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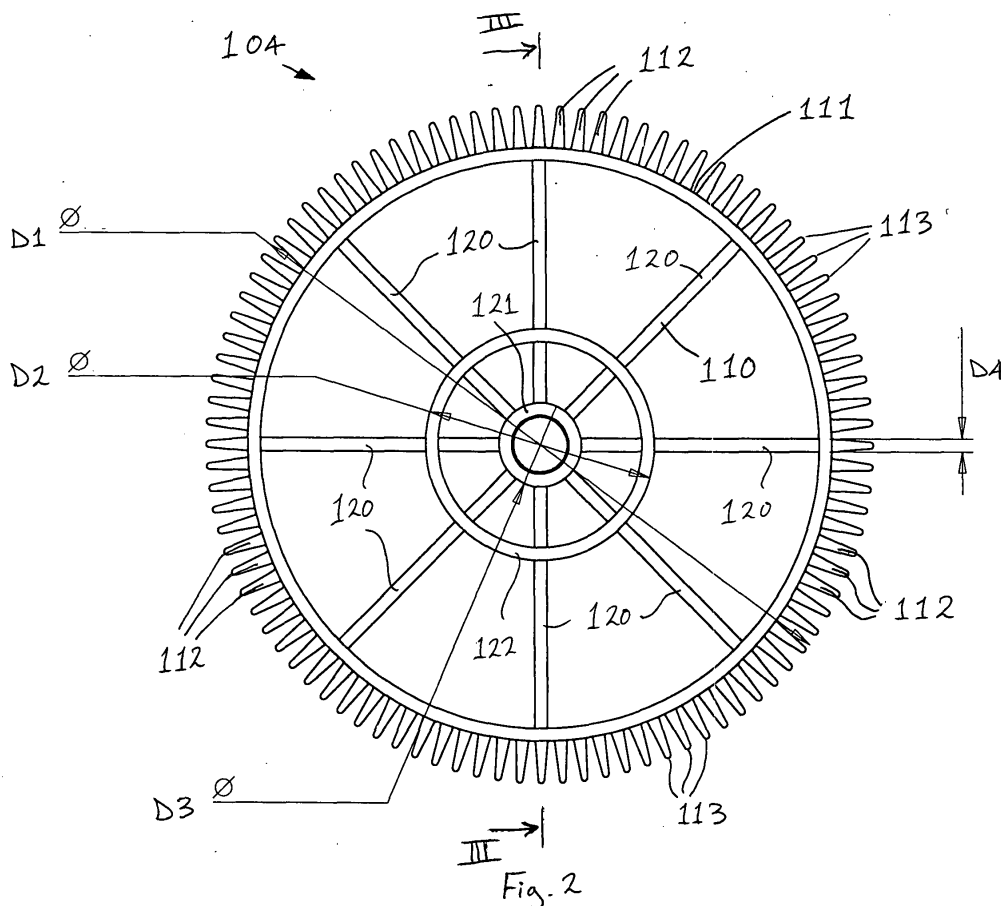
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(54) **A cylinder for use in a knitting machine for engaging fibres to transport the fibres towards one or more knitting needles**

(57) The invention relates to a knitting machine, for example a circular knitting machine, and to a cylinder for use in a knitting machine.



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Description

Introduction

[0001] This invention relates to a knitting machine, for example a circular knitting machine, and to a cylinder for use in a knitting machine.

[0002] In circular knitting machines, it is known to transport fibres from a fibre supply to knitting needles. For example, US Patent Number 4,510,773 describes a circular knitting machine having a pair of feed cylinders, a main cylinder and a doffer cylinder. The feed cylinders transport fibres from a fibre supply to the main cylinder, which transports the fibres to the doffer cylinder, which in turn transports the fibres to knitting needles. Card clothing, having a plurality of wire hooks, is provided releasably attached around the main cylinder and around the doffer cylinder. The wire hooks engage the fibres to facilitate the transportation of the fibres.

[0003] However, there are a number of disadvantages associated with the known circular knitting machines. In particular, it is common for wire hooks to become disengaged from the card clothing after a period of use. The disengaged wire hooks either become embedded in the fibres being transported or are deposited within the knitting machine. In either case, the disengaged wire hooks result in metal contamination of the fibres and/or knitting machine. To subsequently remove these disengaged wire hooks is a time-consuming and laborious task.

[0004] This invention is therefore aimed at overcoming at least some of the disadvantages associated with known knitting machines.

Statements of Invention

[0005] According to a first aspect of the invention there is provided a cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provided on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

the plurality of teeth being integrally formed with the main body part.

[0006] Because the teeth are integrally formed with the main body part, this results in a stronger connection between the teeth and the main body part. As a result, it has been found that the teeth do not break away from the main body part or become disengaged from the main body part, even after a sustained period of use. Thus contamination of the fibres being transported and/or of the knitting machine is successfully avoided using the

cylinder of the invention.

[0007] After a period of use, it may be necessary to replace the cylinder due to wear occurring at the teeth. With the cylinder of the invention, this is a relatively quick and simple procedure, because the teeth are integrally formed with the main body part to form a one-piece cylinder. In particular, the entire old cylinder is removed from the knitting machine and replaced with an entire new cylinder.

[0008] In contrast, in a conventional circular knitting machine, when the wire hooks become worn, the procedure for replacing the hooks requires a greater amount of time and a greater degree of skill on behalf of the operator. In particular, it is necessary for the cylinder to be removed from the knitting machine. The old card clothing is then detached from the cylinder and removed from around the cylinder. Next a new card clothing is positioned around the cylinder and attached to the cylinder. The cylinder, with the new card clothing attached thereto, is then replaced in the knitting machine.

[0009] Injection moulding enables the cylinder of the invention to be produced in a cost-efficient manner. Furthermore, injection moulding enables the cylinder of the invention to be formed with a higher degree of manufacturing accuracy, in comparison with the labour-intensive, hand-made process typically employed to manufacture conventional card clothing.

[0010] Therefore in a preferred embodiment of the invention the plurality of teeth are integrally formed with the main body part by means of an injection moulding process

[0011] The tapered teeth result in greater strength at the teeth base at the outer cylindrical surface of the main body part, and greater flexibility at the tips of the teeth. In this manner, the teeth are less likely to break away or become disengaged from the main body part, while providing the required degree of flexibility to transport the fibres.

[0012] In a further preferred embodiment of the invention one or more of the teeth tapers from a larger width at the outer cylindrical surface of the main body part to a smaller width at a radially outermost tip of the tooth. Even more preferably one or more of the teeth has a radially outermost tip which is rounded. Even more preferably still one or more of the teeth is substantially cone-shaped.

[0013] In the cylinder of the invention, there is no metal-metal contact between the polymeric teeth and the metallic knitting needles. It has been found that the contact between the polymeric teeth and the knitting needles tends to polish the needles as opposed to causing wear of the needles. As a result the wear occurring at the knitting needles is minimised, and thus the knitting needles tend to last longer.

[0014] Thus in a further preferred embodiment of the invention one or more of the teeth is of a polymeric material. Even more preferably all parts of the cylinder are polymeric, thus the cylinder is 100% recyclable.

[0015] Preferably this polymeric material is nylon. According to a second aspect of the invention there is provided a cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provided on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

one or more of the teeth tapering from a larger width at the outer cylindrical surface of the main body part to a smaller width at a radially outermost tip of the tooth.

[0016] In a preferred embodiment of the invention the radially outermost tip of one or more of the teeth is rounded. Even more preferably one or more of the teeth is substantially cone-shaped.

[0017] In the cylinder of the invention, there is no metal-metal contact between the polymeric teeth and the metallic knitting needles. It has been found that the contact between the polymeric teeth and the knitting needles tends to polish the needles as opposed to causing wear of the needles. As a result the wear occurring at the knitting needles is minimised, and thus the knitting needles tend to last longer.

[0018] Thus, in a further preferred embodiment of the invention one or more of the teeth is of a polymeric material. Even more preferably all parts of the cylinder are polymeric, thus the cylinder is 100% recyclable.

[0019] Preferably this polymeric material is nylon.

[0020] According to a third aspect of the invention there is provided a cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provided on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

one or more of the teeth being of a polymeric material.

[0021] Preferably the main part of the cylinder is of a polymeric material. Even more preferably this polymeric material is nylon.

[0022] According to a further aspect of the invention there is provided a cylinder according to the invention wherein one or more of the teeth protrudes radially outwardly.

[0023] Preferably one or more of the teeth protrudes

radially outwardly, substantially normally to the outer cylindrical surface of the main body part.

[0024] According to a fifth aspect of the invention there is provided a knitting machine comprising a cylinder according to the invention.

[0025] In a preferred embodiment of the invention the knitting machine comprises a main cylinder and a doffer cylinder, the main cylinder being configured to transport fibres to the doffer cylinder, and the doffer cylinder being configured to transport fibres to one or more knitting needles.

[0026] Preferably the main cylinder comprises a cylinder according to the invention as herein described.

[0027] Even more preferably the doffer cylinder comprises a cylinder according to the invention as herein described.

In a still further preferred embodiment of the invention the knitting machine comprises one or more feed cylinders for transporting fibres to the main cylinder.

[0028] Preferably one or more of the feed cylinders comprises a cylinder according to the invention.

[0029] According to a sixth aspect of the invention there is provided a circular knitting machine.

[0030] In a preferred embodiment of the invention the knitting machine comprises a main cylinder and a doffer cylinder, the main cylinder being configured to transport fibres to the doffer cylinder, and the doffer cylinder being configured to transport fibres to one or more knitting needles.

[0031] Preferably the main cylinder comprises a cylinder according to the invention as herein described.

[0032] Even more preferably the doffer cylinder comprises a cylinder according to the invention as herein described.

In a still further preferred embodiment of the invention the knitting machine comprises one or more feed cylinders for transporting fibres to the main cylinder.

[0033] Preferably one or more of the feed cylinders comprises a cylinder according to the invention.

Brief Description of the Drawings

[0034] The invention will be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a partially cut-away, side view of a knitting machine according to the invention;

Fig. 2 is a side view of a cylinder according to the invention of the knitting machine of Fig. 1.

Fig. 3 is a view along line III-III in Fig. 2.

Fig. 4 is a side view of another cylinder according to the invention; and

Fig. 5 is a view along line V-V in Fig. 4.

Detailed Description

[0035] Referring to the drawings, and initially to Figs. 1 to 3 thereof, there is illustrated a knitting machine according to the invention, in this case a Jacquard circular knitting machine 1.

[0036] As illustrated in Fig. 1, the knitting machine 1 comprises two feed cylinders 101, 102, a main cylinder 103, a doffer cylinder 104, and a plurality of knitting needles. The feed cylinders 101, 102 are used to transport fibres from a fibre supply to the main cylinder 103, the main cylinder 103 being used to transport the fibres to the doffer cylinder 104, and the doffer cylinder 104 being used to transport the fibres to the knitting needles. The knitting needles are arranged to pass relative to the doffer cylinder 104 in a co-operating manner to facilitate the threading of the fibres onto the knitting needles, in the conventional manner known to those skilled in the art.

[0037] Referring now to Figs. 2 and 3, the doffer cylinder 104 is illustrated in further detail. The doffer cylinder 104 comprises a main body part 110 having an outer cylindrical surface 111, and a plurality of teeth 112 for engaging fibres to transport the fibres towards the knitting needles. The teeth 112 protrude radially outwardly from the outer cylindrical surface 111, substantially normally to the outer cylindrical surface 111 (Fig. 2).

[0038] As illustrated in Figs. 2 and 3, each tooth 112 tapers from a larger width at the outer cylindrical surface 111 to a smaller width at the radially outermost tip 113 of the tooth 112. In addition the tips 113 of the teeth 112 are rounded, with the result that the teeth 112 are substantially cone-shaped.

[0039] The main body part 110 comprises eight spokes 120 which extend from a central hub 121 to the outer cylindrical surface 111. A reinforcing hoop 122 is provided between the hub 121 and the outer cylindrical surface 111.

[0040] The teeth 112 are integrally formed with the main body part 110 by means of an injection moulding process. Both the plurality of teeth 112 and the main body part 110 are of a polymeric material, in this case nylon.

[0041] Some possible dimensions for the doffer cylinder 104, with reference to Figs. 2 and 3, are as follows: -

D1	160.6mm
D2	55.0mm
D3	19.8mm
D4	3.0mm
D5	59.0mm
D6	9.5mm
D7	3.0mm
D8	3.0mm
D9	3.0mm
D10	5.5mm

D11 26.75mm

[0042] The two feed cylinders 101, 102 and the main cylinder 103 are also formed by nylon injection moulding. The two feed cylinders 101, 102 and the main cylinder 103 are of a similar construction to the doffer cylinder 104 described previously with reference to Figs. 2 and 3. In particular, the cylinders 101, 102, 103 also comprise teeth integrally formed with a main body part.

[0043] With reference to Fig. 1, the following is a list of parts of the circular knitting machine 1, together with the corresponding reference numeral:

001	Card Wheel Shafts Distance GG
002	Gusset 2
003	Grub Screw M 6x12
004	Cover
005	Cone Drive
006	Centring Sleeve For Cone Drive
007	Safety Guard
008	Countersunk Screw M 6x12
009	Cardwire-Needle Engagement GG
010	Cover for Doffer
011	Card Wheel Doffer TESA Coated
012	Gusset 1
013	Drawing Wheel TESA Coated
014	Cover for Drawing Wheel Left
015	Base 2
016	Dowel Pin 4x10
017	Washer 25x2
018	Hexagon Screw M 5x20
019	Bearing Washing 15x52x10 Nylon
020	Swivel Bearing Couple
021	Roll IGEL Saw Toothed
022	Spacer 15x43x6.5
023	Sliver Guide Perspex
024	Sliver Guide Perspex

[0044] In use, the feed cylinder 101 rotates clockwise and the feed cylinder 102 rotates counter-clockwise to transport fibres from a fibre supply to the main cylinder 103. The teeth of the main cylinder 103 engage the fibres, and the main cylinder 103 rotates clockwise to transport the fibres to the doffer cylinder 104. The teeth 112 of the doffer cylinder 104 engage the fibres, and the doffer cylinder 104 rotates counter-clockwise to transport the fibres to the knitting needles. The knitting needles pass relative to the doffer cylinder 104 in a co-operating manner to facilitate the threading of the fibres onto the knitting needles, in the conventional manner known to those skilled in the art.

[0045] In Figs. 4 and 5, there is illustrated another doffer cylinder 200 according to the invention, which is similar to the doffer cylinder 104 of Figs. 1 to 3, and similar elements in Figs. 4 and 5 are assigned the same reference numerals.

[0046] The layout of the teeth 112 on the outer cylindrical surface 111 is different between the doffer cylinder

200 (Figs. 4 and 5) and the doffer cylinder 104 (Figs. 2 and 3). In particular, the doffer cylinder 200 has more teeth 112 on the outer cylindrical surface 111, and the teeth 112 are packed together more closely.

[0047] The invention is not limited to the embodiments hereinbefore described, with reference to the accompanying drawings, which may be varied in construction and detail.

Claims

1. A cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provided on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

the plurality of teeth being integrally formed with the main body part.

2. A cylinder as claimed in claim 1 wherein the plurality of teeth are integrally formed with the main body part by means of an injection moulding process.

3. A cylinder as claimed in claim 1 or 2 wherein one or more of the teeth tapers from a larger width at the outer cylindrical surface of the main body part to a smaller width at a radially outermost tip of the tooth.

4. A cylinder as claimed in any of claims 1 to 3 wherein one or more of the teeth has a radially outermost tip which is rounded.

5. A cylinder as claimed in claim 3 or 4 wherein one or more of the teeth is substantially cone-shaped.

6. A cylinder as claimed in any of claims 1 to 5 wherein one or more of the teeth is of a polymeric material.

7. A cylinder as claimed in any of claims 1 to 6 wherein the main body part is of a polymeric material.

8. A cylinder as claimed in claim 6 or 7 wherein the polymeric material is nylon.

9. A cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provid-

ed on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

one or more of the teeth tapering from a larger width at the outer cylindrical surface of the main body part to a smaller width at a radially outermost tip of the tooth.

10. A cylinder as claimed in claim 9 wherein the radially outermost tip of one or more of the teeth is rounded.

11. A cylinder as claimed in claim 9 or 10 wherein one or more of the teeth is substantially cone-shaped.

12. A cylinder as claimed in any of claims 9 to 11 wherein one or more of the teeth is of a polymeric material.

13. A cylinder as claimed in any of claims 9 to 12 wherein the main body part is of a polymeric material.

14. A cylinder as claimed in claim 12 or 13 wherein the polymeric material is nylon.

15. A cylinder for use in a knitting machine, the cylinder comprising:-

a main body part having an outer cylindrical surface; and

a plurality of outwardly protruding teeth, provided on the outer cylindrical surface of the main body part, for engaging fibres to transport the fibres towards one or more knitting needles;

one or more of the teeth being of a polymeric material.

16. A cylinder as claimed in claim 15 wherein the main body part is of a polymeric material.

17. A cylinder as claimed in claim 15 or 16 wherein the polymeric material is nylon.

18. A cylinder as claimed in any of claims 1 to 17 wherein one or more of the teeth protrudes radially outwardly.

19. A cylinder as claimed in claim 18 wherein one or more of the teeth protrudes radially outwardly, substantially normally to the outer cylindrical surface of the main body part.

20. A cylinder for use in a knitting machine substantially as hereinbefore described with reference to the accompanying drawings.

21. A knitting machine comprising a cylinder as claimed

in any of claims 1 to 20.

- 22.** A knitting machine as claimed in claim 21 wherein the knitting machine comprises a main cylinder and a doffer cylinder, the main cylinder being configured to transport fibres to the doffer cylinder, and the doffer cylinder being configured to transport fibres to one or more knitting needles. 5
- 23.** A knitting machine as claimed in claim 22 wherein the main cylinder comprises a cylinder as claimed in any of claims 1 to 20. 10
- 24.** A knitting machine as claimed in claim 22 or 23 wherein the doffer cylinder comprises a cylinder as claimed in any of claims 1 to 20. 15
- 25.** A knitting machine as claimed in any of claims 22 to 23 wherein the knitting machine comprises one or more feed cylinders for transporting fibres to the main cylinder. 20
- 26.** A knitting machine as claimed in claim 25 wherein one or more of the feed cylinders comprises a cylinder as claimed in any of claims 1 to 20. 25
- 27.** A circular knitting machine as claimed in any of claims 21 to 26.
- 28.** A knitting machine substantially as hereinbefore described with reference to the accompanying drawings. 30

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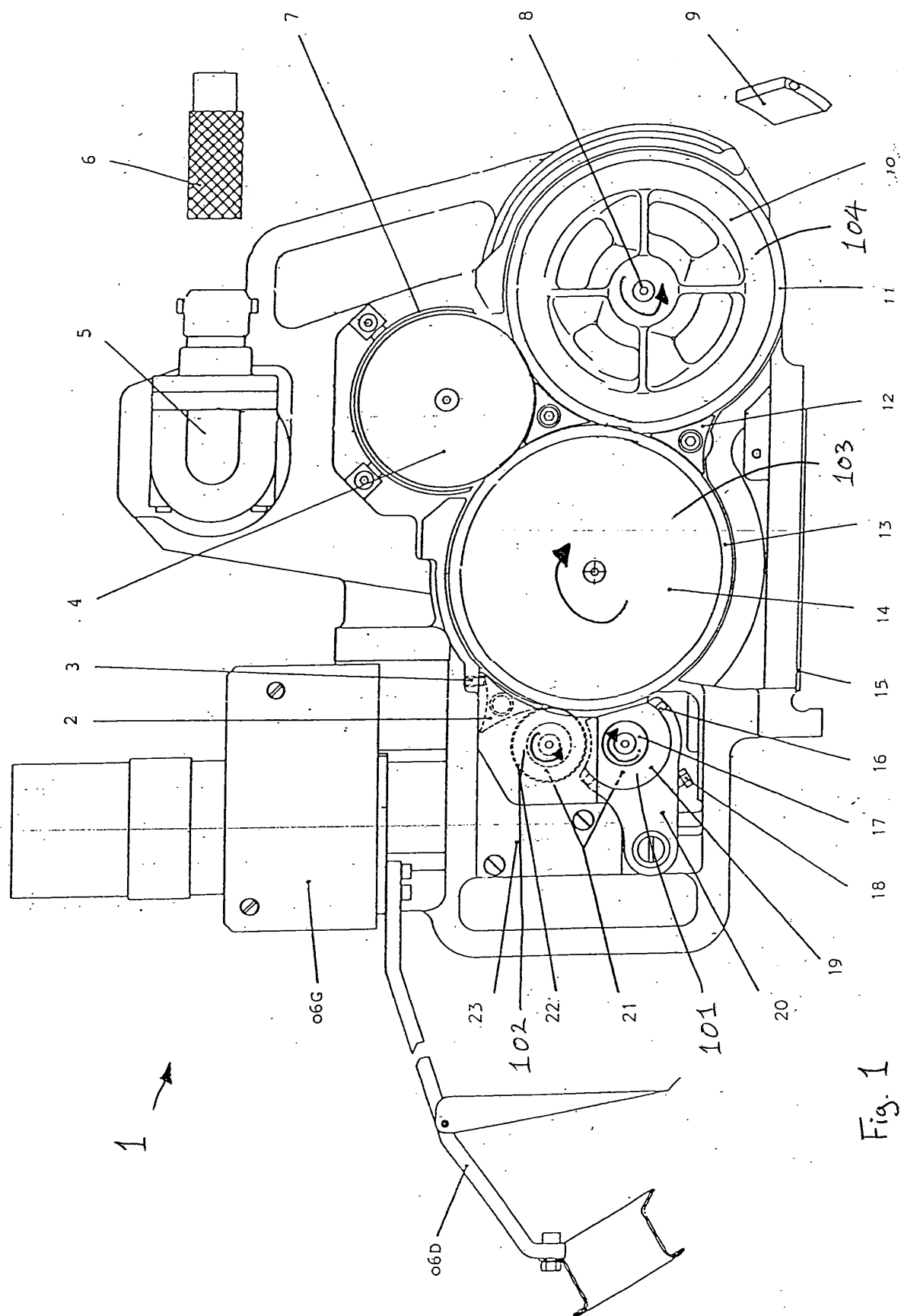
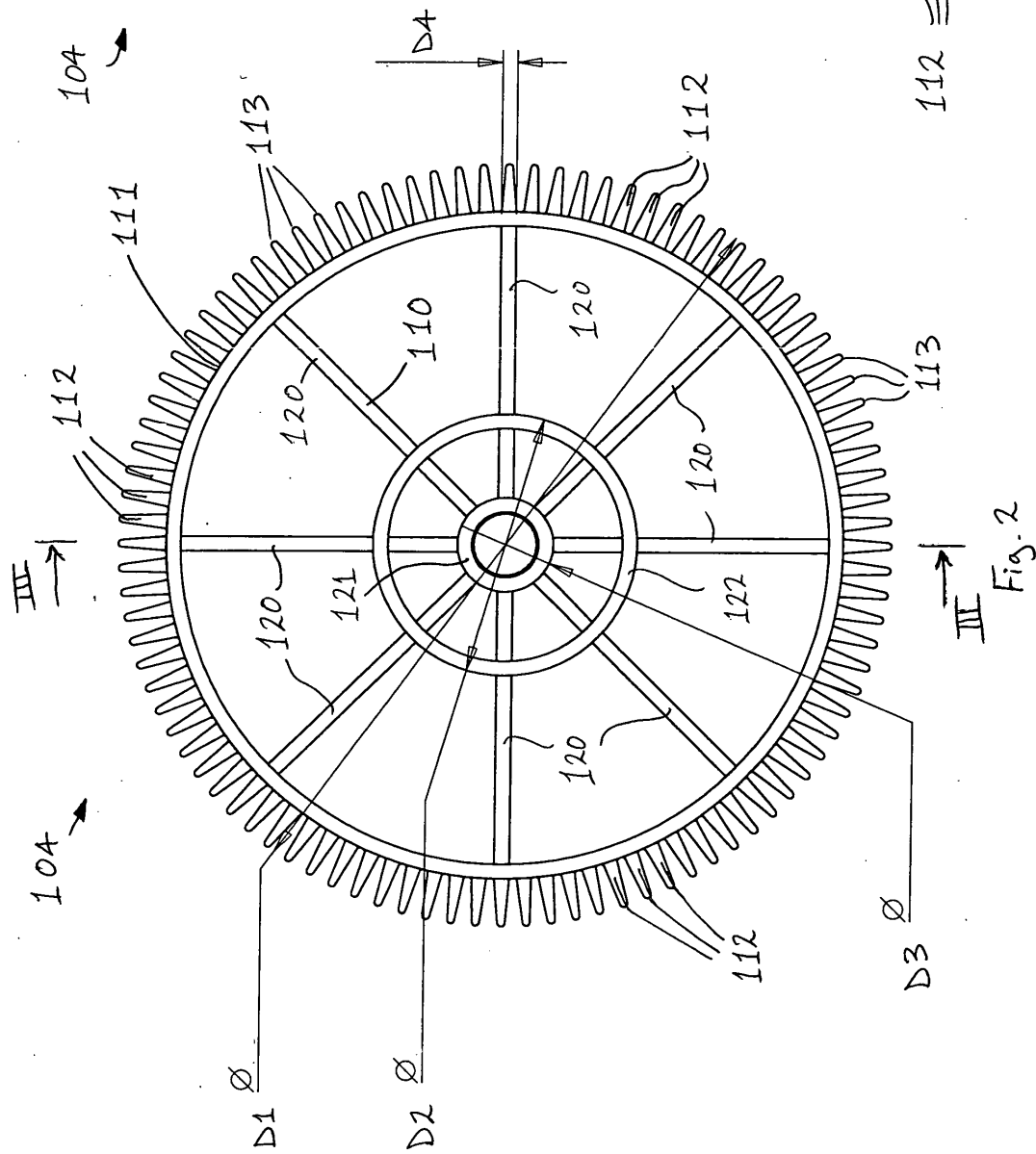
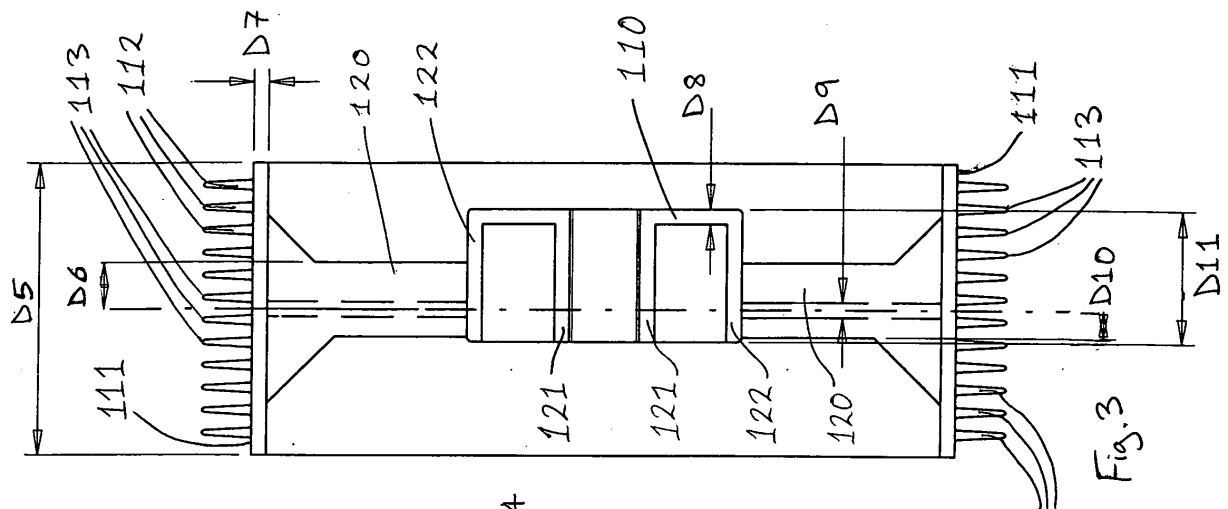


Fig. 1



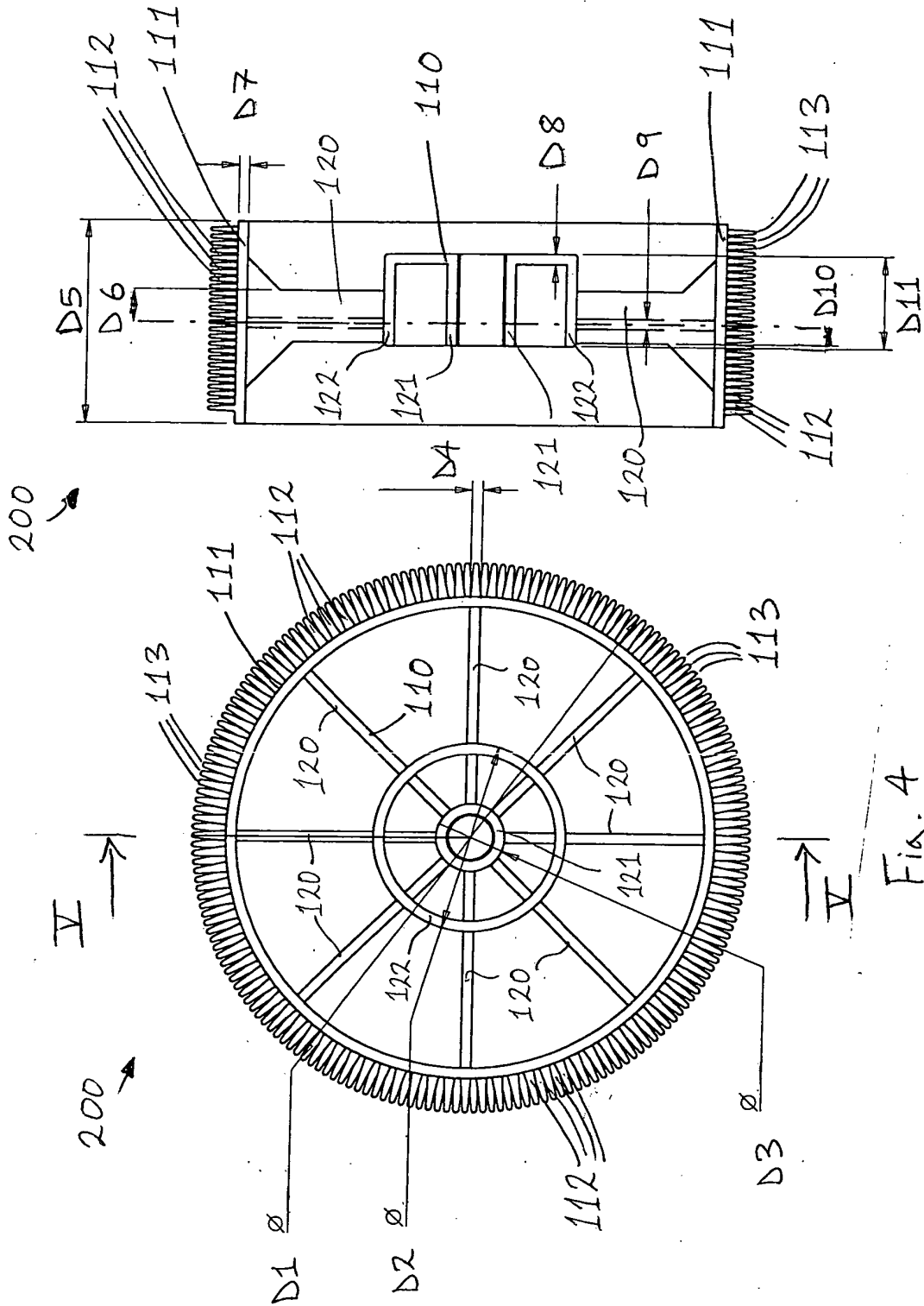


Fig. 5

Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 05 00 0117

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 April 2005	Examiner Sterle, D
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 00 0117

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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29-04-2005

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