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(54) Arrangement for bevelling belt preforms

(57) The present invention relates to an arrangement for shaping grinding material, particularly for bevelling belt preforms (10) manufactured of flexible grinding material. The belt preform is transported along a counterpart (11) and simultaneously treated from the side opposite to the counterpart by a grinding member (12) pressed against the belt preform. In the invention, the counterpart (11) comprises at least one rotating member with a substantially cylindrical outer surface (14). Allowing the belt preform to rotate over the counterpart reduces the stress it is subjected to, whereby the counterpart's lifetime can be lengthened considerably.

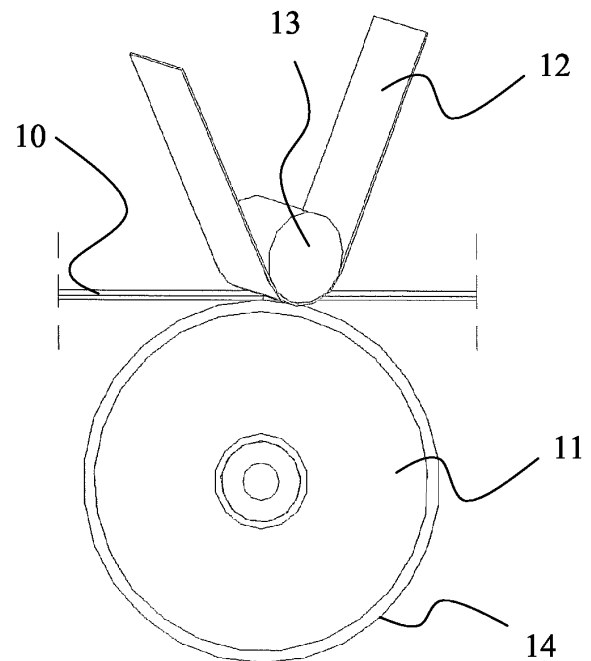


FIG. 3

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Description

TECHNICAL FIELD

[0001] The present invention relates to an arrangement according to the preamble of claim 1.

[0002] An arrangement according to the invention is used particularly in bevelling flexible grinding belt material in a manufacturing process of an endless grinding belt.

PRIOR ART

[0003] It is usual to make endless grinding belts of a flexible grinding material in the roll form. In order to put together the flexible grinding material, treatable belt preforms to be joined to each other are shaped by cutting, for instance. To achieve a durable joint of uniform thickness, the ends of the belt preforms are to be made wedge-shaped. Hereby, one end of the belt preform is bevelled by the side covered with the grinding material, whereas the opposite end is bevelled by the backside. Such bevelling is conventionally performed in a grinding unit where the ends of the belt preform are transported between a counterpart, i.e. a press plate of a suitable size and shape, made of hard metal, and a grinding belt guided towards the belt preform by a contact roll that is positioned obliquely.

[0004] Particularly grinding the backside of the belt preform requires a press plate with a hard and wear-resistant structure, because the belt preform surface covered with the grinding material moves along the press plate at the same time as the grinding pressure exerted by the contact roll presses the belt preform against the press plate.

[0005] Despite their properties, the materials used in known solutions wear out quickly. Wearing of the press plate is the most rapid in the small area where the contact roll exerts its pressure. Such stationary wearing quickly abrades a hollow into the press plate, whereby both the grinding depth of the belt preform and its grinding geometry change in a detrimental way.

[0006] Such wearing of the press plate causes continuous adjustment and installation work that takes time and requires great expertise. Further, the wearing causes undesired variation in the grinding result and deteriorates thus the quality of the work. Also the continuous changing of press plates causes considerable costs.

[0007] Known press plates used in grinding are shaped as rectangular parallelepipeds and arranged substantially stationarily below the contact roll. On the other hand, it is also known to use a round sheet-like counterpart the end surface of which is supported against the belt preform.

PRESENTATION OF THE PROBLEM

[0008] The problems of known solutions can be sub-

stantially avoided by means of the present invention. An object of the invention is thus to facilitate the grinding of flexible grinding material by reducing the stress directed at a counterpart of the grinding unit. This object is achieved by providing the arrangement according to the invention with the characteristic features of claim 1. The subsequent dependent claims present appropriate further development and variations of the invention, intended to improve the operation of the invention still further.

[0009] The invention is based on the idea of minimizing the friction between the counterpart and the belt preform supported against it, shaped of a flexible grinding material. Minimal friction is achieved by preventing the belt preform from sliding relative to the counterpart, which can be done by causing the counterpart positioned below to assume a movement speed that substantially corresponds to the transport speed of the belt preform.

[0010] In the present invention, the term "belt preform" refers to a long-stretching belt-like grinding material that is obtained from a flexible grinding material in the roll form by cutting.

[0011] The term "counterpart" refers to different types of mechanical members intended to limit such belt preform movements deviating from the feed direction of the belt preform that would otherwise be generated when a grinding unit with its contact roll exerts pressure against the belt preform.

[0012] Further, in the following description, expressions such as "above", "below" etc. refer to directions in relation to the present arrangement or its structural details, as they are shown in the attached figures.

[0013] According to a first preferred embodiment of the invention, an arrangement for shaping a flexible grinding material comprises particularly a counterpart with a substantially cylindrical outer surface, there being a contact area between a belt preform transported in a grinding unit and this outer surface. The counterpart is arranged to rotate in such a way that its circular cross-section is on the plane parallel to the transport direction of the belt preform and perpendicular to the belt preform.

[0014] Several significant advantages over prior art are achieved with the arrangement of the present invention. Handling a grinding unit is made considerably simpler because, thanks to the mobility and the large contact surface of the counterpart, wearing of the counterpart decreases. This means that fewer calibrations are required during the grinding.

[0015] Since wearing of the counterpart decreases, its geometry is retained longer, which improves the quality in the grinding work performed in the grinding element. Naturally, the decreased wearing also involves savings in costs, because the need for replacement parts is reduced.

[0016] According to a second preferred embodiment of the present invention, an arrangement for shaping a flexible grinding material comprises a counterpart having at least two parallel, rotating members with substantially cylindrical outer surfaces. These members form together

a contact area between the belt preform transported in a grinding unit and the corresponding outer surface of the member. Similarly to the first embodiment of the invention, also these rotating members are arranged to rotate in such a way that their circular cross-section is on planes parallel to the transport direction of the belt preform and perpendicular to the belt preform.

[0017] By mutual, parallel displacement of the rotating members it has been possible to provide the grinding unit with a counterpart that enables the grinding belt guided by the contact roll to be set at desired angles and yet to obtain optimal support along the contact line of the contact roll.

[0018] Further advantages and details of the invention are presented in greater detail in the description below.

DESCRIPTION OF THE DRAWINGS

[0019] In the following, the invention is described in more detail with reference to the drawing, in which

Figure 1 shows a side view of a known solution;
Figure 2 shows a front view of a known solution;
Figure 3 shows a side view of a preferred solution according to the present invention;
Figure 4 shows a front view of a solution according to Figure 3;
Figure 5 shows a cross-section of a solution with two parallel, rotating counterparts;
Figure 6 shows a side view of the two parallel, rotating counterparts according to Figure 5;
Figure 7 shows a cross-section of a solution with three parallel, rotating counterparts; and
Figure 8 shows a side view of the three parallel, rotating counterparts according to Figure 7.

PREFERRED EMBODIMENTS

[0020] In the following, preferred embodiments of the present invention are described with reference to the above-mentioned figures. The solutions comprise the structural parts shown in the figures, each of which is designated with a corresponding reference numeral. The reference numerals correspond to the ones in the following description.

[0021] Figures 1 and 2 show a known embodiment of an arrangement for bevelling flexible grinding belt material, hereinafter simply referred to as "belt preform". The figures show the belt preform 1, which is in Figure 1 transported in a path from left to right and in Figure 2 transported in a path oriented towards the plane of the figure. The belt preform moves above a counterpart 2 (press plate) shaped as a rectangular parallelepiped, being simultaneously treated from above by a grinding belt 3 that is directed towards the belt preform guided by a contact roll 4. In order to obtain as rectilinear a bevelling as possible of the belt preform, the contact roll is not only at an angle relative to the belt preform on its cross-sectional

plane shown in Figure 2 but also at an angle relative to this cross-sectional plane.

[0022] Figures 3 and 4 show an embodiment of a completely new construction of an arrangement for bevelling a belt preform 10. The preferred embodiment illustrated in the figures presents the belt preform that is in Figure 3 transported on a belt from left to right and in Figure 4 transported in a path oriented towards the plane of the figure. The belt preform moves upon a counterpart 11 indicated schematically and is simultaneously treated from above by a grinding belt 12 that is directed towards the belt preform guided by a contact roll 13, as in the known solution described above.

[0023] It is to be noted in this context that the above process does not restrict the relation of the grinding unit parts to what is described above. Thus, the counterpart 11 may as well be positioned above or beside the grinding belt 12 and contact roll 13. What is important is that the belt preform is transported along a counterpart and simultaneously treated from the side opposite to the counterpart by a grinding belt or a corresponding grinding member.

[0024] In this embodiment, the counterpart 11 has an outer surface 14 that moves at least in the contact point between the belt preform and the outer surface in the direction substantially corresponding to the moving direction of the belt preform 10. The counterpart preferably comprises a rotating wheel-shaped member with a substantially cylindrical outer surface. This outer surface extends substantially parallelly to the mix-axis 15 of the counterpart. Thus, the outer surface has a width that extends at least over the area to be bevelled. A preferred width for the outer surface is 5 to 40 mm. The outer surface in the counterpart is preferably made so wide that it becomes possible to turn the member when its one side has worn too much.

[0025] In the present embodiment, the rotating member, i.e. the counterpart 11, is in a position where its outer surface will contact the belt preform 10, whereby the cross-sectional plane of the counterpart is at a right angle relative to the belt preform. At the same time, the mid-axis 15 of the counterpart is substantially at a right angle to the transport direction of the belt preform.

[0026] The outer surface 14 of the counterpart 11 can also be shaped convex, concave or tapered (conical counterpart) so that the counterpart can better receive the grinding belt guided by the contact roll 13. Such an outer surface shape is particularly feasible in cases where the angle of the contact roll relative to the transport direction of the belt preform deviates from 90 degrees.

[0027] The counterpart 11 may be manufactured of hard metal, but it may also be only the outer surface of the member that is made of hard metal. However, nothing prevents other manufacturing materials with sufficient durability from being used in the manufacture of the rotating member that forms the counterpart and/or its outer surface.

[0028] When the belt preform 10 contacts the counter-

part 11, a rotating movement is generated that facilitates the movement of the belt preform in the grinding unit. Since the belt preform rolls against the outer surface 14 of the rotating member constituting the counterpart, friction between the counterpart and the belt preform is minimized, which naturally minimizes wearing of the counterpart support surface that is critical at this moment. Since the counterpart rotates continuously during the grinding of the belt preform, also the support surface changes all the time. The changing of the support surface together with the minimal friction brings about outstanding improvement in the durability of the surface profile of the outer surface. Thus, the grinding depth and the geometry of the joint ends of the belt preform remain substantially constant for a longer time.

[0029] Reduced friction between the belt preform 10 and the counterpart 11 also reduces the stress that the belt preform is subjected to by the grinding belt 12, which results in reduced stretching and thereby also reduced wave-formation in the treated joint ends.

[0030] Thanks to the increased durability of the counterpart 11, both working time and material costs can be saved because counterparts need not be changed as often as when conventional counterparts are used. In tests performed it has turned out that a counterpart of the described type holds about 250 hours, which can be compared with durability of about 8 hours for stationary counterparts 2 of the known type.

[0031] A counterpart 11 according to the present solution is preferably freely rotating relative to its mid-axis 15. However, the counterpart can also be provided with a drive (not shown) to maintain a rotation speed independently from the transport speed of the belt preform 10. The rotation speed may be as well higher as lower than or synchronized with the transport speed of the belt preform. The drive may comprise a special drive member arranged in the counterpart, or what is called slave drive. This slave drive preferably obtains its driving force from a feed drive arranged to feed the belt preform into the grinding unit (not shown). By using special drive to rotate the counterpart with a speed that is, for example, higher than the transport speed of the belt preform, the tension of the belt preform in the grinding unit can be affected. In this way, friction-related grinding errors of the grinding belt can be counteracted, because constant tension is maintained in the belt preform.

[0032] If the contact roll 13 of the grinding unit is set at an angle deviating a lot from the direction of the mid-axis 15 of the counterpart 11, there will be geometrical errors in the grinding of the belt preform 10, whereby it is not possible to obtain the desired rectilinear bevels at the joint ends of the belt preform. This error is based on the cylindrical shape of the contact roll and the counterpart and their limited radii in the contact zone of the grinding unit. To avoid such problems, the contact surface of the counterpart is can be formed by two or more substantially parallel rotating members 11, 16 and 17 extending substantially cylindrically in accordance with Figures 5 to 8.

These rotating members are preferably displaced relative to each other in the transport direction of the belt preform. By means of this mutual displacement, the support surface of the corresponding counterpart corresponds better to the position of the contact roll 13 at the corresponding point with regard to its angle. By displacing the counterparts, a significant number of geometrical problems can be avoided and a bevelling of acceptable quality can be obtained.

[0033] The above description and the presented figures are only intended to illustrate the present arrangement in shaping a flexible grinding material belt. Thus, the solution is not restricted only to the embodiment described above or in the attached claims, but a plurality of variations or alternative embodiments are feasible within the idea described in the attached claims.

[0034] Hence, rotating counterparts may have several different diameters. Similarly, the outer surface of the counterpart may have a width that deviates from the embodiment example given above. Particularly in an embodiment in which the counterpart comprises two or more parallel rotating members, the rotating members may have outer surfaces of different widths.

[0035] Although the counterpart is presented above to assume a position substantially parallel to the transport direction of the belt preform, this position can deviate from the transport direction to such an extent that the speed vector of the rotation of the member in the direction of the mid-axis generates tension in the belt preform.

Claims

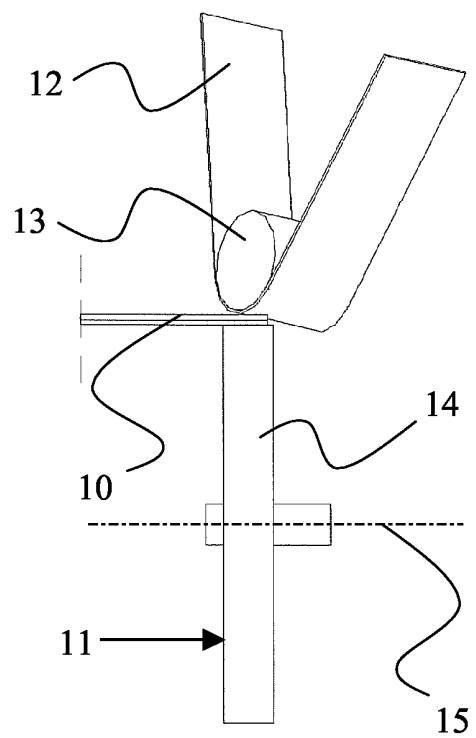
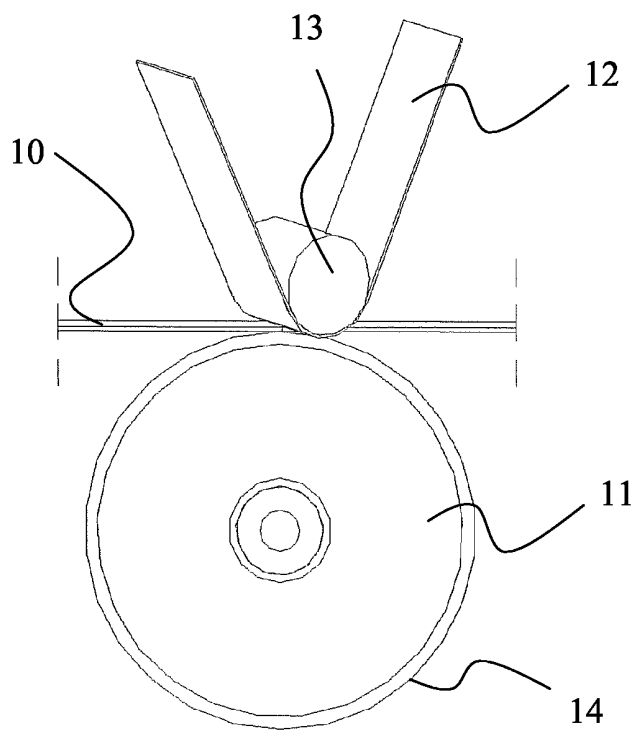
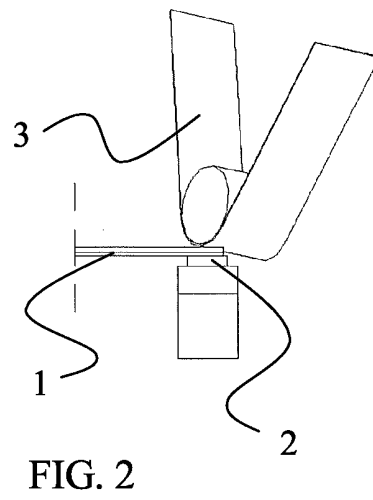
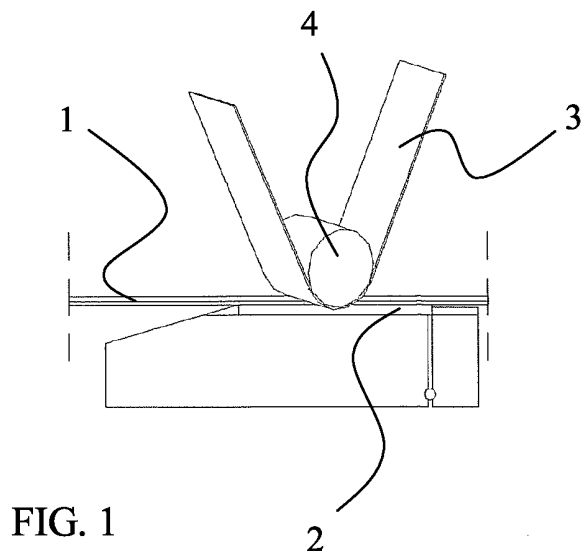
1. An arrangement for shaping grinding material, particularly for bevelling belt preforms (10) manufactured of flexible grinding material, the arrangement comprising a grinding unit where the belt preform is transported along a counterpart (11) and simultaneously treated from the side opposite to the counterpart by a grinding member (12, 13) pressed against the belt preform, **characterized in that** the counterpart (11) comprises at least one rotating member with a substantially cylindrical outer surface (14), whereby the rotating member is in a position where its outer surface is in contact with the belt preform (10); and the cross-section plane of the rotating member is substantially at a right angle to the belt preform at the same time as a mid-axis (15) of the rotating member is substantially at a right angle to the transport direction of the belt preform.
2. An arrangement according to claim 1, **characterized in that** the outer surface (14) has a width of 5 to 40 mm and is substantially parallel to the mid-axis (15) of the rotating member (11).

3. An arrangement according to any one of the preceding claims, **characterized in that** the counterpart (11) comprises at least two substantially parallel rotating members (11, 16, 17) that are displaced relative to each other in the transport direction of the belt preform (10). 5
4. An arrangement according to claim 3, **characterized in that** at least two of the substantially parallel rotating members (11, 16, 17) have outer surfaces (14) of different widths. 10
5. An arrangement according to any one of the preceding claims, **characterized in that** the counterpart (11, 16, 17) is freely rotating relative to its mid-axis (15). 15
6. An arrangement according to any one of the preceding claims 1 to 4, **characterized in that** the counterpart (11, 16, 17) is provided with a drive for maintaining rotation speed independently from the speed of the belt preform (10). 20
7. An arrangement according to claim 6, **characterized in that** the drive is arranged to cooperate with a feed drive of the belt preform (10). 25
8. An arrangement according to any one of the preceding claims, **characterized in that** the rotating member (11, 16, 17) has a convex outer surface. 30
9. An arrangement according to any one of the preceding claims, **characterized in that** the rotating member (11, 16, 17) has a concave outer surface. 35
10. An arrangement according to any one of the preceding claims, **characterized in that** the rotating member (11, 16, 17) has a conical outer surface. 40
11. An arrangement according to any one of the preceding claims, **characterized in that** the rotating member (11, 16, 17) has a rotation direction that deviates from the transport direction of the belt preform (10). 45

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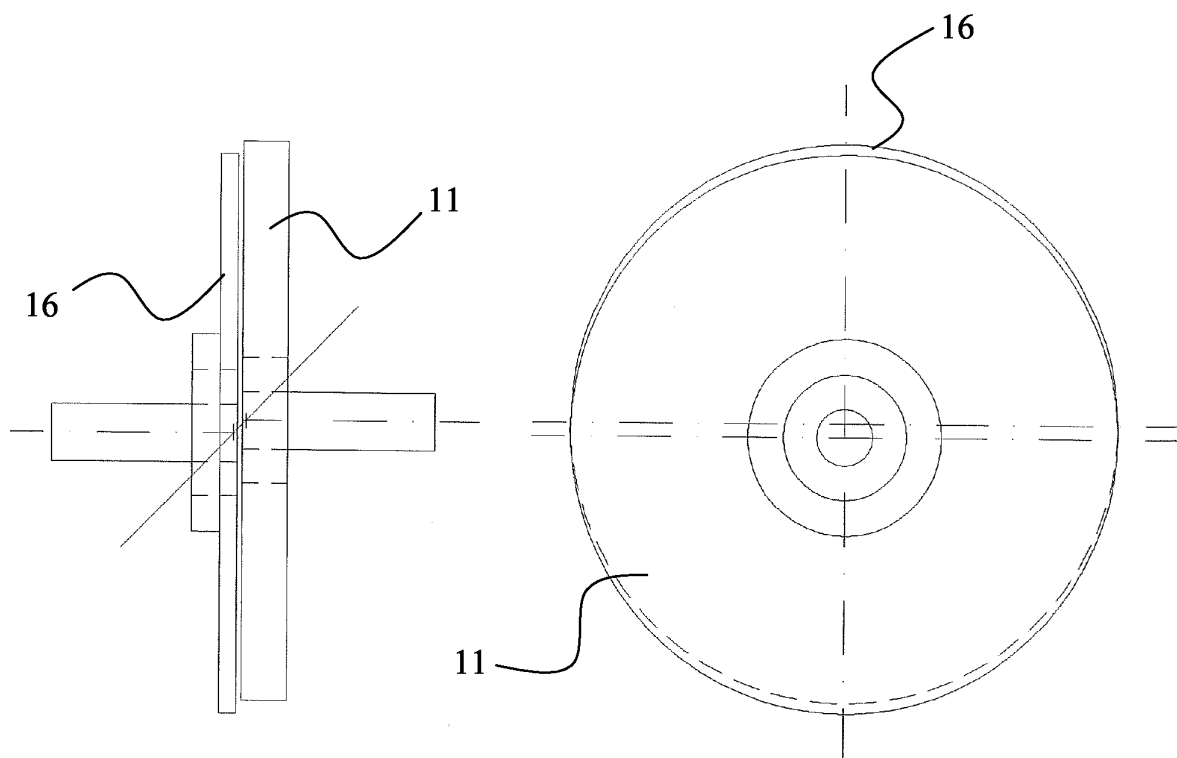


FIG. 5

FIG. 6

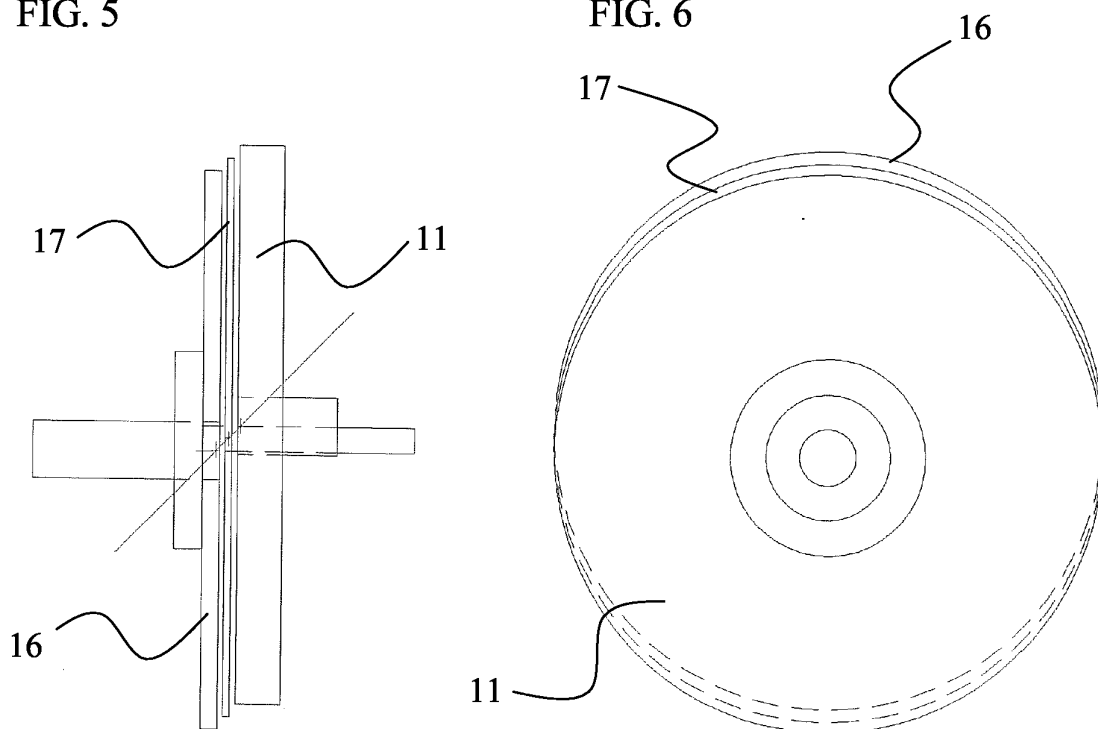


FIG. 7

FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 05 10 7449

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	US 2 890 549 A (FRENTZEL HERMAN C) 16 June 1959 (1959-06-16) * figures *	1-11	B24D11/06 B24B21/00
A	US 5 305 560 A (ROELOFS ET AL) 26 April 1994 (1994-04-26) * column 4, lines 19-25 *		
			TECHNICAL FIELDS SEARCHED (IPC)
			B24D B24B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 November 2005	Examiner Gelder, K
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 10 7449

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22-11-2005

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