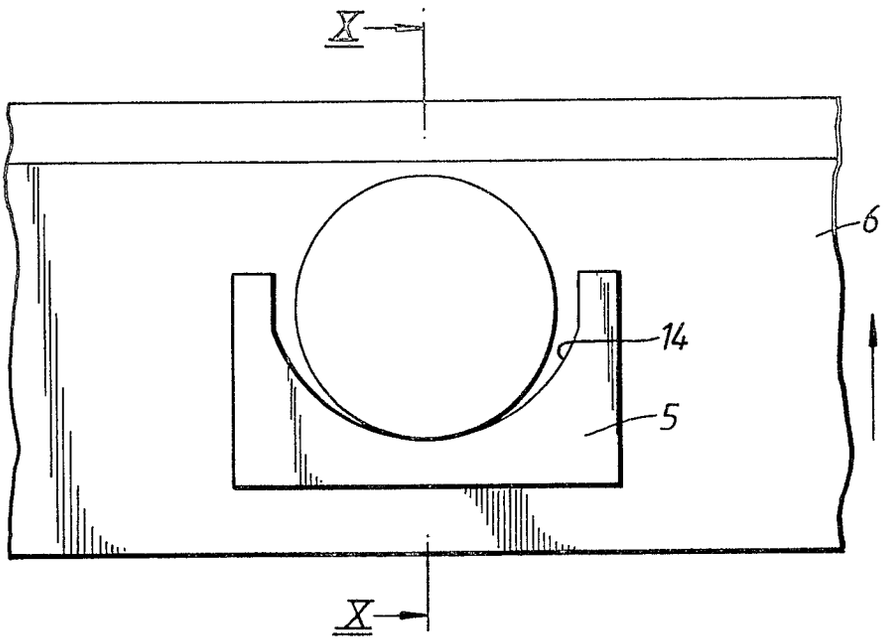

Fig. 9.

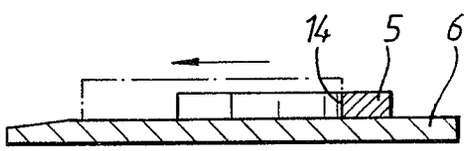

Fig. 10.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 3009

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.4)
D,A	GB-A-2 170 164 (BURTONS) * Whole document * ---	1	B 65 B 35/44 B 65 B 23/12
A	GB-A-2 185 967 (SIG) * Claim 1; figures 1,2 * -----	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 65 B
B 65 G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21-06-1989	NGO SI XUYEN G.

CATEGORY OF CITED DOCUMENTS

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