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(54) **Continuous process for the nobilisation of yarns and device suited to perform said process.**

(57) The invention discloses a continuous process for the nobilization of yarns dyed on cones, comprising a phase during which the yarn (10, 46) continuously runs through an essentially cylindrical treatment chamber (9, 41) and at the same time a phase of letting into the treatment chamber a gaseous fluid under pressure through one or more openings (13), which create a turbulence movement of the fluid

within said chamber. The device performing said process comprises a prismatic body (2) wherein there are a treatment chamber (9, 41) into which the gaseous fluid under pressure is forced to stream and a lid (7, 43) sliding over the treatment chamber, which is activated by mechanical, electrical or pneumatic means.

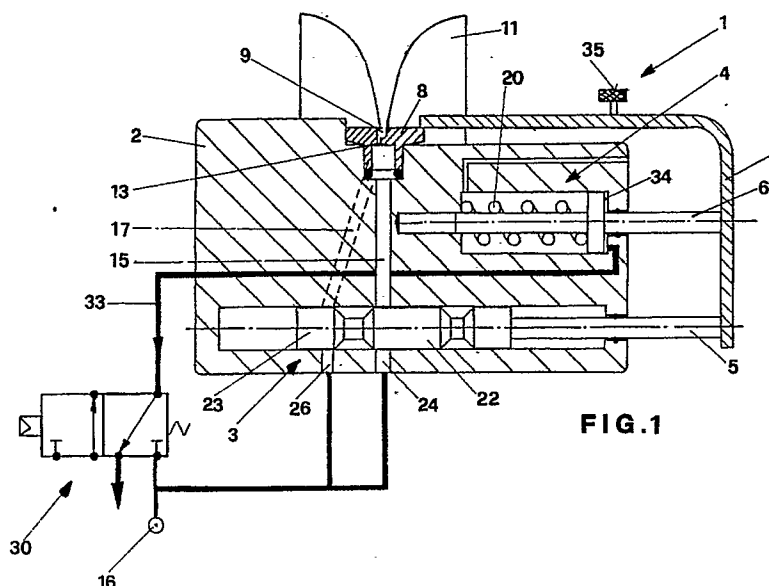


FIG. 1

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The present invention concerns a continuous process of nobilisation by rounding the cross section of single-strand or twisted yarns, died on cones and a device to perform said nobilisation process.

It is a known fact that two methods are essentially applied for the dying of yarns and, more precisely, the dying of skeins or the method of dying on cones. Between the two methods, the one of dying yarn on cones is the less expensive, so that the general tendency is that of employing it whenever possible.

However, said method of dying the yarn on cones, while presenting the advantage of being more cost-effective than the method of dying the skeins, also presents the disadvantage that, during the dying process, the yarn undergoes a pressing action which persists at the end of the treatment and manifests itself in a flattening of the thread, which, therefore, loses its qualities of softness and fluffiness.

In the attempt of eliminating the inconvenience of the flattening of the yarn generated by the dying process on cones, some methods have been developed having the purpose of attempting to fluff up the yarn after the dying process, so as to give back to it its original characteristics.

One of said methods implies sending the yarn, after it has been died, through a radio-frequency field. Said method, by which the treatment can be made either with dry or wet yarn, is not only complex and costly, but up to date it has not proven to give optimum results.

It is with the purpose of eliminating the above-mentioned inconveniences that the present invention has been developed. Its main purpose is to obtain a continuous process of rounding the cross section of the yarn and a device suited to perform said nobilisation process, in order to guarantee the restoration of the quality characteristics of the yarn, after the treatment of dying on cones.

Another purpose of the invention is for the device performing said process to be simple to apply to the winding machines which, after the dying process, rewind the yarn on commercial cones. The above-mentioned purposes and others, which will be better understood hereafter, are reached by a nobilisation process rounding the cross-section of the yarn, particularly suited for single-strand or twisted yarns, which have been died on cones, which in accordance with the patent claims is characterised in that it has:

- a phase during which the yarn continuously runs through an essentially cylindrical chamber, open at both ends, said running-through occurring in an essentially axial direction;
- a phase during which a gaseous fluid under pressure is let into the cylindrical chamber

through one or more openings having transversal axes in relation to the axis of the cylindrical chamber and creating a turbulence motion of the fluid within said chamber.

According to the process of the invention the died yarn, which is wound on a cone is unwound and rewound on another cone. During the passage from one cone to the other, all the yarn, which during the dying treatment had undergone a flattening action, goes through the cylindrical treatment chamber, which is placed between the unwinding cone and the rewinding one. Because of the turbulence motion of the gaseous fluid under pressure, which is forced within the treatment chamber, the yarn, which had been previously compressed, is hit by the turbulence of the gaseous fluid, so that the flattened fibers are fluffed-up and the yarn regains its original, substantially cylindrical shape, which it had lost.

According to a preferred embodiment of the invention, the device performing said rounding process consists of a prismatic body connected with the structure of the winding machine and supporting the block in which the chamber for the treatment of the yarn is obtained. The treatment chamber presents a lengthwise slot allowing the easy introduction of the yarn and some openings arranged preferably tangential to its straight transversal cross-section for the intake of compressed air.

A lid provided with an elastic shutting system and sliding through some operating devices belonging to the prismatic body, closes the chamber while the yarn is running through it and is being treated therein.

According to a different embodiment the treatment chamber does not present any slot for the insertion of the yarn, because it is obtained in part within the prismatic body and in part in the sliding lid, so that the introduction of the yarn into the treatment chamber occurs by displacing the sliding lid. In both embodiments some openings are foreseen. They belong to the prismatic body of the device or are separated from it and arranged at the ends of the treatment chamber, in the area where the yarn runs through and they are used for cleaning purposes. The cleaning is done by blowing air or another gaseous fluid under pressure or by suction.

Advantageously the nobilisation process according to the invention and the device suited to perform said process yield a quality result on the yarn dyed on cones which is comparable with the quality result obtained when dying yarn in skeins, while the cost of the former process remains lower.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and spe-

cific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description and from the drawings, wherein:

- Fig. 1 shows a side view of the lengthwise cross-section of the device of the invention;
- Fig. 2 shows a side view of the device according to the invention;
- Fig. 3 shows a top view of the device of the invention;
- Fig. 4 shows the device of Fig. 1 during its working cycle;
- Fig. 5 shows the device of Fig. 1 in its open position, in the case when the yarn is torn or the cone is empty;
- Fig. 6 shows a magnified transversal cross-section of the block wherein the cylindrical chamber for the treatment of the yarn is obtained;
- Fig. 7 shows a top view of the block of Fig. 6;
- Fig. 8 shows a different embodiment of the device according to the invention;
- Fig. 9 shows the detail of the treatment chamber concerning the differing embodiment represented in Fig. 8.

As can be observed in Fig. 1, the device according to the invention, which is indicated as a whole with 1, consists of a prismatic body 2 wherein a distribution drawer 3 and an activating cylinder 4 are obtained. These present respectively a shutter 5 and a piston 6, both being connected with the sliding lid 7. Moreover, a block 8 is applied on the prismatic body 2. Within this block 8 is obtained the treatment chamber 9 through which the yarn 10 to be nobilized is made to run, as can be observed more closely in Fig. 2.

In the embodiment being described the treatment chamber is obtained within a removable block 8, which is matched with the prismatic body 2. It is, however, understood that said treatment chamber can also be obtained completely within the prismatic body 2, or partly within the prismatic body and partly within the sliding lid, as will be seen hereinafter in the description of a different embodiment of the device according to the invention. During the nobilization process yarn 10 is led by the thread guides 11 applied to the prismatic body 2.

Block 8, within which the treatment chamber 9 is obtained, is also represented magnified in Fig. 4 and in Fig. 5, and it can be observed that the treatment chamber 9 presents a slot 12 for the introduction of yarn 10 and an opening 13, which, through a connecting chamber 14, is connected with a duct 15, which in turn is connected with the

distribution drawer 3, from which, depending on the position of shutter 5, it receives compressed air from the external supply source 16.

Departing from the distribution drawer 3, through some lateral ducts 17, which are visible in Fig. 1 and also in Fig. 3, compressed air is sent on to the bottom part of the thread guides 11 with the purpose of keeping clean the area where the yarn runs through the thread guides themselves.

For the description of the operating mode of the device 1 according to the invention reference is made to the Figs. 1, 4 and 5, which show different stages of the process for the nobilisation of yarn 10.

Yarn 10, as can be observed in the Figs. 2, 6 and 7, is threaded through slot 12 and is thereby introduced into the treatment chamber 9. At the beginning of the process cycle the device according to the invention presents itself as represented in Fig. 1, where it can be observed that the sliding lid 7 leaves the treatment chamber 9 uncovered. This situation occurs at the beginning of the cycle, when yarn 10 is still and is being threaded into the treatment chamber 9, since spring 20 belonging to the activating cylinder displaces to the right piston 6 and, as a consequence also the sliding lid 7, which is connected with it. It can be observed that shutter 5 also follows the sliding lid 7, with which it is also connected, and it arranges itself so that its middle area 22 and its left lateral area 23 intercept on their underside the ducts 24 letting in the compressed air, while their upper sides intercept the ducts 15 and 17 leading the compressed air to the opening 13 of the treatment chamber 9 and to the blasting openings 25 respectively. The pneumatic distribution valve 30 controlling the activating cylinder 4, as can be observed, is of the normally closed type with a pneumatic control and, in this situation it is not being operated.

When the winding machine (not represented in the figure), on which the device according to the invention is applied, begins to re-wind yarn 10 and makes it run in the direction shown by arrow 31 from the dying cone to the commercial cone (not represented in the figure), a pneumatic control shown in Fig. 4 with the dotted line 32 and operated by a micro-switch arranged on the winding machine (not represented in the figure), which is activated by the cone when it begins to rotate, switches the pneumatic distribution valve 30 to its open position represented in Fig. 4. In this situation the compressed air inlet 16 through the duct 33 lets compressed air flow into the active chamber 34 of the activating cylinder 4, whose piston 6 causes lid 7 to close over the treatment chamber 9. At the same time shutter 5 of the distribution drawer 3 is moved to the left. Its middle area 22 frees one of the ducts 24 bringing compressed air and

through duct 15 it lets air into opening 13 and from there into the treatment chamber 9. The compressed-air jet creates within the treatment chamber 9 a turbulence which shakes the fibers constituting yarn 10 and it confers to it the fluffiness which it had lost during the dying process.

The treatment continues until the yarn 10 is torn or the cone being unwound is empty. In both cases, the micro-switch signalling the stand-still of the cone switches off the signal 32 to valve 30 and switches it to the position indicated in Fig. 5, thereby causing the discharge of chamber 34 of the activating cylinder 4. The thrust of spring 20 causes the sliding lid 7 to move to the right. Before the lid positions itself in its final position represented in Fig. 1, it goes through the intermediate position represented in Fig. 5, where the terminal end 23 of shutter 5, belonging to the distribution drawer 3, frees at the same time inlet 25 and the compressed air which, through the ducts 17, flows through the openings 25 arranged near the thread guides 11. Thereby a violent air blast is obtained, which will eliminate possible dust or any other kind of dirt which might have built up during the treatment on the openings 27 through which yarn 10 runs in the thread guides 11. The cleaning air flow through the openings 25 stops when piston 6 reaches the end of its stroke, in which case the device 1 according to the invention resumes the position represented in Fig. 1, wherein shutter 5 intercepts both the ducts 24 and 26 for the compressed air inlet and the intake ducts 15 and 17.

It will be pointed out that this blowing action occurs both before the phase of the complete opening of the sliding lid 7 and before the phase of the complete shutting of the same sliding lid 7, since during a complete back and forth stroke of shutter 5, its middle part 22 and its terminal end 23 intercept twice the intake ducts of compressed air which are connected with the distribution drawer 3.

A different embodiment of the device according to the invention is represented in Fig. 8, where it is indicated as a whole with 40. It will be noticed that the difference consists in the shape of the treatment chamber 41. Said treatment chamber 41, as can be observed more closely in the magnification of Fig. 9, consists of two half-shells, the upper half shell 42 being obtained within a block 49 attached to the sliding lid 43, while the lower half-shell 44 is obtained within a block 48 attached to the prismatic body 45 of the device. It will be noticed that in this embodiment the slot for the threading through of yarn 46 to be treated is missing, since the yarn is introduced into the treatment chamber 41 when the sliding lid 43 is laterally moved to the left. In this case yarn 46, which will undergo the nobilisation process, can easily be inserted into the lower half-shell 44 and it remains

within the treatment chamber 41, when the sliding lid 43 resumes its closed position.

By observing the figures, it will be noticed that in each one of the described embodiments the device according to the invention presents near the sliding lid 7 and 43 a pawl 35 and 47 respectively which gives the possibility of manually operating the sliding lid, if necessary.

In each of the described embodiments the inner surface of the treatment chamber can be lined with ceramic material, or the chamber itself can be made of a hard metal, so as to reduce the wear and tear caused by the rubbing of the yarn during the treatment.

On the basis of what has been described, it can be understood that the device according to the invention reaches the proposed purposes in both of the described embodiments.

The main purpose of nobilizing the yarn which runs through the treatment chamber is reached, whereby the lost fluffiness and the bulk are recovered thanks to the action of the compressed air. In fact, the special essentially cylindrical shape of the treatment chambers 9 and 41 causes the compressed air which is let into them to create a turbulence, which acting within the fibers constituting the yarn shakes them in a disorderly way, thereby conferring to the yarn the bulk and fluffiness which the dying treatment on the cone had deprived it of.

It can also be understood how the device according to the invention can easily be applied to any winding machine now available on the market, since it can be positioned in any free space available between the dying cones being unwound and the commercial cones being rewound.

During the manufacturing process various changes and modifications of the device according to the invention may be made with the purpose of improving its function or making the manufacture easier. For instance, the transversal profile of the treatment chambers may differ from the two described profiles and also the openings letting the air into the chamber can be arranged on the transversal cross-section of the treatment chamber in the most differing positions and according to angles having inclinations differing from each other.

The blowing device consisting of the distribution drawer 3, of shutter 5 and of the ducts 26 and 17 and of the compressed air intake openings 25 can eventually not be incorporated in the device of the invention, but they can rather constitute a single device separated from the device according to the invention and presenting one or more blowing openings in correspondence with each installed device according to the invention.

Moreover, the openings 25, instead of being supplied with a gaseous fluid, such as compressed

air, can also be made to perform a suction action with the help of a vacuum pump, thereby obtaining the same cleaning result.

It is however understood that all of the possible variations and changes will not exceed the scope and spirit of the present invention.

Claims

1. A continuous process for the nobilisation of yarns, particularly suited for single-strand or twisted yarns, dyed on cones, characterized in that it is provided with:
 - a phase during which the yarn (10, 46) continuously runs through an essentially cylindrical treatment chamber (9, 41), open at its ends, said running through process occurring in an essentially axial direction;
 - a phase for the immission into the cylindrical treatment chamber of a gaseous fluid under pressure through one or more openings (13) having transversal axes in relation to the axis of the cylindrical chamber and creating a turbulence movement of the fluid within said chamber.
2. A device suited to perform the continuous nobilisation process according to claim 1, characterized in that it comprises:
 - a chamber (9, 41) for the treatment of the yarn (10, 46), into which is sent the gaseous fluid under pressure;
 - a lid (7, 43) sliding over the treatment chamber (9, 41) activated by mechanical, electrical or pneumatic means, wherein said treatment chamber (9, 41) and said sliding lid (7, 43) belong to the prismatic body (2) of the device.
3. A device according to claim 2, characterized in that the prismatic body presents:
 - a pneumatic cylinder (4), preferably with a single effect, within which a piston (6) slides;
 - a chamber (9, 41) for the treatment of the yarn (10, 46) presenting at least one transversal opening (13) for the intake of the gaseous fluid under pressure;
 - a drawer (3) for the distribution of the gaseous fluid under pressure, within which a shutter (5) slides;
 - some thread guides (11) applied on the prismatic body and arranged at the end of the treatment chamber;
 - a lid (7, 43) closing the treatment chamber, sliding on the prismatic body and connected both with the piston (6) of the pneumatic cylinder (4) and with the shutter (5) of the distribution drawer (3);
- electromechanical means (30) for the distribution of the gaseous fluid under pressure both to the pneumatic cylinder (4) and to the distribution drawer (3), wherein the distribution drawer (3) is connected with each opening (13) of the treatment chamber (9, 41) through a duct (15) obtained within the prismatic body (2) and supplies it with a fluid under pressure through the movement of the shutter (5) whenever the piston (6) of the pneumatic cylinder (4) moves the lid (7) to its closed position over the treatment chamber (9, 41).
4. A device according to claim 1, characterized in that the distribution drawer (3) is connected with each cleaning opening (25) arranged on the outside of the treatment chamber (9, 41) in the area where the yarn runs through, said connection occurring through a duct (17, 26) obtained in the prismatic body (2) and it supplies it through the movement of the shutter (5) when the piston (6) of the pneumatic cylinder (4) moves the lid (7) to its open position beyond the span of the treatment chamber (9, 41).
5. A device according to claim 3 or 4, characterized in that each opening (13) for the intake of the gaseous fluid under pressure is arranged co-planar and tangential to the straight transversal cross-section of the treatment chamber (9, 41).
6. A device according to claim 3 or 4, characterized in that the treatment chamber (9) is obtained within a removable block (8) attached to the prismatic body (2) and presents both a slot (12) for the threading of the yarn (10) and at least one opening (13) for the intake of the gaseous fluid under pressure, obtained within the removable block (8) wherein the treatment chamber (9) is obtained.
7. A device according to claim 3 or 4, characterized in that the treatment chamber (41) is made in two parts (44, 42) separated from each other, one part (44) being made within a block (48) applied to the prismatic body (2), while the other part (42) is obtained within another block (49) applied to the sliding lid (43).
8. A device according to claim 4, characterized in

that the cleaning openings (25) are made on the prismatic body (2) in the area where the thread guides (11) are connected with the prismatic body (2).

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9. A device according to claim 3 or 4, characterized in that the inner surface of the treatment chamber (9, 41) is lined with ceramic material.

10. A device according to claim 3 or 4, characterized in that the inner surface of the treatment chamber (9, 41) is lined by means of a plasma treatment.

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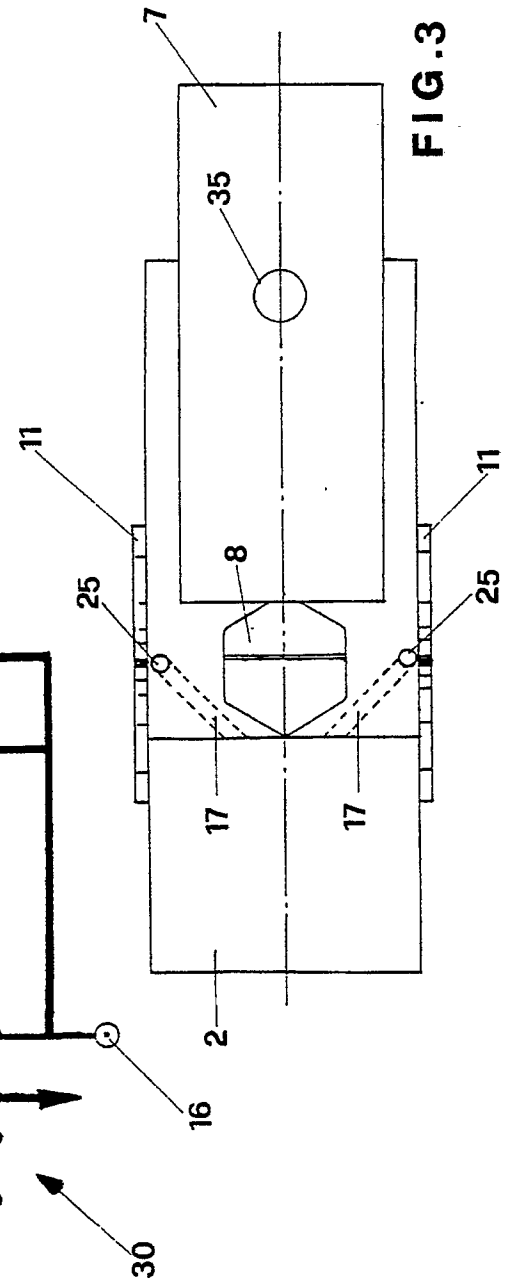
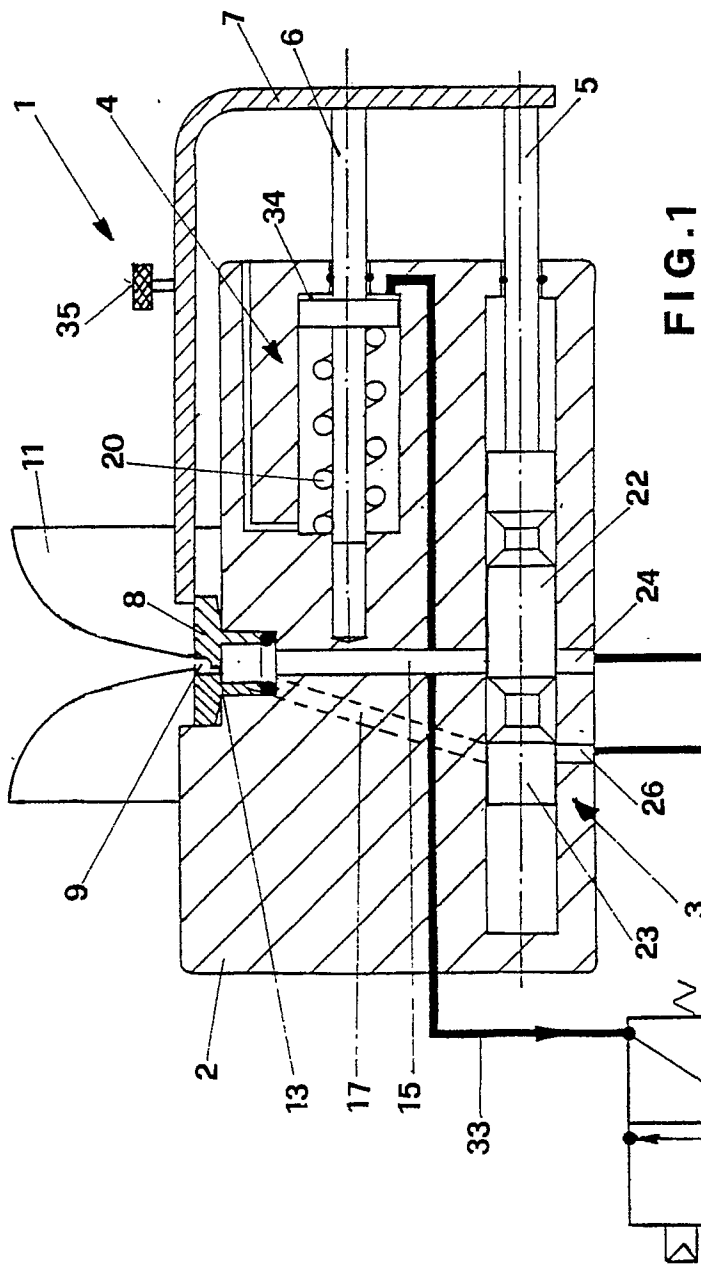
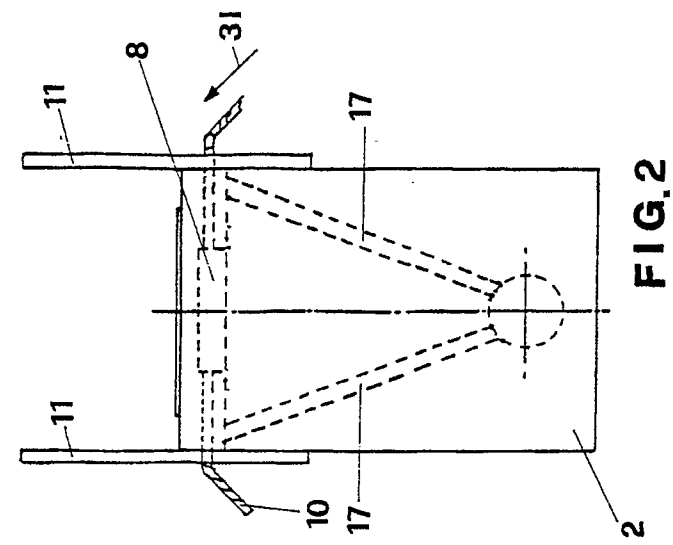
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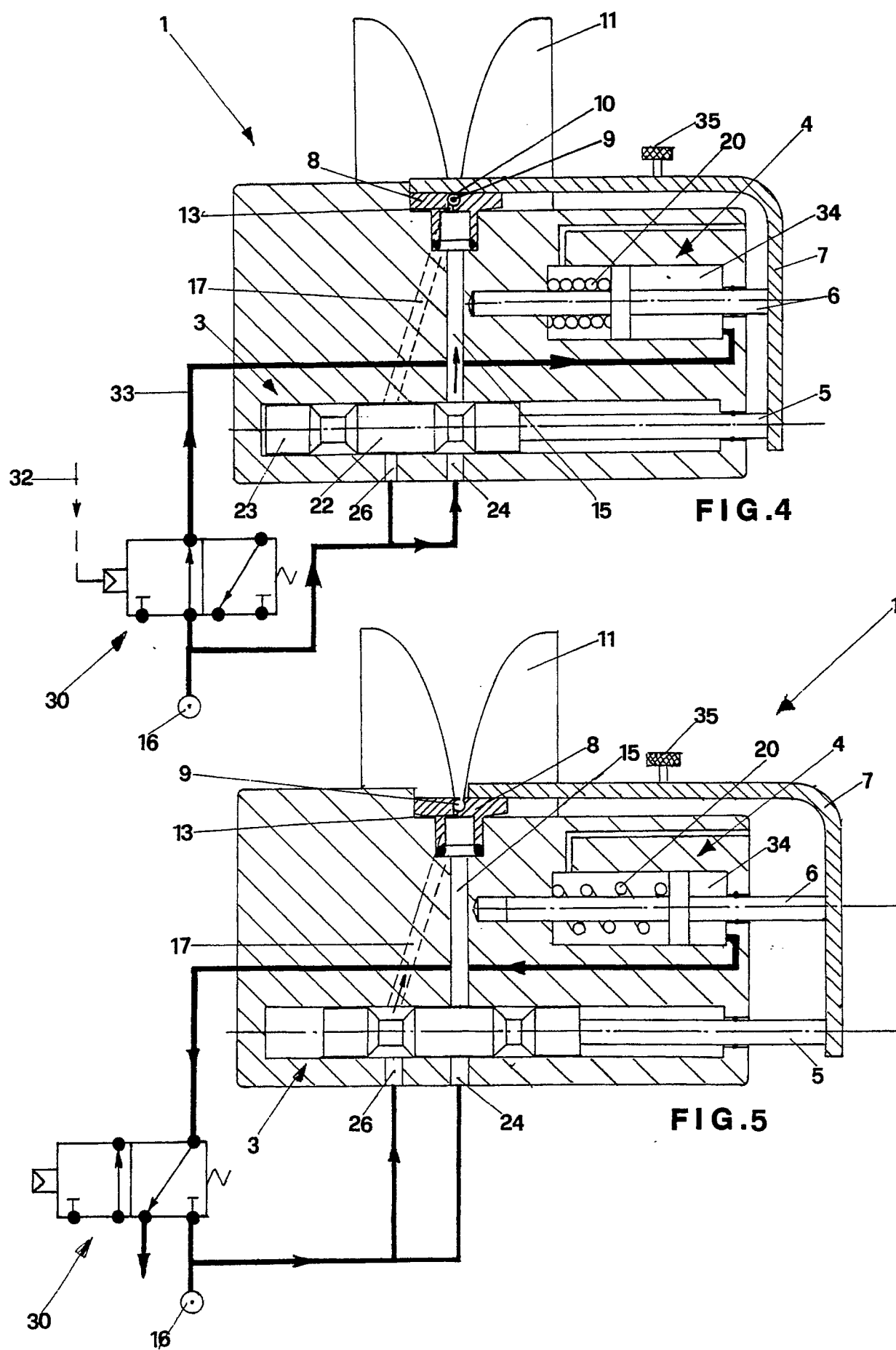
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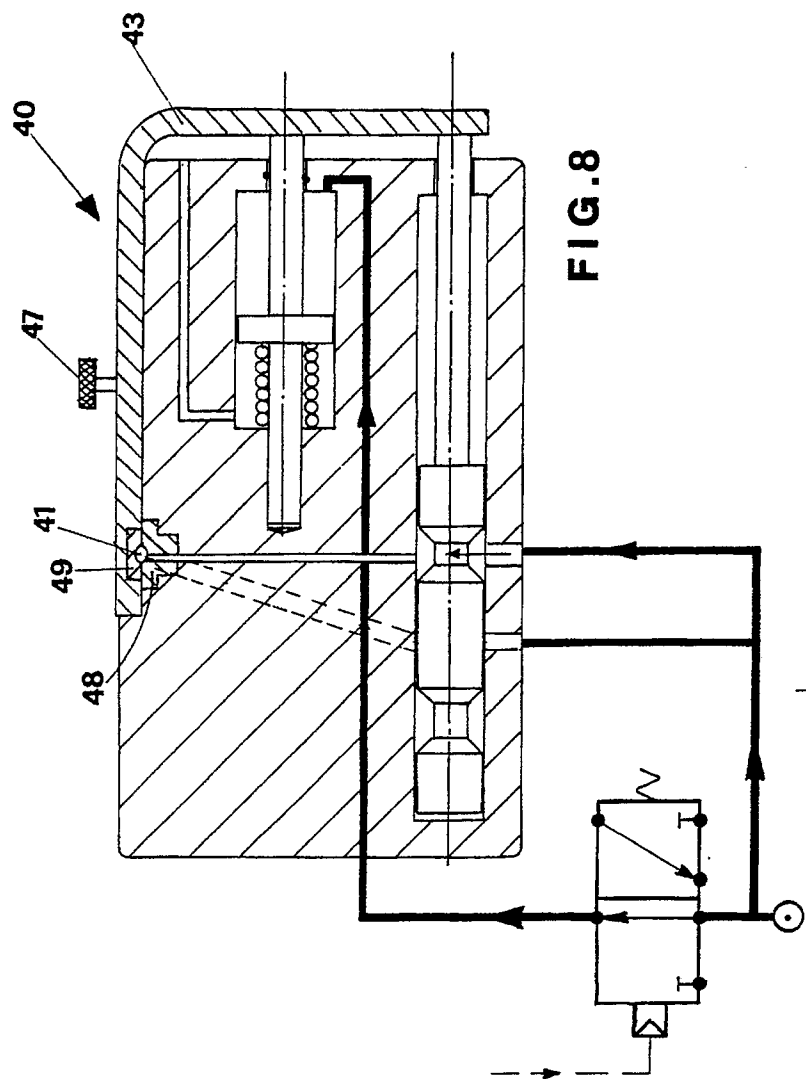


FIG. 8

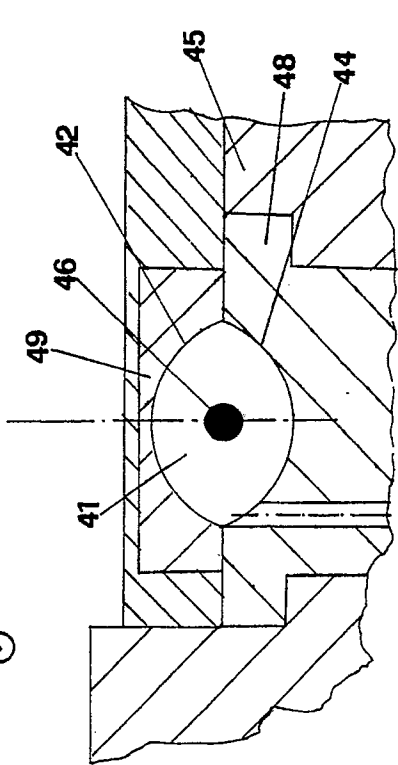


FIG. 9

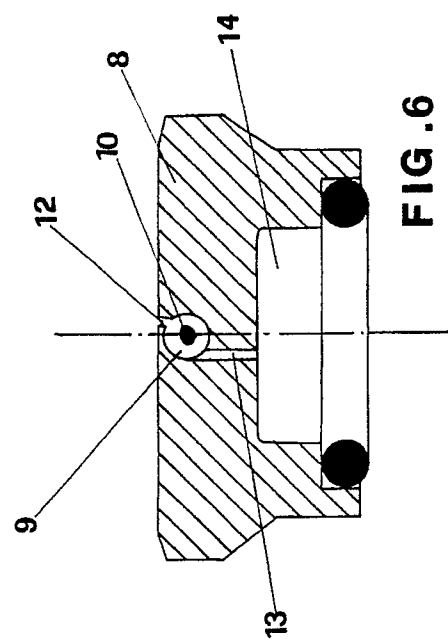


FIG. 6

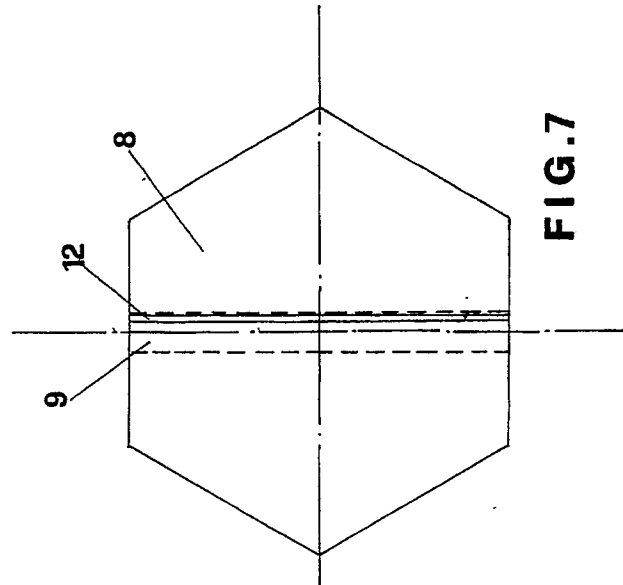


FIG. 7



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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 7905

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)
X,A	US-A-3 632 94 (H.JEURISSEN) * column 2, line 28 - column 6, line 5 * - - -	1,2,3,6	D 02 J 1/00 D 02 J 1/08
A	EP-A-0 121 010 (TORAY INDUSTRIES) * page 3, line 4 - page 14, line 26 * - - - - -	1-3,6,7,9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			D 02 J D 02 G
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		21 June 91	HOPKINS S.C.
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