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(54) **Double-action slicing device and procedure**

(57) The device comprises a supporting surface (1), a rotating disk (2) with a cutting edge (2a) adapted for cutting in first and second rotation directions (S1, S2) towards said surface (1) and a motor (3) connected to said disk (2) for operating the cutting edge (2a) in said first and second rotation directions (S1, S2). Control means are adapted for changing the rotation direction (S1, S2) of the disk (2) in combination with changes in displacements with interference of a workpiece (P) with relation to the cutting edge (2a) between first and second cutting directions (D1, D2) in order to cut slices in both directions (D1, D2) by both sides of the disk (2). The process comprises to alternate said sense and direction changes with forwards motions of the piece.

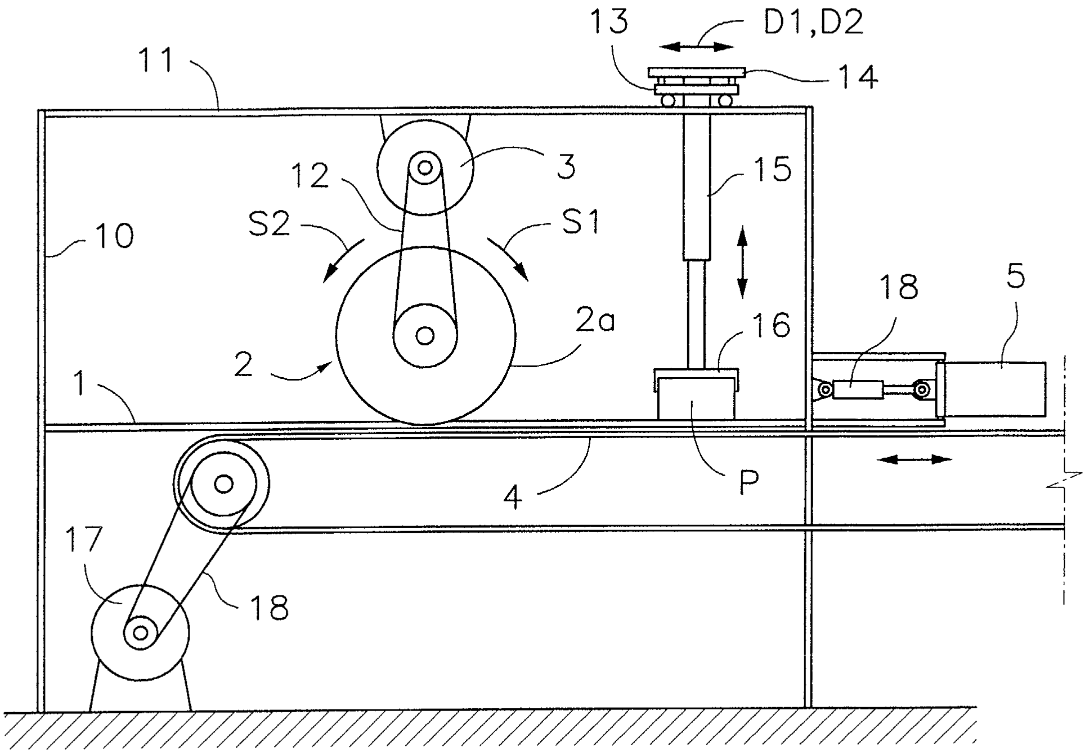

Fig.1

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Description

Field of the invention

[0001] This invention refers to a dual action slicing device and more concretely slicing device provided with a cutting disk adapted and driven for cutting in both rotation directions. This invention also refers to a dual action slicing process using such device. The device and process of this invention is specially applicable to slicing relatively soft and/or lightweight products and it is useful for example in cork, foamed polymers, light metallic alloys, etc. industries and in the sector of foods, pork's produces and pastries, among others.

Background

[0002] Slicing devices are known for cutting slices out of different kinds of materials, that is to say, more or less thin, wide and elongated portions obtained by successive parallel cuts of a piece of material, herein called workpiece, from one end to the other. Generally, such machines comprise a supporting surface, a cutting disk located with relation to such supporting surface and a motor connected to the cutting disk to make it to rotate. The workpiece is moving on the supporting surface in a cutting direction parallel to the plane of the disk, and interfering with it, until the disk cutting edge cuts a slice from one end of the piece to the other. In some machines, the workpiece remains stationary and it is the disk which is moving. Anyways, an essential characteristic for obtaining a good cut in this kind of machines is that the disk cutting edge is adapted for at least cutting in a given rotation direction and that, at the side of the disk where the cutting edge impinges against the workpiece, this rotation direction is towards the supporting surface. This is so because the cutting edge impinging against the working surface in such rotation direction towards the supporting surface tends to press the workpiece against the supporting surface and cooperates in pulling in such cutting direction. This effect is improved if the axis of the disk is located above the supporting plane. On the contrary, if the cutting edge impinge against the workpiece in the opposite direction of rotation, it would tend to lift and vibrate the end of the workpiece in contact with the disk and could cause a defective cut and even break the piece.

[0003] Therefore, in this kind of machine of the prior art, the disk is constantly driven in a single rotation direction to which the disk is fit and the cut is carried out by displacing the workpiece in a single suitable cutting direction. When the cut of a slice has been ended the workpiece has to come back to its initial position and, after it moves forwards in a direction perpendicular to the plane of the disk to determine the thickness wished for the following slice, repeat the displacement in such single suitable cutting direction to newly slice. This backwards displacement means a loss of time and power which increases the cutting operations costs.

[0004] The utility model ES-A-1029673 discloses a machine for cutting cork including above described characteristics.

[0005] The object of this invention is to overcome former and other drawbacks providing a slicing device and process provided with a cutting disk adapted and driven for cutting slices out of a workpiece in the two opposite cutting directions parallel to the disk plane by means of a to and fro displacement of the workpiece.

Short explanation of the invention

[0006] Above object is reached according to this invention by providing a dual action slicing device of the kind which comprises a supporting surface, a rotating disk, provided with at least a cutting edge arranged with relation to such supporting surface and adapted for cutting in at least a first rotation direction towards such supporting surface and a motor connected to such disk for driving such cutting edge at least in such first rotation direction in order to cut a slice out of at least a workpiece by means of a relative displacement with interference between the cutting edge and such workpiece on the supporting surface in a first cutting direction, control means being provided for controlling the disk drive. The device is characterized in that the disk cutting edge is adapted for in addition cutting in an opposite second rotation direction towards the supporting surface and such motor is connected to such disk for in addition driving such cutting edge in such second rotation direction in order to cut a slice out of a workpiece which is at least one, by a relative displacement with interference between the cutting edge and such workpiece on the supporting surface in an opposite second cutting direction, such control means being adapted for alternately changing the first and second disk rotation directions. The control means alternately change the first and second disk rotation directions in combination with corresponding change in such first and second disk cutting directions in relation with the workpiece to carry out successive cuts in both directions, other relative displacements occurring intermittently between the disk and the workpiece in a forwards direction when the disk and the workpiece are not in contact, to determine the width of the slices obtained.

[0007] Advantageously, the device incorporates a collecting and a sorting systems for such slices obtained by cutting the workpiece. The collecting system comprises a conveyor belt having an adjustable speed and a reversible displacement direction which can occur in a direction either parallel to the plane of the disk or perpendicular to it. The sorting system comprises shifter elements selectively driven for expelling from the conveyor belt the slices in order to sort them according to the width thereof resulting from the cut. The drive of such shifting elements as well as the displacements of the conveyor belt are the response to orders coming from programmable control means.

[0008] The device can have two basic configurations. In one of them, the disk is stationary with respect to the supporting surface and the workpiece carries out such displacements in the first and second cutting directions and in such forwards direction with respect to the supporting surface. First and second pulling means associated to the supporting surface and driven by driving means carry out the displacements of the workpiece on the supporting surface in the fist and second cutting directions and in a forwards direction, respectively. Advantageously, such cutting and forward displacements as well as the changes of the disk rotation direction and driving the conveyor belt and the pushers is carried out under the centralized orders of such control means according to preprogrammed operations.

[0009] According to another configuration, the workpiece is stationary with respect to the supporting surface and the disk carries out the said displacements in the fist and the second cutting directions and in such forwards direction with respect to the supporting surface, other configurations being possible resulting from matching the two former ones.

[0010] Using a device as that above described, this invention provides a dual action slicing process which comprises the steps of:

a) have available a rotating disk provided with a cutting edge with relation to a supporting surface;
b) driving such disk for moving such cutting edge in a first rotation direction towards such supporting surface;
c) carry out a relative displacement with interference between the disk and the workpiece on the supporting surface in a first cutting direction in order to cut a slice out of such workpiece;
d) carry out a relative displacement between the disk and the workpiece in a forwards direction when the disk and the workpiece are not contacting to each other after such cut;
e) driving such disk for moving such cutting edge in an opposite second rotation direction towards such supporting surface;
c) carry out another relative displacement with interference between the disk and the workpiece with the supporting surface on an opposite second cutting direction in order to carry out another cut in the said workpiece;
d) carry out another relative displacement between the disk and the workpiece in such forwards direction when the disk and the workpiece are not contacting each other after such other cut; and
e) repeat steps a) to d) until ending the workpiece or completing a number of cuts wished.

[0011] Using such process, the cutting time of a workpiece into slices is virtually cut down fifty per cent and power is saved because both to and fro displacement of the workpiece are used for carrying out cuts, preventing the back displacement to the initial point after each cut required in the devices of the prior art.

<u>Short description of the drawings</u>

[0012] Above and other characteristics and advantages will be more apparent configuration following detailed description of examples of embodiment with reference to the drawing attached, in which:

Fig. 1 is a schematic elevation view of an example of embodiment of the device of this invention;
Fig. 2 is a schematic plan view of another example of embodiment of the device of this invention;
Fig. 3 and 4 are part side views of two useful variations of cutting disk to be used in the device of the invention; and
Fig. 5 to 8 are schematic views in perspective illustrating different steps of the process of this invention.

<u>Detailed description of examples of embodiment</u>

[0013] Referring first to Fig. 1, the dual action slicing device, comprises a frame 10 which supports a supporting surface 1. On a support (not shown) fastened for example to a top part 11 of the frame 10, a rotating disk 2 is mounted so that it can rotate in both directions. Such disk 2 has a cutting edge 2a arranged with relation to such supporting surface 1 and adapted for cutting in both rotating directions S1 and S2. A motor 3 is connected to such disk 2 either directly or by means of a drive, such as a belt 12. Control means are connected with such motor for alternately changing such rotation directions S1 and S2. Associated to the supporting surface 1, for example, extending downwards from such supporting part 11 of the frame 11, first pulling means 13 are mounted for displacing a workpiece (designed with reference P in Fig. 5 to 8), sliding on the supporting surface 1, in first and second opposite cutting directions D1 and D2, parallel to the cutting disk 2 plane. Second pulling means 14 are adapted for displacing such workpiece P sliding on such supporting surface 1 in a forwards direction A perpendicular to the plane of the cutting disk 2.

[0014] In the example illustrated, the first and second pulling means 13, 14 comprise a first slide 13 mounted so that it can move on tracks arranged on such top part 11 of the frame 10 in the cutting directions D1, D2 and a second slide 14 mounted so that it can move on tracks arranged on such first slide 13 in the forwards direction A. From such second slide 14 a telescopic arm 15 is extending downwards which ends in a catching shaped 16. Such first and second slides 13, 15 as well as the telescopic arm 16, are driven by conventional means under the orders of such control means to carry out the displacements of the workpiece P on the supporting surface 1 in the first and second cutting directions D1, D2 and in such forwards direction A, respectively, combined with such alternate changes between the first and second rotation directions S1, S2 of the disk 2 according to a program for implementing the process of this invention which is described below with relation to Fig. 5 to 8.

[0015] Preferably, the motor 3 is an electric motor or an electric back-geared motor and can be connected to the disk 2 either directly or through a drive. The said control means can operate to change the rotation direction of such electric motor 3, which is carried out in a sufficiently quick way through the use of a PLC or, alternatively, when such motor 3 is connected to disk 2 through a drive adapted, such control means can operate on such drive for changing the rotation direction of the disk 2. An as lightweight as possible disk 2 cooperates in the quickness of the rotation direction change.

[0016] The disk 2 is adapted for cutting in both rotation directions S1 and S2. Fig. 3 shows a disk 2 suitable for relatively soft materials such as cork, pastries, pork's produces and the like, in which the cutting edge 2a is smooth and sharp as a circular blade. Fig. 4 shows a disk 2 suitable for hard material, for which the cutting edge 2a comprises a plurality of teeth, each of which is symmetric with respect to a radius of the disk. However, not necessarily all the teeth have to be the same to each other nor have same sizes or shapes, on a same disk teeth having different shapes and sizes can be combined. In the example illustrated in Fig. 4 at the cutting edge 2a sharp teeth alternates with other rounded teeth. It must also be stated that the cut can be achieved on a single workpiece or on a set of adjacent workpieces (Fig. 2) which move jointly.

[0017] Although in the examples of embodiment illustrated the disk 2 is stationary and the workpiece P is the one which moves, in an alternative example, not shown, the workpiece P is placed stationary with respect to the supporting surface 1 and the disk 2 carries out such displacements in the first and second cutting directions D1, D2 and in such forwards direction A with respect to the supporting direction 1. It is also possible to have a configuration (not shown which matches the displacements of the workpiece P with the displacements of the disk 2.

[0018] The device in addition incorporates a collecting system and a sorting system (Fig. 7 and 8) for the slices R obtained by cutting the workpiece P. The said collecting system comprises a conveyor belt 4 having an adjustable speed and reversible displacement direction, which, in the example of embodiment of Fig. 1, moves in a direction parallel to the plane of the disk 2. The conveyor belt 4, which is shown horizontal, although, depending on the application, it could be slightly inclined, is driven by an electric motor 17 through a drive such as a belt 18. The said sorting system comprises shifting elements 5, as blades or gates (of which Fig. 1 and 5 to 8 only shows one for a clearer drawing) mounted hinged and successively arranged close to the conveyor belt 4. The shifting elements 5 are selectively driven by means, for example, of respective fluid dynamic cylinders 18 or other equivalent driving members for expelling from the conveyor belt 4 the slices R (see also Fig. 8) and make them drop in different containers depending on their width resulting from the cut in order to sort them. For this, the conveyor belt and such shifting elements 5 are driven as a response to orders coming from the programmable control means and coordinated with the device cutting actions.

[0019] In the example of embodiment of Fig. 2, on the contrary to the example of Fig. 1, the conveyor belt 4 moves in a direction perpendicular to the plane of the disk 2 and is located at a level lower than the supporting surface 1 so that it starts under it. The conveyor belt 4 thus arranged has a relatively great width which in some cases can be approximately equal to the width of the supporting surface 1. In some applications, for example, in pork's produces, it is possible to group several units of the product to be cut P2 (for example, pieces of sausages) with the catching configuration 16 and to jointly move them by means of the telescopic arm 15 joined to the slides 13, 14 in D1, D2 and A, directions according to the process described below with relation to Fig. 5 to 8, in order to cut at each pass a plurality of slices C2, which directly fall on trays 19 which move on conveyor belts 4.

[0020] Referring now to Fig. 5 to 8 the dual action slicing process of this invention is disclosed below, which is carried out using a device according to the above described with relation to Fig. 1 and 2. The process comprises, first, the step of a) arrange a rotating disk 2 provided with a cutting edge 2a with relation to a supporting surface 1 and then, b) operate such disk 2 for moving such cutting edge 2a in a first rotation direction S1 towards such supporting surface 1 and towards a workpiece P arranged on the supporting surface 1 at one side of the disk 2 (Fig. 5). Then, c) carry out a relative displacement with interference between the disk 2 and a workpiece P on the supporting surface 1 in a first cutting direction D1 in order to cut a slice out of such workpiece P (Fig. 6). At the end of the cutting operation disclosed, the workpiece P passes to occupy a position on the supporting surface 1 on the opposite side of the disk 2.Then, d) carry out a relative displacement between the disk 2 and the workpiece P in a forwards direction A when the disk 2 and the workpiece P are not contacting to each other after such cut (Fig. 7) and thereafter or simultaneously, e) operate such disk 2 for moving such cutting edge 2a in an opposite second rotation direction S2, towards such supporting direction 1 and towards the workpiece P. Then, c) to carry out another relative displacement with interference between the disk 2 and the workpiece P on the supporting surface 1 in an opposite second cutting direction D2 in order to carry out another cut in such workpiece P (Fig. 8) and, after finishing this other cut, d) carry out another relative displacement between the disk 2 and the workpiece P in such forwards direction A when disk 2 and workpiece P are no longer there. From this point, e) repeat the steps a) to d) until finishing the cut of the workpiece P into slices or until completing a number of cuts wished. After each cut, the conveyor belt 4 withdraws the pieces cut or slices C) and the shifters 5 expel them selectively from the conveyor belt, for example, according to their thickness.

[0021] It is important to point out that such first and second cutting directions D1, D2 are substantially parallel to the plane of the disc 2, or which is the same, perpendicular to its spin axis and that the approach and impingement of the workpiece P on the cutting edge 2a is carried out by the side of the disk 2 in which the cutting edge 2a is moving towards the supporting surface 1. This, as it has been stated above, tends to press the workpiece against the supporting surface preventing vibrations and hammering thereof and cooperate to pull it in the corresponding cutting direction D1 or D2, and this is the reason why the process comprises changing the rotation direction S1, S2 of the disk 2 after each cutting operation in order to take profit of the workpiece displacement in both cutting directions D1, D2. As in the systems of the prior art one of the two displacements is always idle the device and the process of this invention provide a virtually doubled productivity.

[0022] A man of the art can devise several modifications and variations without being beyond the scope of this invention as defined in the claims appended.

Claims

1. Dual action slicing device of the kind comprising a supporting surface (1), a rotating disk (2), provided with at least a cutting edge (2a) arranged with relation to said supporting surface (1) and adapted for cutting in at least a first rotation direction (S1) towards said supporting surface (1) and a motor (3) connected to said disk (2) for driving said cutting edge (2a) at least in said first rotation direction (S1) in order to cut a slice out of at least a workpiece (P) by means of a relative displacement with interference between the cutting edge (2a) and said workpiece (P) on the supporting surface (1) in a first cutting direction (D1), control means being provided for controlling the disk drive (2), **characterized in that** the disk (2) cutting edge (2a) is adapted for in addition cutting in an opposite second rotation direction (S2) towards the supporting surface (1) and said motor (3) is connected to said disk (2) for in addition driving said cutting edge (2a) in said second rotation direction (S2) in order to cut a slice out of said workpiece (P) which is at least one, by a relative displacement with interference between the cutting edge (2a) and said workpiece (P) on the supporting surface (1) in an opposite second cutting direction (D2), said control means being adapted for alternately changing the first and second disk (2) rotation directions (S1, S2).

2. Device according to claim 1, **characterized in that** said control means are adapted for alternately changing the first and second disk (2) rotation directions (S1, S2) in combination with corresponding change in said first and second disk (2) cutting directions (D1, D2) in relation with the workpiece (P) to carry out successive cuts in both directions and to carry out other intermittent displacements between the disk (2) and the workpiece (P) in a forwards direction (A) when the disk (2) and the workpiece (P) are not in contact, to determine the width of slices (R) obtained.

3. Device according to claim 2, **characterized in that** said motor (3) is an electric motor and said control means operate for changing the rotation direction of said electric motor.

4. Device according to claim 2, **characterized in that** said motor (3) is connected to disk (2) through a drive and said control means operate on said drive for changing the rotation direction of the disk (2).

5. Device, according to claim 3 or 4 **characterized in that** said motor (3) is an electric back-geared motor.

6. Device according to claim 1, **characterized in that** it incorporates a collecting system for said slices (R) obtained by cutting the workpiece (P).

7. Device according to claim 6, **characterized in that** said collecting system comprises a conveyor belt (4) having an adjustable speed and reversible displacement direction.

8. Device according to claim 7, **characterized in that** said conveyor belt (4) runs in a direction parallel to the plane of the disk (2).

9. Device, according to claim 7, **characterized in that** said conveyor belt (4) runs in a direction perpendicular to the plane of the disk (2).

10. Device, according to claim 7, **characterized in that** said conveyor belt (4) is horizontal or inclined.

11. Device, according to claim 7, **characterized in that** it in addition incorporates a sorting system for said slices (R).

12. Device, according to claim 11, **characterized in that** said sorting system comprises shifting elements (5) selectively operated to expel from the conveyor belt (4) the slices (R) in order to sort them according to the width thereof resulting from the cut.

13. Device, according to claim 12, **characterized in that** said shifting elements (5) are operated as a re-

sponse to orders coming from programmable control means.

14. Device, according to claim 1, **characterized in that** the disk (2) edge is a circular blade and the cutting edge (2a) is smooth and sharp.

15. Device, according to claim 1, **characterized in that** the cutting edge (2a) of the disk (2) comprises a plurality of teeth, equal or different, each of which is symmetric with respect to a radius of the disk.

16. Device, according to claim 2, **characterized in that** the disk (2) is stationary with respect to the supporting surface (1) and the workpiece (P) makes said displacements in the first and second cutting directions (D1, D2) and in said forwards direction (A) with respect to the supporting surface (1).

17. Device, according to claim 16, **characterized in that** it comprises first and second pulling means (13, 14) associated to the supporting surface (1) and operated according to the orders from said control means for carrying out the displacements of the workpiece (P) on the supporting surface (1) in the first and the second cutting directions (D1, D2) and in said forwards direction (A), respectively.

18. Device, according to claim 2, **characterized in that** the workpiece (P) is stationary with respect to the supporting surface (1) and the disk (2) makes said displacements in the first and second cutting directions (D1, D2) and in said forwards direction (A) with respect to the supporting surface (1).

19. Dual action slicing process using a device according to any of the preceding claims **characterized in that** it comprises the steps of:

a) have available a rotating disk (2) provided with a cutting edge (2a) with relation to a supporting surface;
b) driving said disk (2) for moving said cutting edge (2a) in a first rotation direction (S1) towards said supporting surface (1);
c) carry out a displacement relative to the interference between the disk (2) and the workpiece (P) on the supporting surface (1) in a first cutting direction in order to cut a slice out of said workpiece;
d) carry out a relative displacement between the disk (2) and the workpiece (P) in a forwards direction when the disk and the workpiece are not contacting to each other after said cut;
e) driving said disk (2) for moving said cutting edge (2a) in an opposite second rotation direction (S2) towards said supporting surface;
c) carry out another relative displacement with interference between the disk (2) and the workpiece (P) with the supporting surface (1) on an opposite second cutting direction (D2) in order to carry out another cut in the said workpiece;
d) carry out another relative displacement between the disk (2) and the workpiece (P) in said forwards direction when the disk (2) and the workpiece (P) are not contacting each other after said other cut; and
e) repeat steps a) to d) until ending the workpiece (P) or completing a number of cuts wished.

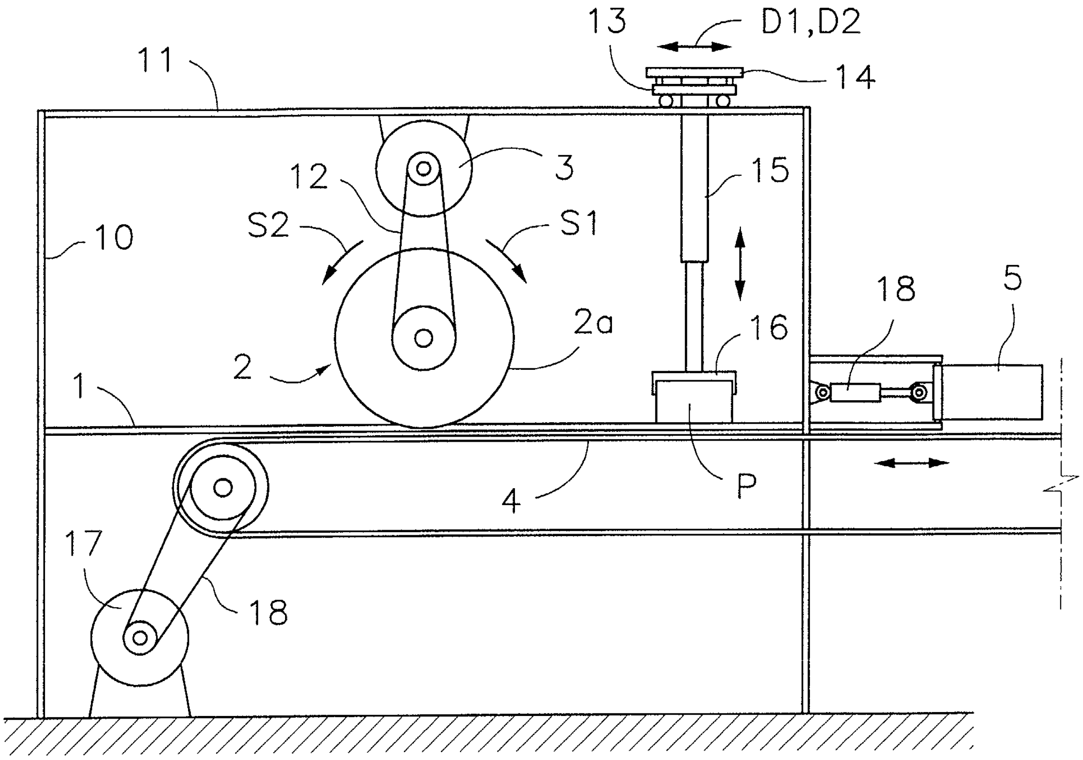

Fig.1

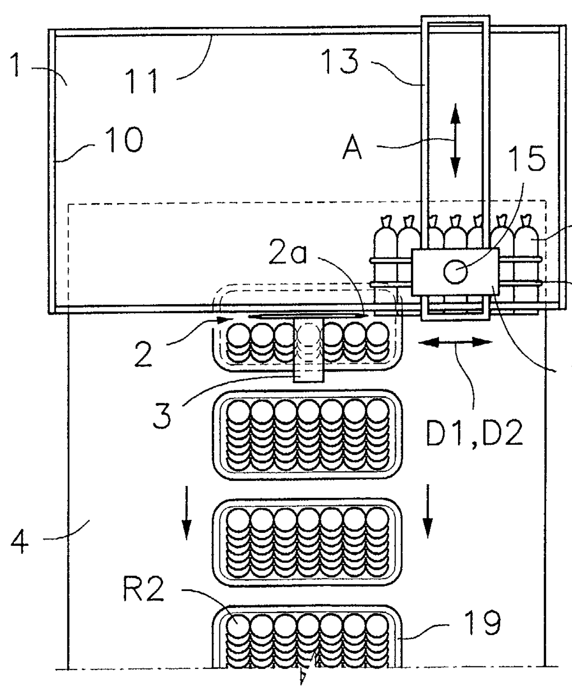

Fig.2

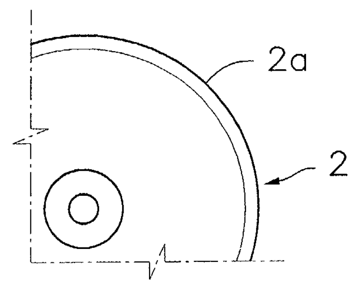

Fig.3

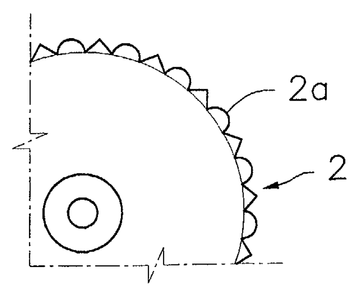

Fig.4

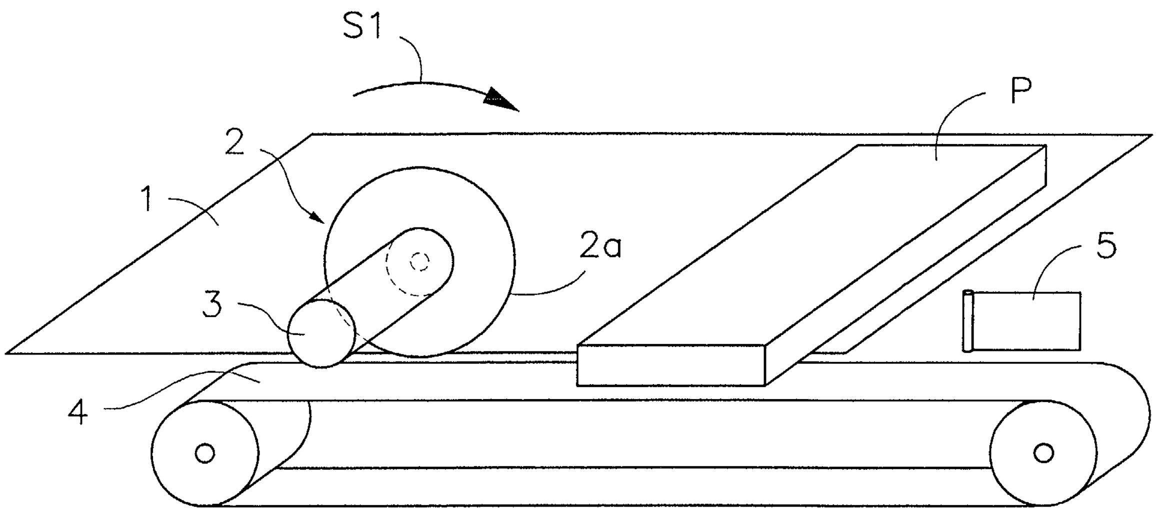

Fig.5

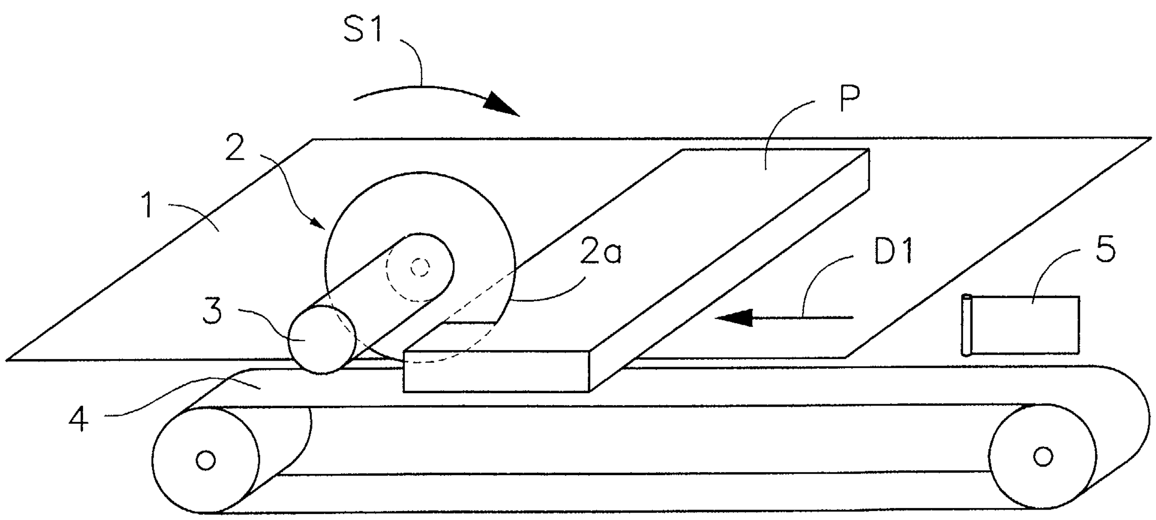

Fig.6

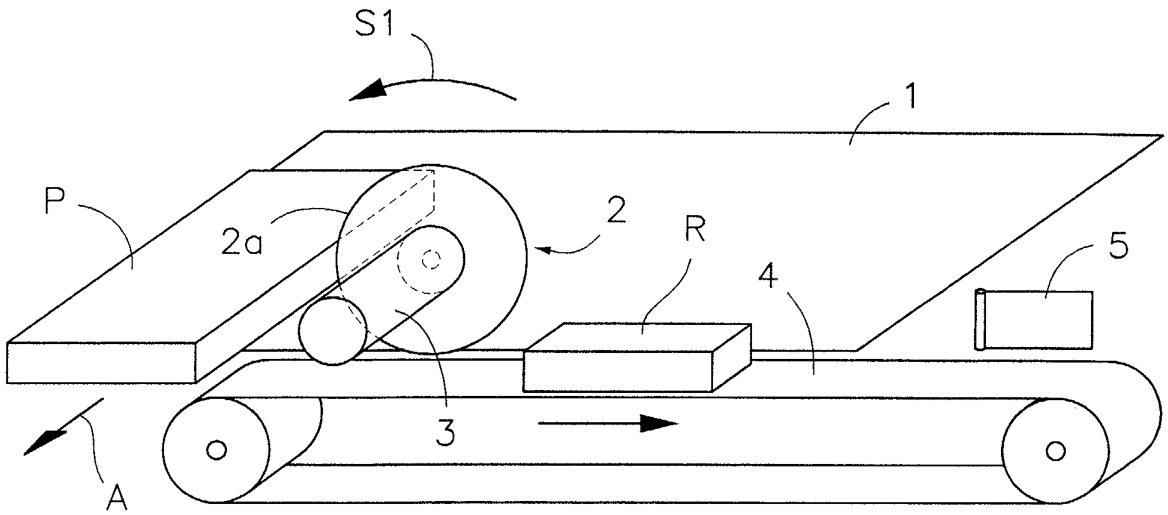

Fig.7

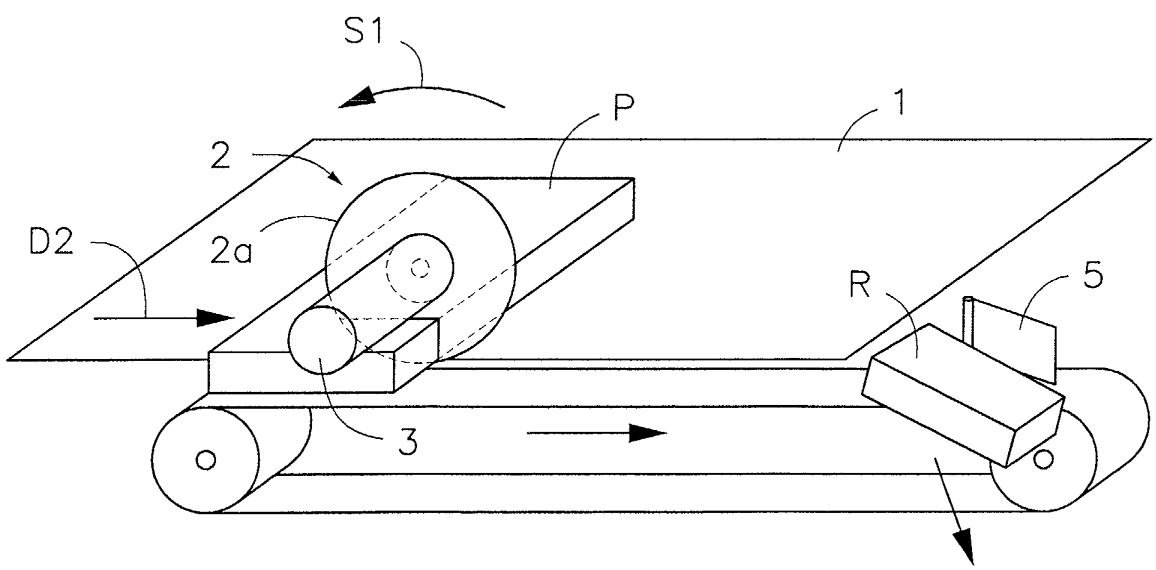

Fig.8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 38 0021

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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
MUNICH	17 July 2003	Wimmer, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 03 38 0021

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