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(54) Method for pneumatic threading in a double hollow spindle of a twister.

(57) A method for pneumatic threading in a two-for-one twisting spindle of double hollow mandrel type, said method comprising seizing the initial portion (1) of wound yarn from the feed bobbin positioned about the lower hollow mandrel (40); seizing the initial portion (3) of wound yarn from the feed bobbin (2) positioned about the upper hollow mandrel (14) to drag it by compressed air injection to the outside of the spindle basket (7); joining the yarns of the two bobbins by means of a knot; and gripping the initial end (3) of the yarn of the feed bobbin (2) of the upper hollow mandrel (14) to pull it so that the two joined yarns of the two bobbins can be conveyed to the winding unit to commence twisting.

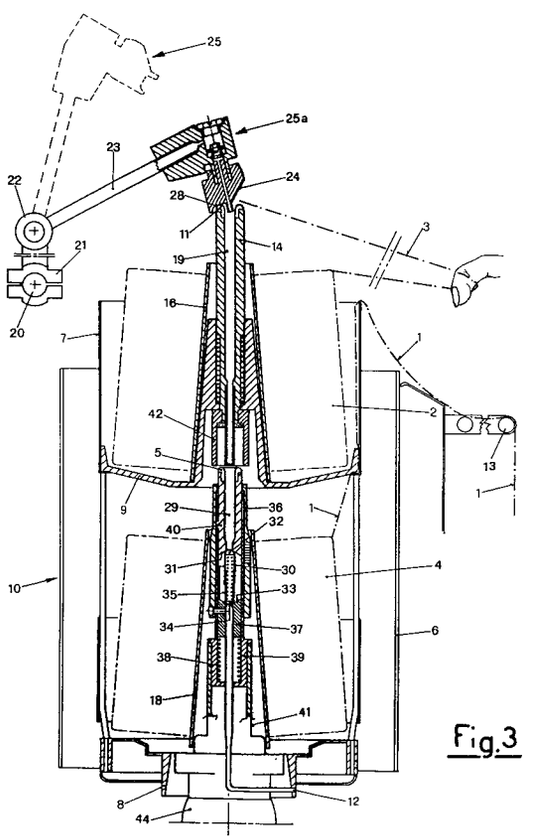

Fig.3

EP 0 519 539 A1

This invention relates to a method for pneumatic threading in a two-for-one twister using a spindle of the double hollow mandrel type.

The invention relates particularly to a two-for-one twisting spindle in which the two yarn bobbins are each mounted on their own hollow mandrel with the yarns unwind upwards, each yarn unwinding from its own bobbin to directly enter its own hollow mandrel without being conveyed during its travel into the space surrounding the other bobbin, all as described and claimed in the European Patent Appln. Publication No. 0 417 850 of the present Applicant.

The yarn braking device, which has long been known (two expansion half-capsules) is located in that portion of the central duct comprising the stationary part of the lower mandrel of the twisting spindle. Both yarns to be twisted together to form the twisted yarn pass through said lower hollow mandrel. Said yarns can be of any composition or structure, and will be known in the ensuing description and claims simply as yarns or twisted yarns, the terms being used interchangeably and including all filaments or filament assemblies or fibres, both natural and artificial. In two-for-one twisting various types of spindles are known, and it is also known that threading the yarn through the central bore of the hollow mandrel is always a problem, as the operation is difficult and laborious. Numerous methods for simplifying this operation have been studied for the various types of twisting spindles. The present applicant has also filed various patent applications on this subject. In this respect, in two-for-one twisters with a single central hollow mandrel automatic pneumatic threading is already well known, in contrast to spindles with a split central mandrel, in which replacing the empty bobbins with full bobbins, or re-starting the twisting process after an interruption for yarn breakage currently involves very costly and laborious operations of poor reliability in forming a multiple twisted yarn.

The applicant has therefore evolved and tried a reliable method for pneumatic threading for a two-for-one twisting spindle comprising a double central hollow mandrel in which a pressure fluid is fed at the required time from a position above the vertical stationary part via a duct arriving at a head positioned at will close to the twisting spindle.

The method of the invention has the following essential advantages:

- it enables extremely reliable pneumatic threading to be obtained on a two-for-one twisting spindle with a split central hollow mandrel each time the twisting process is to be restarted;
- it allows rational automation of costly low-reliability operations, leading to a twisted yarn at lower operating cost;
- it allows rapid and simple bobbin replacement.

These and further advantages are all obtained by the present invention, which provides a method for pneumatic threading in a two-for-one twister with a spindle of double hollow mandrel type in which the two yarn feed bobbins are located coaxially one above the other in the spindle basket, each bobbin being mounted on its own hollow mandrel with the yarn unwinding upwards and each yarn directly entering the hollow mandrel of its own bobbin without being conveyed during its travel into the space surrounding the other bobbin, said method comprising the following operating stages:

- seizing the initial portion of wound yarn from a feed bobbin and unwinding it to leave it hanging by a sufficient length outside the twisting spindle, said feed bobbin having previously been positioned in the spindle basket about the lower hollow mandrel;
- seizing the initial portion of wound yarn from a feed bobbin and unwinding it in order to retain it while said feed bobbin is being inserted into the spindle basket about the upper hollow mandrel;
- resting said retained initial yarn portion on the mouth of the central bore of the upper hollow mandrel;
- bringing up to the mouth of the central bore of the upper hollow mandrel a head connected to a compressed air source;
- pressing said head against the underlying upper hollow mandrel so that this latter moves downwards and makes contact with and then pushes downwards the sleeve which is rigid with the lower support seat for the expansion yarn braking device, to enable this latter device to move sideways and expose the central bore of the lower hollow mandrel;
- injecting compressed air through an injection nozzle, the air stream from which drags the initial yarn portion of the feed bobbin mounted about the upper hollow mandrel, in a downward direction through the central bores of the two coaxial hollow mandrels, so that it passes through the accumulator disc and is conveyed to the upper edge of the basket of the twisting spindle, where it is seized and retained for a certain length outside the two-for-one twisting spindle;
- extracting the bobbin mounted about the upper hollow mandrel and supporting it outside the spindle basket;
- joining by means of a knot the initial end of the yarn of the bobbin positioned about the lower hollow mandrel to the yarn portion of the upper feed bobbin supported outside the spindle basket, said knot being made at any

point of the yarn portion leaving the upper hollow mandrel and entering the lower hollow mandrel, said yarn being present within the upper and lower hollow mandrels by the effect of the aforesaid pneumatic threading;

- gripping the initial end of the yarn of the upper hollow mandrel feed bobbin, previously dragged out of the spindle by the air stream, and pulling said end until the knot of the two joined yarns emerges from the spindle basket, while at the same time the bobbin mounted about the upper hollow mandrel is being moved into the spindle basket to axially superpose the underlying bobbin;
- seizing at the upper edge of the twister spindle basket the initial ends of the yarns of the two feed bobbins and conveying them to the winding unit to commence the known two-for-one twisting operation.

With reference to the aforesaid, the accompanying drawings show a preferred embodiment which however is not binding or limiting in terms of the relative positions of the components, and the consequent simplifications which may derive therefrom. Said embodiment is described hereinafter in relation to the various operating stages of the method, with reference to the accompanying figures, in which:

Figure 1 is a partly sectional axonometric schematic front view of a double hollow mandrel twisting spindle with a frusto-conical bobbin mounted on the lower hollow mandrel housed in the twister spindle basket, said figure showing a head connected to a compressed air source and positioned above the twister spindle;

Figure 2 is a axonometric perspective schematic view of the detail of Fig. 1 at the moment in which the service operator takes a frusto-conical bobbin from any store to mount it on the upper hollow mandrel and resting on a lower disc which, as is well known to the expert of the art, separates the two feed bobbins when both are inserted one above the other in their spindle basket, said figure also showing the hand of the operator which has unwound the initial portion of yarn from the bobbin while held outside the spindle;

Figure 3 is a schematic axial section through the double hollow mandrel twisting spindle showing the outline of the two bobbins one above the other in the spindle basket, and with the initial portions unwound from said bobbins, the initial portion of the upper bobbin being held at a sufficient length by the operator and with it resting on the mouth of the central bore of the upper hollow mandrel, said figure representing the moment in which the head of the compressed air nozzle rests against the mouth of said central bore of the upper hollow mandrel;

Figure 4 is an enlarged schematic axial section through the upper part of Figure 3, showing the contact region between the lower surface of the head for injecting the compressed air stream and the surface of the mouth of the upper hollow mandrel;

Figure 5 is an enlarged schematic axial section through the upper part of Figure 3, representing the moment in which the compressed air injection head pushes the underlying upper hollow mandrel downwards and automatically activates, on termination of its pushing action, its injection nozzle for the compressed air stream which drags the initial portion of the upper feed bobbin through the central bores of the two overlying hollow mandrels;

Figure 6 is a schematic section on the line A-A of Figure 5, this figure showing the circular mouth of the central bore of the upper hollow mandrel released from contact with the lower thrust surface of the injection head for the compressed air stream, the overlying initial yarn portion of the feed bobbin being conveyed across said circular mouth;

Figure 7 is a schematic axial section through the double hollow mandrel twisting spindle showing the outlines of the two bobbins one above the other in the spindle basket, and with the initial portion unwound from the upper bobbin already drawn by the air stream through the central bores of the two coaxial hollow mandrels and through the hole in the accumulator disc to lie at the upper edge of the spindle basket of the twister, said figure also showing the two hollow mandrels thrust downwards and with the yarn braking device shifted sideways;

Figure 8 is a schematic axial section through the overall twisting spindle with the two feed bobbins, the lower bobbin being housed in the spindle basket while the upper bobbin is positioned and supported on a support table fixed rigidly to the front frame of the twister, said figure showing the joining of the end of the initial yarn portion unwound from the lower bobbin by a knot to a point of the yarn portion previously threaded through the hollow mandrels, said yarn portion of the upper bobbin extending from the exit of the lower hollow mandrel to the lower entrance of the upper hollow mandrel;

Figure 9 is a schematic axial section through the double hollow mandrel twisting spindle showing the outlines of the two bobbins one above the other in the spindle basket, and with the portions unwound from said bobbins already being pulled away from the upper edge of the twister spindle basket by the operator, by gripping with his hand that end of the initial portion unwound from

the feed bobbin which has been threaded through the overlying hollow mandrel.

In the figures, equal parts or parts of equal or equivalent function carry the same reference numerals.

Although the method described hereinafter refers to frusto-conical bobbins, it is adaptable to bobbins of cylindrical or any other shape.

For the purpose of overall clarity, those parts not necessary for understanding the invention are omitted from the figures, in that they are already known and because they are not concerned in the operation of the present invention.

In the accompanying drawings: 1 is the initial yarn portion unwound from the underlying bobbin 4, which has already been positioned about the lower hollow mandrel 40 in the spindle basket 7. The end of said initial yarn portion 1 is left free and lies outside the circular casing 6 of the twisting spindle 10; 3 is the initial yarn portion unwound from the overlying feed bobbin 2; 5 is the upper end of the hollow mandrel 40, ie the lower unwinding head, through the central bore 29 of which the yarns unwound from the feed bobbins 4 and 2 enter and slide to form the twisted yarn; 8 is the yarn accumulator disc of known type on the spindle 10; 12 is the duct through which the yarns 1 and 3 leave the disc 8; 11 is the upper end of the hollow mandrel 14, known as the upper unwinding head, through the central bore 19 of which the yarn 3 slides during the twisting process; 15 is the front frame of the twisting spindles 10, which are positioned one after the other to form the entire face of the twister; 16 and 18 are the conical tubes of the feed bobbins, said tubes centering the bobbins about the respective hollow mandrels; 20 is the longitudinal support element for the head 25 which effects the pneumatic threading by injecting compressed air, this latter originating from the hose 27 which is advantageously connected to the compressed air system of the factory or machine; 26 is the injection nozzle fed with compressed air via the tubular element 23, which can be rotated via the joint 22 fixed by the bracket 21 to the element 20; 13 is a support table fixed rigidly to the front frame 15 of the twisting spindles 10; 9 is a plate or disc fixed advantageously to the upper hollow mandrel, this plate as is well known to the expert of the art separating the two feed bobbins when both are inserted one above the other in the spindle basket; 24 is an angular surface portion which enables the initial wound yarn portion 3 to enter and slide through the bore 19 of the hollow mandrel during the pneumatic threading operation; 28 is the thrusting surface portion of the head 25 which presses against the upper end 11 of the hollow mandrel 14 to push the lower resting seat 33 of the yarn braking device 30 downwards; 44 is the pulley which rotates the known rotating part of the spindle 10. Said pulley 44 is normally rotated by a belt as is well known in the art; 30 is the expansion yarn braking device for controlling the yarn tension within the spindle. In this case the object shown in the figure is an expansion capsule, already known in the art, consisting of two cylindrical elements 32 and 34 positioned axially and held in their rest position pressing against the seats 31 and 33 by the elastic force of a helical spring 35 housed advantageously within its interior; 36 is a sleeve enclosing the lower hollow mandrel 40, which sleeve 36 can slide and is fixed as one piece to a hollow pin 37 which defines in its cavity the lower support seat 33 for the cylindrical element 34 of the yarn braking device 30; 38 is a helical spring housed in the cavity of the fixed bush 39, this latter supported by the fixed tubular element 41 of the spindle 10. Said helical spring 38 exerts a continuous upward thrust on the lower surface of the hollow pin 37; 42 is the end bush of the upper hollow mandrel 14. Said bush 42 is fixed as a single piece to the lower end of the hollow mandrel 14 and in moving axially downwards it makes contact with the top of the sleeve 36, causing it to move axially downwards; 46 is the duct which conveys compressed air into the injection nozzle 26 when the duct 46 is moved upwards to connect it to the pressure region 45, compressed air always being present in this latter region; 43 is the permanent magnet inserted into the wall 36 surrounding the lower hollow mandrel 40, said permanent magnet 43 moving axially downwards to lie in a position in front of the yarn braking device 30.

The operations involved in implementing the method of the present invention will now be described with reference to the figures of the accompanying drawings, which show a configuration simple to understand both constructionally and operationally.

It will be assumed that the spindle 10 is fed with frusto-conical feed bobbins 2 and 4 to provide yarns 1 and 3 which are to form the twisted yarn.

The bobbin 4 is inserted into the basket 7 so that it is housed about the lower hollow mandrel 40 of the spindle. Simultaneously, or beforehand, an initial portion of its yarn 1 of sufficient length is unwound and allowed to hang by a certain length outside the twisting spindle 10 (see Figure 1).

The feed bobbin 2 is then taken from any store and is firstly mounted about the hollow mandrel 14 to rest on the plate 19, after which having unwound its initial portion of wound yarn 3 it is mounted in the spindle basket 7 together with said hollow mandrel 14 and said plate 19 (see Figure 2).

The initial portion of wound yarn 3 is then held and its end rested on the mouth of the end 11 of the central bore 19 in the upper hollow mandrel 14

(see Figure 3).

The head 25 is then moved into contact with the mouth 11 of the central bore 19 by rotating into into the position 25a (see Figure 4). The head is then pressed downwards. The thrust surface 28, in contact with the end 11, urges the hollow mandrel 14 to move downwards together with the end bush 42. This latter by moving downwards makes contact with the sleeve 36 and pushes it downwards together with the hollow pin 37, the internal cavity of which forms the lower support seat 33, which by moving downwards releases the device 30 which is then attracted sideways by the permanent magnet 43 now positioned in front of said device 30. In this respect, the permanent magnet 43 which is rigid with the sleeve 36 is also moved downwards. At this moment the central bores 19 and 29 of the two hollow mandrels 14 and 40, which are superposed and coaxial, are free for the passage of the initial portion 3 unwound from the feed bobbin 2.

At the next moment the head 25 is pressed downwards with increased force by the operator, to assume the position 25b of Figure 5 and Figure 7. It is precisely at this moment that the thrusting force of the operator exceeds the force generated by the compressed air on the injection nozzle block 26, so that the duct 46 is moved upwards to communicate with the region 45 in which compressed air is present. This latter passes through said duct 46 and the orifice of the nozzle 26 to create a strong air stream which drags the initial yarn portion 3 downwards through the central bores 19 and 29 of the two coaxial hollow mandrels so that it emerges from the accumulator disc 8 via the duct 12. The same air stream conveys it to the upper edge of the basket 7 of the twister spindle 10 where it is gripped by the operator, who pulls out a certain length. The bobbin 2 is then extracted from the basket 7 and rested outside the spindle 10 on the table 13. Immediately afterwards, the operator joins by means of a knot 17 the initial end of the yarn 1 to any point of the yarn 3 between leaving the lower edge of the upper hollow mandrel 14 and entering the lower hollow mandrel 40 via its upper edge 5. After this, the operator grips the end (see Figure 8) of the initial yarn portion 3 and pulls said end until the knot 17 of the two joined yarns 1 and 3 leaves the basket 7 and the circular casing 6. At the same time the operator mounts the bobbin 2 in the spindle basket 7 in a position coaxial and vertical to the underlying bobbin 4 to then immediately convey the initial ends of the yarns 1 and 3 to the winding unit (not shown as it is of known type) to commence the the known two-for-one twisting operation.

The relative terminology such as "above" and "below" etc. is used in the description and/or claims only to describe the relationship of certain elements relative to others when the twisting spindle is in its normal vertical position, and must not be interpreted as limiting to this precise position.

Claims

1. A method for pneumatic threading in a two-for-one twister with a twisting spindle of double hollow mandrel type for forming a multiple twisted yarn, in which the two yarn feed bobbins are located coaxially one above the other in the spindle basket, each bobbin being mounted on its own hollow mandrel with the yarn unwinding upwards and each yarn directly entering the hollow mandrel of its own bobbin without being conveyed during its travel into the space surrounding the other bobbin, said method being characterised by:
   - seizing the initial portion of wound yarn from a feed bobbin and unwinding it to leave it hanging by a sufficient length outside the twisting spindle, said feed bobbin having previously been positioned in the spindle basket about the lower hollow mandrel;
   - seizing the initial portion of wound yarn from a feed bobbin and unwinding it in order to retain it while said feed bobbin is being inserted into the spindle basket about the upper hollow mandrel;
   - resting said retained initial yarn portion on the mouth of the central bore of the upper hollow mandrel;
   - bringing up to the mouth of the central bore of the upper hollow mandrel a head connected to a compressed air source;
   - pressing said head against the underlying upper hollow mandrel so that this latter moves downwards and makes contact with and then pushes downwards the sleeve which is rigid with the lower support seat for the expansion yarn braking device, to enable this latter device to move sideways and expose the central bore of the lower hollow mandrel;
   - injecting compressed air through an injection nozzle, the air stream from which drags the initial yarn portion of the feed bobbin mounted about the upper hollow mandrel, in a downward direction through the central bores of the two coaxial hollow mandrels, so that it passes outside the accumulator disc and is conveyed to the upper edge of the basket of the twisting spindle, where it is seized and retained for a certain length outside the two-for-one twisting spindle;
   - extracting the bobbin mounted about the

upper hollow mandrel and supporting it outside the spindle basket;

- joining by means of a knot the initial end of the yarn of the bobbin positioned about the lower hollow mandrel to the yarn portion of the upper feed bobbin supported outside the spindle basket, said knot being made at any point of the yarn portion leaving the upper hollow mandrel and entering the lower hollow mandrel, said yarn being present within the upper and lower hollow mandrels by the effect of the aforesaid pneumatic threading;
- gripping the initial end of the yarn of the upper hollow mandrel feed bobbin, previously dragged out of the spindle by the air stream, and pulling said end until the knot of the two joined yarns emerges from the spindle basket, while at the same time the bobbin mounted about the upper hollow mandrel is being moved into the spindle basket to axially superpose the underlying bobbin;
- seizing at the upper edge of the twister spindle basket the initial ends of the yarns of the two feed bobbins and conveying them to the winding unit to commence the known two-for-one twisting operation.

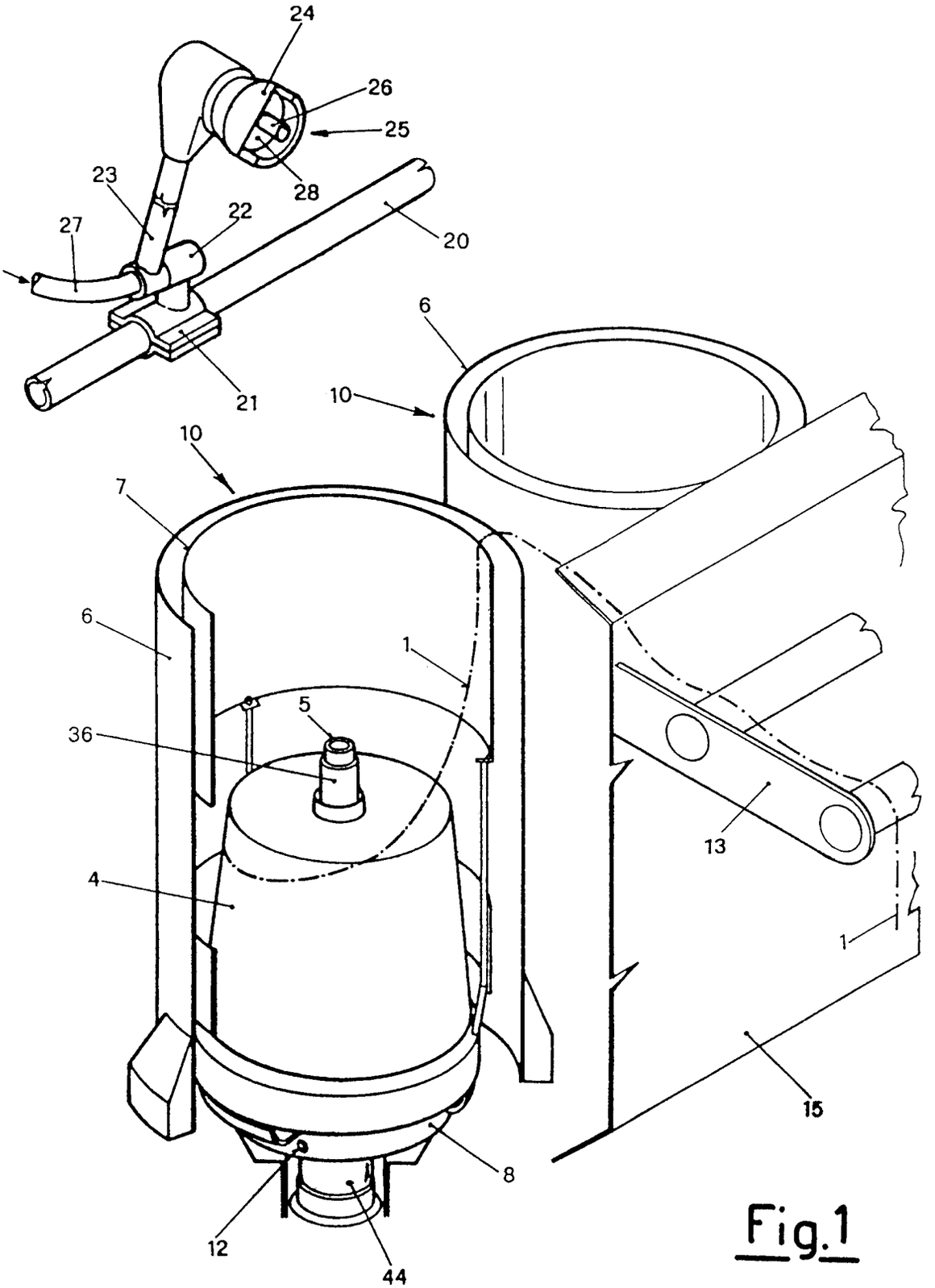

Fig.1

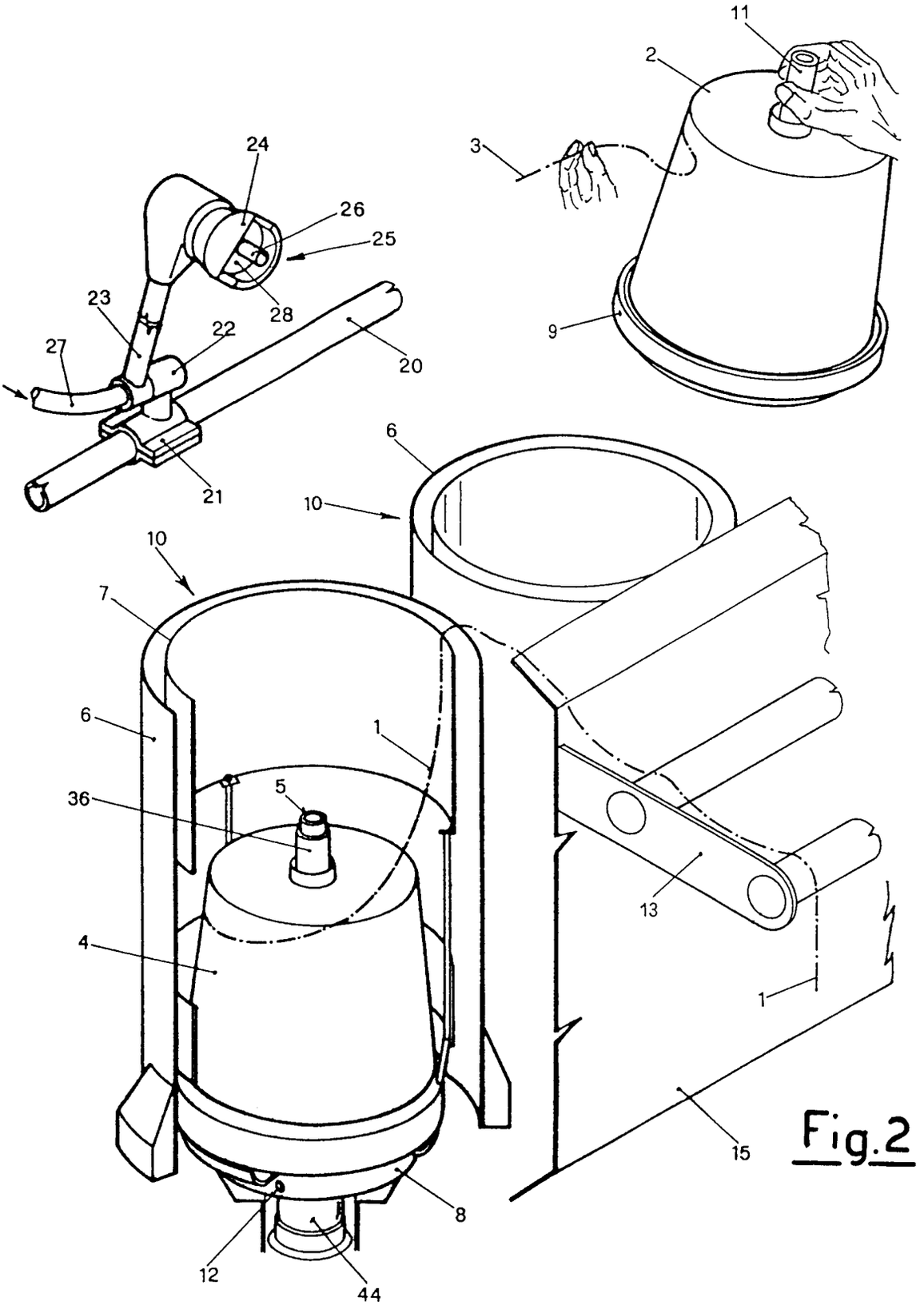

Fig.2

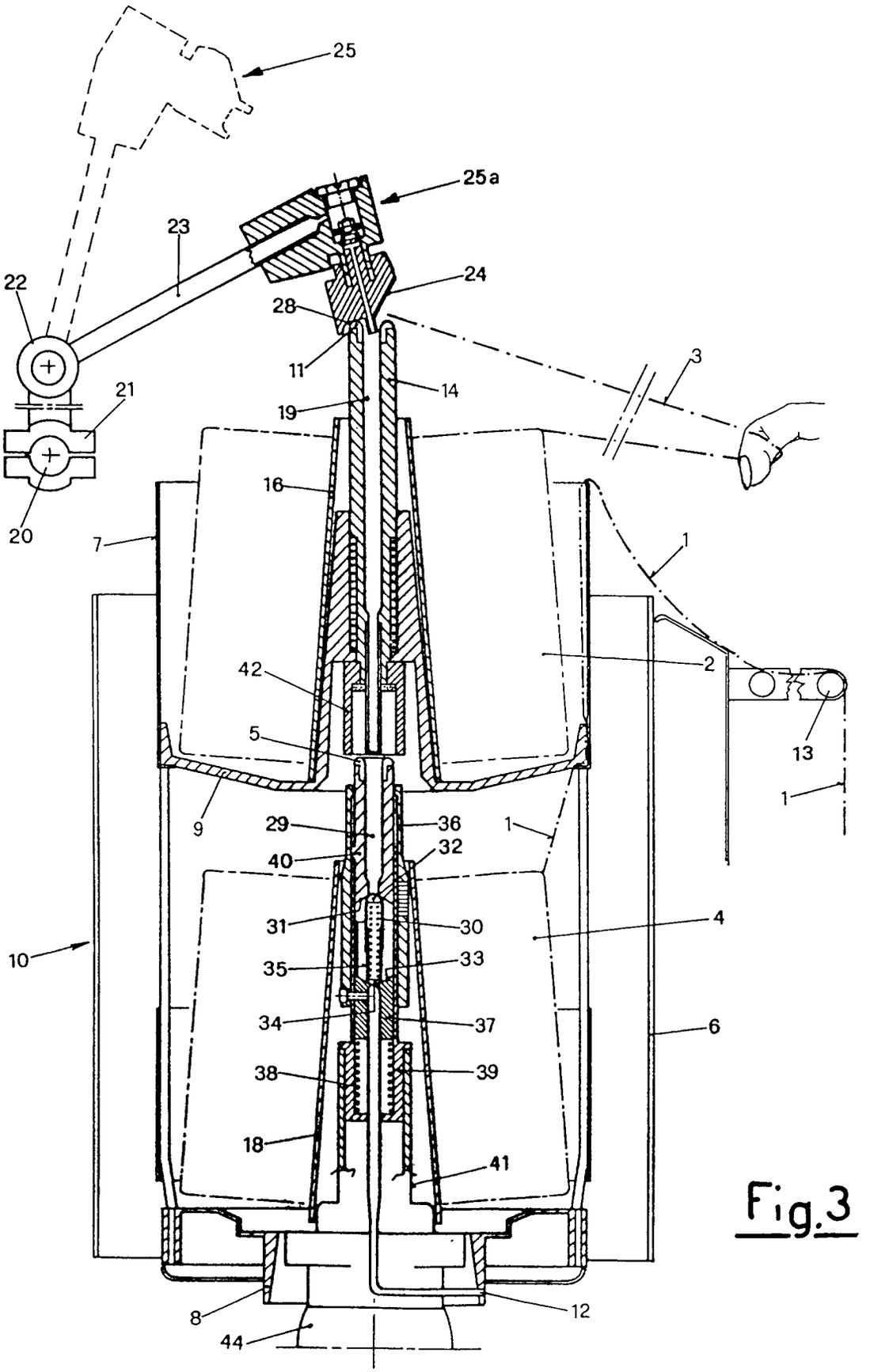
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Fig.3

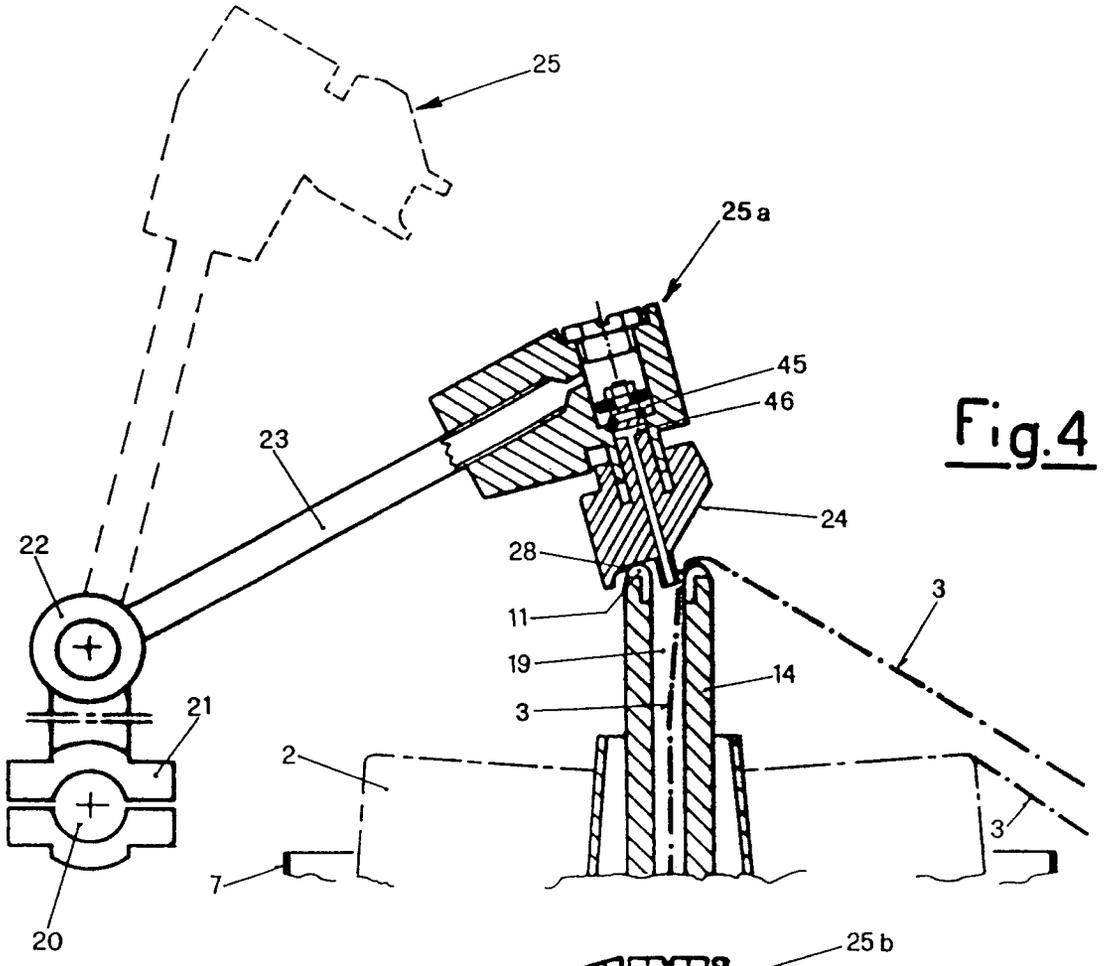


Fig.4

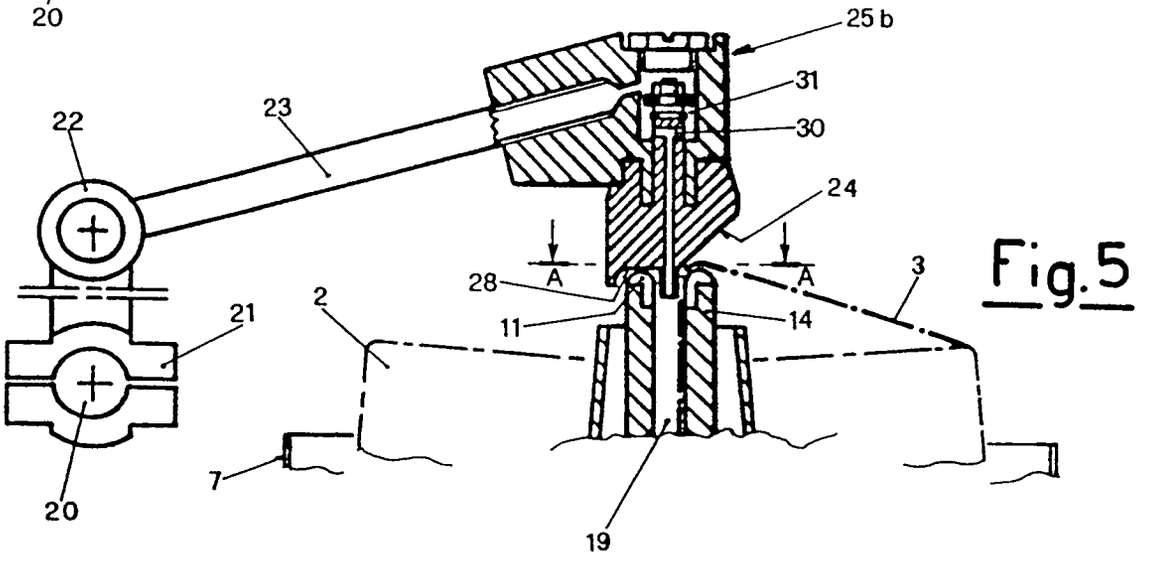
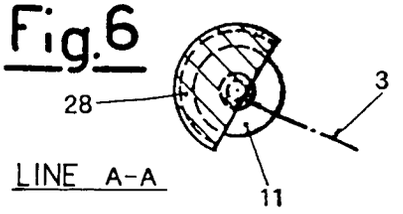


Fig.5

Fig.6



LINE A-A

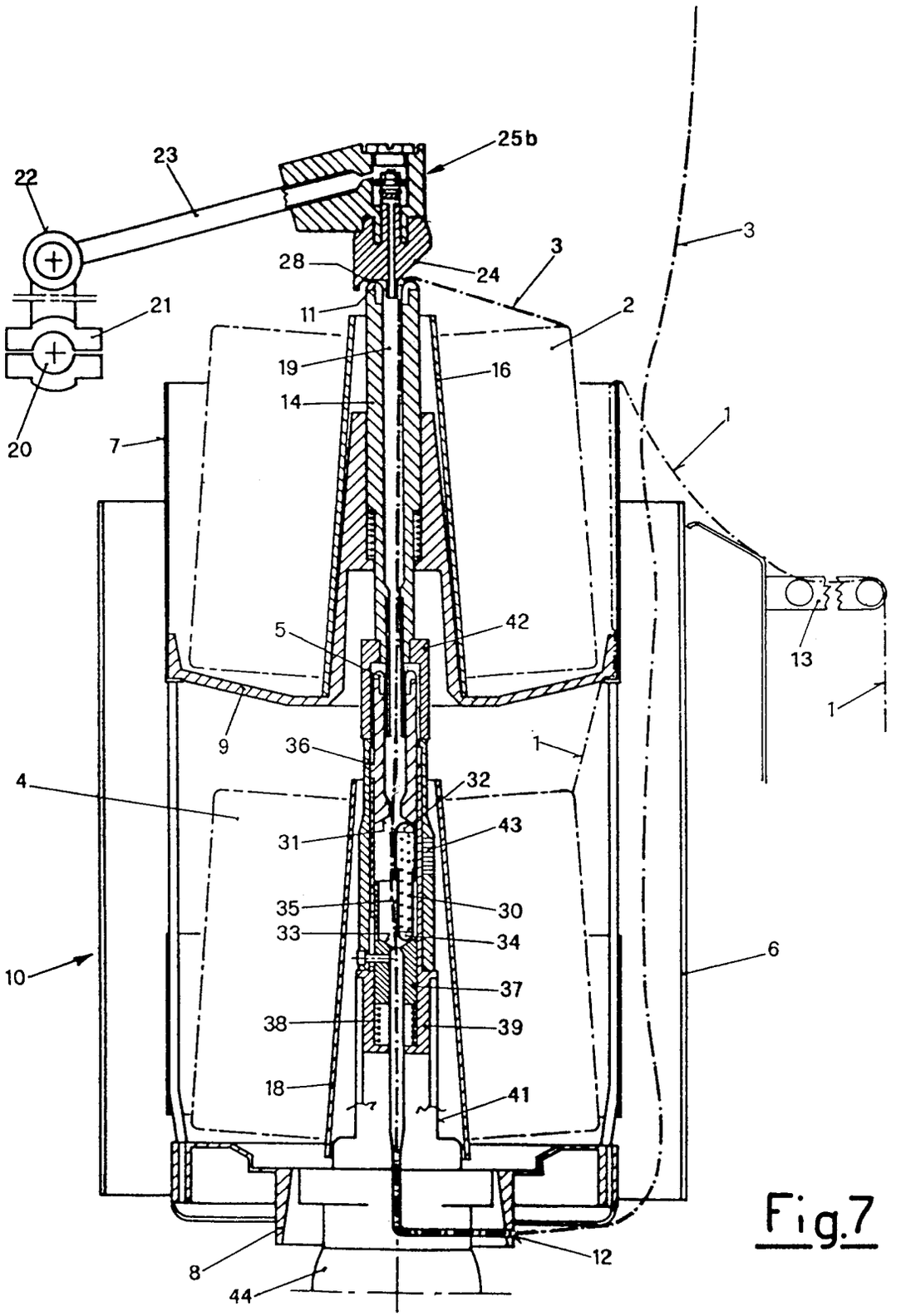

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Fig.7

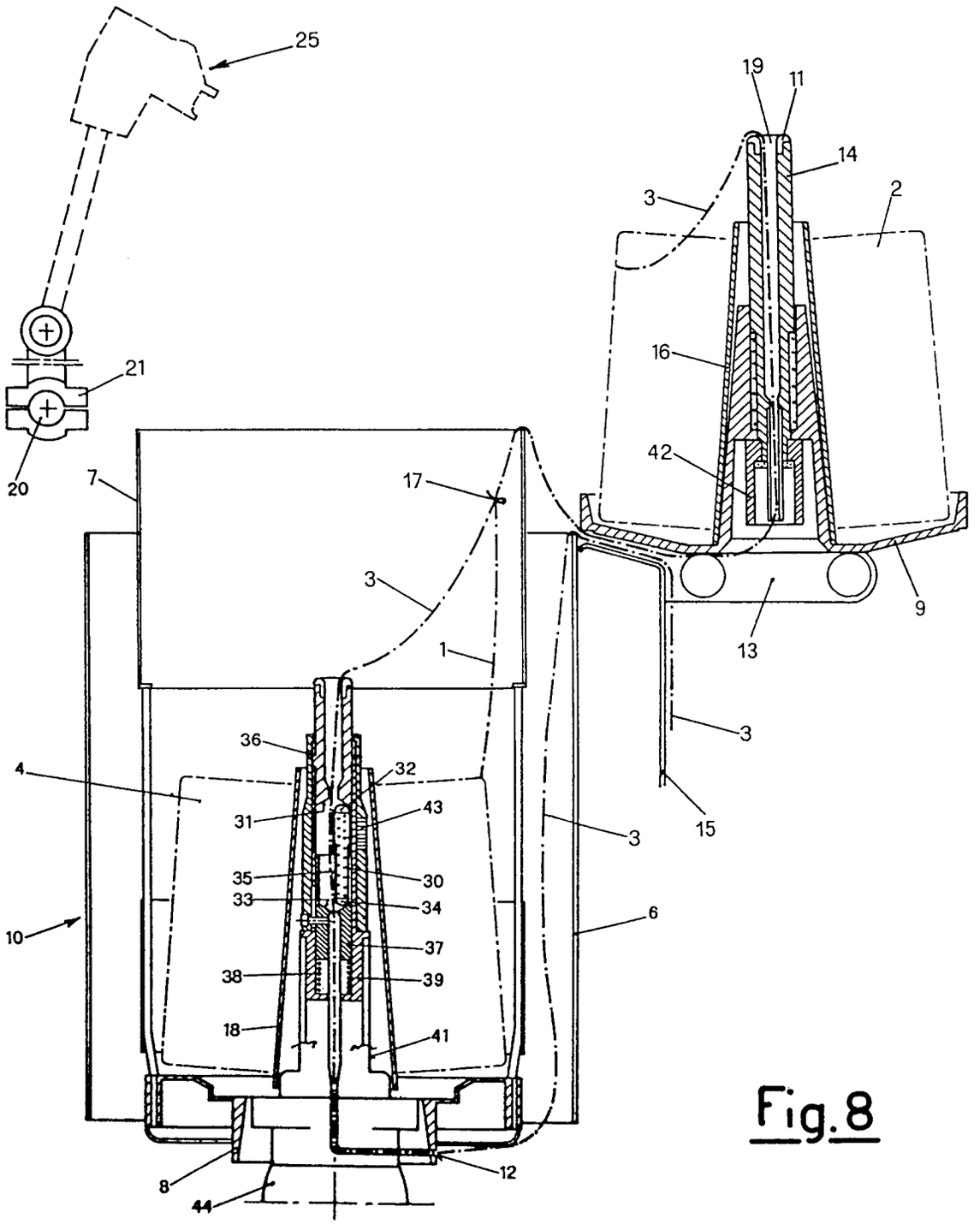
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Fig.8

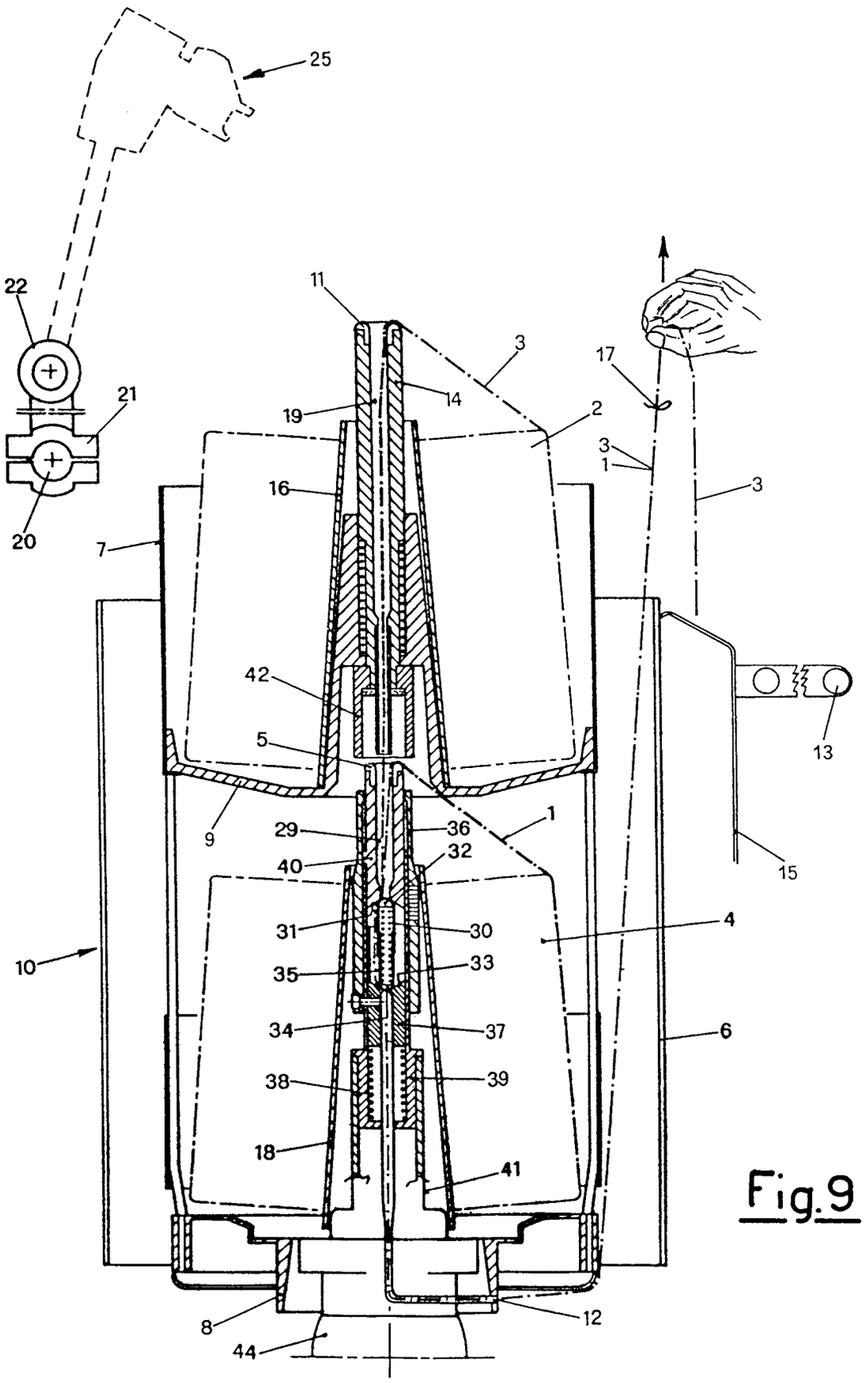
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Fig.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 20 1569

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	EP-A-0 383 960 (PALITEX PROJECT-COMPANY) * figures *	1	D01H15/007 D01H1/10
A	FR-A-2 367 692 (PALITEX PROJECT-COMPANY) * figures *	1	
A	DE-B-2 544 456 (SAURER-ALLMA) * figures *	1	
A	EP-A-0 051 547 (VERDOL) * figures *	1	
A,D	EP-A-0 417 850 (SAVIO)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
D01H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 AUGUST 1992	RAYBOULD B.D.J.

CATEGORY OF CITED DOCUMENTS

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