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(54) Expansible chuck for bobbins

(57) The invention relates to an expanding chuck for bobbins, of the type comprising at least one central rotation element (4) revolving about its own axis and having an external cam-shaped profile, as well as a plurality of jaws (3) associated in a sliding way externally to said cam-shaped profile. In order to improve the operating conditions and in order to reduce the complexity of the device, the chuck comprises means of restraint (2) circumferentially sliding together with said jaws with respect to said central rotation element, said means of restraint constraining said jaws to keep substantially constant mutual angular distances, and in order to allow movement of said jaws only in a radial direction relative to said means of restraint (Fig. 1).

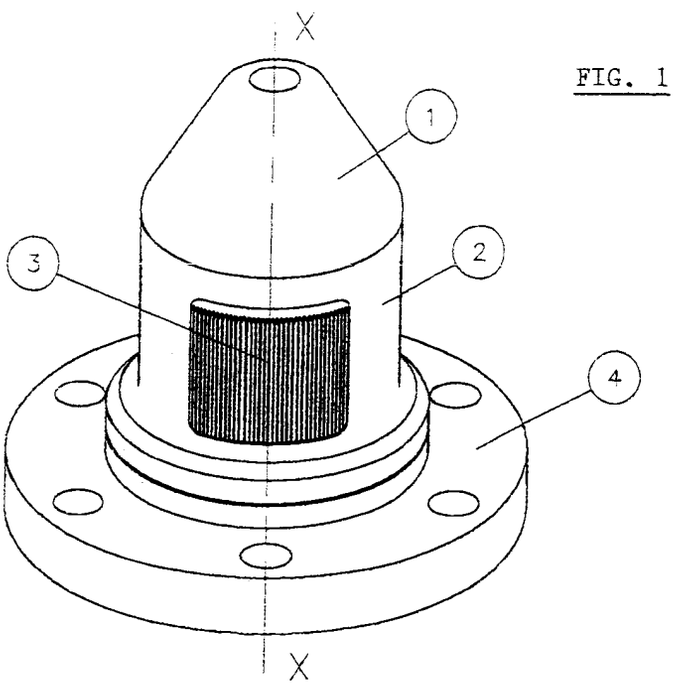

FIG. 1

EP 1 090 869 A2

Description

[0001] The present invention relates to a chuck with an expanding-extremity for bobbins of the type comprising a central rotational element or hub, fastened to a guide shaft, and one or more jaws which engage with both the bobbin mounted on the chuck and the hub when the same bobbin is unwound.

[0002] The making of such expanding chucks with central hubs having cam-shaped external profiles in such a way that the jaws - coupled to such profiles by various techniques - are pushed radially towards the internal tubular surface of the bobbin when the latter is rotated about its own axis, is already known in the art. The rotation of the bobbin causes a relative rotation (due to friction that is generated) between the jaws and the cam-shaped profile of the hub until the jaws are pushed towards the internal surface of the bobbin by the upper portions of the cam-shaped profile. When the jaws come into contact with the bobbin, they are engaged by friction with the latter and with the shaped profile of the hub, so causing the hub with the jaws and the same bobbin to rotate together as one. The rotation of the bobbin is also regulated by means of braking or motorized drive connected to the guide shaft on which the central hub is fastened. US Patent 2.219.124, in the name of Bandy, describes an expanding chuck for paper bobbins comprising a central cylindrical hub having a lateral cam-shaped profile on which are arranged two semicircular-section jaws held on a free-mounted ring in correspondence of one of the hub extremities. The two jaws extend to all the lateral surface of the hub and are free of move in circumferential direction, about the surface of the hub, and in radial direction, for as far as the extremity ring allows. According to this embodiment, the jaws can move in a circumferential direction, one with respect to the other, and therefore it is necessary that the jaws extend for all the lateral surface of the hub in order to guarantee simultaneous engagement of the jaws with the top portions of the cam-shaped profile during the unwinding of the paper bobbin. That involves the use of a limited number of jaws, in as much as increasing the number of jaws diminishes the cross-sectional area of the latter and consequently, for the same axial size, thickness and materials, reduces their ability to resist the forces to which they are subject.

[0003] Since the jaws are pushed into contact with the bobbin at the higher portions of the cam-shaped profiles, which are equal in number to the number of jaws, the force exerted by the bobbin bears only on some points of the jaws and hub; this leads to high wear on the internal surface of the jaws and breakup of the entire chuck.

[0004] Patent US 4.519.620, in the name of Keith, relates to an expanding chuck for bobbins in which the jaws are comprised of rollers in hard material, forced by extremity rings to roll on the external cam-shaped profiled surface of a central hub. The extremity rings ensure that the rollers can rotate about their own axes while maintaining a constant mutual angular separation, and that they can move radially with respect to the central hub.

[0005] Such an embodiment, while permitting the use of a high number of rollers and consequently ensuring even distribution of the load over the entire hub, has the disadvantage that in order to prevent the rollers, subject to rolling friction, from rotating it is necessary that the bobbin exert high loading on the same rollers, thus causing heavy wear on the parts. Where rotation of the rollers was not prevented, even small movements of the load would cause rotation of the rollers and consequent wear of the parts. Moreover, manufacture of such a chuck involves the production and subsequent assembly of a high number of components.

[0006] One aim of the present invention is to provide an expanding chuck for bobbins that resolves the disadvantages of the prior art.

[0007] It is a further aim of the present invention to furnish an expanding chuck for bobbins that is particularly simple and economical to produce and to assemble.

[0008] Another aim of the present invention is to produce a chuck for bobbins that is effective in use and subject to limited wear and little breakdown.

[0009] These and other aims are achieved by the expanding chuck for bobbins according to the first independent Claim and the succeeding dependent Claims.

[0010] The expanding chuck according to the present invention comprises a central rotational element fastened to a guide shaft and having a cam-shaped profile on the external lateral surface, as well as a plurality of jaws associated in a sliding way externally to such cam-shaped profile. The chuck also comprises means of restraint moving circumferentially together with the jaws, restraining the same jaws and keeping them at a substantially constant mutual angular separation and permitting the jaws to move only in a radial direction with respect to same means of restraint.

[0011] According to a particular aspect of the present invention, the means of restraint comprises a substantially cylindrical sleeve coaxially coupled to the central rotating element. The sleeve has a plurality of openings on its own lateral surface to house each of the jaws.

[0012] According to another aspect of the invention the jaws have an internal surface in contact with the cam-shaped profile. The cam-shaped profile and the internal surface of every jaw are so shaped that the internal surface of every jaw bears on the cam-shaped profile of the central rotating element in at least two points.

[0013] According to a further aspect of the present invention, the two points of bearing of the internal surface of the jaws slide on portions of the cam-shaped profile, the cams having an involute profile - or having a profile approximated to such involute, such two points remaining always the same distance from the axis of the chuck.

[0014] A preferential embodiment of the present in-

vention will now be described, by way of example and not limitation, with the aid of the attached figures, in which:

figure 1 is a perspective view of an expanding chuck according to a preferential aspect of the present invention;
figure 2 is a view in lateral section of the chuck of figure 1;
figure 3 is a view of figure 2 at section A-A, of the chuck of figure 1;
figure 4 is a magnified view of the particular coupling between a jaw and the cam-shaped profile of the embodiment shown in figure 3.
figure 5 is a lateral view of a retaining sleeve according to a preferential aspect of the present invention;
figure 6 is a partial view of a cam-shaped profile on the lateral surface of the central hub of a chuck according to another aspect of the invention;
figure 7 is a view of a jaw according to another aspect of the present lateral invention;
and figure 8 is a view from above of the jaw of figure 6.

[0015] Figures 1 and 2 illustrate a preferential embodiment of an expanding chuck according to the present invention. The chuck comprises a central rotating element, or hub, 4, fastened on a guide shaft, and revolving about its own axis " x ", as well as a plurality of jaws 3 mobile in radial direction and sliding on the external lateral cam-shaped surface of the same element 4. The jaws 3 are retained in contact with the external cam surface of the rotation element 4 due to opportune means of restraint, also sliding on hub 4 together with the jaws 3. Such means of restraint, in the particular embodiment of the invention represented here, comprises a sleeve 2 within which the same jaws 3 are housed.

[0016] Sleeve 2, substantially cylindrical, is coupled coaxially to hub 4, in such way as to be circumferentially slidable with respect to the latter, and is held on to the same hub 4 in the axial direction by removable cap 1, held together with hub 4 by screw-type means of connection. The jaws 3 are retained by sleeve 2 in such way that axial or circumferential movements of the jaws 3 with respect to same sleeve 2 are prevented, but that at the same time such radial movements of jaws 3 are permitted.

[0017] The hub 4 also presents means 5a, 5b for fastening to a guide shaft, not shown, that can be opportunely connected to means of driving or braking the shaft in order to regulate the rotation of hub 4.

[0018] As illustrated in figure 3, the profile 6 of the external surface of hub 4 is shaped with cams and comes into contact with each of the jaws 3 in at least one point. The jaws 3 slide circumferentially, together with sleeve 2, on the cam-shaped profile 6 and, following the latter, they are free to move in a radial direction for a distance defined by their coupling with sleeve 2.

[0019] Sleeve 2, as shown in figure 5, presents , along its own lateral surface 7, openings 8 within which are lodged the jaws 3 in such a way that the latter are constrained in the circumferential and axial directions, but are able to move, for a predefined distance, in a radial direction. The employment of such means of restraint 2 permits a plurality of jaws 3, coupled in a sliding way to hub 4, to be employed, thus ensuring an efficient grip on the bobbin to be unrolled, without the same jaws 3 being subject to concentrated high forces and to wear.

[0020] Figure 6 shows a partial view of the cam-shaped profile 6 of hub 4. Such profile 6, in particular, is realized according to a broken line that, obtained starting from a base circumference 101, comprises a succession of equal line segments. Such segments present two top regions 13 and 14, at different distances from circumference 101.

[0021] Figures 7 and 8 illustrate respectively a profile view and a top view from above of a jaw 3 according to a particular aspect of the present invention. Each of the jaws 3 comprises a body 102 having one external high-friction surface 10 and an internal surface 9 to connect with the cam-shaped profile 6 of hub 4.

[0022] The external high-friction surface 10 can advantageously be knurled to facilitate blocking of the bobbin during use of the chuck. Moreover, internal surface 9 presents two jutting out portions 11a, 11b, located substantially at the circumferential extremities of the jaw 3, for the contact of every jaw 3 on the cam-shaped profile 6. Body 102 of every jaw 3 is also equipped with lugs 12, engaging with the sleeve 2, to prevent the jaw 3 from escaping from the same sleeve 2 in a radial direction.

[0023] Figure 4 shows in detail, according to a peculiar aspect of the invention, how the cam-shaped profile 6 and the jaws 3 are in contact. In particular, two points on each of the jaws 3 bear against the cam-shaped profile 6 of hub 4, in correspondence of the jutting out portions 11a, 11b of internal surface 9 of the same jaw 3. Moreover the portion of internal surface 9 comprised between the contact portions 11a, 11b extends above one top region 13 of profile 6. According to another aspect of the invention, the cam-shaped profile 6 is shaped in such a way that the portions of contact 11a, 11b of each jaw 3, sliding relatively to profile 6, move substantially for the same distances both circumferentially and radially. That allows only radial movement parallel to itself of each jaw 3 when the latter, sliding relatively to hub 4, follows the cam-shaped profile 6. The shape of such cam-shaped profile is therefore ideally an involute and in practice it is approximated to this involute, for reasons of simplicity of construction.

[0024] In use, the bobbin mounted on the expanding chuck presents a cylindrical internal surface that is in contact with sleeve 2 and the external surface 10 of the jaws 3. When the bobbin begins unwinding, the friction between the internal surface of the bobbin and sleeve 2 due to the pressure exerted by the same bobbin caus-

es sleeve 2, the jaws 3 and the bobbin to rotate together with respect to hub 4, in as far as the latter is advantageously braked.

[0025] Such relative motion of sleeve 2 with respect to hub 4 leads to the sliding of the jaws 3 on the cam-shaped profile 6 and the consequent radial movement of the jaws 3 in centrifugal direction. In fact, the contact portions 11a, 11b, which in resting position are located on cam-shaped profile 6 at a minimal distance from the rotation axis "x" of hub 4, are forced to slide towards the top regions 13, 14 of the profile 6 at an increasing distance from axis "x".

[0026] Advantageously, profile 6 is so shaped that the jaws 3 are pushed radially in centrifugal direction by the same cam-shaped profile 6, whichever direction the bobbin is rotated in.

[0027] The radial centrifugal movement of the jaws 3 and the corresponding sliding of these on segments of the cam-shaped profile 6 placed at a greater distance from the rotation axis "x" causes an increase in friction between the contact portions 11a, 11b of each cam 3 and the same cam-shaped profile 6 which stops the jaw 3 sliding relative to hub 4. When, because of the constraint reactions and of the friction between parts, each jaw 3 no longer slides on the cam-shaped profile 6 with respect to hub 4, then bobbin, sleeve 2, jaws 3 and hub 4 all rotate together.

[0028] In this way, the bobbin is stably locked to hub 4, without concentrations of strains on the jaws 3 or of high wear between the parts.

Claims

1. Expanding chuck for bobbins, of the type comprising at least one central rotation element revolving about its own axis and having an external cam-shaped profile, as well as a plurality of jaws externally associated in a sliding way to said cam-shaped profile, characterized by comprising means of restraint circumferentially sliding together with said jaws with respect to said central rotation element, said means of restraint constraining said jaws to maintain them at substantially constant mutual angular distances and to allow only movement of said jaws in a radial direction relative to said means of restraint.

2. Chuck according to Claim 1, characterized by said means of restraint comprising a substantially cylindrical sleeve mounted coaxially on said central rotation element, said sleeve having a plurality of openings on its own lateral surface to house each of said jaws.

3. Chuck according to any of the previous Claims, characterized by said jaws comprising an internal surface in contact with said cam-shaped profile, said internal surface of the jaws and said cam-shaped profile of the central rotating element being shaped in such a way that said internal surface of the jaws contacts said cam-shaped profile in at least two points.

4. Chuck according to Claim characterized 3 by said two points of contact on said cam-shaped profile being arranged substantially at the circumferential extremities of said internal surface of each of said jaws and that the portion of said internal surface comprised between said two contact points extends above one top region of said cam-shaped profile.

5. Chuck according to Claim 3 or 4, characterized by said two contact points of said internal surface of the jaws slides on portions of said cam-shaped profile shaped according to an involute or according to a broken line approximating to such an involute.

6. Chuck according to any of the previous Claims, characterized by each of said jaws comprising an external high-friction surface to contact said bobbins.

7. Chuck according to Claim 6, characterized by said external surface of each of said jaws being knurled.

8. Chuck according to any of the previous Claims, characterized by said jaws comprising one internal surface in contact with said central rotation element in wear-resistant material.

9. Chuck according to any of the previous Claim, characterized by said cam-shaped profile following a broken line approximated to an involute, which extends from an ideal inner circular profile.

FIG. 1

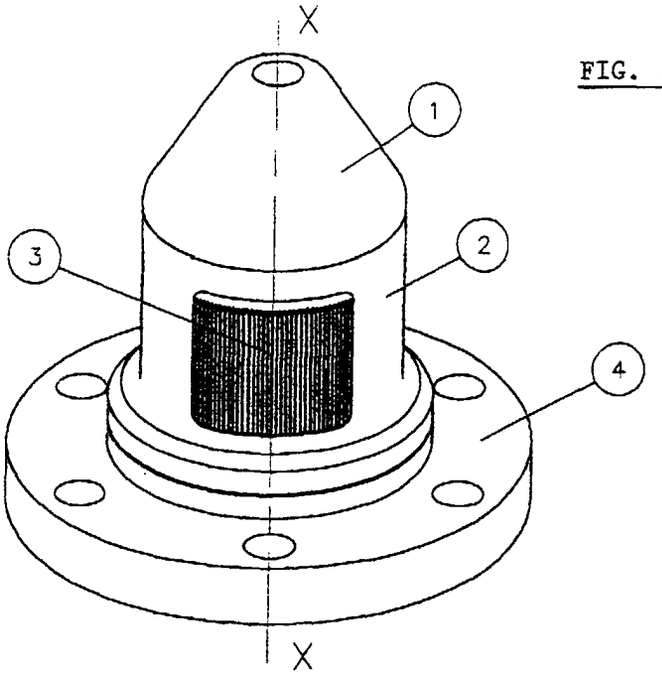

FIG. 2

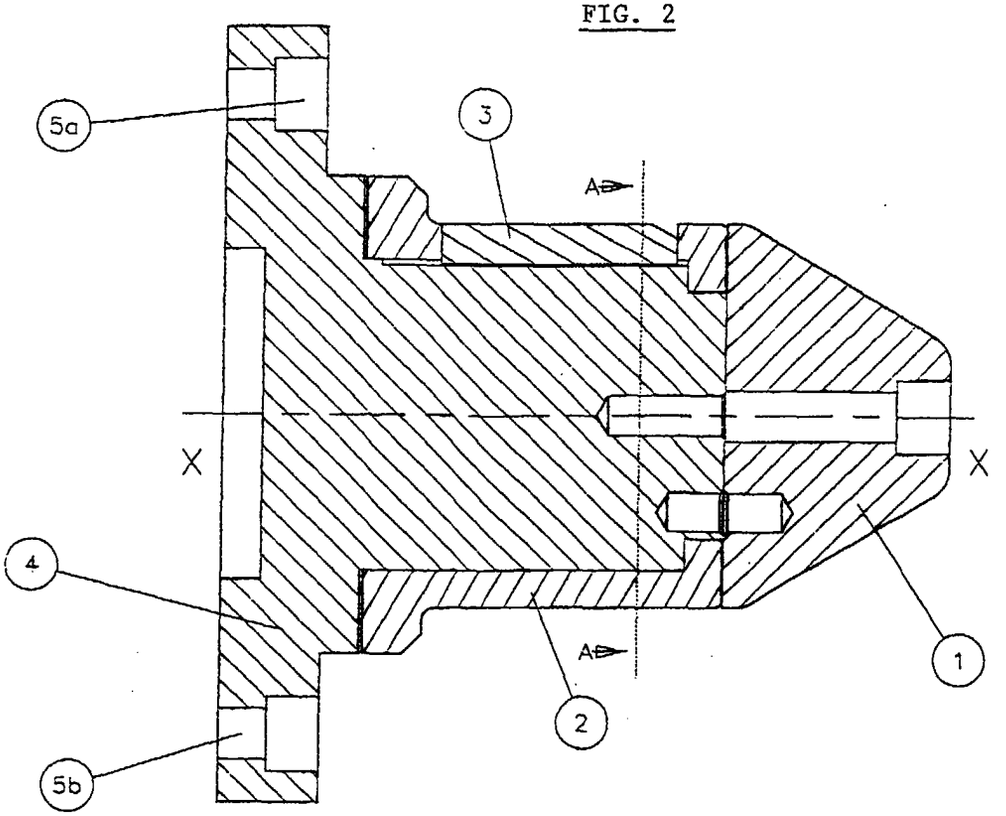

FIG. 3

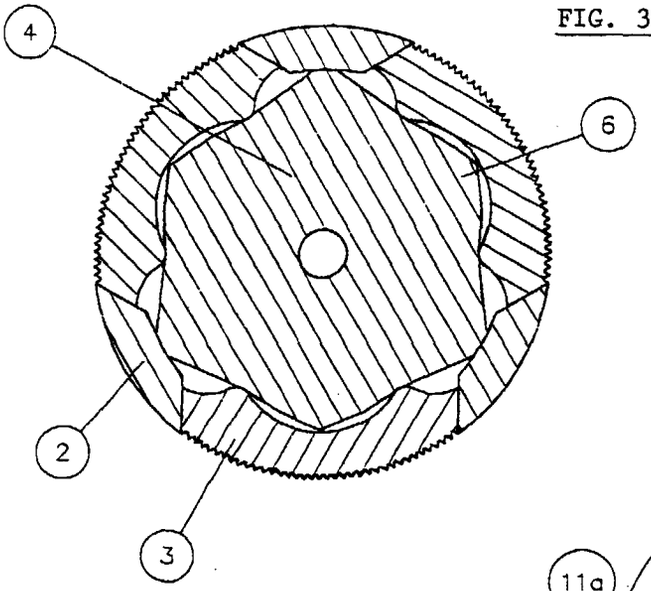

FIG. 4

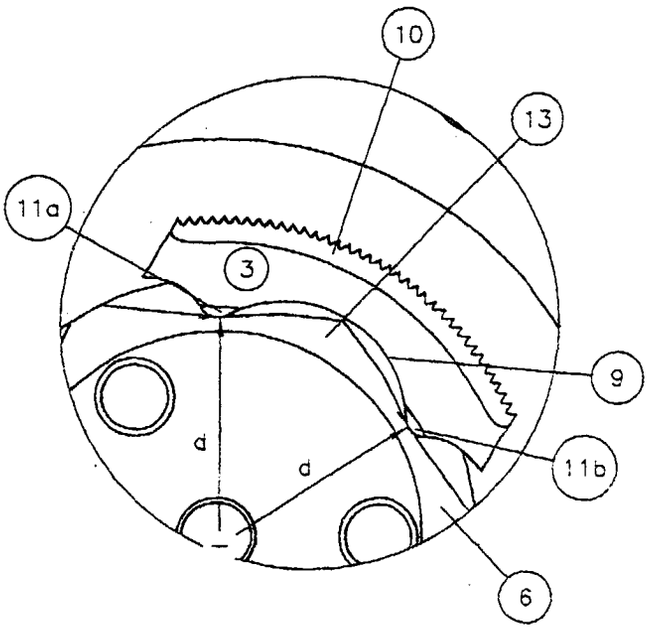

FIG. 5

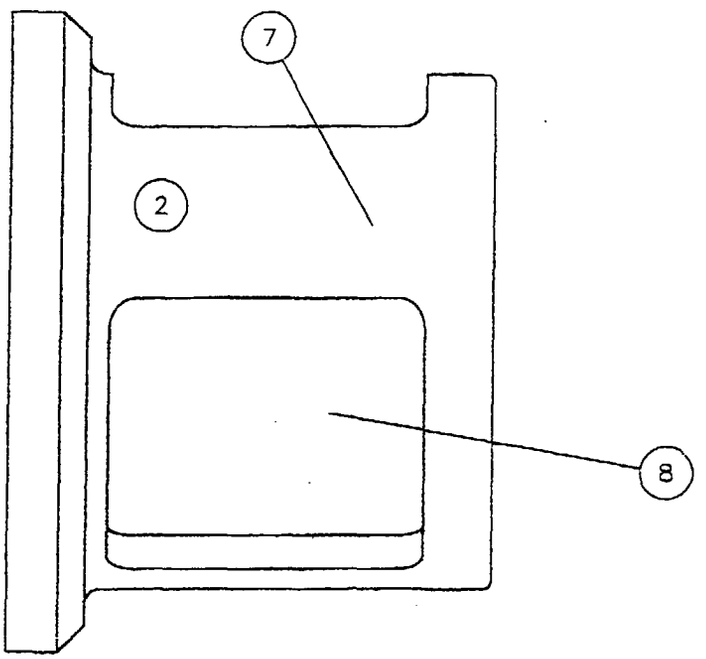

FIG. 6

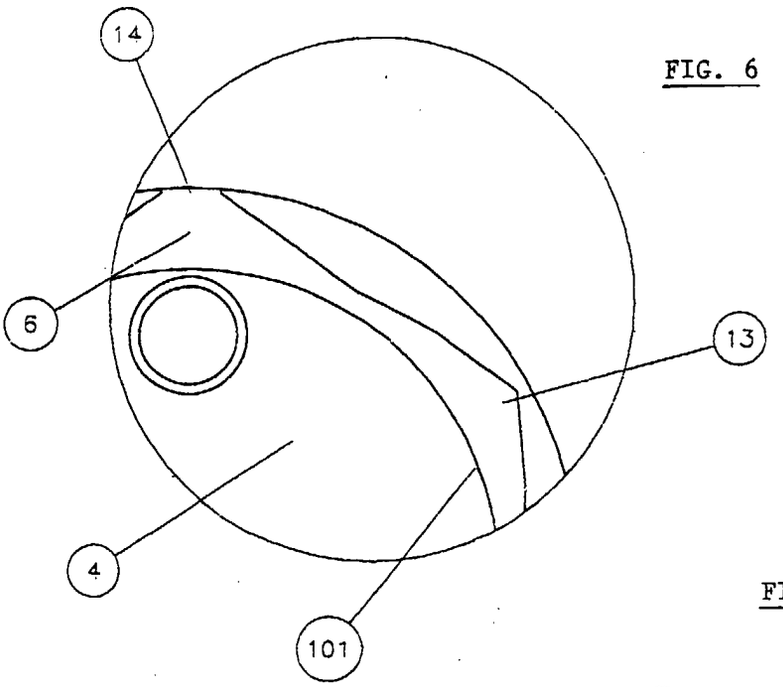

FIG. 7

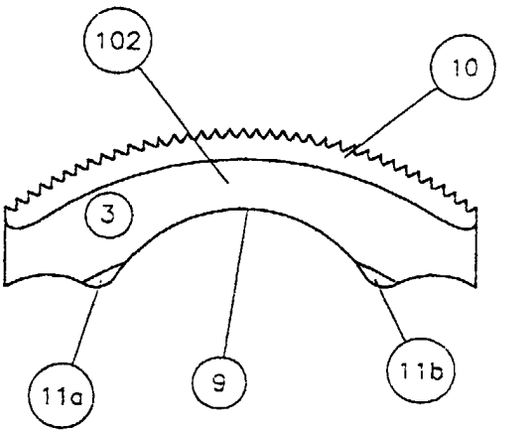

FIG. 8