(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 475 483 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **91202077.3**

(51) Int. Cl.5: **B65H 57/22**, B65H 63/08

(22) Date of filing: **14.08.91**

(30) Priority: **29.08.90 IT 2132590**

(43) Date of publication of application:
18.03.92 Bulletin 92/12

(84) Designated Contracting States:
CH DE FR GB LI

(71) Applicant: **SAVIO S.p.A.**
Via Udine 105
I-33170 Pordenone(IT)

(72) Inventor: **Badiali, Roberto**
Via Carducci, 1/A
I-33170 Pordenone(IT)
Inventor: **Ouaia, Amedeo**
Via Ceolini, 70
I-33080 Porcia, Pordenone(IT)

(74) Representative: **Roggero, Sergio et al**
Ing. Barzanò & Zanardo Milano S.p.A. Via Borgonuovo 10
I-20121 Milano(IT)

(54) Device for adapting the tension of the thread as it unwinds in a spooler.

(57) The present invention relates to a device for adapting the tension of the thread as it unwinds in a spooler, which is designed to wind thread at high speed, the said device comprising at least three rings (25), which act as unwinding accelerators, at least one being located above the top of the cop and the others around the unwinding cop, and the said rings occupy a fixed axial position during the entire unwinding operation, whereas they rotate angularly to open at the moment when a new supply cop is mounted and rotate back angularly to close concentrically around the cop which begins unwinding.

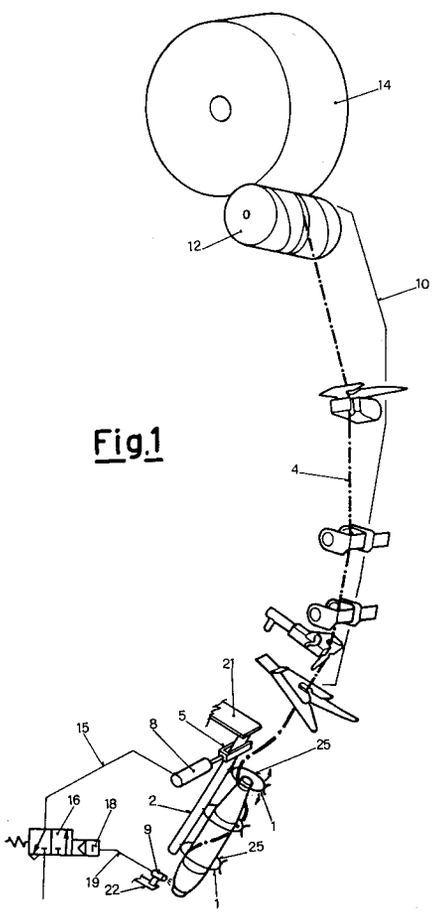


Fig.1

EP 0 475 483 A1

The present invention relates to a device for adapting the unwinding tension of the thread in a spooler, which is designed to wind thread at high speed unwinding it from a cop below and collecting it on a forming reel above Some textile working stages involve firstly transferring the thread, at the maximum speed possible, from one package to another. For example, a thread produced in a spinning machine, particularly in a continuous ring frame, is normally wound onto a spool or reel. The thread is then transported and supplied as a spinning cop and undergoes a subsequent unwinding stage. Spooling involves transferring (rewinding) from the starting cop to the collecting reel, with unravel unwinding, i.e. with axial extraction of the thread from the stationary cop. The starting package is often a cop coming from a ring spinner. Due to the mechanical limitations of a continuous ring frame, the spinning cops have a relatively small quantity of thread, up to a few hundred grams at most. Consequently, they are rewound onto reels on which the quantity of thread and shape are suitable for use in a subsequent operation. Incidentally, the thread from several cops is collected in succession on a single reel. The purpose is always to obtain packages which are more suitable for the subsequent working stages such are dyeing, warping, inserting the weft, etc.

During these transfer operations, the thread may be improved by removing sections with defects of various types. With the continuous increase in the speed of such operations (the length of thread transferred in one unit of time) to reduce production costs, ever greater tension values in the thread are created and, therefore, more frequent breakages occur, which cause a considerable fall in the operating performance of the spooler and its productivity. Incidentally, breakage of the thread occurs under a tension which is greater than the thread's resistance to tensile stress.

The thread on each spinning cop, which has been supplied at a set position of a spooler, is drawn upwards with a tension value which gradually increases between the beginning and the end of the spinning cop in the unwinding phase,as is well known to the textile dressers. Indeed, when the layer of thread on each spinning cop decreases as the winding operation of the spooler progresses, the layer of thread thus diminished twists only round the bottom end of the cop and the thread, drawn out of it, travels upwards twisting back round the surface of the cop. In this case, the angle of separation of the layer of thread decreases and therefore tension is applied to the travelling thread due to the friction between the lengths of thread, or the contact of the thread with the cop and this may lead to breakage of the thread. This phenomenon occurs more readily in spoolers with a high winding speed. In the more modern spoolers thread transfer speeds of 20-30 m/s are reached.

Furthermore, since the tension at the start of unwinding thread from a single spinning cop is low, the thread is wound onto the reel at a low tension and thus the layer of thread wound at low tension may be expanded outwards at one end of the reel due to the pressure of the layer of thread on top of it. Since usually to obtain one reel several spinning cops are used, the expanded part appears within each set period thus causing the formation of a reel with faulty winding which may give rise to unacceptable production for subsequent working stages.

In such an operating process a device is required which adjusts the winding tension of the thread between the beginning and the end of the cop thus reducing the unwinding tension at the end of the supply cop. Elements are known in the state of the art which by acting on the path of the thread in a fixed position guide it in precise unwinding forms which make it possible to limit the maximum tension values at which breakages of the winding thread frequently occur. These known elements, which act as unwinding accelerators (balloon-breakers) have various geometrical forms, as is well known by those working within the field. However, in the best of cases they only lessen the phenomenon, but do not lead to an optimum result of uniformity in the unwinding tension between the beginning and the end of the unwinding of the thread from the supply cop.

Means of controlling the spooling speed, i.e. the winding speed, have also been proposed as a countermeasure to keep the thread tension at practically constant levels from the beginning to the end of the cop from which the thread is unwound, as described in US Patent 4805846.

To obtain a thread tension which is approximately constant, in the said Patent the effect of the spooling speed on the thread tension is used. Indeed, by considerably reducing the spooling speed, when the thread is unwound from the bottom part of the spinning cop, the tension is kept at a nearly uniform level for the entire duration of the spooling process. Such a solution will considerably reduce the operating performance of the spoolers in that for a certain interval of time the unwinding speed is considerably reduced and therefore a smaller quantity of thread will be transferred (wound on) in one unit of time. To all practical purposes this is unusable since it results in a considerable drop in the operating performance of the spooler and consequently its productivity is penalised.

The aim of the present invention is to resolve the above-mentioned problems of the known state of the art by providing a device which ensures that the tension of the thread supplied in the spooler is

kept at an essentially constant value during unwinding of the entire spinning cop and which offers the following advantages:

- it can be applied for any type of thread be it fine, medium or thick;
- it can be installed on existing spoolers;
- it enables the thread at high transfer speed to assume a geometrical configuration of contained energy dissipation which is highly important in the above-mentioned known state-of-the-art applications

These and yet other advantages are achieved by the device described in the present invention capable of adapting to a nearly uniform value the value of the unwinding tension in a spooler, which is designed to wind thread at high speed unwinding it from a cop below that supplies thread to the forming reel above, the said device including:

- three rings which act as unwinding accelerators, one located above the top of the cop, the other two surrounding the unwinding cop, the said rings occupying a fixed axial position during the entire unwinding operation, whereas they rotate angularly to open at the moment when a new supply cop is mounted and rotate back angularly to close concentrically thus surrounding the cop which is starting to unwind, said rings, which contain and limit centrifugation of the thread, comprising two semi-circular elements which rotate in opposite directions to open and close the ring that they form;
- a kinematic mechanism which activates the said rotation of the rings, the said kinematic mechanism being a pneumatic actuator, which at the end of its rod has a fork with teeth on the two inner sides and each side engages with one of the two tubular elements, located concentrically one inside the other, and the semi-circular elements of the rings, which act as unwinding accelerators, are fixed to the said tubular elements;
- an element capable of detecting the end of unwinding of the thread from the supply cop, the said detection element being a photocell, or any photoelectronic element positioned and secured at the end part of the accumulation of wound thread.

The device for adapting the tension of the thread as it unwinds from a cop, described in the present invention, takes on concrete form in its practical application according to an additional embodiment which includes a multiplicity of rings, which act as unwinding accelerators, at least one of which is located above the top of the cop, the others concentrically surrounding the unwinding cop, the said rings occupying a fixed axial position during the entire unwinding operation, whereas they rotate angularly to open at the moment when a new supply cop is mounted and rotate back angularly to close concentrically around the cop, which begins the unwinding phase.

The invention shall be described in detail below on the basis of the example of embodiment schematically represented in the drawings in the attached Figures, and additional details and characteristics shall be explained, in which connection it must be well understood that any variations in reciprocal positions of the elements and the consequent simplifications which could arise therefrom must be regarded as included in the protection requested as constructional variations covered by the general concept.

In the attached drawings:

- Fig. 1 is an axonometric schematic view of the device covered by the present invention, showing also the path of the thread from the unwinding cop below up to the forming reel above and the said view shows the moment rewinding of the thread wound onto the cop supplying the spooler begins;
- Fig. 2 is an axonometric schematic view of the device covered by the present invention at the moment when the cop is full of wound thread and is therefore the moment when unwinding of the thread to transfer it to the reel above begins;
- Fig. 3 is an axonometric schematic view of the device covered by the present invention at the moment when the rings are in the open position in order to mount a new supply cop of wound thread and is therefore the moment just before unwinding of the thread from the cop to transfer it to the reel above begins.

In the Figures the same elements bear the same reference numbers.

Furthermore, for the purpose of clarity of the invention as a whole, in the Figures the parts not necessary to understanding the invention, such as the operating and functional units along the path of the thread, the motorisation centre of the thread guide roller, the reel-carrier arm, the various supporting structures and the means of supply, support and cop removal, are omitted.

In the said attached Figures:

1 are the semi-circular elements of the rings which act as unwinding accelerators and the said elements 1 are anchored rigidly to outer tubular element 2, which has a toothed band 29 at the top that engages with the teeth 28 located on the inner side of fork 5; 25 are the semi-circular elements which, combined together with semi-circular elements 1, form the three rings, which act as unwinding accelerators, and when they are closed around cop 3,they are essentially concentric. One of the three rings is located above the tip of the

bobbin and its position is such that the distance from the top edge of the bobbin fluctuates around 20mm (in accordance with the experimental results of the proposer); The said semi-circular elements 25 are anchored rigidly to inner tubular element 6, which has a toothed band 30 at the top which engages with the teeth located on the inner side of fork 5; 3 is the cop of wound thread made in a ring spinner; 4 is the path, shown by a dotted and dashed line, of the thread which is unwound from cop 3 below and runs upwards to wind itself in crisscross coils around the forming reel 14.

5 is a fork element fixed rigidly as a single body to the end of rod 11 of actuator 8. The said fork element has along its inner sides, opposite each other, teeth 28, which function in a similar way to a rack by engaging with teeth 29 and 30 of the two tubular elements 2 and 6 located concentrically one inside the other; 8 is a pneumatic actuator which, by means of rod 11, moves fork 5 forwards in the direction of arrow 7. Fork 5 with the teeth 28 on its inner sides will rotate tubular elements 2 and 6, engaging with their teeth 28 and 30, in the direction of rotational arrows 7. The said rotational arrows oppose each other, i.e. tubular element 2 will rotate angularly in a clockwise direction and thus semi-circular elements 1 fixed rigidly to it will rotate in a clockwise direction, whilst inner tubular element 6 will rotate in an anti-clockwise direction in perfect synchronism and thus semi-circular elements 25 fixed rigidly to it will rotate in an anti-clockwise direction. The said anti-clockwise rotation of elements 25 is made possible by the presence of circumferential openings made in outer tubular element 2. Clearly, the said opposite angular rotations enable the rings which act as unwinding accelerators to be opened;

9 is a photocell, or any photoelectronic element, capable of detecting the moment when unwinding of the thread from the supply cop ends.

The said photocell 9 is fixed near the bottom end of cop 3 on a supporting plate 22.

At the moment at which the photocell detects the end of unwinding, and therefore the lack of wound thread, it sends, through wire 19, an electrical signal which activates solenoid valve 18, the latter will operate distributor 16 designed to control the direction of the flow of air under pressure so as to deliver, through pipe 20, the air under pressure to actuator 8, through pipe 15. Actuator 8, via rod 11, will push fork element 5 in the direction of arrow 7, making the two concentric tubular elements 2 and 6 rotate angularly in opposite directions, one inside the other. Semi-circular elements 1 and 25 will open first to release the bobbin with no wound thread and then to mount the new supply cop, corresponding to Figure 3; 21 is a flat supporting element fixed as a single body to the spooler frame (not illustrated). The said flat element 21 supports tubular elements 2 and 6 but allows them to rotate round each other; 12 is the supply cylinder which rotates reel 14 and, imparting an alternating back-and-forth movement, guides the thread onto the said reel 14; 10 is the schematic side outline of the structure of a spooler; 14 is the reel which is a package of thread with a truncated cone shape, or a cylindrical shape, and the said package is produced by a single spooler and intended for subsequent working stages (dyeing, warping, weaving, etc.). The operation of the device for adapting the unwinding tension of the thread in a spooler, illustrated by the attached drawings, can be easily understood by those working within the field.

A cop 3 full of wound thread is placed on the cop-holder pin (not shown) in the supply position. The rings which act as unwinding accelerators have their semi-circular elements 1 and 25 open (see Fig. 3). Photocell 9, the moment it detects the presence of wound thread on cop 3, the latter being fitted and positioned at the front on the cop-holder post, will generate an electrical signal which, through wire 19, will activate solenoid valve 18 which in turn will operate distributor 16 to direct the flow of compressed air from pipe 20 to pipe 15 so that actuator 8 pulls back rod 11 (in the opposite direction to the direction of arrow 7) and thus fork 5 rigidly connected to it.

The said linear movement of fork 5 will make the two tubular elements 2 and 6 rotate angularly so that semi-circular elements 1 and 25 connected to them will close again into concentric rings around cop 3, which is ready to provide supply thread to the forming reel above 14.

Its thread 4, using known means and devices, is brought to wind itself onto the forming reel 14 and rewinding of the thread begins, i.e. the transfer of thread 4 from cop 3 below to reel 14 above.

The device covered by the present invention is positioned as shown in Fig. 2. Thread 4, drawn upwards by supplier cylinder 12, on unwinding from cop 3, causes a gradual and continuous lowering of the wound thread. This lowering will continue until the moment when all the wound thread is collected and wound onto reel 14. At the said moment of the end of unwinding, photocell 9, detecting that no wound thread is present, will generate an electrical signal which, through wire 19, will activate solenoid valve 18, which will operate distributor 16 to direct the flow of compressed air from pipe 20 to pipe 15 so that actuator 8 will push rod 11, and thus fork 5, forward and the latter will move in the direction of arrow 7.

The said linear movement of fork 5 will make the two tubular elements 2 and 6 rotate angularly so that semi-circular elements 1 and 25 will open

again in order to release the bobbin with no wound thread and consequently mount a new cop of wound thread (see Fig. 3).

The unwinding cycle of the new cop 3 will recommence as described above.

In this way the tension of thread 4 is maintained at an essentially uniform level for the entire duration of the spooling process due to the operating presence of the device in question, which will consequently prevent most of the breakages of thread 4 during its transfer from cops 3 to reel 14.

All this enables extremely striking comparisons to be made particularly in the case of high-speed spoolers in which the speed of transfer of thread 4 from cop 3 to reel 14 is in the order of 2000 m/min and above.

Since the tension of the thread remains nearly uniform it is possible, as frequent accidental breakages do not occur, to obtain great improvements in the operating performance of spoolers and consequently in their productivity.

It is purely by way of example that three rings concentric to the unwinding cop have been used since any number of rings which act as unwinding accelerators may be used; furthermore various modifications in detail may also be made to the kinematic mechanism for opening or closing the semi-circular elements and also to the pneumatic actuator without going beyond the scope of the invention.

Claims

1. A device for adapting the tension of the thread as it unwinds in a spooler, which is designed to wind thread at high speed unwinding it from a cop below which supplies thread to a forming reel above and the said device is characterised in that it has:

- three rings which act as unwinding accelerators, one located above the top of the cop, the other two surrounding the unwinding cop, the said rings occupying a fixed axial position during the entire unwinding operation, whereas they rotate angularly to open at the moment when a new supply cop is mounted and rotate back angularly to close concentrically surrounding the cop which is starting to unwind;.
- a kinematic mechanism which activates the said rotation of the rings which act as unwinding accelerators;
- an element capable of detecting the end of unwinding of the thread from the supply cop.

2. A device for adapting the tension of the thread as it unwinds in a spooler, according to Claim 1, characterised in that the three rings; which act as unwinding accelerators, since they contain and limit centrifugation of the thread, comprise two semi-circular elements, which rotate in opposite directions to open and close the ring that they form.

3. A device for adapting the tension of the thread as it unwinds in a spooler, according to Claim 1, characterised in that the kinematic mechanism which activates the rotation of the rings is a pneumatic actuator which at one end of its rod has a fork with teeth on both inner sides and each inner side engages with one of the two tubular elements placed concentrically one inside the other and the semi-circular elements of the rings, which act as unwinding accelerators, are fixed to the said tubular elements.

4. A device for adapting the tension of the thread as it unwinds in a spooler, according to Claim 1, characterised in that the element that detects the end of unwinding of a supply cop is a photocell, or any other optical sensor, positioned and secured at the end part of the accumulation of wound thread.

5. A device for adapting the tension of the thread as it unwinds in a spooler, according to Claim 1, characterised in that it has a multiplicity of rings which act as unwinding accelerators, at least one of which is located above the top of the cop, the others concentrically surrounding the unwinding cop, the said rings occupying a fixed axial position during the entire unwinding operation, whereas they rotate angularly to open at the moment when a new supply cop is mounted and rotate back angularly to close concentrically surrounding the cop, which is about to start unwinding.

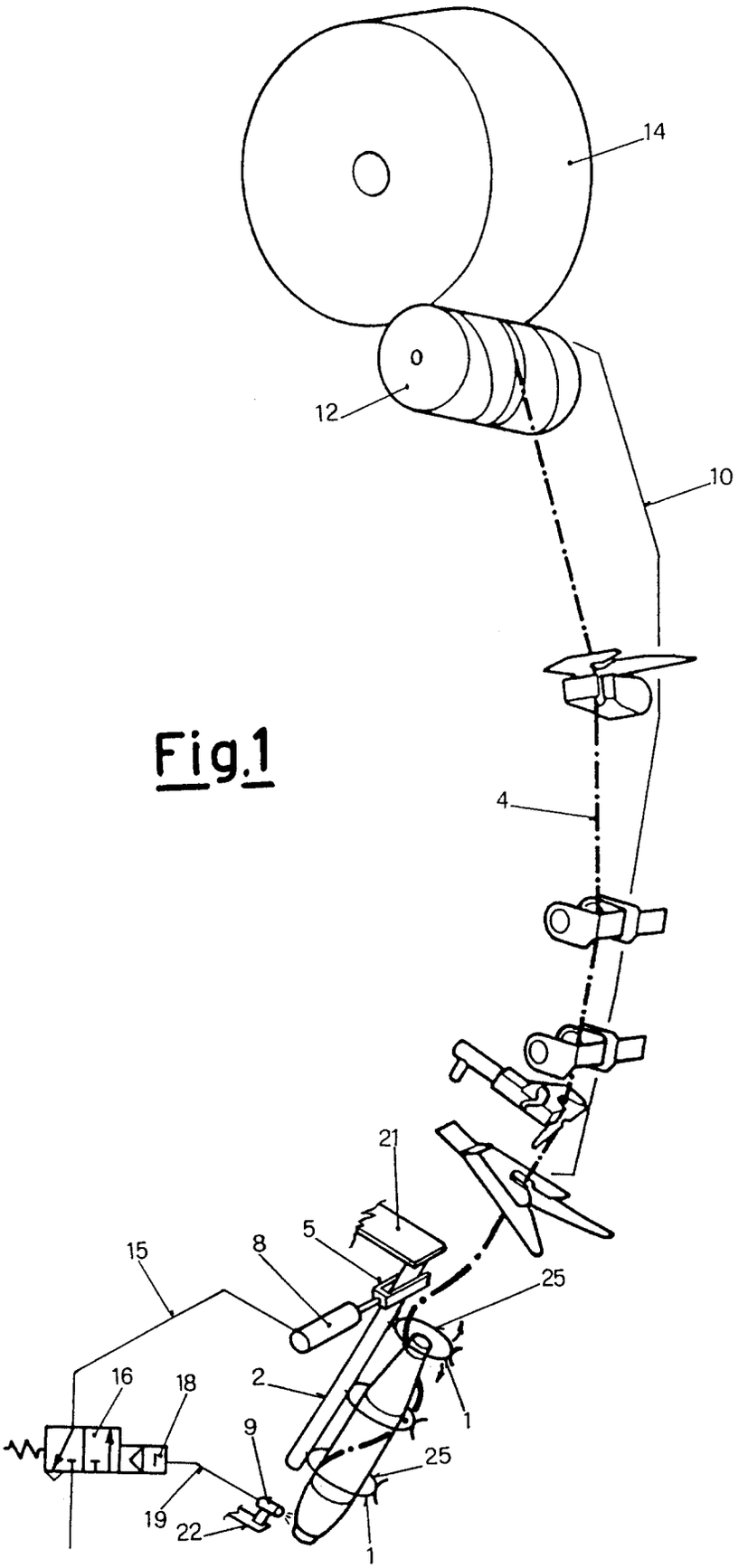


Fig.1

Fig.3

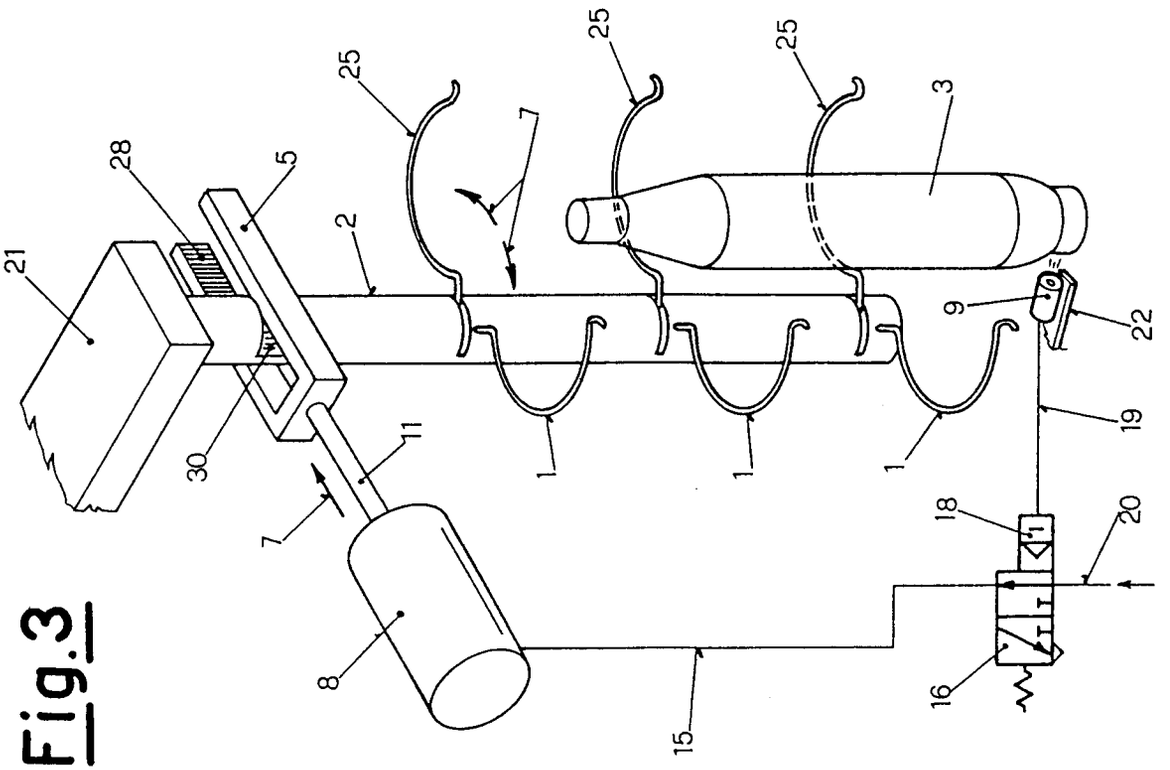
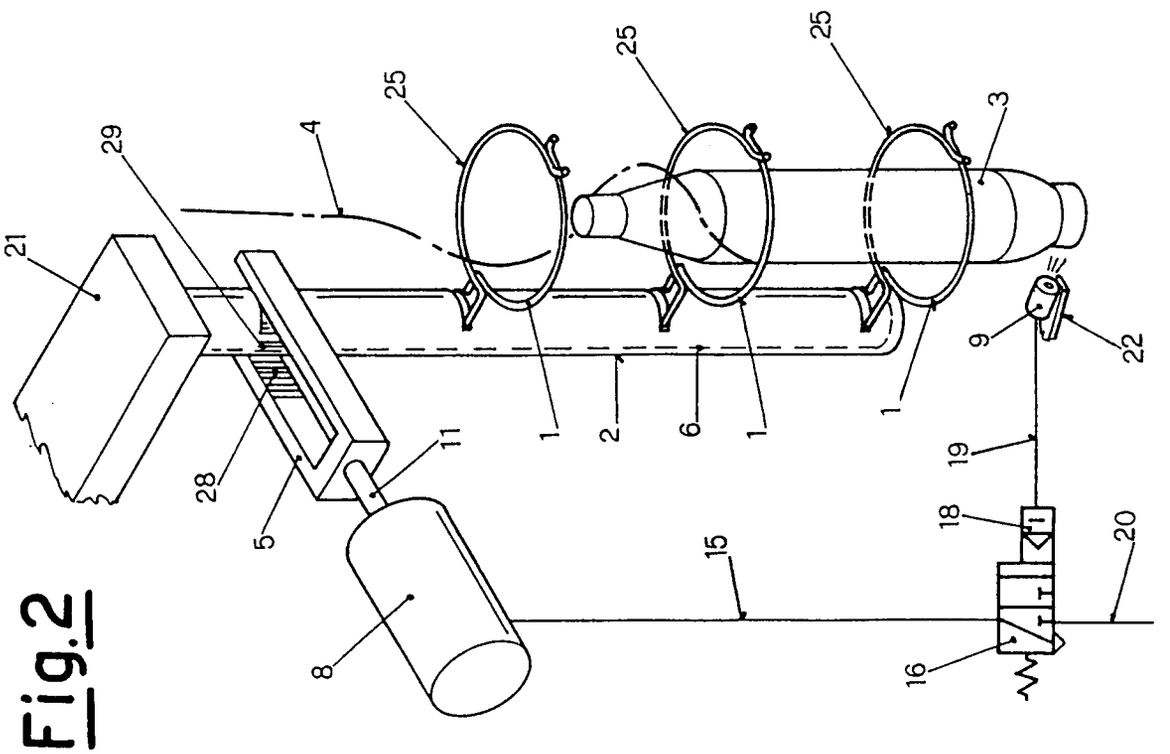

21
28
5
2
25
25
25
3
7
9
22
19
30
11
7
1
1
1
18
20
8
16
15

Fig.2


21
29
4
25
25
25
3
9
22
19
28
5
11
2
6
1
1
1
18
20
15
8
16

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 20 2077

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.5)
A	CH-A-316 367 (INVENTA A.G. FÜR FORSCHUNG UND PATENTVERWALTUNG) * figure 5 * ---	1,2,5	B65H57/22 B65H63/08
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 388 (M-549)(2445) 25 December 1986 & JP-A-61 178 373 (MURATA MACH LTD) 11 August 1986 * the whole document * ---	1,3,4	
A	US-A-3 011 736 (FÜRST ET AL.) * figures 4-6,11,13,15 * ---	1-3	
A	EP-A-0 225 670 (PICANOL N.V.) * page 3, line 39 - page 4, line 5 * * page 5, line 26 - page 6, line 28 * * figures 3,4,6-10 * ---	1,3,4	
A	GB-A-839 368 (REINERS) * page 3, line 13 - line 46 * ---	1,4	
A	FR-A-2 383 112 (LINDAUER DORNIER) -----		TECHNICAL FIELDS SEARCHED (Int. Cl.5) B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 NOVEMBER 1991	RAYBOULD B.D.J.

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

EPO FORM 1503 03.82 (P0401)