(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 797 793 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
20.06.2007 Bulletin 2007/25

(51) Int Cl.:
A46B 13/00 *(2006.01)*

(21) Application number: **06255296.3**

(22) Date of filing: **14.10.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(30) Priority: **19.12.2005 US 311208**

(71) Applicant: **Weiler Corporation**
Cresco, Pennsylvania 18329-0149 (US)

(72) Inventor: **Hettes, Frank J.**
Greentown, Pennsylvania 18426 (US)

(74) Representative: **Murnane, Graham John**
Murgitroyd & Company
165-169 Scotland Street
Glasgow G5 8PL (GB)

(54) Disc brush

(57) A disc brush (10) has a disc (20) having a face (22) including at least a first portion (24) and a second portion (26). A plurality of abrasive filaments (40) are fixed to the first portion (24) and extend generally perpendicularly from the disc. The abrasive filaments (40) are arranged around the second portion (26). The second portion (26) is recessed from the first portion (24) to form a recess (28) having a diameter and axial depth sufficient to receive at least a portion of a raised portion of a work piece. In one preferred embodiment, the disc brush (10) is provided with an arbor hole (32) to allow the disc brush (10) to be driven by a rotary drive device and is sized to fit within a well portion of an automobile wheel (50) to allow the disc brush (10) to be rotatably driven to de-burr an interior portion of the wheel.

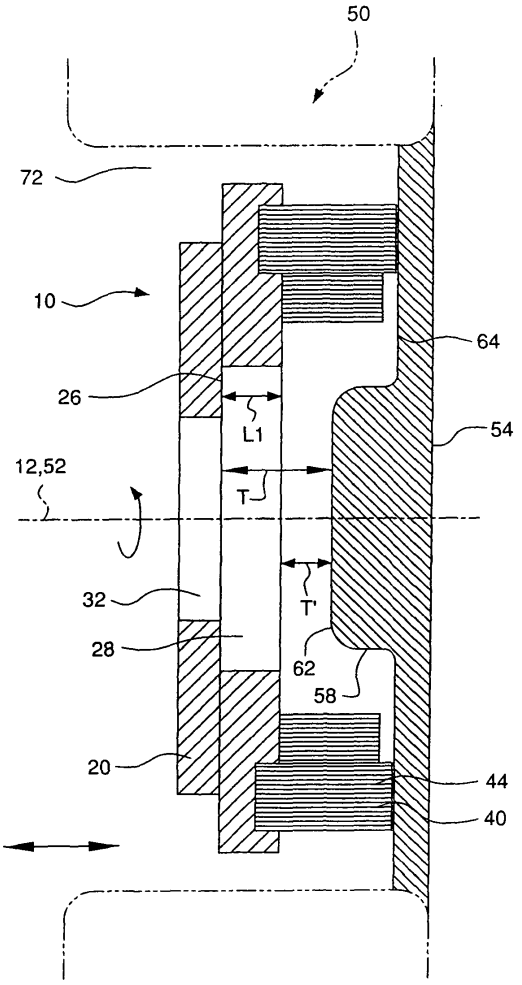

FIG. 4

EP 1 797 793 A2

Description

FIELD OF THE INVENTION

[0001] The invention relates generally to rotatably driven disc brushes.

BACKGROUND OF THE INVENTION

[0002] It is known to employ a disc brush having a plurality of abrasive filaments, coupled to and driven for rotation by a rotary drive apparatus, for de-burring.

[0003] While the prior art brushes are well-adapted for use on planar surfaces, a problem may occur when the brush is used to de-burr a contoured surface. For example, the interior well portion of an automobile wheel typically includes a raised surface proximate a central portion of the wheel hub. A disc brush having bristles arranged in an annulus surrounding a central portion of a disc is used in the de-burring operation performed on the interior well portion. When the brush is in a pristine condition, the brush functions satisfactorily to de-burr the interior surface of the hub adjacent the raised surface. However, with continued use the brush filaments wear away, to a point where the central portion of the brush disc contacts the raised surface, preventing further use of the brush. In the prior art brushes, the filaments are not completely consumed at the point where the contact between the raised surface and the disc prevents further use of the brush. Consequently, the brush filaments are not fully utilized. For example, if, when the brush is in a pristine condition, the filaments have a length of 5.0 inches, and there are 3 inches of travel between the work piece raised surface and the central portion of the disc when the tips of the filaments operatively engage the work piece, then the disc brush would have to be replaced when the filaments have worn by 3 inches. Thus, of the original 5 inch length, only approximately 3 inches, or 60 percent of the abrasive filament provided, is productively consumed. A need exists therefore to reduce waste and improve utilization of the abrasive filaments of disc brushes used with work pieces having contoured surfaces.

BRIEF DESCRIPTION OF THE INVENTION

[0004] The invention is a disc brush comprising a disc having a face including at least a first portion and a second portion. A plurality of abrasive filaments are fixed to the first portion, extend generally perpendicularly from the disc, and are arranged around the second portion. The second portion is recessed from the first portion to form a recess having a diameter and axial depth sufficient to receive at least part of a raised portion of a work piece.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0005] For the purpose of illustrating the invention, there are shown in the drawings an embodiment of the invention which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown. In the drawings:

[0006] Figure 1 is a plan view of a disc brush in accordance with a preferred embodiment of the present invention.

[0007] Figure 2 is a cross-sectional view of the disc brush of Figure 1, taken along line 2-2 of Figure 1.

[0008] Figure 3 is a cross-sectional view of a conventional automobile wheel.

[0009] Figure 4 is cross-sectional view of the disc brush of Figures 1 and 2, shown decoupled from a drive apparatus and also shown positioned within an interior well of the conventional automobile wheel of Figure 3 in a position suitable for a de-burring operation of an interior surface of a hub portion of the wheel.

DETAILED DESCRIPTION OF THE DRAWINGS

[0010] Referring to the drawings, and initially to Figures 1 and 2, a disc brush in accordance with the present invention is indicated generally by the reference numeral 10. The disc brush 10 comprises a disc 20 having a first face 22 including at least a first portion 24 and a second portion 26. The disc brush 10 further comprises a plurality of abrasive filaments 40 fixed to the first portion 24 and extending generally perpendicularly from the disc 20 and arranged around the second portion 26 preferably in an annular pattern. The second portion 26 is recessed from the first portion 24, forming a recess 28. The recess 28 has a diameter D1 and axial depth L1 sufficient to receive at least part of a raised portion of a work piece. The recess diameter D1 is preferably in the range of 7.5 to 8.5 inches. The total diameter of the disc 20 is preferably in the range of 14.5 to 15.5 inches.

[0011] The plurality of abrasive filaments 40 each have a fixed end 42 attached to the first portion 24 and a tip 44. The filaments 40 are preferably fabricated from a polymeric base material, such as a linear polyamide (commonly know as nylon) impregnated with an abrasive grit, such as silicon carbide or aluminum oxide. As noted, the filaments 40 are preferably arranged on the first portion in an annular pattern, preferably in discrete bundles. The radial extent of the annulus preferably corresponds generally to the radial extent of the portion of the working surface to be de-burred. For example, the radial extent of the annulus may comprise an inner radius R1 in the range of 4.5 to 5.0 inches and an outer radius R2 in the range of 7.25 to 7.75 inches. In addition, the brush may, for example, comprise a first set of filament bundles having a total exposed length L2 of 3.75 inches and a second set of filament bundles having a total exposed length L3 of 3.25 inches. Alternatively, if used on a relatively flat work piece, each filament bundle could have the same length. It will, of course, be understood that specific dimensions are given only as illustrative, and are not in-

tended to limit the invention to specific dimensions or ranges of dimensions. Rather, individual dimensions may be chosen as appropriate for particular applications of the brush.

[0012] The disc 20 has a central axis 12. The disc 20 comprises the first face 22 as well as a second face 30. The disc 20 may be fabricated as a single, unitary member. Alternatively, the disc 20 may be fabricated as an assembly of multiple members, for example, a first member 34 and a second member 36 rigidly connected together. The disc 20 may be fabricated from any number of materials well known to those of ordinary skill in the art of surface finishing tools, for example, metal, wood, or polymeric materials. A preferred material of construction for the disc 20 is polypropylene. The abrasive filaments 40 are affixed to the disc 20 in a conventional manner well known to the artisan in the field.

[0013] The disc 20 may be operably coupled to the rotary drive device (not illustrated) using any of a number of means well known to the person of ordinary skill in the art. For example, in the preferred embodiment illustrated, the disc 20 includes an arbor hole 32 by which the disc 20 is coupled to an arbor (not illustrated) of a rotary drive device (not illustrated). The arbor hole 32 is circular, preferably with a diameter D2 of approximately 5.9 inches to receive a standard arbor, and is centered about the disc central axis 12. Alternatively, other forms of drive and other opening shapes, such as square or hexagonal, can be used without departing from the invention. The particular drive device and the manner in which the brush is coupled to the drive device is not critical to the present invention.

[0014] In the preferred embodiment illustrated, the recess 28 and the arbor hole 32 are coaxial, and meet to form a continuous opening extending through the disc 20. However, the recess depth L1 need not extend to meet the arbor hole 32. Moreover, it is not a requirement of the present invention that the arbor hole 32 be provided, and if provided, the arbor hole need not extend to a depth to meet the recess 20.

[0015] The person of ordinary skill in the art will recognize that various means other than the arbor hole 32 could be employed to couple the disc brush 10 to a rotary drive device. For example, the disc 20 could be provided with a rod rigidly fixed to and extending from the second face 30. The rod could be received by and coupled to the rotary device. Alternatively, fasteners such as screws could be used to couple the disc brush 10 to the rotary device.

[0016] With reference now to Figure 3, the disc brush 10 illustrated in Figures 1 and 2 is particularly well-adapted for use with an automobile wheel 50. The wheel 50 rotates about an axis of rotation 52, and typically comprises a hub portion 54 and a rim portion 66. The hub portion 54 has an exterior side 56, visible to an observer outside the automobile (not shown) when the wheel 50 is mounted to the automobile, and an interior side 58. The hub portion 54 also has a central portion 60, where the wheel 50 mounts to the automobile axle assembly (not shown). Typically, forces acting on the hub portion 54 are highest proximate this central portion 60, and it is conventional that the central portion 60 will be thicker and more massive than other portions of the hub 54. Frequently, the hub portion 54 will be designed such that the interior side 58 is contoured, with the interior side of the central portion 60 projecting inwardly from a remainder of the hub 54 interior side, the central portion 60 thus having an interior raised surface 62. Typically, it is not necessary to de-burr the raised surface 62, but only a surrounding annular work surface 64. The annular arrangement of the filaments 40 is chosen to correspond to the extent of the work surface 64 requiring the deburring operation. The rim portion 66 includes first and second rim flanges 68 and 70, respectively. The rim flanges 68, 70 are used to retain a tire (not shown) to the wheel 50. A wheel well 72 is formed within the rim portion 66 and hub portion 54.

[0017] With reference now to Figure 4, the disc brush 10 is shown within the wheel well 72. The wheel 50 is shown in phantom, and is not as part of the invention. In use the disc brush 10 is driven for rotation about the central axis 12 and simultaneously the tips 44 of the abrasive filaments 40 are brought into contact with the annular work surface 64 of the hub interior side 58. As the abrasive filaments 40 rotate against the hub 54, the wheel 50 work piece is de-burred. The disc brush 10 has a length of travel T between the raised surface 62 and the second portion 26 where disc 20 eventually, with sufficient wear of the filaments 40, contacts the raised surface 62.

[0018] The travel T associated with the disc brush 10 exceeds the corresponding travel T' a prior art brush not provided with the recess would permit. That is, since the recess diameter D1 and depth L1 are sufficiently large to receive at least a part of the raised surface 62, the disc brush 10 enables an additional length of travel relative to a prior art disc, up to an amount equal to the recess depth L1. This additional travel increases the amount of the abrasive filaments 40 which may be productively used before the disc brush 10 must be replaced.

[0019] For example, if the recess depth L1 is chosen to be approximately 0.85 inches, then for the geometry of the preferred embodiment illustrated in conjunction with the wheel geometry illustrated, the length of travel is approximately 2.65 inches. If the recess 28 was not provided, the length of travel would be approximately 2.65 - 0.85 = 1.8 inches. Thus, of the original 3.75 inch length L1, approximately 1.8/3.75 = 48 percent of the abrasive filament material would be consumed before replacement of a prior art disc brush would be required, compared to 2.65/3.75 = 70 percent of the abrasive filament material in the disc brush 10 being productively consumed. The disc brush 10 of the present invention thus significantly reduces waste of abrasive fibers 40. As the cost of the abrasive fibers 40 is a significant cost element of the disc brush 10, a significant decrease in the overall cost of the disc brush 10 results.

[0020] From this disclosure, the artisan will recognize that other types of abrasive media, such as a non-woven abrasives, could be substituted for the abrasive filaments 40. Further, the artisan will recognize that the present invention need not be applied solely to disc brushes used in de-burring operations, but could be applied to rotary discs adapted for other types of surface finishing operations involving contoured parts.

[0021] While the invention has been described and illustrated with respect to the exemplary embodiments thereof, it should be understood by those skilled in the art that the foregoing and various other changes, omissions and additions may be made therein and thereto, without parting from the spirit and scope of the present invention.

Claims

1. A disc brush comprising:

a disc having a face including at least a first portion and a second portion; and
a plurality of abrasive filaments fixed to the first portion and extending generally perpendicularly from the disc and arranged around the second portion,
the second portion being recessed from the first portion to form a recess having a diameter and axial depth sufficient to receive at least a part of a raised portion of a work piece.

2. The disc brush of claim 1, wherein the recess is concentric with a remainder of the disk.

3. The disc brush of claim 1 or 2, wherein the abrasive filaments comprise a polymeric material impregnated with an abrasive grit.

4. The disc brush of any of claims 1 to 3, wherein the abrasive filaments are grouped in bundles.

5. The disc brush of any of claims 1 to 4, wherein the work piece is an automobile wheel and the disc is sized to fit within an interior well of the wheel and the recess is sized to receive a raised surface of a central portion of a hub of the wheel.

6. The disc brush of claim 5, wherein the recess diameter is in the range of 7.5 to 8.5 inches.

7. The disc brush of claim 5 or 6, wherein the recess axial depth is in the range of 0.25 to 2.0 inches.

8. The disc brush of any preceding claim, wherein the disc is fabricated from a polymeric material.

9. The disc brush of claim 8, wherein the polymeric material is polypropylene.

10. The disc brush of any preceding claim further comprising means to couple the disc to a rotary drive device.

11. The disc brush of claim 10, the disc further including a second face having an opening extending at least partially through the disc and forming an arbor hole, wherein the means to couple the disc to the rotary drive device includes the arbor hole.

12. The disc brush of claim 11, wherein the arbor hole has a diameter in the range of 5.8 to 6.0 inches.

13. The disc brush of any preceding claim, wherein the disc comprises a first member and a second member rigidly connected to the first member.

14. The disc brush of claim 13 wherein the second member has an opening extending at least partially therethrough to form the recess.

15. The disc brush of claim 13 wherein the first member has an opening extending at least partially therethrough to form an arbor hole and a second member having a second opening extending at least partially therethrough to form the recess.

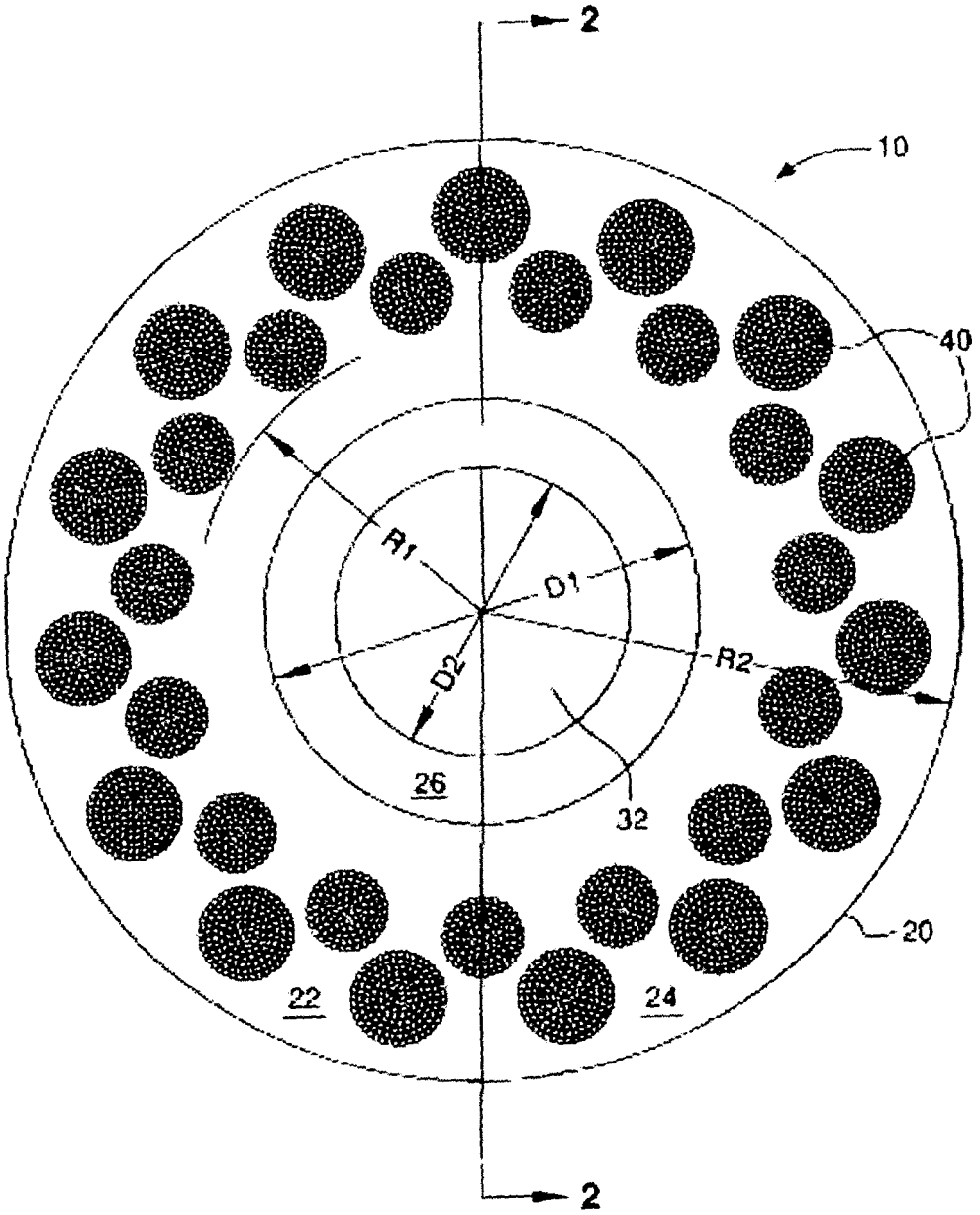

FIG. 1

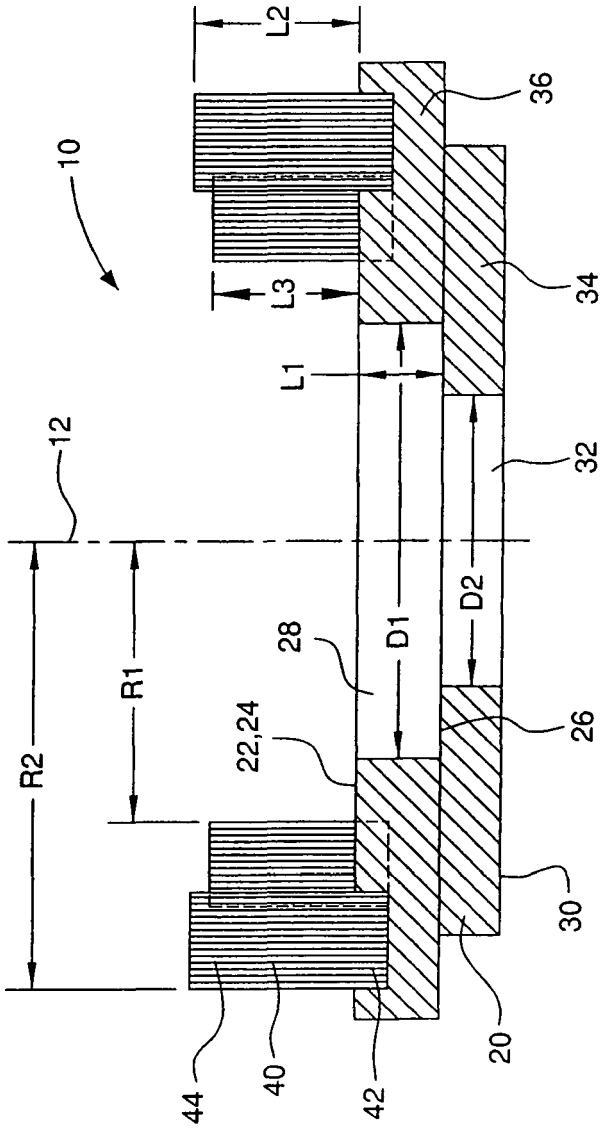

FIG. 2

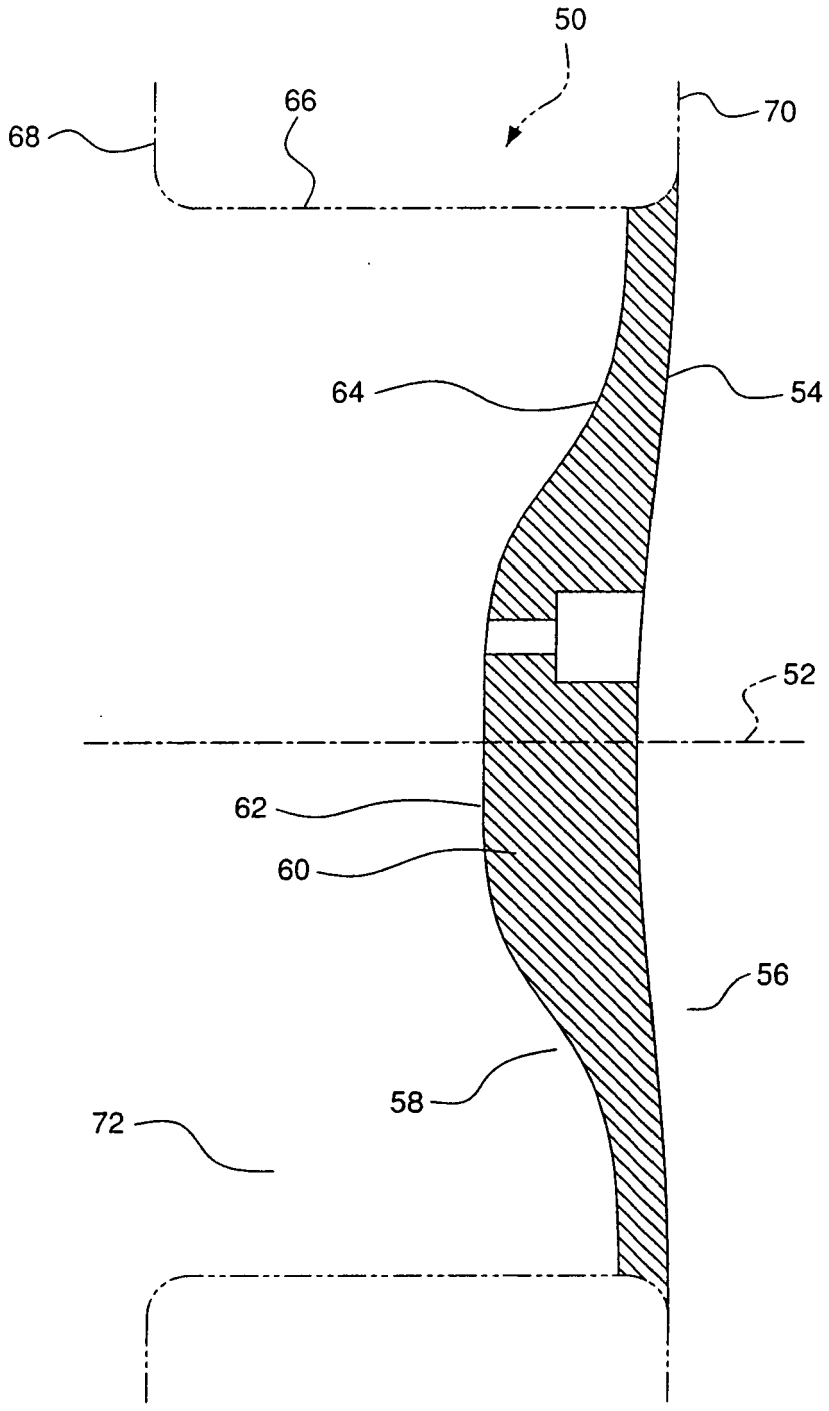

FIG. 3

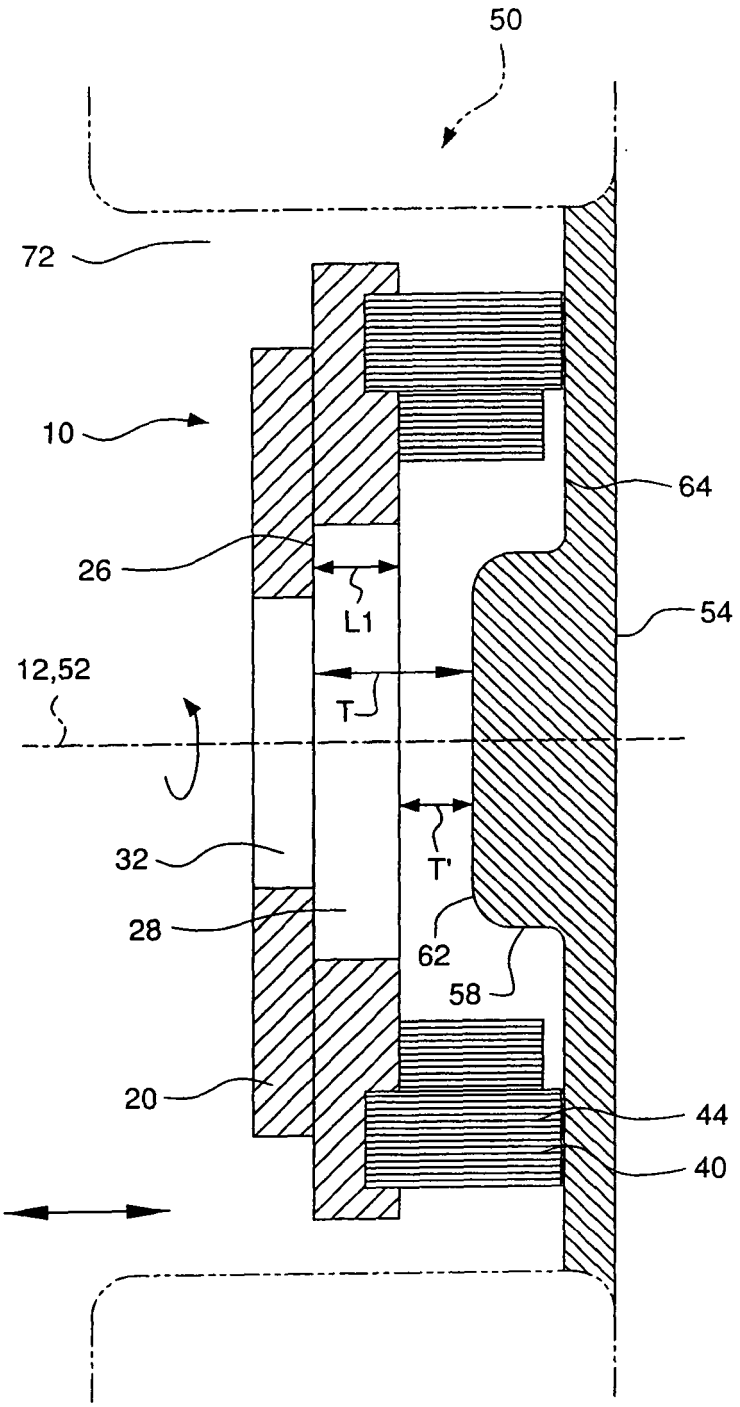

FIG. 4