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(54) **Yarn feeder with lightweight yarn-winding drum**

(57) A housing (12) supports a yarn-winding drum (14) driven to rotate by a motor (13). The yarn-winding drum (14) comprises a molded frame (26) made of a synthetic material and provided with a hub (28) having a plurality of spokes (30) which radially project therefrom and have an aerodynamic profile in the direction of rotation.

The spokes bear respective yarn-bearing arms (32) which project from the outer ends of the spokes (30) in a direction substantially parallel to the axis of the hub and also have an aerodynamic profile in the direction of rotation. A stiffening ring (36) is connected to the free ends of said yarn-bearing arms (32) coaxially to the hub (28).

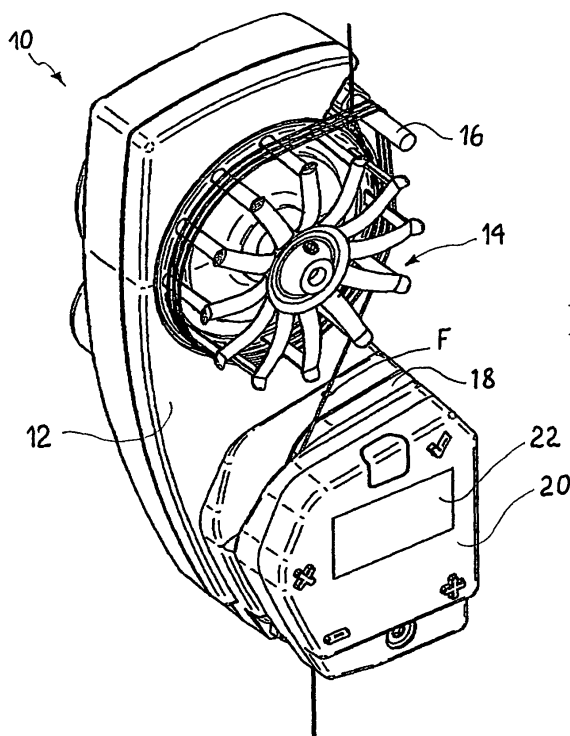


Fig. 1

Description

[0001] The present invention relates to a yarn feeder provided with a yarn-winding drum having a lightweight structure.

[0002] As known, yarn feeders are used in textile lines, which comprise a yarn-winding drum driven to rotate by a motor for drawing the yarn from a reel and feeding it to a downstream textile machine. A feeder of this type is described, e.g., in EP 1 710 334 of Applicant.

[0003] In order to improve the responsiveness of the yarn feeder, US 4,669,677 describes a yarn-winding drum having a lightweight structure and comprising a spider assembly of bent metal rods which are interconnected to form a cylindrical frame.

[0004] The advantage of the above structure is that it has a high shape rigidity, but it is not satisfactory from the point of view of the inertia because, in addition to the metal rods, it has a high number of connection parts which increase the inertia of the drum and make it rather complex and, consequently, expensive.

[0005] US 6,131,842 describes a drum consisting of a plurality of arms which radially project from a hub connected to the driving shaft of the feeder. Each arm consists of a bent metal wire having two parallel, radial portions which are axially spaced from each other and are connected by a longitudinal portion on which the yarn is supported.

[0006] The above drum has a very light structure and, therefore, it is satisfactory in relation to the reduction of the inertia; however, it has the drawback that it has a limited shape rigidity due to the arms being made of a thin metal wire. As known, this circumstance affects the accuracy of the yarn-feeding process.

[0007] Therefore, it is a main object of the present invention to provide a yarn feeder provided with a yarn-winding drum which has both a low inertia and, more generally, a low resistance to rotation, as well as a high shape rigidity.

[0008] It is another object of the invention to provide a yarn-winding drum which has a relatively simple structure and is relatively cheap to manufacture with respect to the lightweight drums of the prior art.

[0009] The above object and other advantages, which will better appear from the following description, are achieved by the yarn feeder having the features recited in claim 1, while the dependent claims state other advantageous, though secondary features of the invention.

[0010] The invention will be now described in more detail with reference to a preferred, non-exclusive embodiment shown by way of non limiting example in the attached drawings, wherein:

- Fig. 1 is a perspective view of a yarn feeder provided with a lightweight yarn-winding drum according to the invention;
- Fig. 2 is a front view of the yarn feeder of Fig. 1;

- Fig. 3 shows a portion of Fig. 2 to an enlarged scale and in cross section along axis III-III;

5 - Fig. 4 is an exploded, perspective view of the yarn-winding drum according to the invention;

10 - Fig. 5 is a perspective view showing a detail to an enlarged scale of the yarn-winding drum according to the invention;

15 - Fig. 6 shows the profile in cross section of a first portion of the yarn-winding drum according to the invention;

20 - Fig. 7 shows the profile in cross section of a second portion of the yarn-winding drum according to the invention.

[0011] With reference to the above Figures, a yarn feeder 10 comprises a housing 12 in which a motor 13 is incorporated (Fig. 3). A yarn-winding drum 14 is keyed to the shaft 13a of motor 13. In a way known per se, the yarn is wound between yarn-winding drum 14 and an adjustable sloping pin 16 which forms part of a conventional mechanism for separating the yarn loops, which is well known in the field and, accordingly, will not be further described. Yarn F unwinding from drum 14 passes through a tension sensor 18, which is housed within housing 12 for the feedback control of the feeder, and then is fed to a general downstream machine (not shown). The operative parameters of feeder 10 are managed by a push-button panel 20 provided with a display 22 (Fig. 1).

25 **[0012]** According to the invention, yarn-winding drum 14 comprises a molded frame 26 of a synthetic material (Fig. 4), preferably a thermoplastic material such as Nylon with addition of carbon fibers. Frame 26 has a hub 28 and a plurality of spokes 30 spaced at equal angles, which radially project from the hub and have an aerodynamic profile in the direction of rotation. Spokes 30 have respective yarn-bearing arms 32 projecting from their outer ends in a direction substantially parallel to the axis of the hub, i.e., along the generatrices of a cylinder. The yarn-bearing arms also have an aerodynamic profile in the direction of rotation. Preferably, spokes 30 have a biconvex profile (Fig. 6), while the profile of yarn-bearing arms 32 comprises a convex outer surface 32a and slightly concave inner surface 32b (Fig. 7). In the embodiment shown herein, the profiles of both spokes 30 and yarn-bearing arms 32 are symmetrical with respect to the transverse, middle lines of their respective sections.

30 **[0013]** A projection 34 is formed in the area of connection of spoke 30 with its respective yarn-bearing arm 32. Projection 34 is sloping outwards at an angle α which is advantageously in the range 20° to 40°, preferably 30°, with respect to a plane perpendicular to the axis of the drum, in the direction opposite to yarn-bearing arms 32.

35 **[0014]** A stiffening ring 36 (Figs. 4 and 5) is coaxially connected to the base of frame 26, which is defined by

the free ends of yarn-bearing arms 32. Stiffening ring 36 has a plurality of equally-spaced longitudinal holes 38 that are restrainedly engaged by respective pins 40 which longitudinally project from the free ends of yarn-bearing arms 32 (Fig. 5). Preferably, stiffening ring 36 is also made of a thermoplastic material such as Nylon with addition of carbon fibers.

[0015] Yarn winding drum 10 is keyed to shaft 13a of motor 13, with interposition of a bush insert 44 which is received in hub 28, is preferably made of aluminum, and over which the drum is molded. A screw 52 is screwed into bush insert 44 and engages a flattened surface 54 of shaft 13a for coupling the drum to the shaft.

[0016] Drum 10 according to the invention, which essentially consists of a frame 26 made of a lightweight synthetic material with spokes 30 and yarn-bearing arms 32 interconnected by a stiffening ring 36, has a high rigidity, a low inertia, as well as a low aerodynamic drag due to spokes 30 and yarn-bearing arms 32 having respective aerodynamic profiles. This circumstance, as a person skilled in the art will immediately understand, enhances the responsiveness of yarn feeder 10 to the driving inputs.

[0017] Projections 34 have the aim both of preventing yarn loops from slipping away from drum 10 during the feeding process, and of rewinding onto the drum any loop which, after a stop, has accidentally slipped away from the drum due to a loosening of the yarn downstream of the feeder.

[0018] Bush insert 44 allows drum 10 to be firmly coupled to shaft 13a without deforming the drum.

[0019] A preferred embodiment of the invention has been described herein, but of course many changes may be made by a person skilled in the art within the scope of the claims. For example, the profiles of spokes 30 and yarn-bearing arms 32 may differ from those indicated as preferred, whereby any other profile having a low aerodynamic drag, e.g., a wing-like, drop-shaped profile, and the like, may be used. Of course, it is not necessary that all the spokes and/or yarn-bearing arms have the same profile, as they may have different, e.g., alternated, profiles. Nevertheless, certain parts of the drum should be only intended as preferred, though non-essential, for achieving the invention. For example, bush insert 44 may be removed if hub 28 is formed with a sturdy shape which allows screw 52 to be firmly secured without deforming the drum. Moreover, pins 40 may be fixed to holes 38 of ring 36 in a way different from what described, e.g., they may be glued, hot riveted, laser welded, and the like; frame 26 and ring 36 could even be made enbloc. Of course, the materials may differ from those indicated as preferred. For example, stiffening ring 36 may be made of aluminum as well as of a synthetic material different from that indicated as preferred.

Claims

1. A yarn feeder (10), comprising a housing (12) which supports a yarn-winding drum (14) driven to rotate by a motor (13), **characterized in that** said yarn-winding drum (14) comprises:
 - a molded frame (26) made of a synthetic material and provided with a hub (28) having a plurality of spokes (30) which radially project therefrom, which spokes have an aerodynamic profile in the direction of rotation and support respective yarn-bearing arms (32) which project from the outer ends of the spokes (30) in a direction substantially parallel to the axis of the hub and also have an aerodynamic profile in the direction of rotation, and
 - a stiffening ring (36) connected to the free ends of said yarn-bearing arms (32) coaxially to the hub (28).
2. The yarn feeder of claim 1, **characterized in that** said yarn-winding drum (14) also comprises a bush insert (44) which is received in the hub (28), may be keyed to the shaft (13a) of said motor (13), and is provided with connection means (52) engaging corresponding means on the shaft (13a) for their mutual, rotational coupling.
3. The yarn feeder of claim 2, **characterized in that** said connection means comprise a screw (52) screwed into said bush insert (44), and said corresponding means comprise a flattened surface (54) formed on said shaft (13a) and engageable by said screw (52).
4. The yarn feeder of any of claims 1 to 3, **characterized in that** said frame (26) is molded over said screw insert (44).
5. The yarn feeder of any of claims 1 to 4, **characterized in that** said bush insert (44) is made of aluminum.
6. The yarn feeder of any of claims 1 to 5, **characterized in that** a projection (34) is formed in the area of connection of each of said spokes (30) with the respective yarn-bearing arm (32), which projection is sloping outwards at an angle (α) with respect to a plane perpendicular to the axis of the drum in a direction opposite to the yarn-bearing arms (32).
7. The yarn feeder of claim 6, **characterized in that** said angle (α) is in the range 20° to 40°.
8. The yarn feeder of claim 7, **characterized in that** said angle (α) is 30°.

9. The yarn feeder of any of claims 1 to 8, **characterized in that** said stiffening ring (36) has a plurality of longitudinal holes (38) which are restrainedly engaged by respective pins (40) which longitudinally project from the ends of the yarn-bearing arms (32). 5
10. The yarn feeder of any of claims 1 to 9, **characterized in that** at least one of said spokes (30) has a biconvex profile. 10
11. The yarn feeder of any of claims 1 to 10, **characterized in that** at least one of said yarn-bearing arms (32) has a profile with a convex outer surface and a slightly concave inner surface. 15
12. The yarn feeder of any of claims 1 to 11, **characterized in that** said ring (36) is also made of a synthetic material. 20
13. The yarn feeder of any of claims 1 to 12, **characterized in that** at least one of said frame (26) or ring (36) is made of Nylon with addition of carbon fibers. 25

Amended claims in accordance with Rule 137(2) EPC. 25

1. A yarn feeder (10), comprising a housing (12) which supports a yarn-winding drum (14) driven to rotate by a motor (13), said yarn-winding drum (14) comprising : 30
- a molded frame (26) made of a synthertic material and provided with a hub (28) having a plurality of spokes (30) which radially project therefrom, which spokes have an aerodynamic profile in the direction of rotation and support respective yarn-bearing arms (32) which project from the outer ends of the spokes (30) in a direction substantially parallel to the axis of the hub and also have an aerodynamic profile in the direction of rotation, and 35
 - a stiffening ring (36) connected to the free ends of said yarn- bearing arms (32) coaxially to the hub (28), **characterized in that** 40

at least one of said spokes (30) has a biconvex profile, and 45

at least one of said yarn-bearing arms (32) has a profile with a convex outer surface and a slightly concave inner surface. 50

2. The yarn feeder of claim 1, **characterized in that** said yarn-winding drum (14) also comprises a bush insert (44) which is received in the hub (28), may be keyed to the shaft (13a) of said motor (13), and is provided with connection means (52) engaging corresponding means on the shaft (13a) for their mutual, 55

rotational coupling.

3. The yarn feeder of claim 2, **characterized in that** said connection means comprise a screw (52) screwed into said bush insert (44), and said corresponding means comprise a flattened surface (54) formed on said shaft (13a) and engageable by said screw (52).

4. The yarn feeder of any of claims 1 to 3, **characterized in that** said frame (26) is molded over said screw insert (44).

5. The yarn feeder of any of claims 1 to 4, **characterized in that** said bush insert (44) is made of aluminum.

6. The yarn feeder of any of claims 1 to 5, **characterized in that** a projection (34) is formed in the area of connection of each of said spokes (30) with the respective yarn-bearing arm (32), which projection is sloping outwards at an angle (α) with respect to a plane perpendicular to the axis of the drum in a direction opposite to the yarn-bearing arms (32).

7. The yarn feeder of claim 6, **characterized in that** said angle (α) is in the range 20° to 40°.

8. The yarn feeder of claim 7, **characterized in that** said angle (α) is 30°.

9. The yarn feeder of any of claims 1 to 8, **characterized in that** said stiffening ring (36) has a plurality of longitudinal holes (38) which are restrainedly engaged by respective pins (40) which longitudinally project from the ends of the yarn-bearing arms (32).

10. The yarn feeder of any of claims 1 to 9, **characterized in that** said ring (36) is also made of a synthetic material.

11. The yarn feeder of any of claims 1 to 10, **characterized in that** at least one of said frame (26) or ring (36) is made of Nylon with addition of carbon fibers.

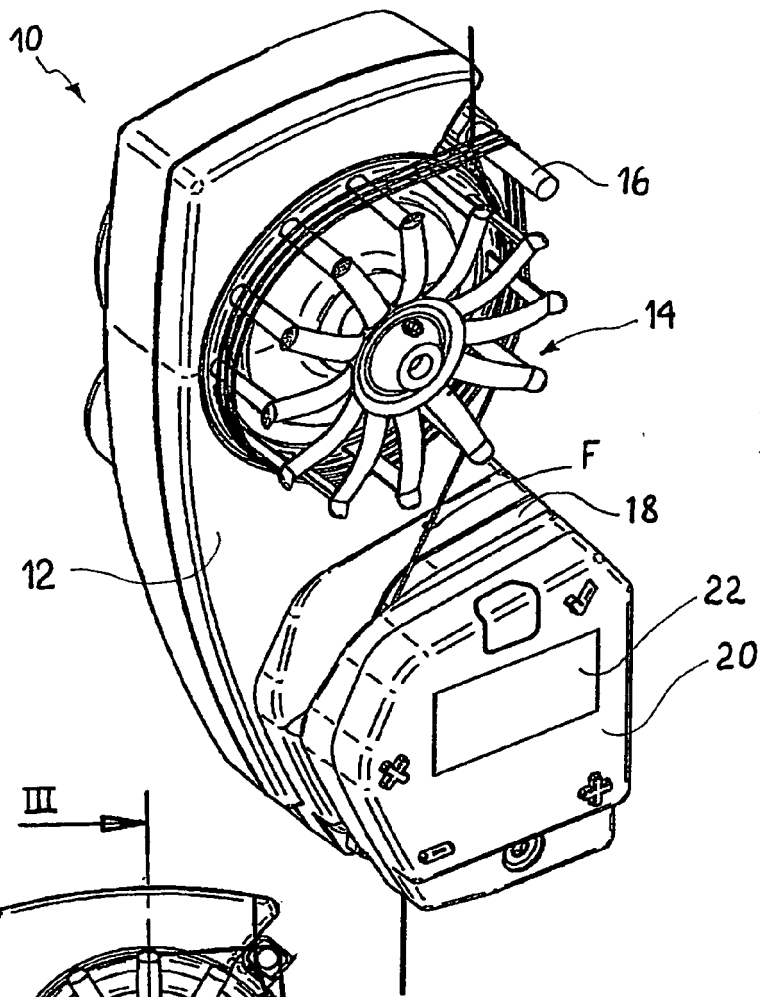


Fig. 1

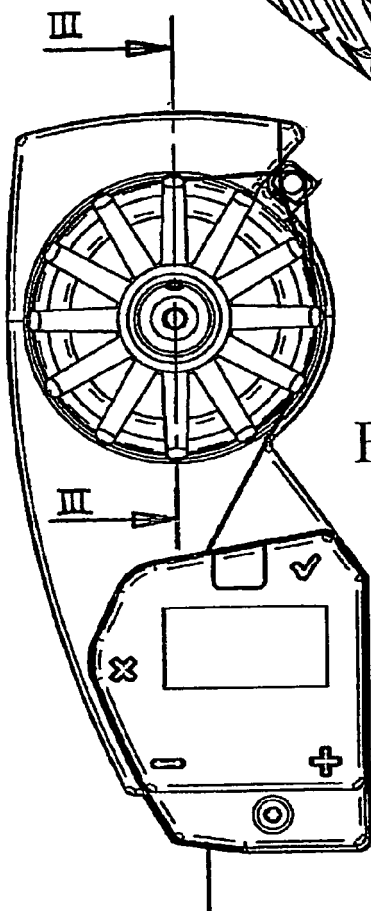


Fig. 2

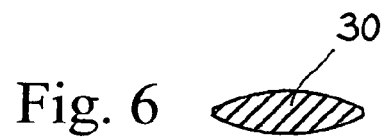


Fig. 6

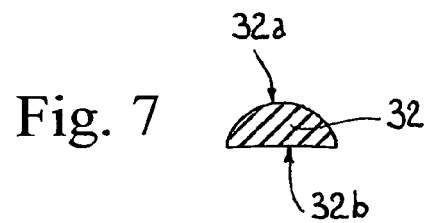
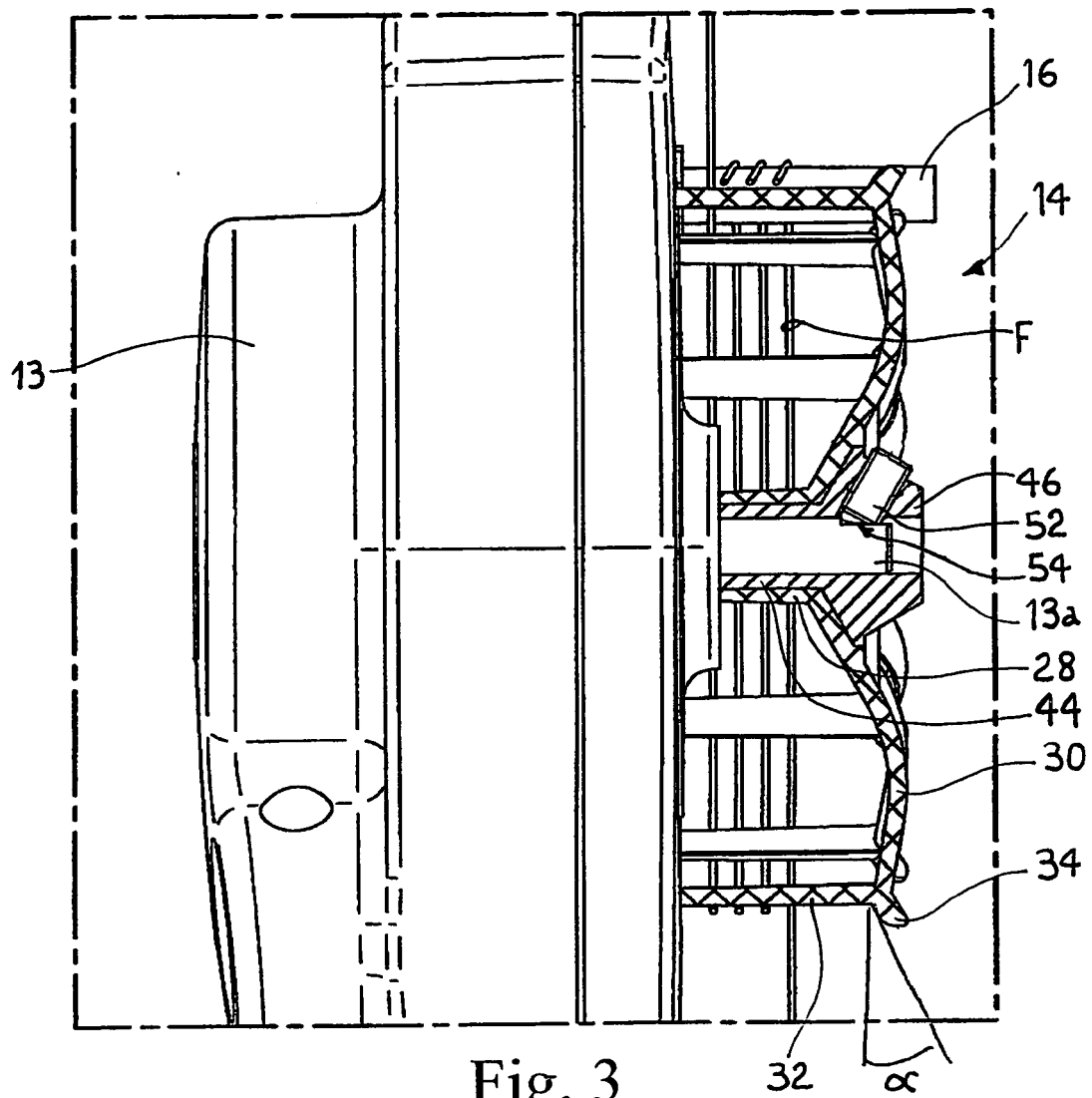
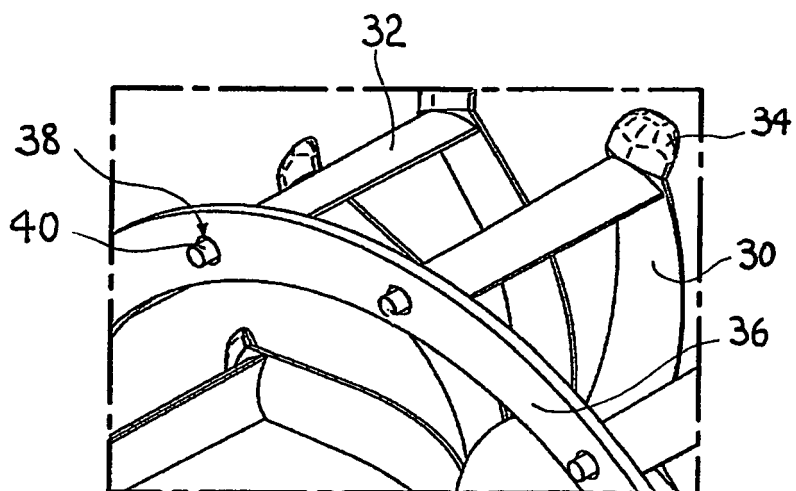
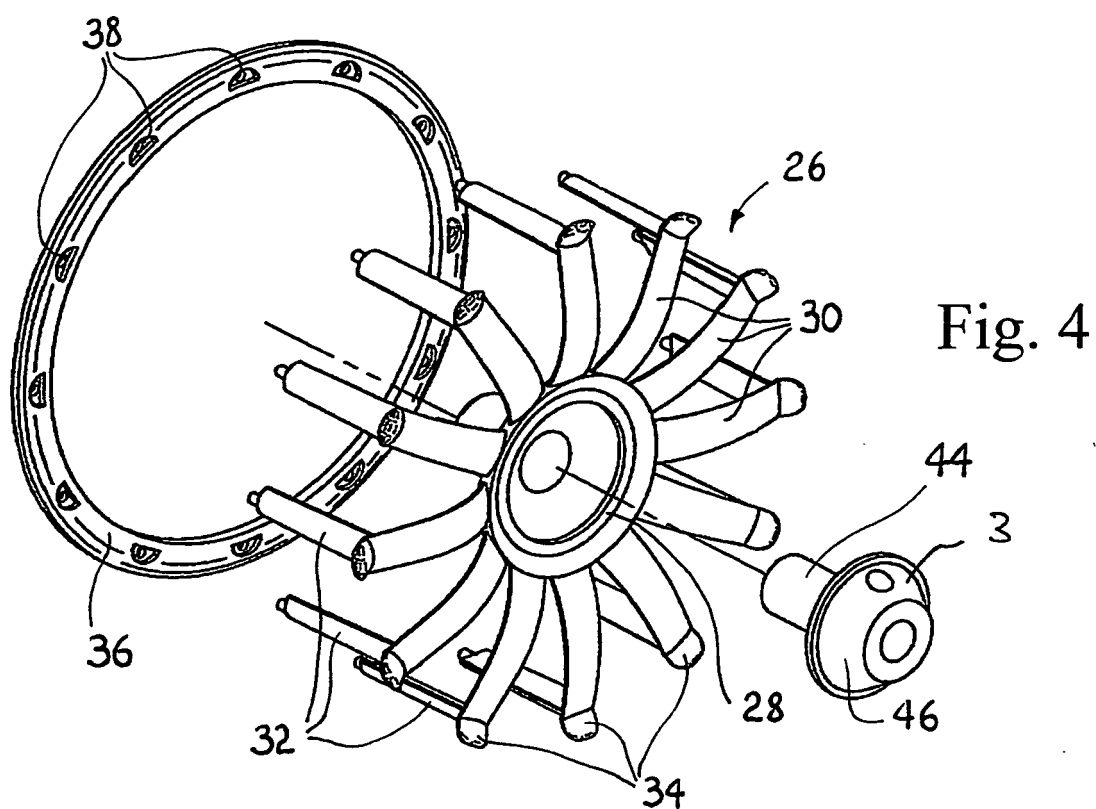


Fig. 7







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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 July 2009	Examiner Lemmen, René
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