PATENT SPECIFICATION (11) 1 566 779

1 566 779

(21) Application Nos. 42434/77 (22) Filed 12 Oct. 1977
(31) Convention Application No. 2 648 715
(32) Filed 27 Oct. 1976 in
(33) Fed. Rep. of Germany (DE)
(44) Complete Specification published 8 May 1980
(51) INT CL³ D01H 1/12
(52) Index at acceptance D1N 1B11 1B1 1B2 1B9

(54) METHOD AND APPARATUS FOR CLEANING FIBROUS MATERIAL

(71) We, SCHUBERT & SALZER MASCHINENFABRIK AKTIENGESELLSCHAFT, of Friedrich-Ebert-Strasse 84, 8070 Ingolstadt, Germany, a German Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described, in and by the following statement:—

This invention relates to a method of cleaning fibrous material which is fed to an opener roller in the form of a sliver, is opened out by means of this roller into the form of individual fibres, and is then fed to an open-end spinning apparatus, and also to an apparatus for performing this method.

In the known sliver opening assemblies of spinning preparation machines, the coarse contaminants, such as residues of husk, stem (stalk) and seed kernel are in wide measure separated and removed by scutching the cotton flock. However, not only does this result in residues being removed but also in partial comminution of these residues, so that particles of 300μ and smaller are formed, which again become attached to the fibres in the form of microscopic dust. Thus, considerable amounts of microscopic dust then adhere to the fibres; the largest component of this microscopic dust amounts to 150μ or even smaller (Melliand Textilberichte 8/1976, pp 609—613).

It is known, in the case of open-end spinning apparatus, to open out the sliver to the form of individual fibres and to guide the fibres thus formed over and beyond a dirt-separation opening which comprises a dirt-separation edge (British Patent Specification 1,270,495. For avoiding losses of fibres and air current directed oppositely to the direction of travel of the contaminants is introduced into the stream of fibres and air passing to the spinning rotor. Contaminants which are as light as or even lighter than the fibres are, together with the fibres, held back by this inwardly-directed air current in the fibre/air stream and pass into the spinning rotor together with the fibres. The fine dust settles on the wall of the spinning rotor and in the fibre-collecting groove, and has a disturbing effect. The shape of the fibre-collecting groove is continually altered, and the spinning process disturbed, as a result of which thread breakages occur.

Underlying this invention is the object of providing a method and an apparatus which enable the fine dust components contained in the fibre material to be removed.

According to the invention there is proposed a method of cleaning fibrous material in an open-end spinning operation wherein material introduced in the form of a sliver to a sliver opener roller, is opened out by means of the opener roller in the form of individual fibres, and is then cleaned whilst in transit towards a spinning chamber wherein the fibrous material is subjected to an air suction stream which is outwardly directed with respect to the opener roller. The method is characterised in that the fibrous material, whilst being subjected to the air stream is guided in the circumferential direction of the opener roller and is therefore subject to the action of the opener roller.

The fibrous material is preferably secured in the form of a fibre tuft while the suction air current acts on it. In this way the removal effect is increased, as the fine dust is removed, in the area in which it is separated from the fibres, before it can once again settle between the fibres and has once again to be released from the fibres by friction between clothing/fibres, guide/fibres and fibres/fibres.

According to the invention, there is provided for the performance of this method, apparatus including a delivery device, an opener roller and a housing which accommodates the opener roller. A dirt-removal opening is provided in a housing wall which surrounds the opener roller and the apparatus is characterised in that the dirt-removal opening is connected to means for subjecting the fibrous material to an air suction stream which is outwardly directed with respect to the opener roller, and by means for guiding the fibrous material in the circumferential direction of the opener roller whilst being sub-

jected to the air suction stream, this guiding means being in the form of a sieve-like cover for the dirt-removal opening in the prolongation of the inner housing wall, the thus developed dirt-removal opening constituting a dust-removal opening. The dust-removal opening is conveniently, positioned in the vicinity of a fibre tuft. Conveniently, and for the purpose of making allowances for the rapid movement of the contaminants being removed in the circumferential direction of the opener roller, the dust separation opening extends outwardly beyond the fibre tuft in the direction of the free end of the latter. In order to prevent the fine dust, which has already been separated, from being sucked back into the fibre/air stream, the dust-separation opening extends a distance beyond the free end of the fibre tuft which is less than 50% of the mean fibre length.

The nature and properties of the dust vary according to the particular fibrous material treated. The cover may therefore be exchangeable so as to allow accommodation to the type of fibrous material to be treated. The cover may extend as far as the gripping point of the delivery device; if the delivery point is constituted as a delivery roller, with an associated recessed feed unit, at least part of the cover may be an integral part of the said feed unit.

The dirt separation device can be used by itself or in conjunction with a separation opening together with a separating edge. In the latter case the dust-separation opening is followed by a dirt-separation opening having a dirt-separation edge.

It is possible according to a further feature of the invention and with a view to improving the conveyance of fibres from the delivery device to the fibre feed duct, particularly after the dust-separation opening, to provide, in the housing wall, an air supply opening which relative to the direction of fibre conveyance lies in front of the dust-removal opening. An air supply opening may be provided after the dust-removal opening for the purpose of compensating for the amount of air removed, by suction, at the dust-removal opening; this air supply opening may, with advantage, be constituted as a dirt-removal opening.

It has already been proposed that a porous or perforated intermediate wall should be situated in the vicinity of the fibre tuft, in the housing wall lying opposite the circumference of the opener roller, this porous or perforated intermediate wall separating the space inside the housing from a chamber, in which a condition of low pressure is effected (British Patent Specification 1 321 809). However, this intermediate wall, together with the air current which acts, through it, on the fibre tuft, has the effect of lifting the fibre tuft away from the opener roller when the spinning apparatus is stopped. We are not concerned here with a dust-removal opening. Furthermore, air suction is not in use during operation of the spinning apparatus. Also, the fibres are not, during the sliver opening process, conveyed along this intermediate wall but are secured after they have been lifted away from the area in which they can be acted on by the opener roller.

Also known is a dirt-removal opening which is equipped with grating bars and which is closed off, on the side lying remote from the opener roller, by a screen or sieve (British Patent Specification 1,361,986, Figure 10-12). However, an apparatus of this kind very rapidly becomes clogged with contaminants, and is then no longer workable, as it does not hold the fibrous material in the area in which it can be acted on by the opener roller, so that fibres cannot be guided over and beyond it in a way such as could clean this screen or sieve.

The apparatus according to the invention not only removes dust particles and small fibre fragments which have been released in the course of previous treatments but also the dust particles and small fibre fragments which have been released, in the sliver opening device, by the opening process. In this way an appreciable reduction in thread breakages is achieved.

The invention is further explained hereinafter with reference to the accompanying drawings, in which:

Figure 1 is a cross-section through an open-end spinning machine with the fine dust removal apparatus according to the invention and also with a conventional dirt-removal apparatus;

Figure 2 is a cross-section through another embodiment of open-end spinning apparatus arranged according to the invention, with a fine dust removal apparatus situated remote from the vicinity of the fibre tuft;

Figure 3 is an embodiment of the invention in which the sieve-like cover of the dust-removal opening is constituted by a part of the recessed feed member and by a part of the housing wall;

Figure 4 is a modification of the apparatus in which the dust removal apparatus is an integral part of the recessed feed unit;

Figure 5 shows a further modification of the apparatus which adjoins a dirt-removal apparatus; and

Figure 6 illustrates part of the apparatus followed by an air supply opening.

The fibrous material is fed, in the form of a sliver 1, and through a feed device 2, to a sliver opener roller 3. The feed apparatus 2, which in principle could be constructed in other ways, comprises, in the embodiment illustrated in Figure 1, a delivery roller 20 and a recessed feed unit 21 which cooperates with the roller 20. The front end of the sliver 1, which forms a fibre tuft 10, is opened out

by the sliver opener roller 3 to the form of individual fibres 11, and in this form is fed, through a fibre feed duct 4, to a spinning chamber 5. The particular form of construction adopted for the spinning chamber 5 is without importance for the present invention. Thus, the spinning chamber 5 may, for example, and as shown, be a spinning rotor, or an open-end spinning chamber which operates electrostatically, pneumatically, or in some other way. The fibrous material is drawn off, from the spinning chamber 5 and in the form of a thread, in a known manner (not shown).

The sliver opener roller 3 is surrounded by a housing 30 which is provided with a wear-resistant lining 34, which has the terminologically-required opening 340 and 341 for the feed of the sliver 1 to the opener roller 3 and for leading the fibres 11 into the fibre feed duct 4.

A dust removal opening 6 is provided in the housing 30 between the delivery device 2 and the spinning chamber 5, and is closed off by a sieve- or screen-like cover 72. The cover 72 is an integral part of the lining 34, while the dust-removal opening 6 is provided in the recessed feed unit 21. The recessed feed unit 21 is pressed by a first compression spring 210 against the delivery roller 20, and is sealingly urged against the lining 34 by a second compression spring 211.

Provided in the recessed feed unit 21 is a tubular connection piece 81 which communicates with the dust-removal opening 6 and around which there fits a hose-like duct 8. An air suction source 82 is connected, by way of a filter 80, to the duct 8.

The fibrous material is fed by means of the delivery device 2 and in a known manner to the opener roller 3. At the front end of the sliver 1 the fibres 11 are separated by the opener roller 3, and are guided between the opener roller 3 and the lining 34, to the fibre feed duct 4 (as indicated by the arrow 32). These fibres then pass through this duct 4 to the spinning chamber 5, where they are spun. On their way to the fibre feed duct 4 the fibres pass over the dust-removal opening 6, and are held by the cover 72 in the area in which they are acted on by the opener roller 3.

Microscopic dust is rubbed from the surface of the fibres 11 by the friction of the fibres 11 against the clothing teeth by the opener roller 3, by the friction of the fibres 11 against one another, and by the friction of the fibres 11 against the lining 34 and against the cover 72. In the vicinity of the cover 72 the fibres 11 are subjected to an air current which acts through the cover 72. In this way the fine dust removed by friction from the fibres 11 is sucked away and discharged. Conveniently, the dust-containing air sucked away through the duct 8 is discharged by way of a filter 80 and cleaned.

On that side nearest to the opener roller 3 the sieve surface of the cover 72 is kept free by the fibres 11 sliding over it. On its outside the cover 72 is kept free of deposits by the continuous removal, by suction, of the microscopic dust.

The dust-removal apparatus according to the present invention may also be used in combination with a dirt-removal device for coarser particles, which has a dirt-removal opening 9 and a dirt-removal edge 90. The construction of the dirt-removal device and its arrangement in the fibre-conveyance path is without importance for the present invention. If the housing 30 is equipped with a lining 34, the latter has an opening 342 for the dirt-removal device.

The apparatus according to the invention can be modified in various ways.

Thus, it is possible to locate the dirt-removal opening 6 at any point in the housing wall 31 between the delivery device 2 and the fibre feed duct 4 (Figure 2). The dust-removal opening 6 is closed off by a sieve-like cover 7 as a prolongation of the wall 31; this cover 7 is so fitted in the housing 30 that no projecting edge is formed—between the cover 7 and the wall 31, at least in the conveyance direction indicated by the arrow 32—such as would cause the fibres 11 to remain in a suspended condition or against which they could accumulate. The sieve-like cover 7 may form a part of the housing 30, for example in the form of a lining (Figure 1), or can be exchangeable.

It is possible by exchanging the cover 7, to accommodate to the fibrous material which is to be spun. A controlled removal of the microscopic dust is possible by suitably selecting the mesh size of the cover 7.

The mesh size of the cover 7 or 72 is to be so dimensioned that the dust is removed in the desired way, whereas the fibres 11 are guided and are not hindered in their transportation.

The fibres 11 are conveyed towards and in the fibre feed duct 4 in an air current. As air is removed, by suction, through the duct 8, it may be advantageous if, as considered in the direction of fibre conveyance, the cover 7 or 72 of the dust-removal opening 6 is followed by an air feed opening 37 (Figure 6). If, as shown in Figures 1 and 3, there is provided a dirt-removal opening 9, this opening 9 may fulfil the function of the air feed opening 37, the removal of the coarse dirt components taking place subject to the opposing force of an air current which is introduced at this point.

As shown in Figures 1, 3 and 4, the dust-removal opening 6 is preferably located in that area 33 of the housing 30 (which surrounds the opening roller 3) at which the

fibres 11 are separated from (out of) the fibre tuft 10 of the sliver 1, which is retained by the feed device 2.

While the fibres 11 are still retained by the delivery device 2, the dust constituents are shaken away from the fibres 11 through friction between clothing/fibres, Fibres/fibres, and fibres/cover, and are at once removed by the air suction. In this way it is ensured that the dust components removed from the fibres 11 cannot resettle on the fibres 11.

The fibres 11 are conveyed, in the direction of the arrow 32 and in an air current, between the opener roller 3 and the housing wall 31 or lining 34, and in this way arrive at the spinning chamber 5. This air current is created by the rotation of the sliver opener roller 3.

Further, the air current is additionally strengthened if the spinning chamber 5 is of a construction such that a partial vacuum is needed for spinning. Taking into account the flow of the spinning air system, the dust-removal opening 6, which is effective by the cover 7 or 72, is so dimensioned that this opening 6 extends not only under the fibre tuft 10 but also beyond the latter. In this way the fine dust separated from the fibre tuft 10 is reliably led away subject to the air suction effective in the duct 8. However, the cover 7 or 72 should not extend beyond the fibre tuft 10 by more than 50% of the mean fibre length. If the cover 7 or 72 does extend beyond the fibre tuft 10 by more than 50% of the mean fibre length, there is progressively greater danger, with increasing length of the cover 7 or 72, that fine dust already sucked away will be sucked back into the fibre/air current whose direction is indicated by the arrow 32. In this way there is also an increasing risk of fine dust settling in the spinning chamber 5 and leading to disturbances in the spinning process.

The fibres 11 are conveyed over the dust removal opening 6 in an air current. It may therefore be advantageous if, according to the strength, in each case, of the suction air current through the duct 8, and air feed opening 36 is provided in front of the dust-removal opening 6 (Figures 2 and 3). As Figure 3 shows, a part 22 of the recessed feed unit 212 may be constituted as a sieve-like cover, so that at least a part of the cover is an integral part of the recessed feed unit 212. If the cover 7 extends to a point below the sieve-like part 22 of the recessed feed unit 212, then the cover 7 will have a larger opening 70 in this area so as to prevent the cover 7 becoming clogged.

The recessed feed unit 21 may, however, also be prolonged in the circumferential direction of the sliver opener roller 3 and, with its end which extends from the gripping point 23 (between the delivery roller 20 and the recessed feed units 21) to the opener roller 3, form the cover 72, this end being formed as a sieve or screen, a duct 8 connected to a suction air source 82 ending under this part 22 of the recessed feed unit 21.

An embodiment of this kind will be described below with reference to Figure 4. The recessed feed unit opening 35 in the housing 30 is larger than usual in this embodiment as it at the same time incorporates the dust removal opening 6. The recessed feed unit opening 35 is screened, from the inside of the housing, by a screening element 24, which is connected to the recessed feed unit 21. The radial distance of the housing wall 31 from the opener roller 3 is only greater than usual by an amount such that the inner surface 240 of the screening element 24 can lie a sufficient distance away from the opener roller 3 to ensure that the screening element 24 retains the fibres 11 in the active area of the sliver opener roller 3. As in the case of the embodiment of the apparatus according to the invention illustrated in Figure 1, the dust-removal opening 6 is again located in the recessed feed unit 21. By way of contrast to the embodiment shown in Figure 1, the recessed feed unit is pressed outwardly by the compression spring 211, so that the screening element 24 is caused to bear against the wall 31.

The manner of operation of this embodiment is similar to that of previous embodiments. This embodiment, as also the embodiment illustrated in Figure 1, may be found advantageous if it is desired that the fibre tuft 10 be supported over a long distance so as to promote uniform opening-out of the sliver 1.

The removal, by suction, of the fine dust released may take place both in the circumferential direction and also laterally. As shown in Figure 3, a space (not shown) which communicates with the duct 8 and which is arranged laterally if the opening-up area 33 is also screened off by a sieve-like cover 71. Thus the removal by suction, of the fine dust released from the fibres 11 also takes place towards the sides.

As the foregoing description indicates, the apparatus according to the invention may be modified in various ways and may also be combined with a hitherto-known dirt-removal apparatus. The duct 8 may be connected to the cover 7 either directly, or indirectly, i.e. by way of an intermediate space (not shown). The degree of low pressure effective in the duct 8 may be controllable, depending on the fibre throughput and the degree of contamination of the fibres. Also, filter 80 may be constituted as a single simple filter, or as a relatively large filtering unit.

As has been explained with reference to the embodiment shown in Figure 2, it is, in principle, unimportant for the subject matter of the invention where the cover 7 of the dust-removal opening 6 is located along the

fibre conveyance path. Thus, it is also possible to provide a dust-removal opening if a dirt-removal opening 91 is located in the immediate vicinity of the feed device 2 (Figure 5). In this case the dust-removal opening 6 is provided, in the wall of the housing 30, between the dirt-removal opening and the start of the fibre feed duct 4.

The foregoing description shows that the subject matter of the invention may be modified in various ways. It is a feature common to all the embodiments that the sliver 1 shall be guided, in the area in which it can be affected by the opener roller 3, over a sieve-like surface, namely the cover 7, 70 or 72, while this sliver 1 is simultaneously subject to the effect of air suction which is outwardly directed relative to the opener roller 3.

WHAT WE CLAIM IS:—

1. A method of cleaning fibrous material in an open-end spinning operation wherein material introduced in the form of a sliver to a sliver opener roller, is opened out by means of the opener roller in the form of individual fibres, and is then cleaned whilst in transit towards a spinning chamber wherein the fibrous material is subjected to an air suction stream which is outwardly directed with respect to the opener roller characterised in that the fibrous material, whilst being subjected to the air suction stream is guided in the circumferential direction of the opener roller and is therefore subject to the action of the opener roller.

2. A method according to claim 1, characterised in that the fibrous material is secured, as a fibre tuft, while the air suction acts on it.

3. Apparatus for cleaning fibrous material in an open-end spinning apparatus with a delivery device, an opener roller and a housing which accommodates the opener roller, in which a dirt-removal opening is provided in a housing wall which surrounds the opener roller, characterised in that the dirt-removal opening is connected to means for subjecting the fibrous material to an air suction stream which is outwardly directed with respect to the opener roller, and by means for guiding the fibrous material in the circumferential direction of the opener roller whilst being subjected to the air suction stream, this guiding means being in the form of a sieve-like cover for the dirt-removal opening in the prolongation of the inner housing wall, the thus developed dirt-removal opening constituting a dust-removal opening.

4. Apparatus according to claim 3, characterised in that the dust-removal opening lies in the vicinity of a fibre tuft provided by the delivery device.

5. Apparatus according to claim 4, characterised in that the dust-removal opening extends, in the direction of the free end of the fibre tuft, beyond this fibre tuft.

6. Apparatus according to claim 5 to which fibres of a predetermined mean length are delivered, characterised in that the dust-removal opening extends outwardly beyond the free end of the fibre tuft by a distance less than 50% of the mean fibre length.

7. Apparatus according to any of claims 3 to 6, characterised in that the housing has a lining which is formed as a sieve-like cover in the vicinity of the dust-removal opening.

8. Apparatus according to any of claims 3 to 7, characterised in that the cover is exchangeable.

9. Apparatus according to any of claims 3 to 8, in which the delivery device comprises a delivery roller and a recessed feed unit, characterised in that at least a part of the cover is an integral part of the recessed feed unit.

10. Apparatus according to any of claims 3 to 9, characterised in that the dust-removal opening is followed by a dirt-removal opening which has a dirt-separating edge.

11. Apparatus according to any of claims 3 to 10, characterised by an air feed opening in the housing wall at a point which lies, with reference to the fibre-conveyance direction in front of the dust-removal opening.

12. Apparatus according to any of claims 3 to 9 and claim 11, characterised in that the dust-removal opening is followed by an air feed opening.

13. Apparatus according to claim 12, characterised in that the air feed opening is formed as a dirt-removal opening.

14. A method of cleaning fibrous material substantially as hereinbefore described with reference to any of the accompanying Figures of drawings.

15. Apparatus for cleaning fibrous material substantially as hereinbefore described with reference to, and as shown in, any of the Figures of the accompanying drawings.

MARKS & CLERK,
Chartered Patent Agents,
57—60 Lincolns Inn Fields,
London, WC2A 3LS.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980.
Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1566779 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.1

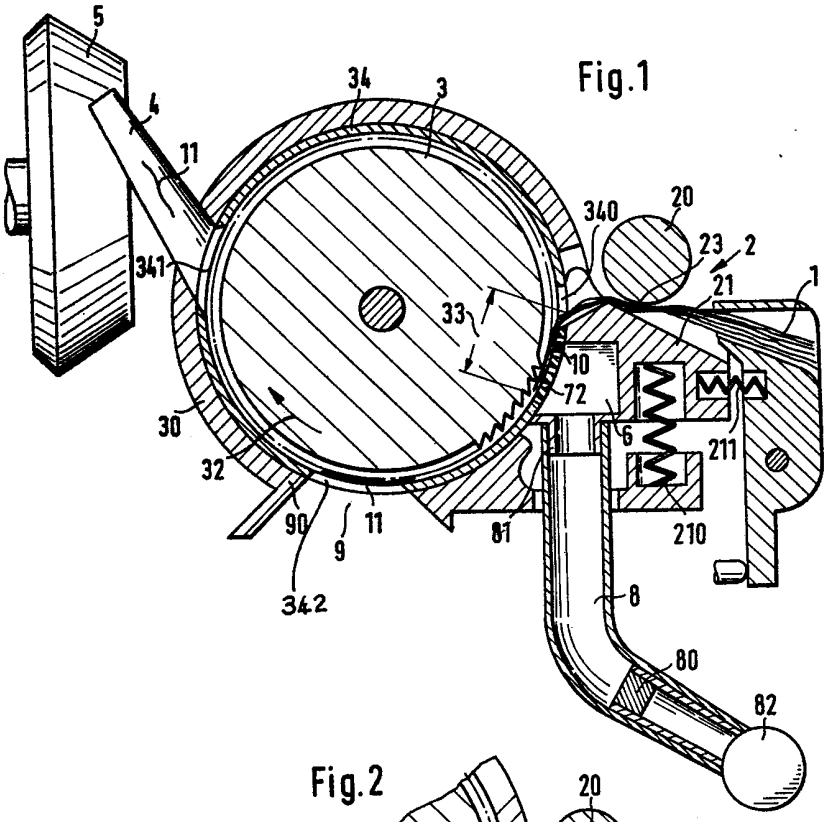
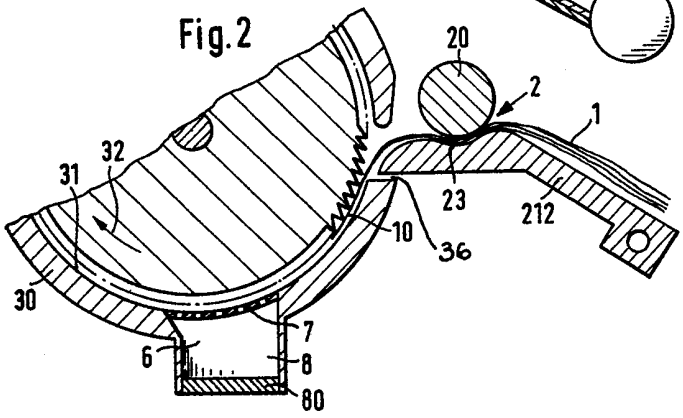


Fig.2



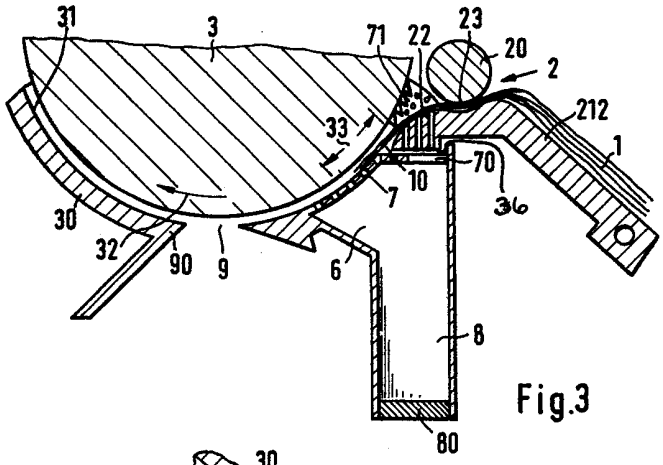

31
3
71
22
23
20
2
212
1
33
70
10
7
36
30
32
90
9
6
8
80

Fig.3

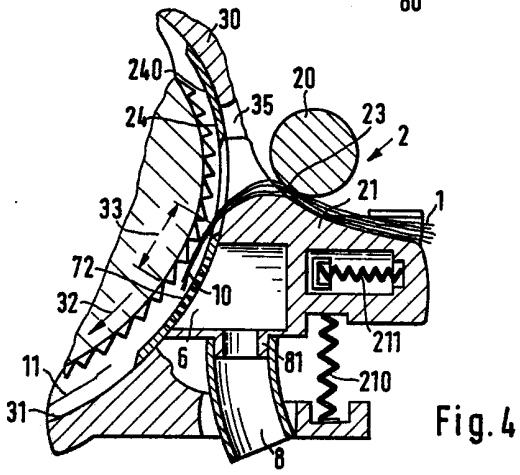

30
240
20
35
24
23
2
21
1
33
72
32
10
211
11
6
81
210
31
8

Fig.4

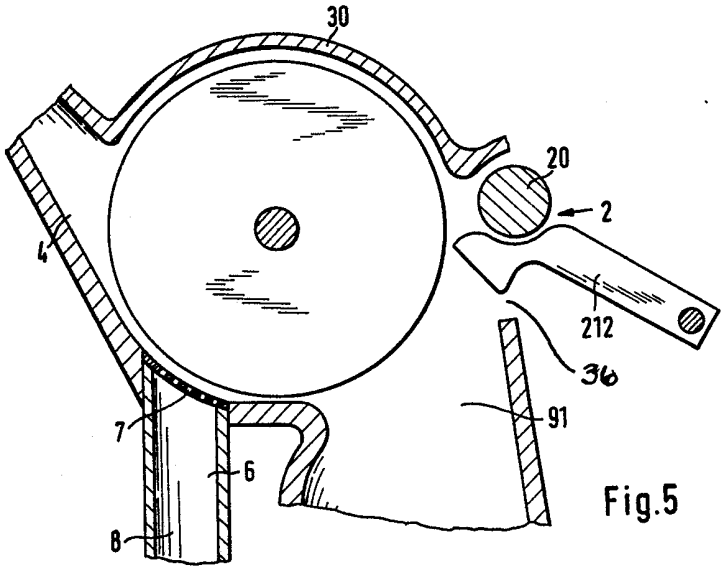


Fig.5

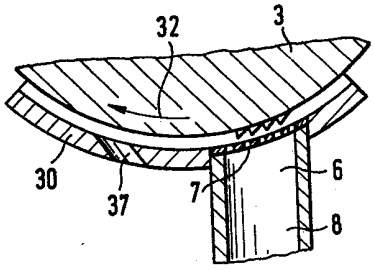


Fig.6