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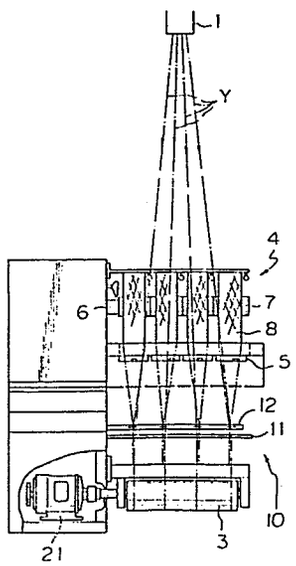
(54) **Apparatus for taking-up filamentary yarn.**

(57) A take-up apparatus 10 for use in a no-godet winding system is provided with at least one feed roller 3 having suitable surface characteristics and replacing conventional godet rollers. The yarn feed roller 3 is located downward of a winder 4. A filamentary yarn Y extruded downwardly from a spinneret 1 is directly received by the yarn feed roller 3 without contacting objects such as a conventional godet roller, and is then turned by the yarn feed roller 3 in direction of travel upwardly to the winder 4. Due to the provision of the feed roller 3, winding tension can be controlled to any desirable level irrespective of the value of the upstream tension. Further, the influence of a reciprocative motion of a traverse guide 5 disposed between the feed roller 3 and winder 4 can be prevented from being transmitted upstream to the melting zone, whereby a yarn of uniform quality can be obtained.

Fig. 1



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APPARATUS FOR TAKING-UP FILAMENTARY YARN

This invention relates to an apparatus for taking up a synthetic filamentary yarn spun or extruded from a spinneret.

Recently, as disclosed in Japanese Examined Patent Publication (Kokoku) No. 57-55805 and U.S. Patent No. 3,053,611, increasing use has been made of the so-called "no-godet winding system", in which a filamentary yarn extruded from a spinneret is wound at a high speed directly by a take-up winder without the help of intermediate godet rollers. This system has the merit of enabling a more compact overall installation and decreasing the manufacturing cost thereof.

In this system, however, due to the long distance between the spinneret and the winder and the required winding speed of the yarn on the winder, the yarn tension, generally, becomes very high and is difficult to control to an optimum value for obtaining a yarn package having good quality. This high yarn tension is also disadvantageous for imparting interlacing to the running yarn with an interlacing means provided in the yarn passage, because the interlacing cannot satisfactorily be imparted to the running yarn under the high yarn tension.

The no-godet winding system has another drawback in that the reciprocative motion of the traverse guide exerts a direct influence on the as-spun non-solidified filament yarn in the melting zone just below the extruding orifice of the spinneret in a melt-spinning process, resulting in a periodic unevenness along the length of the yarn corresponding to the period of the reciprocative motion of the traverse guide.

An alternative winding system for a yarn

having a godet is proposed in U.K. Patent No. 2074618A. This document teaches a winder in which a first and a second traverse guide moving in synchromism with one another are located upstream and downstream, respectively, of a roller having a smooth surface whereby a yarn to be taken up is wrapped half a turn on the roller in a zone between the two traverse guides. According to the document the winding tension can be controlled to a proper level for forming a desirably shaped package. However, the problem of yarn unevenness caused by the direct influence of the reciprocative motion of the first traverse guide remains unresolved because the first traverse guide is located upstream of the smooth surface roller.

The present invention provides an improved apparatus for taking up a filamentary yarn extruded from a spinneret, in which the effects of the reciprocative motion of the traverse guide on the as-spun yarn in the melting zone directly below the extruding orifice of the spinneret can be completely elminated so that the resultant yarn has substantially no periodic unevenness corresponding to the motion of the traverse guide. The apparatus according to the present invention also results in a desirably shaped yarn package because of its tension controlling capacity.

According to the present invention there is provided an apparatus for taking up a filamentary yarn continuously extruded from a spinneret onto a yarn package, comprising

(a) a yarn winding means which comprises

(a-1) a bobbin supporting means including at least a spindle for rotatably supporting a bobbin on which a yarn package is formed,

(a-2) a yarn traversing means for recipro-

catively guiding the yarn in the direction of the axis of the spindle,

(a-3) a means for rotating the bobbin, and

(a-4) a means for operating the yarn traversing means;

(b) a yarn feeding means which comprises

(b-1) at least a positively rotating feed roller for receiving the yarn moving from the spinneret and feeding the received yarn in the direction to the bobbin by bringing the yarn into contact with a partial periphery of the feed roller,

(b-2) a means for driving the feed roller; and

(c) the feed roller being provided in a position below the yarn traversing means to receive the yarn coming down from the spinneret at a substantially stable position on the feed roller and to feed upwardly the received yarn to the bobbin through the yarn traversing means.

Preferred embodiments of the present invention will now be described with reference to the accompanying drawings wherein

Fig. 1 is a side view of an installation for spinning and taking up a synthetic filamentary yarn to which an apparatus according to the present invention is applied;

Fig. 2 is a front view of the installation shown in Fig. 1;

Figs. 3 and 4 are, respectively, front and side views of an embodiment in which a revolving type winder is utilized;

Figs. 5 and 6 are perspective views of a yarn feed roller provided with different surface patterns, respectively; and

Fig. 7 is a perspective view of an embodiment of feed roller.

Figs. 1 and 2 illustrate a multi-cop type spindle drive winder embodying the present invention. Four filamentary yarns Y melt-spun from a spinneret 1 travel downward to a take-up apparatus 10. Midway between the spinneret 1 and take-up apparatus 10, spinning oil is applied to each yarn Y by an oiling roller (not shown) in a conventional manner. Each yarn is then taken up as a yarn package 8 on a bobbin 7 fitted on a driving spindle 6 of a winder 4 through reciprocative motion of a traverse guide 5 along the axial direction of the yarn package. Reference numeral 20 designates a pressure roller which assists in controlling the package shape.

This take-up apparatus 10 is provided with a tension control means comprising a cylindrical feed roller 3 located downwardly of the winder 4 and driven by a motor 21. The yarn Y passes over the feed roller 3 prior to being introduced to the traverse guide of the winder 4. In this connection, it is important for the present invention that the yarn Y extruded from the spinneret 1 travels free of contact with objects causing positive movement of the yarn until received by the feed roller 3. Of course, the yarn touches the oiling roller or a yarn guide 11 for changing the yarn passage as shown in Fig. 1. These, however, do not cause substantial changes in yarn tension because friction between them and the yarn is not so large as that resulting from contact with a conventional godet roller or traverse guide as in the winding systems disclosed in the prior art.

As the feed roller 3 is located below the winder 4, the direction of travel of the yarn Y changes from downward to upward. In the process, the yarn is wrapped half around the feed roller 3. This wrapping of the yarn on the roller 3 prevents the tension in the downstream portion from affecting that in the upstream portion and vice versa. Thus, the yarn tension downstream of the feed roller 3 can be controlled to one

suitable for forming a desirably shaped package, irrespective of the higher yarn tension upstream, by controlling the driving speed of roller 3.

On the other hand, the yarn tension downstream of the feed roller 3, which varies periodically due to the reciprocative motion of the traverse guide 5, is prevented from affecting the yarn tension upstream thereof, whereby the tension variation due to the traverse guide 5 can be prevented from influencing the non-solidified yarn in the melting zone.

The feed roller 3 may be installed at a fixed position relative to the winder 4; however, it is preferably made adjustable in position in accordance with the types of the yarn to be wound or the take-up speed.

Any type of conventional winder can be utilized for the present invention, such as a single-cop type or a multi-cop type; a surface-drive type or a spindle-drive type; or a single spindle type or a revolving type having two spindles, in which, as shown in Figs. 3 and 4, two spindles 6a and 6b secured on a rotatable arm 9 are alternately located at a first position 6a where the yarn package is developing and at a second position 6b where doffing and donning of the yarn package are carried out by revolving the arm 9, whereby continuous winding can be performed without cut-down of the yarn.

The number of feed rollers is not limited to one as shown in the drawings, but may be two or more so long as they are located downward of the winder.

The ratio L/ℓ of a distance L between the traverse guide 5 and the feed roller 3 relative to a stroke ℓ of the traverse guide 5 is preferably within a range of from 3 to 15, more preferably from 4 to 6. Of course, from the point of view of tension fluctuation, the ratio is desirably as large as possible. However, increase of the ratio means a longer distance L. This increases

the size of the overall installation and, in turn, the difficulty of machine operation. Accordingly, the ratio should be less than 15. A fulcrum yarn guide 12 (Figs. 1 and 2) may be provided between the traverse guide 5 and the feed roller 3 at the center of the traverse motion of the yarn.

Further, an interlacing means, such as an air nozzle 13 (Figs. 1 and 2), may be provided between the fulcrum guide 12 and the feed roller 3. Since the yarn tension in this zone can be kept sufficiently low, the filaments of the yarn Y can be interlaced with each other in favourable conditions by the air nozzle 13 to form a compact yarn.

The feed roller 3 may have an outer surface of satin finish plating for providing a suitable surface for controlling the yarn tension.

Preferably, the surface is provided with a plurality of alternate satin finished portions 14 and mirror surface portions 15 arranged in the axial direction of the roller, as shown in Fig. 5.

Further, the surface may be provided with a plurality of grooved portions 16 as shown in Fig. 6.

The ratio of the width of the satin finished portion 14 or of the grooved portion 16 relative to that of the remaining portion is preferably within a range of from 1:2 to 1:7.

The feed roller 3 may consist of a plurality of large diameter portions 3a having relatively narrow width corresponding to the yarn receiving positions as shown in Fig. 7.

A yarn tension within a range of from 0.05 g/d to 0.3 g/d, preferably from 0.1 g/d to 0.2 g/d, can be attained at a position between the feed roller 3 and the traverse guide 5 by the apparatus according to the present invention. This tension is optimal for forming a good shaped yarn package.

The apparatus according to the present invention

may be operated at a yarn speed on the feed roller of not less than 4,000 m/min.

The effects of the present invention will be more apparent from the following example:

Example

Two kinds of nylon filament yarns were taken up by the apparatus shown in Figs. 1 and 2 at a rate of 4,000 m/min. As a control, the same kinds of yarn were taken up by a conventional apparatus of the no-godet winding type.

The yarn tension during the take-up operations and the unevenness of thickness of the resultant yarn were measured in each case. The results are listed in the following table.

Item	Nylon 14d x 5f		Nylon 70d x 24f	
	Invention	Control	Invention	Control
Yarn tension (g/d)	0.32	0.89	0.13	0.53
Unevenness, U (%)	0.30	0.40	0.30	0.60

As apparent from the table, the yarn tensions and the U% values were smaller when winding with the apparatus embodying the present invention as compared with those when winding with the conventional system.

As described above, by applying the take-up apparatus according to the present invention to a spinning process for synthetic filamentary yarn, a uniform yarn quality and a desirably shaped yarn package can be obtained because the reciprocative motion of the traverse guide necessary for forming the package is prevented from influencing the tension at melting zone just below the discharging orifice of the spinneret and because the yarn tension can be controlled to a suitable level for package winding.

Further, due to elimination of godet rollers usually provided above a winder, operators can carry out threading of a starting yarn in a natural and relaxed working pose.

Moreover, the feed roller can be positioned close to the floor. Since the height of an overall installation is substantially determined by the distance between the feed roller and the spinneret, this results in a more compact installation.

CLAIMS

1. An apparatus for taking up a filamentary yarn continuously extruded from a spinneret onto a yarn package, comprising

(a) a yarn winding means which comprises

(a-1) a bobbin supporting means including at least a spindle for rotatably supporting a bobbin on which a yarn package is formed,

(a-2) a yarn traversing means for reciprocatively guiding the yarn in the direction of the axis of the spindle,

(a-3) a means for rotating the bobbin, and

(a-4) a means for operating the yarn traversing means;

(b) a yarn feeding means which comprises

(b-1) at least a positively rotating feed roller for receiving the yarn moving from the spinneret and feeding the received yarn in the direction to the bobbin by bringing the yarn into contact with a partial periphery of the feed roller,

(b-2) a means for driving the feed roller; and

(c) the feed roller being provided in a position below the yarn traversing means to receive the yarn coming down from the spinneret at a substantially stable position on the feed roller and to feed upwardly the received yarn to the bobbin through the yarn traversing means.

2. An apparatus according to claim 1, wherein the bobbin supporting means comprises first and second spindles each provided on a revolving arm which revolves bobbins supported on the spindles and moves alternately the bobbins on the respective spindles to a winding position, and a means for revolving the revolving arm.

3. An apparatus according to claim 1 or claim 2, wherein the bobbin supporting means is adapted to receive at

least two bobbins per single spindle.

4. An apparatus according to any one of the preceding claims, wherein the means for rotating the bobbin comprises a surface driving roller positively driven and being in contact with the yarn package, and a means for rotating the surface driving roller.

5. An apparatus according to claim 1, claim 2 or claim 3, wherein the means for rotating the bobbin comprises a means for directly rotating the spindle.

6. An apparatus according to any one of the preceding claims, wherein a fulcrum yarn guide is provided between the feed roller and the yarn traversing means, and an interlacing means for imparting interlace to the yarn is provided between the feed roller and the fulcrum yarn guide.

7. An apparatus according to any one of the preceding claims, wherein a ratio (L/l) of a distance (L) between the yarn traversing means and the feed roller relative to a stroke (l) of the yarn traversing means is within a range of from 3 to 15.

8. An apparatus according to any one of the preceding claims, which is operable so that the tension acting on the yarn between the feed roller and the yarn traversing means is within a range of from 0.05 grams/denier to 0.3 grams/denier.

9. An apparatus according to any one of the preceding claims, wherein the feed roller is drivable at a peripheral speed of at least 4000 meters/minute.

10. An apparatus according to any one of the preceding claims, wherein the peripheral surface of the feed roller comprises a plurality of alternate striped patterns of satin finished portion and mirror finished portion arranged generally in the axial direction of the feed roller.

11. An apparatus according to any one of claims 1 to 9, wherein the peripheral surface of the feed

roller comprises a plurality of alternate striped patterns of grooved and mirror finished portions arranged generally in the axial direction of the feed roller.

12. An apparatus according to any one of the preceding claims, wherein the yarn feeding means has only a single feed roller.

13. An apparatus according to claim 12, wherein the single feed roller has at least a large diameter portion at a corresponding position to the received yarn and at least a small diameter portion adjoining the large diameter portion.

14. An apparatus for winding up filamentary material continuously extruded from a spinneret on to a bobbin, which apparatus includes

a bobbin for taking up the filamentary material wound thereon,

a roller arranged to receive the filamentary material from the spinneret and from which the bobbin is arranged to receive the filamentary material, and

between the bobbin and the roller, a filament traversing means reciprocable in a direction generally axially of the bobbin for guiding the filamentary material in the said axial direction during wind-up of the filamentary material on to the bobbin,

characterized in that the said roller is a feed roller located downwardly of the bobbin and drivable to forward the filamentary material from the spinneret generally upwardly towards the bobbin through the yarn traversing means.

Fig. 1

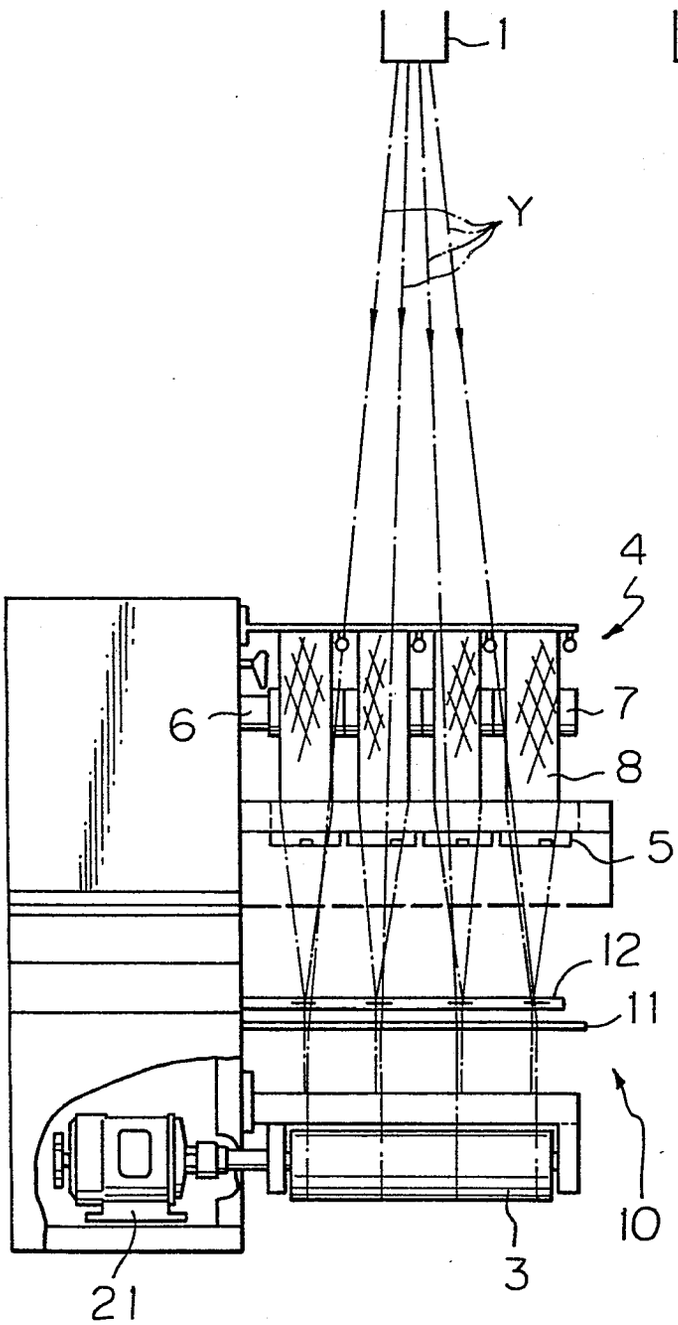


Fig. 2

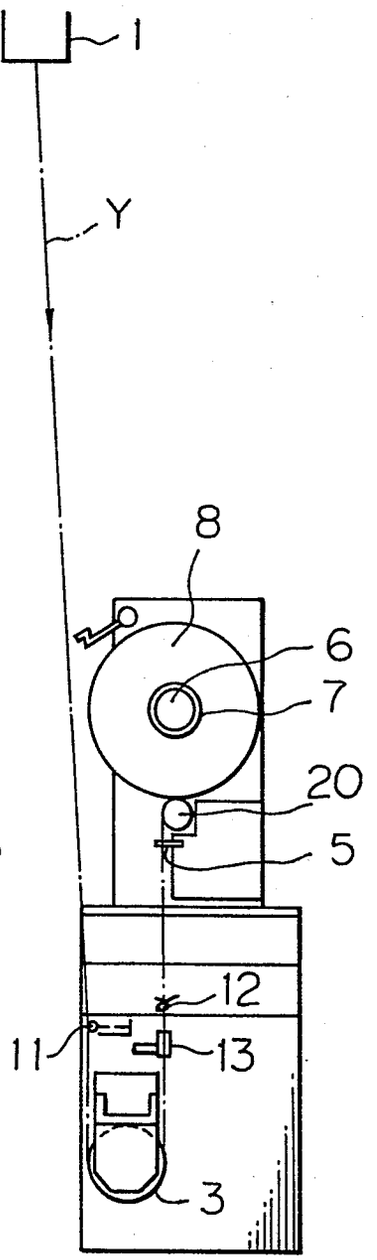


Fig. 4

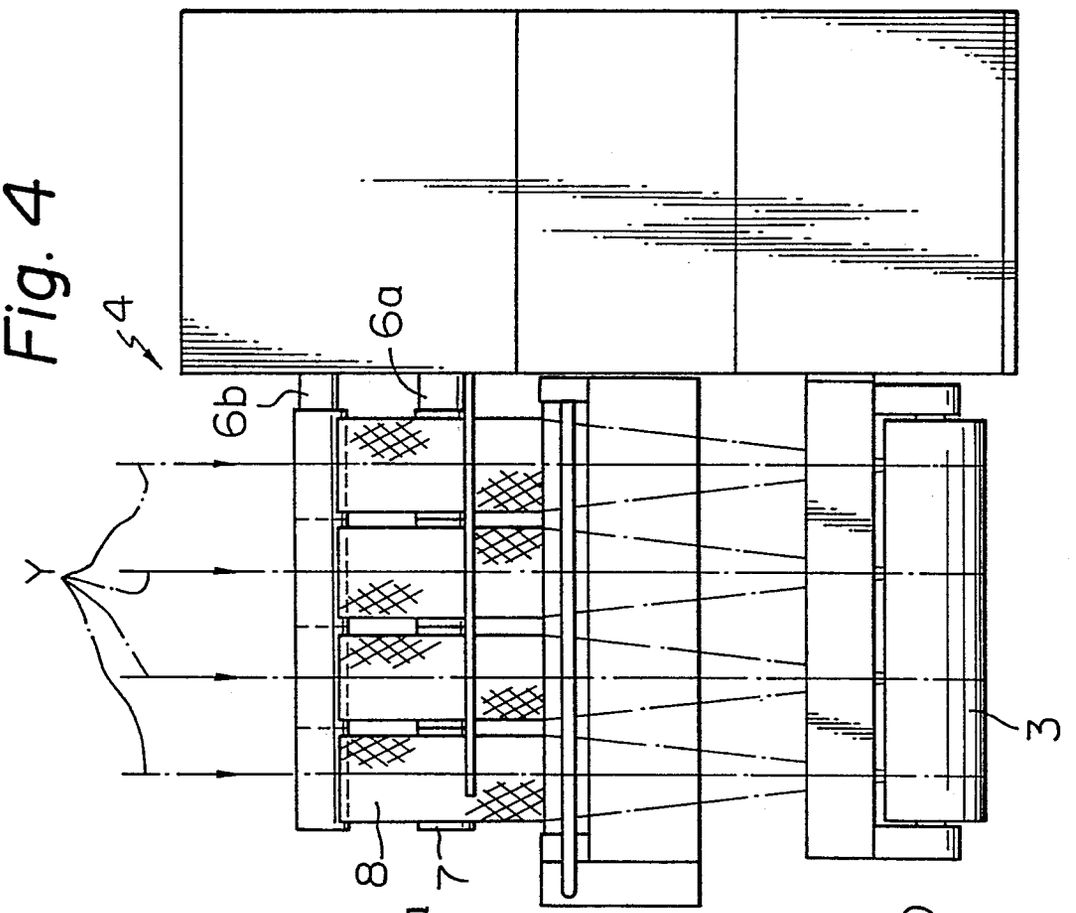


Fig. 3

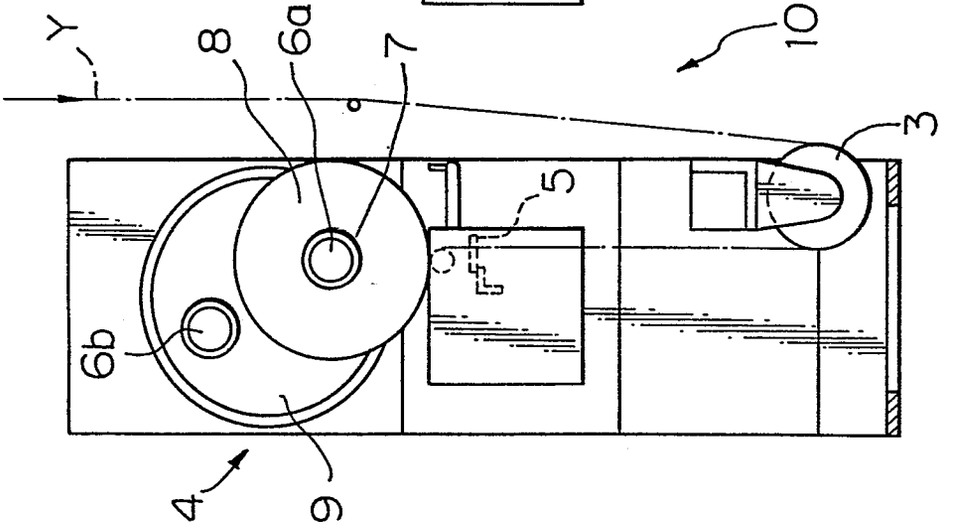


Fig. 5

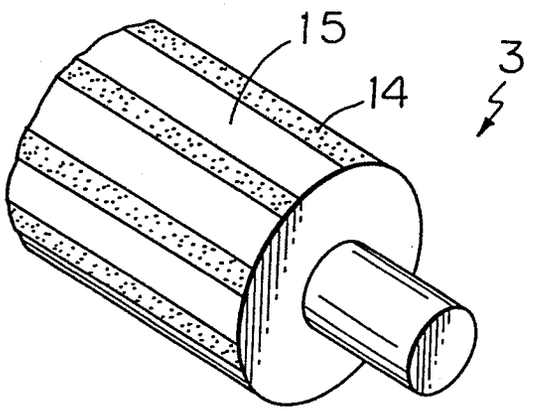


Fig. 6

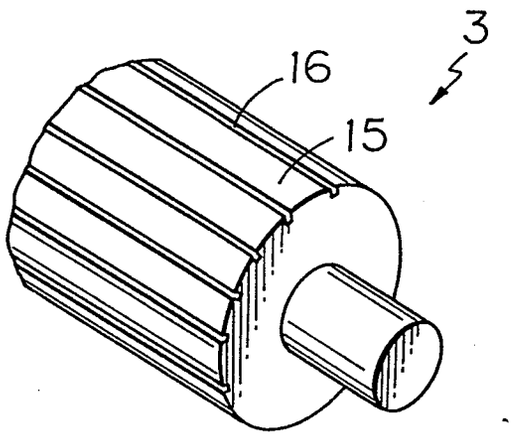
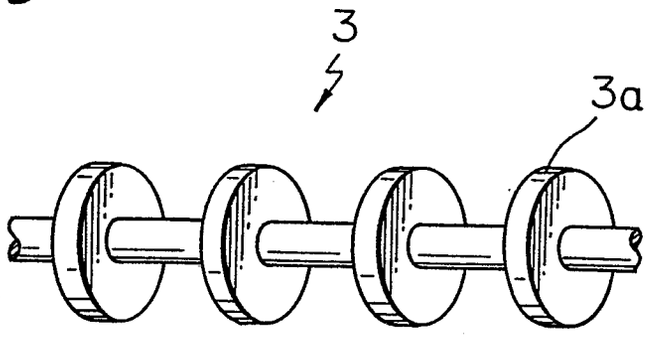


Fig. 7



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EUROPEAN SEARCH REPORT

0121302

Application number

EP 84 30 0775

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	DE-A-2 633 406 (BARMAG BARMER) * Whole document *	1,3,4, 13,14	D 01 D 7/00 B 65 H 54/72
A	EP-A-0 010 772 (TEIJIN LTD.) * Whole document *	2,4,5	
A	FR-A-1 584 791 (SCHAERER) * Page 4, claim 2; figures 4-6 *	10,11	

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

D 01 D
B 65 H
D 01 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-05-1984	DEPRUN M.

CATEGORY OF CITED DOCUMENTS

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