



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.03.2008 Bulletin 2008/11

(51) Int Cl.:
D04B 15/56 (2006.01) D04B 35/32 (2006.01)

(21) Application number: **07253463.9**

(22) Date of filing: **31.08.2007**

(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 MT NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

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(30) Priority: **02.09.2006 GB 0617323**

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(54) **Textile material guide**

(57) A textile material guide (10) which comprises a body (14) arranged to be rotatably mounted on a shaft (12). The body (14) comprises fixing means (34,36) for mounting the body (14) on a shaft (12). The body (14) has a circumferential surface (18) configured to guide

movement of textile material in a first direction and constrain lateral movement of the textile material relative to the body (14). The body (14) has one or more blade formations (24) which are configured so that rotation of the body (14) induces an airflow away from the guide during use.

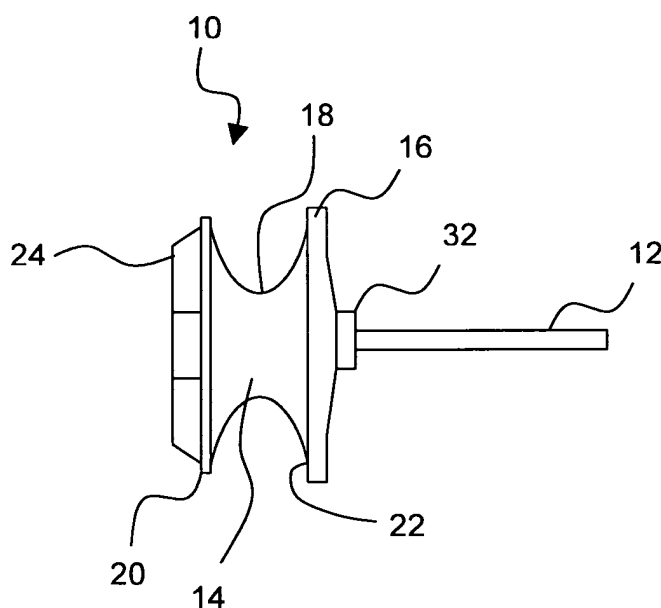


Fig. 1

Description

[0001] The present invention relates to a guide for textile material and more particularly to a rotating guide over which a length of textile material can be fed.

[0002] Guides of this kind are typically provided on textile machinery in order to ensure correct alignment of the material as it is fed into machinery. In particular such guides are intended to allow substantially free running of material along its length, whilst constraining the length of material against lateral motion. Known textile material guides take the form of a wheel mounted for free rotation on a stationary shaft.

[0003] The following description proceeds in relation to yarn in particular, although it will be understood that the present invention is relevant to various types of textile materials such as for example, threads, filaments, cords, individual fibres and other strands of material.

[0004] It is a known problem with yarns that some shearing occurs within the yarn as it is fed over a guide, resulting in loosening and freeing of the fibrils within the yarn. Shearing of the yarn is a particular problem in the vicinity of carriers, through which yarn is fed.

[0005] Carriers generally take the form of metal or ceramic parts, which have an eyelet, through which the yarn passes. Guide wheels are typically mounted in the vicinity of carriers, in order to constrain the feeding of the material into the carrier eyelet. The direction of travel of the yarn changes as the yarn passes through the carrier eyelet such that the yarn rubs against the carrier, causing increased loosening of the fibrils in the yarn. This results in an unwanted build up of fibrils or short fibres at the point of input into the carrier.

[0006] One solution to this problem involves generation of a directed air flow, for example from a compressed air source to maintain the fibrils within the yarn. The result of providing a generally laminar air flow in this manner is that the loose fibrils are included within the resulting textile structure.

[0007] However the provision of compressed air in conjunction with one or more wheels results in a complicated guide arrangement, the correct operation of which is reliant on the control of the air flow and the alignment of the wheels, the carrier and the air source. This can result in reliability problems and machine downtime.

[0008] Furthermore a number of problems have been identified with the operation of currently available guide wheels. Rubbing between the wheel and the yarn or friction between the internal wheel bearing surfaces can cause electrostatic forces to build, which attract the yarn and/or fibrils. This can cause a problematic build-up of fibrils which can inhibit the smooth running of yarn over the wheel. When wheels become degraded or worn out through use, they are generally discarded and replaced.

[0009] In addition, a conventional wheel must be pushed onto a shaft and manually located in the required position along the shaft for use. This is a time-consuming operation and so conventional wheels are not routinely

removed when not in use, since this requires the subsequent repositioning of the wheels for later use. Hence conventional wheels are not routinely cleaned, which reduces the operational life of the wheels.

[0010] In view of the foregoing problems, the present invention aims to provide a textile material guide with improved control of the feed of material and which can positively contribute to the operational efficiency of textile manufacture.

[0011] According to the present invention there is provided a textile material guide comprising a body which is rotatably mountable on a shaft, the body comprising fixing means for mounting said body on a shaft; a circumferential surface, wherein the circumferential surface is configured to guide movement of textile material in a first direction and constrain lateral movement of the textile material relative to the body; and, wherein the body has one or more blade formations thereon which are configured so that rotation induces an airflow away from the guide.

[0012] Typically the passage of the textile material over the guide causes the body to rotate and thus generate an airflow. In this embodiment the rotation of the body is passive in response to the frictional contact between the textile material and the circumferential surface. The passage of the textile material drives the rotation of the guide in order to induce the airflow. In this regard the guide may be considered to be a passively or self-propelled fan wheel.

[0013] The flow of air establishes a pressure gradient sufficient to dissipate any loose fibrils, lint or other airborne contaminants in the vicinity of the body. Thus a separate source of pressurised air is not required. Furthermore the strength of the airflow is determined by the rotational speed of the body and does not require separate control.

[0014] In one embodiment, the body comprises first and second side surfaces separated by the circumferential surface, which is disposed therebetween. The body typically comprises a wheel and the circumferential surface typically extends around the periphery of the wheel. The circumferential surface may be angled or curved so as to create a circumferential groove.

[0015] Preferably the blade formations are provided on the first side of the body and are shaped to displace air outwardly of the centre of rotation of the body. Thus the blade formations act as a radial blower. Typically the formations extend radially from the centre of rotation of the body and, in one embodiment the formations are integrally formed with body. The formations may be curved in shape so as to produce swirling or vortex flow during use. Typically the blade formations are curved about an axis parallel with the axis of rotation of the body.

[0016] The creation of a vortex flow generates turbulent flow conditions around the body, which effectively disperses loose fibrils. The positive pressure gradient created around the perimeter of the body prevents fibrils or other airborne contaminants from being deposited on

the body.

[0017] According to a preferred embodiment, the textile material guide has fixing means disposed between a portion of the body and the shaft during use. Preferably the material guide has first and second fixing means, the first fixing means being fixable to the shaft and the second fixing means being fixable to the body portion. Yet more preferably, the body is rotatable relative to the first fixing means and the second fixing means is rotatable relative to the shaft.

[0018] The first and second fixing means advantageously provide a bearing arrangement which is simple in form and which provides minimal resistance to the rotation of the body.

[0019] In one embodiment, the second fixing means is fixable to the body portion so as to define an internal cavity portion within the body. Typically the internal cavity is shaped to loosely enclose the first fixing means. Typically each of the first and second fixing means have an aperture therein for reception of the shaft, the aperture of the first fixing means being smaller than the aperture of the second fixing means. The aperture of the first fixing means may be offset from the aperture of the second fixing means prior to insertion of the shaft. Typically the shaft end is profiled so as to displace the first fixing means upon insertion into the body.

[0020] This type of offset bearing lock provides an interference fit for the shaft which allows the body to stay in a position in which the body is placed on the shaft.

[0021] According to a preferred embodiment, the internal cavity has an end wall such that the shaft is received within the cavity and abuts against the end wall during use. Thus the body has an opening for reception of the shaft in one side only. This is particularly advantageous since the depth of the cavity determines the location of the body on the shaft during use. Hence the body can be correctly located on the shaft for use simply by inserting the shaft into the cavity until it abuts the end wall. This removes the need for an operator to measure the position of the body on the shaft each time the body is removed or replaced.

[0022] In one embodiment the textile material guide comprises a guard member. Typically the guard member is located adjacent a second side of the body. Preferably the guard member substantially covers the second side of the body and has an opening therein for reception of the shaft. In one embodiment the guard member is fixed to the shaft and does not rotate with the body during use. Such a guard member prevents entry of lint or fibrils in the vicinity of the fixing means.

[0023] Preferably the cavity has two or more cylindrical cavity portions of differing dimensions.

[0024] Preferably the body comprises a co-polymer material. The dielectric strength and discharge capability of a copolymer can advantageously be tailored to prevent the build up of an electrostatic charge during use.

[0025] The textile material guide may be provided for use on a knitting machine.

[0026] Preferred embodiments of the invention are described in further detail below with reference to the accompanying drawings, of which:

Figure 1 shows a side view of a textile material guide according to the present invention;

Figure 2 shows an end view of the textile material of figure 1;

Figures 3a and b show respective end views of first and second fixing means for the textile material guide of figures 1 and 2;

Figure 4 shows an exploded cross-sectional view of a textile material guide according to the present invention; and,

Figure 5 shows a pair of textile material guides according to further embodiment of the present invention arranged for use.

[0027] Turning firstly to figure 1, there is shown a side view of a textile material guide according to the present invention in the form of a wheel 10 attached to a shaft 12. The wheel 10 generally comprises a body portion 14, a guard member 16 and fixing means for fixing the body to the shaft, which are described in further detail below with reference to figures 3 and 4.

[0028] The wheel body 14 has a circumferential surface 18 extending between a first side 20 and an opposing second side 22 of the wheel body. The circumferential surface 18 is shaped to form a groove or gulley, which extends around the periphery of the wheel. Thus the diameter of the wheel at a mid point between the first 20 and second 22 side is smaller than the diameter of the wheel at either side thereof. In the embodiment of figure 1, the circumferential surface is curved inwardly so as to form a generally U-shaped groove or gulley. Alternatively, the circumferential surface could have angled sides forming a V-shaped groove.

[0029] Blade formations 24 are provided on the first side 20 of the wheel body 14 and protrude from the side wall 20 in an axial direction. The blade formations 24 take the form of a series of blades disposed around a central hub portion 26 as can be seen in figure 2. Each blade 24 extends outwardly of the hub in a radial direction and is curved along its length so as to form an arc-shaped projection extending from the hub towards the outermost circumferential edge of the wheel body 14.

[0030] A series of five equally spaced blades 24 are shown in figure 2, although varying numbers of blades of varying depths may be provided as required. In one embodiment, four blades have been found to provide suitable operational characteristics. In addition, it has been found that the curved shape of the blades has a beneficial impact on the vortex generated about the wheel during use, although straight blades could also be

used.

[0031] Returning to figure 1, the guard member 16 takes the form of a lint guard, which is generally disc shaped, such that, in use the lint guard is seated adjacent the second side 22 of the wheel body. The diameter of lint guard 16 is greater than the diameter of the second side 22 of the wheel and is provided with a peripheral flange 28, which can be seen in figure 4. The lint guard also has a central aperture 30 such that the shaft 12 can pass therethrough during use. An axial flange 32 is disposed around the central aperture 30 such that the thickness of the lint guard is greatest at the axial flange 32.

[0032] Turning now to figures 3 and 4, the construction of the wheel 10 is described in further detail. Figures 3a and 3b show respective first 34 and second 36 fixing means which are generally cylindrical in shape. The first and second fixing means have respective central apertures 38 and 40 extending therethrough. The outer diameter of the second fixing means 36 is greater than that of the first fixing means 34. The diameter of the central aperture 40 of the second fixing means 36 is also greater than the diameter of the central aperture 38 of the first fixing means 34.

[0033] As can be seen in figure 4, the wheel body 14 has an internal cavity 42 extending inwardly from the second side 22 surface. The cavity 42 is formed of three cylindrical cavity portions of differing diameters, each cavity portion being arranged about the wheel axis. The first cavity portion 44 is immediately adjacent the second side 22 and has the largest diameter. The second cavity portion 46 is interposed between the first 44 and third 48 cavity portions and is smaller in diameter than the first cavity portion. The third cavity portion 48 is of the smallest diameter and is closed at one end by end wall 50. Each cavity has a cylindrical outer cavity wall which is joined to the cavity wall of the adjacent cavity portion by either of the annular walls 45 or 47. Thus the three cavity portions are arranged in side by side in a stepwise fashion.

[0034] The wheel body 14, the blade formations 24, the first and second fixing means and the lint guard 16 are formed of plastic, which is typically a copolymer material. A suitable copolymer material may be an acetal copolymerizate, and one such material is Hostaform (RTM), which is made up of trioxane and small amounts of comonomeres. This material has a dielectric strength in the region of 3.5 kV/mm and a dissipation factor at 100 Hz of roughly 20×10^{-4} . The wheel body and blade formations are formed integrally, typically by injection moulding or the like, whilst the lint guard is formed as a separate part.

[0035] When assembled for use, the first fixing means 34 is located within the second cavity portion 46 and the second fixing means 36 is located in the first cavity portion 44. The lint guard is pressed over the second side 22 such that the peripheral flange 28 extends over the second side 22, correctly locating the central aperture 30 with the wheel axis.

[0036] It is to be noted that the diameter of the second

fixing means 36 is substantially equal to the diameter of the first cavity portion 44, such that the second fixing means frictionally engages the wall of the first cavity portion and is securely held in place during use. In contrast, the diameter of the first fixing means 34 is smaller than that of the second cavity portion 46 such that the first fixing means is loose within the second cavity portion and can move relative thereto. Thus once assembled, the aperture 30 in the second fixing means is aligned with the wheel axis and the opening 30 of the lint guard, whereas the aperture 38 of the first fixing means is offset therefrom.

[0037] Once the wheel 10 has been assembled, shaft 12 is inserted through the opening 30 in the lint guard and the central aperture 40 of the second fixing means 36. The shaft end initially abuts against the side of the first fixing means 34 due to its offset alignment. However upon pressing the shaft 12 into the wheel 10, the rounded shaft end displaces the first fixing means into alignment with the wheel axis such that the shaft passes through the opening 38 into abutment with the end wall 50.

[0038] The diameter of the aperture 38 within the first fixing means 34 is substantially equal to the diameter of the shaft 12 so that the shaft is gripped by the fixing means 34 during use. In contrast the diameter of the aperture 40 in the second fixing means is larger than the diameter of the shaft 12 such that the shaft does not frictionally engage therewith. Thus during use, the wheel is held on the shaft by fixing means 34 but is allowed to freely rotate relative thereto. In this manner the first 34 and second fixing means act as bearing members.

[0039] The opening 30 in the lint guard is typically sized to grip the shaft such the lint guard does not rotate during use.

[0040] Turning now to figure 4, a pair of wheels are mounted on shafts extending from a carrier 52. An elastomeric yarn 54 is passed around the peripheral groove of each wheel and around a portion of the carrier 52 such that the wheels allow movement of the yarn in a longitudinal direction but substantially prevent lateral movement thereof. The wheels may be used in conjunction with a ground yarn and/or an elastomeric yarn as required. As the yarn is fed, the wheel rotates freely, thus rotating the blade formations which disturb the air in the vicinity of the wheel 10.

[0041] The blade formations 24 are shaped to drive air radially, thus creating vortex having a pressure velocity which is directly proportional to the rotational speed of the wheel. For normal operational speeds relating to circular weft knitting machinery, the yarn moves at roughly 1.2 to 1.4 m/s, equating to a wheel rotational speed of between 14,000 and 20,000 rpm.

[0042] The electrical properties of the copolymer are instrumental in the dissipation of electrostatic charge during use of the wheel. In particular the combination of dielectric strength and discharge capability does not permit electrostatic charge to be retained by the wheel material, such that, whilst electrostatic charge does build up during

use, the charge will only attain a cyclic peak, at which point the material will discharge to earth via other machinery components. The net effect is to negate ionic attraction of short staples and fibrils, thus allowing the wheel to run without clogging.

[0043] The wheels according to the present invention have been found to run for extended periods of time when compared to conventional wheels. Furthermore, the wheels can be easily removed, washed and replaced in order to allow further extended run times. Whilst the textile guides of the present invention have been found to be particularly suited to use as an elastomeric fan wheel for guiding yarns on a circular weft knitting machine, it is to be understood that the present invention can usefully be employed on other types of textile machinery. In addition the size and shape of the blade can be altered to generate varying flow conditions to suit varying operation parameters.

[0044] In an alternative embodiment of the present invention, the first or second fixing means may comprise a ball bearing in place of a plastic ring. Such a bearing arrangement may take the form of a ring-shaped steel ball race bearing.

Claims

1. A textile material guide comprising a body which is rotatably mountable on a shaft, the body having: fixing means for mounting said body on a shaft; a circumferential surface configured to guide movement of textile material in a first direction and constrain any lateral movement of the textile material relative to the body; and, one or more blade formations protruding from said body, said blade formations being configured to induce an airflow away from the guide upon rotation of said body during use.
2. A textile material guide according to claim 1, wherein the body comprises first and second side surface, the circumferential surface being disposed therebetween.
3. A textile material guide according to claim 1 or claim 2, wherein the circumferential surface is shaped so as to provide a circumferential groove.
4. A textile material guide according to any preceding claim, wherein the blade formations are arranged to displace air outwardly of the centre of rotation of the body.
5. A textile material guide according to any preceding claim, wherein the blade formations extend radially from the centre of rotation of the body.
6. A textile material guide according to any preceding claim, wherein the blade formations are integrally formed with the body.
7. A textile material guide according to any preceding claim, wherein the blade formations protrude from a side surface of the body.
8. A textile material guide according to any preceding claim, wherein each blade formations is curved along its length.
9. A textile material guide according to any preceding claim, wherein the guide comprises first and second fixing means the first fixing means being fixable to the shaft and the second fixing means being fixable to a body portion.
10. A textile material guide according to claim 9, wherein the body is rotatable relative to the first fixing means and the second fixing means is rotatable relative to the shaft.
11. A textile material guide according to any preceding claim, wherein the body comprises an internal cavity, the fixing means being mountable within the internal cavity for use.
12. A textile material guide according to claim 11 when dependent on claim 9 or 10, wherein the first fixing means is loosely enclosed within the internal cavity and the second fixing means is fixedly engaged within the cavity.
13. A textile material guide according to claim 11 wherein the internal cavity has an end wall such that the shaft is received within the cavity and abuts against the end wall during use.
14. A textile material guide according to any preceding claim, further comprising a guard member locatable adjacent the body.
15. A textile material guide according to claim 14, wherein the guard is shaped to cover a portion of the body during use.
16. A textile material guide according to claim 14, wherein the guard is shaped to cover a side of the body
17. A textile material guide according to claim 14, wherein the guard locatable on the shaft such that the guard does not rotate with the body during use.
18. A textile material guide according to any preceding claim, wherein the body comprises a co-polymer material.
19. A textile material guide according to any preceding

claim wherein the body is arranged to be rotated by the passage of material thereover during use.

- 20.** A textile material guide according to any preceding claim provided for use on a knitting machine.

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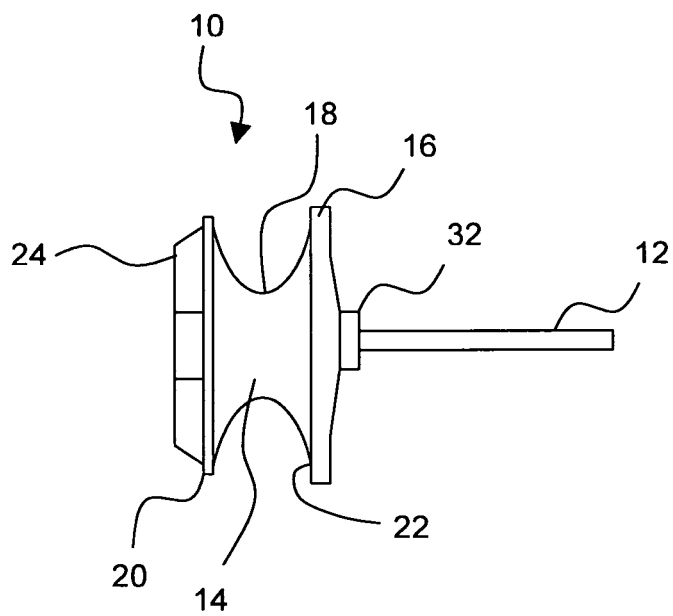


Fig. 1

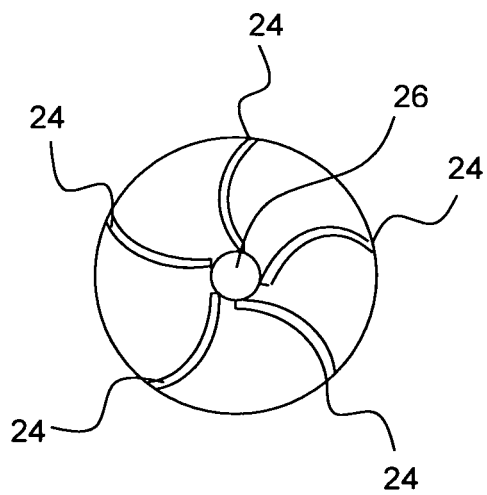


Fig. 2

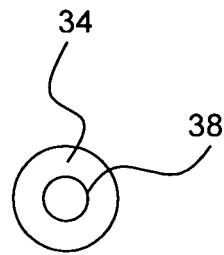


Fig. 3a

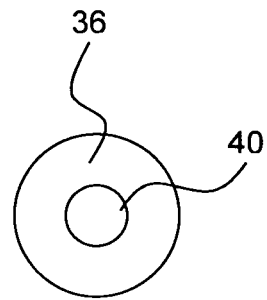


Fig. 3b

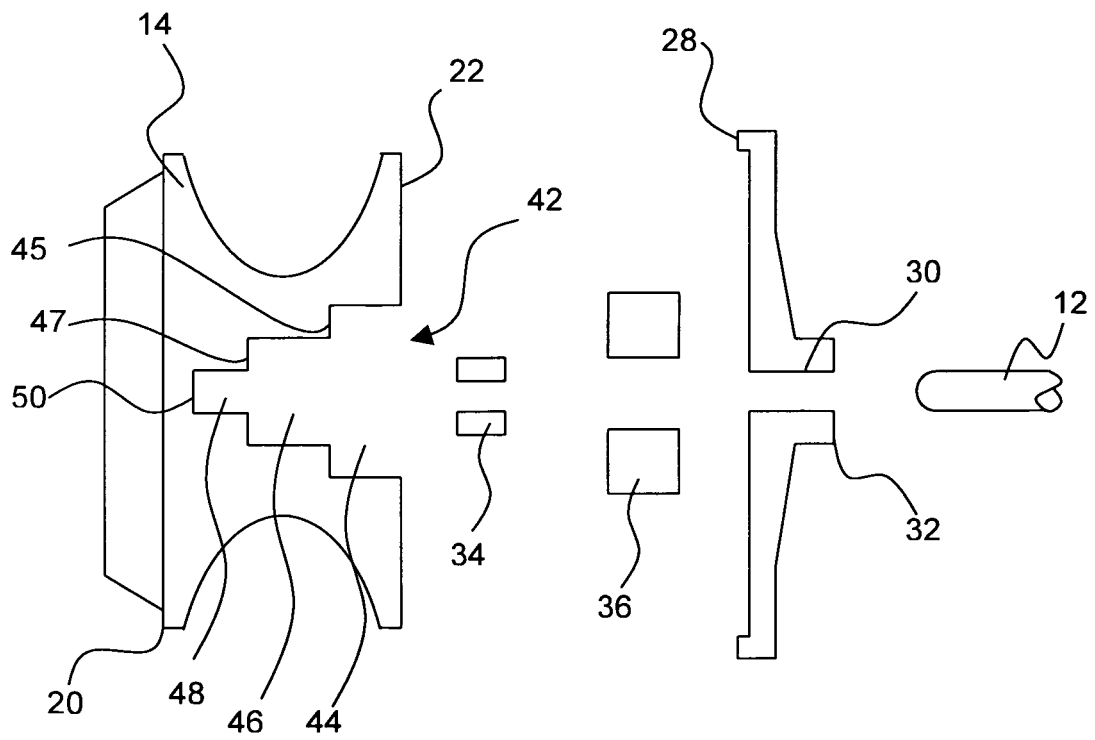


Fig. 4

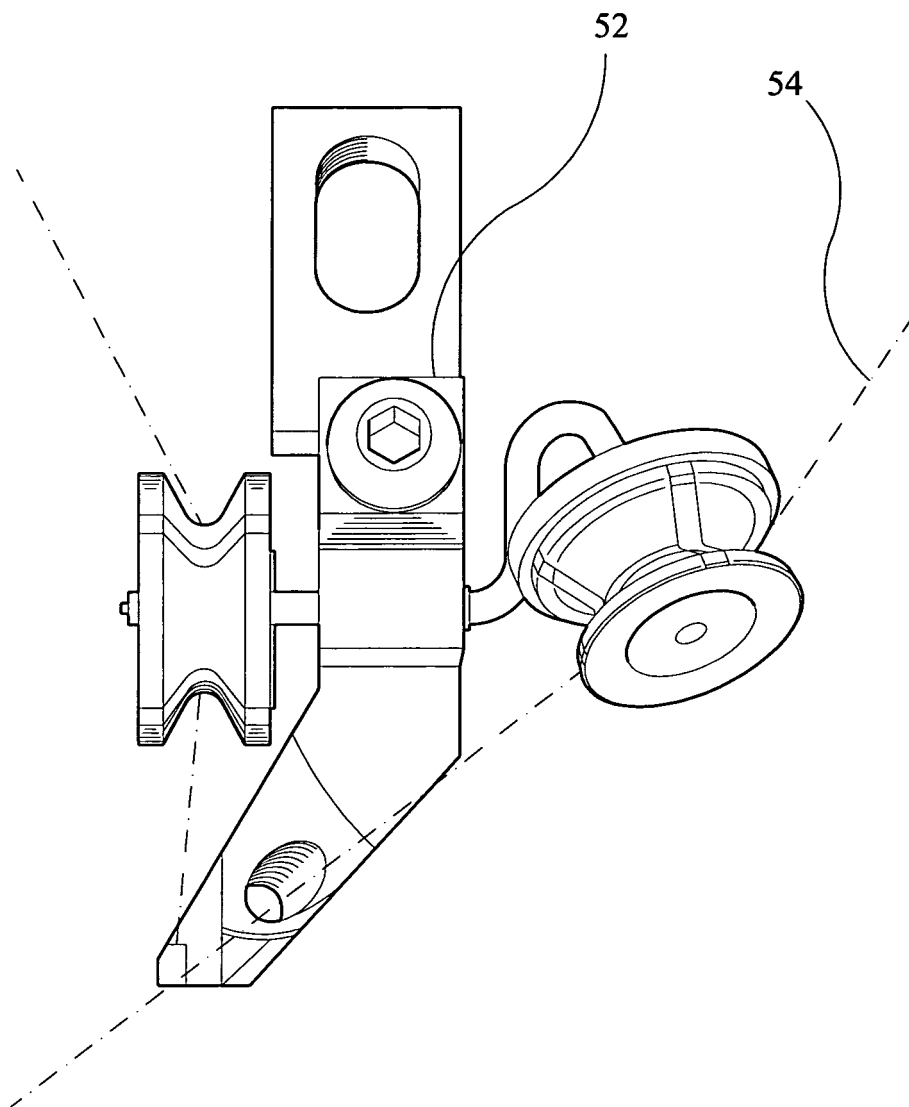


FIG 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 25 3463

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 6 149 092 A (CHEN JEN HUI [TW]) 21 November 2000 (2000-11-21) * the whole document *	1	INV. D04B15/56 D04B35/32
A	US 5 513 503 A (GRAY ED [US] ET AL) 7 May 1996 (1996-05-07) * the whole document *	1	
A	US 6 568 620 B1 (LAMPPRECHT ALFRED [DE] ET AL) 27 May 2003 (2003-05-27) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 7 December 2007	Examiner Pieracci, Andrea
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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 07 25 3463

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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07-12-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6149092 A	21-11-2000	TW 423535 Y	21-02-2001
US 5513503 A	07-05-1996	NONE	
US 6568620 B1	27-05-2003	AU 6464299 A	27-03-2000
		BR 9913514 A	05-06-2001
		CA 2343271 A1	16-03-2000
		CN 1314866 A	26-09-2001
		CZ 20010817 A3	12-09-2001
		WO 0014002 A1	16-03-2000
		DE 19840727 A1	25-05-2000
		EG 22127 A	30-08-2002
		EP 0985620 A2	15-03-2000
		ES 2216392 T3	16-10-2004
		HK 1040508 A1	24-02-2006
		ID 29548 A	06-09-2001
		JP 3459061 B2	20-10-2003
		JP 2002524367 T	06-08-2002
		PL 347944 A1	22-04-2002
		PT 985620 T	30-06-2004
		RU 2200697 C2	20-03-2003
		SK 2912001 A3	08-10-2001
		TR 200100669 T2	23-07-2001
		TW 234539 B	21-06-2005