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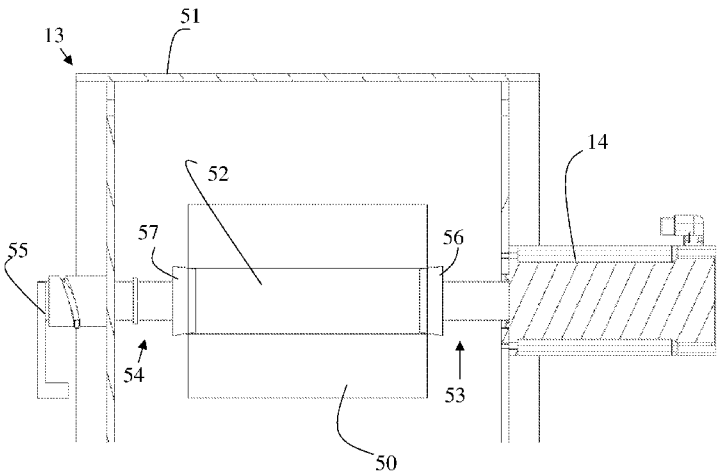

Fig. 2

(57) Abstract: Described are, among other things,abobbin drive unit (13) comprising a bobbin motor (14) configured to rotate a bobbin (50) around the axis of a bobbin tube (52). The bobbin drive unit comprises a first attachment (53) with a bearing configured to hold a first end of the bobbin tube and a second attachment (54) with a bearing configured to hold a second end of the bobbin tube. The bobbin can then rotate when attached in both ends of the tube. Hereby a bobbin drive unit configured to hold the bobbin in both tube ends of the bobbin is provided. By securing both ends of the bobbin tube, rotation of the bobbin can take place at a high speed without creating vibrations or oscillation to the bobbin drive or surrounding components that would otherwise risk interfering with sensors or deteriorate components and potentially reduce the life time of components of a yarn feeding arrangement.

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BOBBIN DRIVE UNIT, YARN FEEDING ARRANGEMENT AND A HOLDER FOR HOLDING A BOBBIN

TECHNICAL FIELD

The present disclosure relates to a bobbin drive unit and devices related thereto.

BACKGROUND

A general development trend in weaving is that the speed of the weaving machine is constantly being increased. Another trend is the increased use of flat or tape formed yarns, which shall be inserted without any twist. Examples of such yarns are polypropylene tape, carbon fiber tape, aramid and glass fiber tape. Presently the speed of a rapier weaving machines weaving flat or tape yarns without twist is limited by the low capacity of the zero twist yarn feeding devices that exist today.

Existing systems for feeding yarns without twist (zero-twist) typically have an un-wind motor that is controlled by measuring the length of a big loop buffer that is located between the bobbin and the weaving machine. The loop can be either free hanging or have a mechanical member that forms the loop by gravity, pressurized air or by under-pressure (aspirator). The existing systems can be considered as storage feeders, where the weaving machine can take the amount of yarn it needs, so called “negative yarn feed” or “feed on demand”.

WO2018013033 describes a yarn feeding arrangement configured to enable weaving of textile at high speed with zero-twist using a rapier weaving machine. The weft yarn feeding arrangement is adapted to control of weft yarn by at the same time control the speed of a motor driven bobbin and a motor driven loop buffer device. The motor driven bobbin is driven to supply the correct amount of weft yarn during each cycle of the weaving machine.

There is a constant desire to improve yarn feeding to textile machines. Hence, there is a need for an improved yarn feeding device.

SUMMARY

It is an object of the present invention to provide an improved yarn feeder arrangement.

This object and/or others are obtained by the weft yarn feeding device as set out in the appended claims.

As has been realized, the high speed in the weaving industry today and in the future will put high demands on the components to make the yarn feeding arrangement work properly.

This problem is solved by providing a bobbin drive unit comprising a bobbin motor configured to rotate a bobbin around the axis of a bobbin tube to un-roll yarn from the bobbin. The bobbin drive unit comprises a first attachment with a bearing configured to hold a first end of the bobbin tube and a second attachment with a bearing configured to hold a second end of the bobbin tube. The bobbin can then rotate when attached in both ends of the tube. Hereby a bobbin drive unit configured to secure the bobbin in both tube ends of the bobbin is provided. By securing both ends of the bobbin tube, rotation of the bobbin can take place at a high speed without creating vibrations or oscillation to the bobbin drive or surrounding components that would otherwise risk interfering with sensors or deteriorate components and potentially reduce the life time of components of a yarn feeding arrangement. This can be particularly advantageous when the bobbin drive unit is configured to tangentially un-roll yarn from the bobbin in a so called zero twist feeding.

In accordance with one embodiment, at least one of said first and second attachment is provided with a quick release mechanism, i.e. a mechanism allowing for quick and easy detachment of the attachment(s). The quick release mechanism can be any type of known

quick release mechanism that enables release of the attachment in a single action without the need to, for example, unscrewing a nut or bolt or a similar action requiring multiple actions to be performed and which are time consuming and can require the use of a tool. Hereby the bobbin can be changed fast and easily without the need for use of a tool while being secured in both ends when rotating in the bobbin drive unit.

In accordance with one embodiment a shaft is provided, the shaft being connectable to the inside of the bobbin tube. Hereby a holder for attaching both sides of the tube of the bobbin to the bobbin drive unit can be provided that is easy to change.

In accordance with one embodiment, the shaft is in one end connected to a motor and in a second end connected to a support for holding the shaft. Hereby a mechanism whereby the shaft can be rotated by one single motor is obtained.

In accordance with one embodiment, the shaft is in both ends connected to a motor. Hereby a mechanism whereby the shaft can be rotated by two motors is obtained so that an increased force can be applied for rotating the bobbin without having to make use of a bigger motor and whereby the requirement for traction is not increased when accelerating the bobbin since both ends of the tube can be used to gain traction.

In accordance with one embodiment, a bobbin holder for rotatably holding one end or both ends of the bobbin tube is provided, wherein the bobbin holder is connected to a motor of the bobbin drive. Hereby an alternative mechanism for attaching the bobbin to the bobbin drive unit is obtained wherein the bobbin does not need to be connected to a shaft.

In accordance with one embodiment, the bobbin holder comprises at least a first and preferably also a second conical element arranged to be attached to the first end and second end of the tube, respectively. Hereby an efficient arrangement for holding the bobbin in

place is provided. The conical element can take up some deviations between the inner diameter of different tubes on different bobbins.

In accordance with one embodiment the bobbin holder is formed by a cylindrical element configured to be axially inserted to the tube to center the bobbin. The holder can also comprise an element to axially press against the side of the bobbin to transfer a force from the motor and rotate the bobbin.

In accordance with one embodiment supports are provided at each side of the bobbin to prevent the bobbin from falling down when released from the attachments.

In accordance with a second aspect of the invention, a yarn feeding arrangement comprising a yarn buffer device connected to the bobbin drive unit according to the above is provided. Hereby the entire yarn feeding arrangement can benefit from the reduced vibrations caused by holding the bobbin, in particular the bobbin tube, in both ends while rotating the bobbin by the bobbin drive unit.

In accordance with a third aspect of the invention a holder for holding a bobbin is provided, the holder comprising a shaft, the shaft comprising an expandable part configured to lock to the inside of a tube of a bobbin. Hereby an efficient holder for holding a bobbin that is fixed on both sides of the bobbin while being rotated by a bobbin drive unit is provided.

In accordance with one embodiment, the expandable part comprises lock elements configured to press against the inside of the tube of a bobbin. Hereby a mechanism whereby the expandable part can lock with high friction to the tube is provided.

In accordance with one embodiment, the expandable part comprises lock elements configured to penetrate into the inside of the tube of a bobbin. Hereby a mechanism whereby the expandable part can lock efficiently to the tube is provided.

In accordance with one embodiment, the lock elements are provided with recesses. Hereby the lock elements can be held in place when outside the tube by e.g. an O-ring placed in the recesses.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in more detail by way of non-limiting examples and with reference to the accompanying drawings, in which:

- Fig. 1 is a view illustrating a weft yarn feeding arrangement,
- Figs. 2 and 3 illustrate a bobbin drive unit in accordance with a first embodiment,
- Figs. 4 and 5 illustrate a holder for a bobbin,
- Figs. 6 and 7 illustrate a holder when placed in a support for rotating a bobbin.,
- Figs. 8 and 9 illustrate a bobbin drive unit in accordance with a second embodiment,

DETAILED DESCRIPTION

In the following a weft yarn feeding arrangement and in particular the bobbin drive unit that can be used in such a weft yarn feeding arrangement will be described. In the Figures, the same reference numerals designate identical or corresponding elements throughout the several figures. It will be appreciated that these figures are for illustration only and are not in any way restricting the scope of the invention. Also, it is possible to combine features from different described embodiments to meet specific implementation needs.

In Fig. 1, an exemplary weft yarn feeding arrangement 12 comprising a motor driven bobbin 13 is depicted. The unit for rotating a bobbin is also referred to as a bobbin drive unit 13 herein when no bobbin is placed in the drive unit. The exemplary yarn feeding arrangement of Fig. 1 comprises a motor driven loop buffer device 16. The arrangement 12 can be used to feed a yarn with zero twist. In the arrangement 12, weft yarn 40 is tangentially un-rolled from the motor driven bobbin 13. The motor driven bobbin 13 is connected to a motor 14.

The motor 14 can in accordance with some embodiments be directly connected to a shaft on which the bobbin in placed. In accordance with some embodiments the motor is connected via a gearing mechanism or the bobbin is rotated by the motor 14 by a line shaft. Other configurations for rotating the bobbin by controlling the motor 14 can be envisaged. The weft yarn passes the motor driven loop buffer device 16, which is adapted to form a weft yarn buffer. The weft yarn is supplied from the motor driven buffer device 16 to a weaving machine 10. The weaving machine 10 can for example be a rapier weaving machine or a projectile weaving machine. The motor driven buffer device 16 can be formed by a yarn loop-forming arm 22. The arm 22 can be moved to form an adjustable buffer of weft yarn to be supplied to the weaving machine 10. The movements of the arm 22 are achieved by a motor 18 connected to the arm 22. The arm can be connected either directly to the motor shaft or via a gear arrangement to the motor. A force sensor or a tension sensor 29 can also be provided to detect and output a signal representing the actual yarn tension. In the set-up in accordance with Fig. 1 the weft yarn inserted in to the weaving machine will always have a controlled yarn tension, i.e. there will be no loose yarn that can be drawn into the weaving machine. The arm motor 18 and also the motor 14 of the motor driven bobbin 13 can be controlled by a controller 32 as will described in more detail below.

In accordance with one embodiment the motor driven bobbin 13 is configured to unroll the bobbin by a center drive as is shown in Fig. 1.

When controlling a weft yarn feeding arrangement 12 as described above, a controller 32 can be used. The controller can be provided with control data to control the speed of the motor 14 driving the bobbin and the movement of the motor driven loop buffer device 16. By controlling the motor driven bobbin 13 and motor driven loop buffer device 16, weft yarn can be supplied to the weaving machine correctly at high weaving speed.

When using some types of yarn feeding arrangements, such as the one described above for providing zero twist feed of yarn, it is not possible to connect the end tail to a new bobbin.

As a consequence, for each bobbin exchange, the weaving machine is stopped and remain stopped until the bobbin is exchanged and the machine can be restarted.

For reasons of high productivity, it would be advantageous if the exchange of bobbin can be made fast to minimize the down time of the weaving machine.

In conventional yarn feeding arrangements where the bobbin is rotated by a motor, or brought to rotation by the yarn drawn of by the weaving machine, the bobbin is typically fixed to a shaft that sticks out from the motor. The shaft has a free end and the tube of the bobbin can be entered onto the free end of the shaft.

However, in high speed applications that can be implemented using the yarn feeding arrangement depicted in Fig. 1, it has been discovered that the fixing of the bobbin to the shaft as performed in conventional systems can provide problems. One problem has been found to result from the configuration with the shaft rotating the bobbin in one end and having one free end. The rotation in one end can give vibrations in the system when the other end is free. These vibrations or oscillations or similar can seriously disturb the sensor signals used by the control system. When the sensor signals are disturbed they can become unreliable and the performance of the control system control system will typically be impaired. An additional disadvantage caused by such vibrations and oscillations is that the vibrations and oscillations can propagate to the rest of the yarn feeding arrangement and potentially disturb other arts as well as reduce life length of components in the system.

Thus, when increasing the speed of e.g., a yarn feeding arrangement as depicted in Fig. 1, an increased stability and also an increased demand to transfer a high torque from the motor to the bobbin at acceleration is typically required.

This can be obtained by attaching the tube of the bobbin in both ends. Further to facilitate bobbin exchange when the bobbin is attached in both ends, the attachments used to fix the

bobbin can be provided with a quick release mechanism. The attachments used are preferably designed to allow for bobbins with different length of the tube and also for different inner diameters of the tube.

In accordance with one embodiment, a first end of the bobbin is connected to a motor that drives it, and the other, second, end is connected to a shaft part that is rotatably mounted with a bearing. This second end can advantageously be movable in axially, or mainly axially direction by a quick release mechanism.

In Fig. 2 a yarn feeding arrangement comprising a bobbin drive unit 13 is depicted. The bobbin drive unit 13 comprises a motor 14. The motor 14 is configured to rotate a bobbin 50. The bobbin 50 has a spool body with a tube 52. In use, the driving of the motor 14 will rotate the bobbin 50 around the axis of the tube 52 to thereby un-roll weft yarn from the bobbin 50. A support frame 51 is provided to support all parts of the bobbin drive unit 13. In accordance with one embodiment, the bobbin drive unit 13 comprises a first attachment 53 with a bearing configured to hold a first end of the tube 52 and a second attachment 54 with a bearing configured to hold a second end of the tube such that the bobbin 50 can rotate when attached in both ends of the bobbin drive unit to feed yarn to a weaving machine. Thus, bearings are provided at both sides of the ends of the bobbin tube. The bearings can be part of a motor, or separate bearings can be provided. Hereby the bobbin 50 can rotate while being secured at both ends of the bobbin tube. In other words, when in operation there will be no free end of the bobbin tube that can cause vibrations.

The attachments 53, 54 can in some embodiments comprise a bobbin holder 56, 57 for rotatably holding both ends of the tube, at least one of the bobbin holder(s) being connected to a motor 14 of the bobbin drive unit 13. The bobbin holders 56, 57 can be formed by conical elements that when brought towards each other connect to the tube 52 by a clamping force that locks the attachments 56, 57 to the tube. The conical elements will have a dimension that fits with the inner diameter of the tube 52. To enable the transfer of a high

torque, especially during acceleration and retardation of the bobbin, the conical element at the side of the motor 14 can have a high friction surface that provides a friction above some set threshold value. In one embodiment the conical part can also be provided with a sharp edge such as knife-like parts that penetrates the surface of the bobbin tube in order to get a connection strong enough to transmit the high torque that is necessary for a high acceleration or retardation. Other solutions to obtain such a transmission is of cause also possible.

The holder in the other end can in accordance with some embodiments be formed by a similar conical element and be fixed with a bearing to a device that makes it easy to open in axial direction, or mainly in axial direction, see below. This conical element does not however need to have any extra measures for high friction to the bobbin center when it is not adapted to transfer torque from a motor. As different bobbin types have different length and different inner diameter of the tube 52, the second attachment 54 advantageously has means to adapt to a varying tube diameter and or tube length, for example by a mechanism configured to move the attachment in an axial direction. Also, the conical elements can be exchangeable and the shape of the conical elements themselves allow for some variation in bobbin tube diameter. Settings to adjust for a new bobbin tube length and or bobbin tube diameter is preferably done when switching from one bobbin type to another bobbin type. The holder can have other shapes than conical elements. For example, a cylindric portion to center the tube and a high friction part connecting to the tube. Other holders are also envisaged.

In accordance with some embodiments one or both of the attachments are provided with a quick release mechanism 55. The quick release mechanism 55 can be of several types. In Fig. 2 the quick release mechanism 55 is of a mechanical type being operated by turning a lever. In accordance with some embodiments the quick release mechanism is a pneumatic type mechanism, i.e. a quick release mechanism working with pneumatics. In accordance with some embodiments the quick release mechanism is a hydraulic type mechanism, i.e. a

quick release mechanism working with hydraulics. In such types of quick release mechanisms, the quick release mechanism can be a pneumatically or hydraulic cylinder that opens the bobbin holders upon command from an operator or automatically by a command from a controller 32 (see Fig. 1) when an end of bobbin sensor has detected that the bobbin is almost finished and the yarn feeding arrangement is stopped for bobbin switch.

Alternatively, the quick release mechanism 55 can consist of an electrical motor that opens the bobbin holders in the same way as cylinders are opened for a hydraulic or pneumatic based quick release mechanism. In another embodiment the quick release mechanism can be an arrangement based on a spring providing a spring force. The spring force can partly or fully alter the force needed to hold or release the quick release mechanism.

In Fig. 3, the bobbin drive unit 13 is depicted with the quick release mechanism 55 in an open state. In the open state, the bobbin 50 can be removed and a bobbin exchange can take place.

In Fig. 4 another type of holder 66 for a bobbin tube 52 is depicted. The holder 66 comprises a shaft 62 with an expandable part 67 that fits to the inner diameter of the tube 52 in the center of the bobbin. To enable the transfer of the high torque, especially during acceleration and retardation of the bobbin, the expandable part 67 can in some embodiments be equipped with lock elements 69 or similar that can expand towards the inside of the tube of the bobbin. The lock elements can in accordance with one embodiment have knives or other sharp parts to penetrate into the tube of the bobbin. The tube is often made of a paper or plastics material.

The shaft 62 is designed to be easily removable from both the side where motor is provided and the other side which typically is a support side. The shaft 62 can lock to the inside of the bobbin with the expandable part 67, or to the ends with for example cones or other elements. In a weaving mill there can be several such holders 66 with shaft 62 for each

channel of a yarn feeding arrangement, for example two holders can be used. One holder 66 can then be mounted on the bobbin in use, and another holder 66 can be mounted on the bobbin next to be used so that the bobbin is ready for a fast and easy replacement when the bobbin in use is finished. The holder 66 with shaft 62 and its fixation hereby provides for a design that allows easy and fast exchange of bobbins.

In Fig. 4, the holder 66 is depicted in a position with the expandable part retracted. In Fig. 5, the expandable part is in a projected position with lock elements 69 projecting out from the expandable part to attach to an inner surface of a bobbin tube thereby connecting in a locked position the bobbin 50. The lock elements 69 can be provided with recesses 63. The recesses 63 can be provided on the radial outside of the lock elements 69. The recesses 63 can be configured to receive an elastic member such as an O-ring that can be provided to keep the lock members in place when the holder 66 is located outside a bobbin tube 52.

In Fig. 6, the holder 66 is depicted when placed and locked in a tube 52 of a bobbin 50. The lock elements 69 are in contact with the inside of the tube 52.

Fig. 7 is similar to Fig. 6, but in Fig. 7 the lock elements 69 are retracted and the holder 66 is freed to be removed from the tube 52. Thus, there will be a space 68 between the lock elements 69 and the tube 52.

In Fig. 8, the holder 66 is showed in bobbin drive unit 13. The bobbing drive unit 13 is provided with a quick release mechanism 55. The quick release mechanism 55 is of a mechanical type but of another design than the quick release mechanism in Fig. 2 and is usually referred to as a toggle clamp where a lever is pulled to release the mechanism. In Fig. 8, the quick release mechanism 55 is in a closed position in which the holder 66 is locked in the bobbin drive unit 13. Any other type of quick release mechanisms such as excentre lock mechanisms can be used. In accordance with some embodiments, a release mechanism assembly not requiring separate tool to lock or release the bobbin can be used.

Fig. 9 is similar to Fig. 8. In Fig. 9, the quick release mechanism 55 is in an open position in which the holder 66 can be released from the bobbin drive unit 13. Fig 9 further shows supports 70 for an easier exchange of a bobbin 50. At exchange of the bobbin 50, the quick release 55 is opened and the bobbin tube needs to be supported to not fall out. This can be solved by manually holding the bobbin 50 during exchange. However, by providing a support 70 on the bobbin drive unit at each side of the bobbin, the bobbin 50 will stay in place even when the bobbin is released. The supports 70, will typically allow the bobbin to fall down a few mm, e.g. 1 – 10 mm, that can be the distance from the bobbin tube outside diameter to the support. When putting in a new full bobbin, the bobbin can often weight up to 6 kg, sometimes even up to 12 kg. As is easily understood, it can be difficult to hold the bobbin and place it in a correct position with only one hand and at the same time lock the quick release with the other hand. With the support 70, the bobbin 50 can be placed in an entering position using both hands and then the quick release can be closed. If conical entering parts are used as holders, the bobbin tube will be centered automatically. If other types of holders are used, the operator may need to center the bobbin tube manually but in this case the operator can use one hand to center one end of the bobbin tube at the time. The gap between the support and the bobbin tube outside diameter is preferably as short as possible, but still secure. The gap is secure when in operation with the bobbin rotating, the support does not touch the bobbin tube. Typically, the distance can be about 1 - 10 millimeters.

CLAIMS

1. A bobbin drive unit (13) configured to unroll yarn from a bobbin (50), the bobbin drive unit comprising a bobbin motor (14) configured to rotate the bobbin (50) around the axis of a bobbin tube (52), the bobbin drive unit comprising a first attachment (53) with a bearing configured to connect from a first end of the bobbin tube and a second attachment (54) with a bearing configured to connect from a second end of the bobbin tube such that the bobbin can rotate in bearings at both side ends of the tube.

2. The bobbin drive unit according to claim 1, wherein at least one of said first and second attachment is provided with a quick release mechanism (55).

3. The bobbin drive unit according to claim 1 or 2, comprising a shaft (62), the shaft being connectable to the inside of the bobbin tube.

4. The bobbin drive unit according to claim 3, wherein the shaft is in one end connected to a motor and in a second end rotatably connected to a support for holding the shaft.

5. The bobbin drive unit according to claim 3, wherein the shaft is in both ends connected to a motor.

6. The bobbin drive unit according to claim 1 or 2, comprising a bobbin holder (56, 57) for rotatably holding one end or both ends of the bobbin tube, the bobbin holder being connected to a motor of the bobbin drive.

7. The bobbin drive unit according to claim 6, wherein the bobbin holder comprises a at least a first conical element arranged to be attached to at least one of the first end and the second end of the tube.

8. The bobbin drive unit according to claim 6, wherein the bobbin holder comprises a cylindrical part configured to be axially inserted into the tube.

9. The bobbin drive unit according to any one of claims 1 – 8, wherein the bobbin drive unit comprises supports (70) provided at each of said first and second attachment for preventing a bobbin from falling down when released from said first and second attachments.

10. The bobbin drive unit according to any one of claims 1 – 9, wherein the bobbin drive unit is configured to rotate the bobbin to tangentially un-roll yarn from the bobbin.

11. A yarn feeding arrangement (12) comprising a yarn buffer device (16) connected to the bobbin drive unit according to any one of claims 1 – 10.

12. A holder (66) for holding a bobbin, the holder comprising a shaft (62), the shaft comprising an expandable part (67) configured to lock to the inside of a tube of a bobbin.

13. The holder according to claim 12, wherein the expandable part comprises lock elements (69) configured to press against the inside of the tube of a bobbin.

14. The holder according to claim 12, wherein the expandable part comprises lock elements (69) configured to penetrate into the inside of the tube of a bobbin.

15. The holder according to claim 13 or 14, wherein the lock elements (69) are provided with recesses (63).

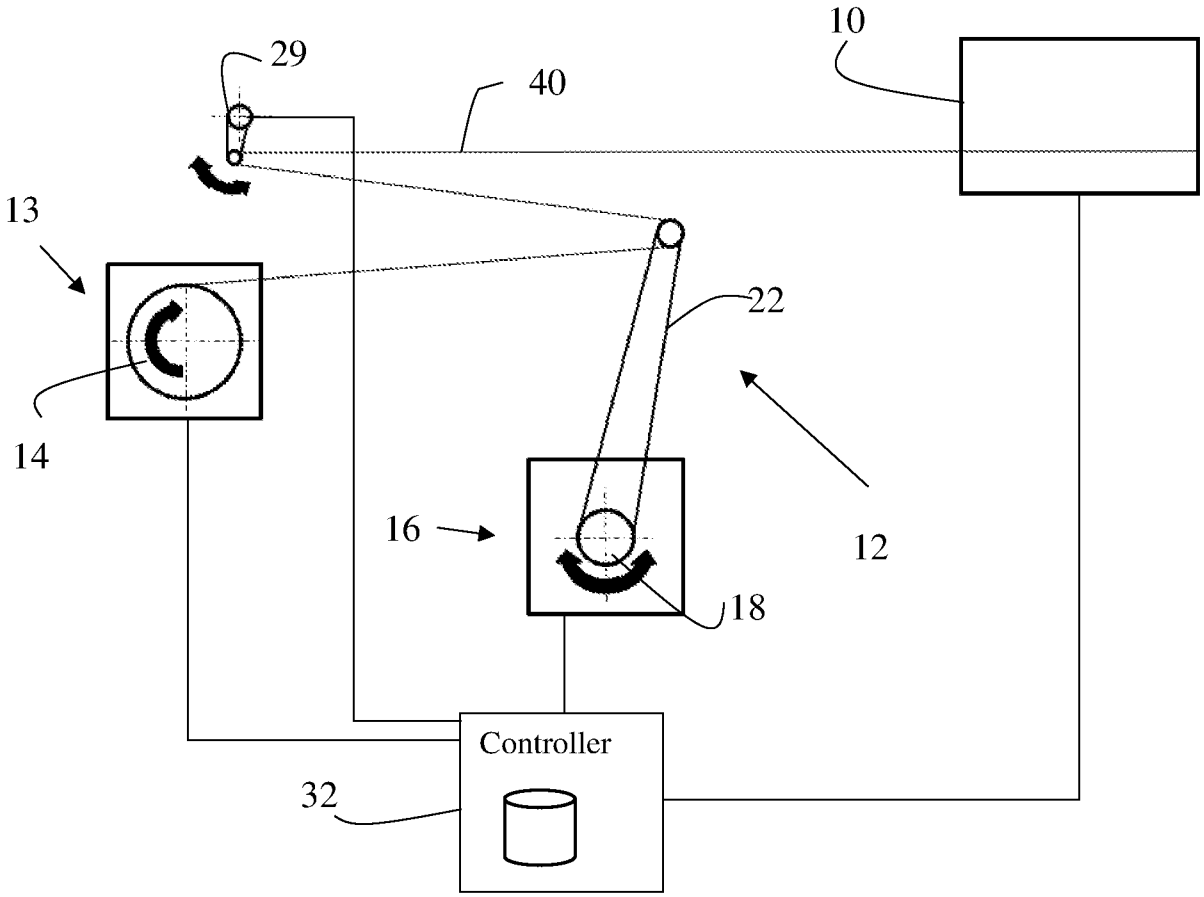

Fig. 1

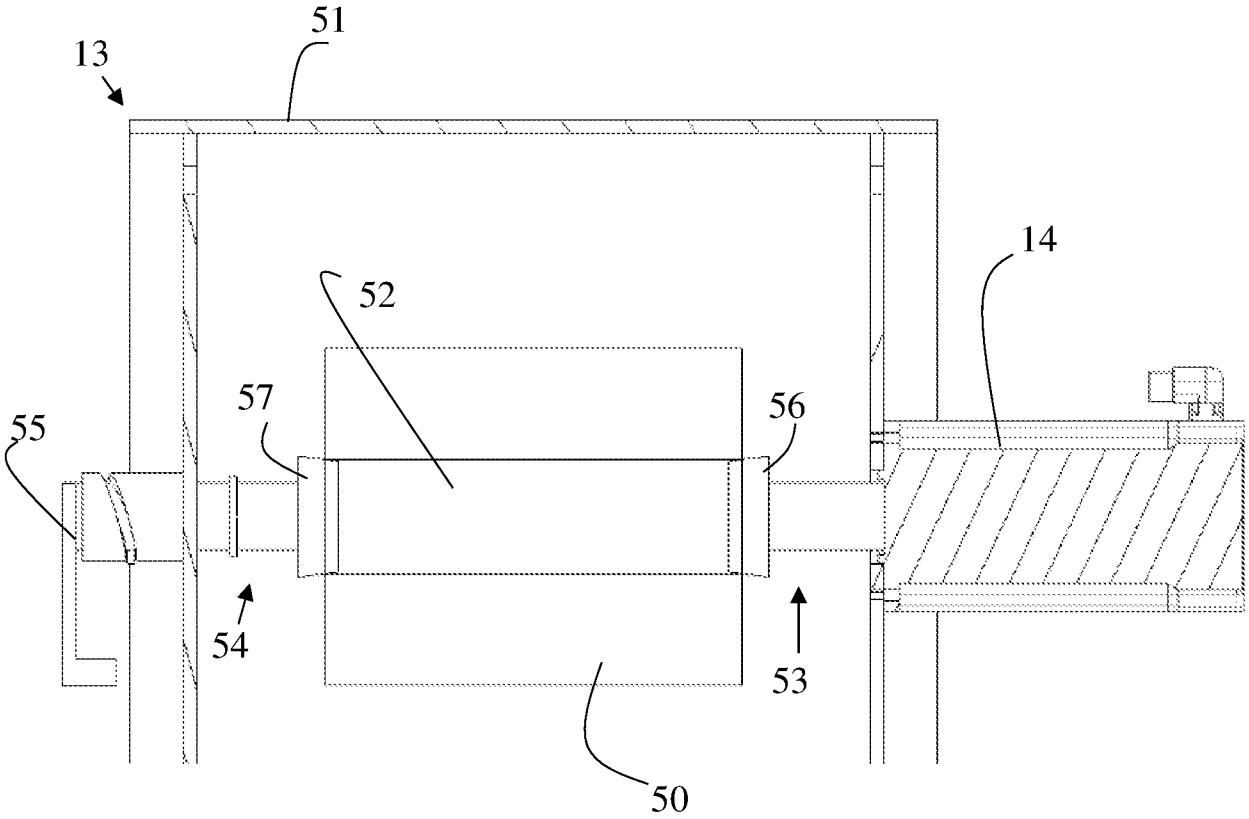

Fig. 2

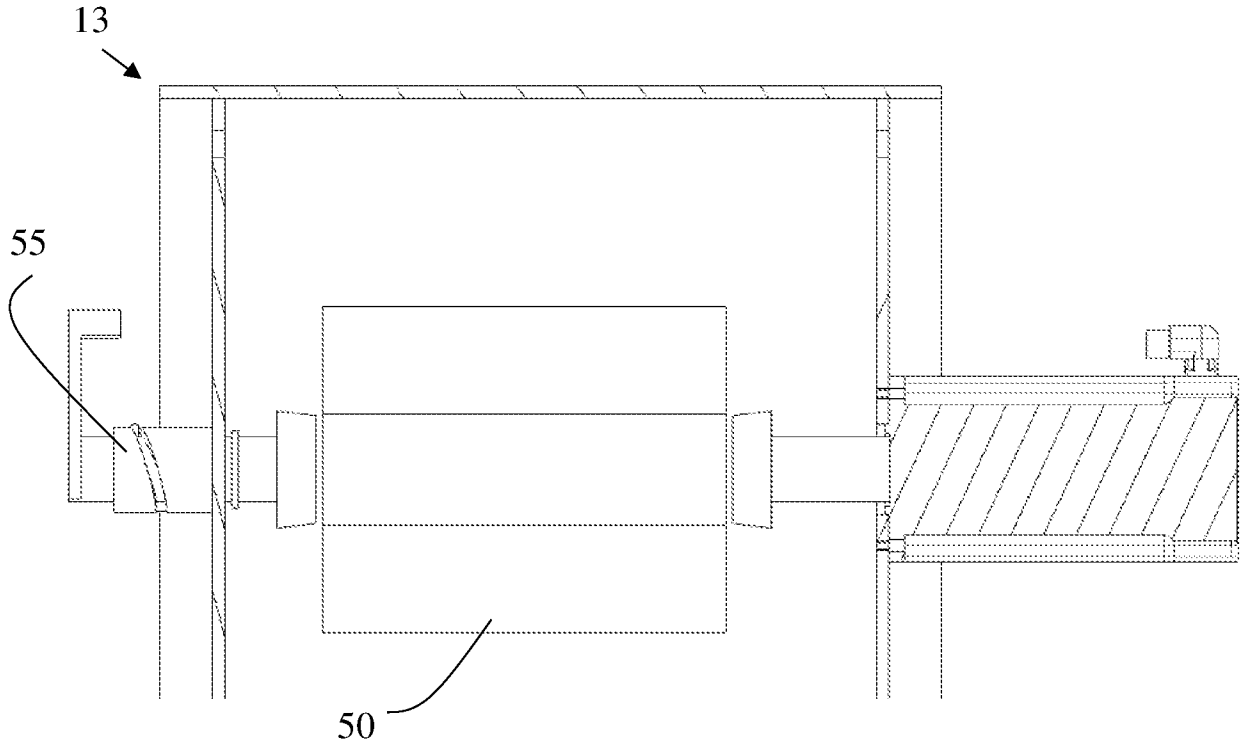

Fig. 3

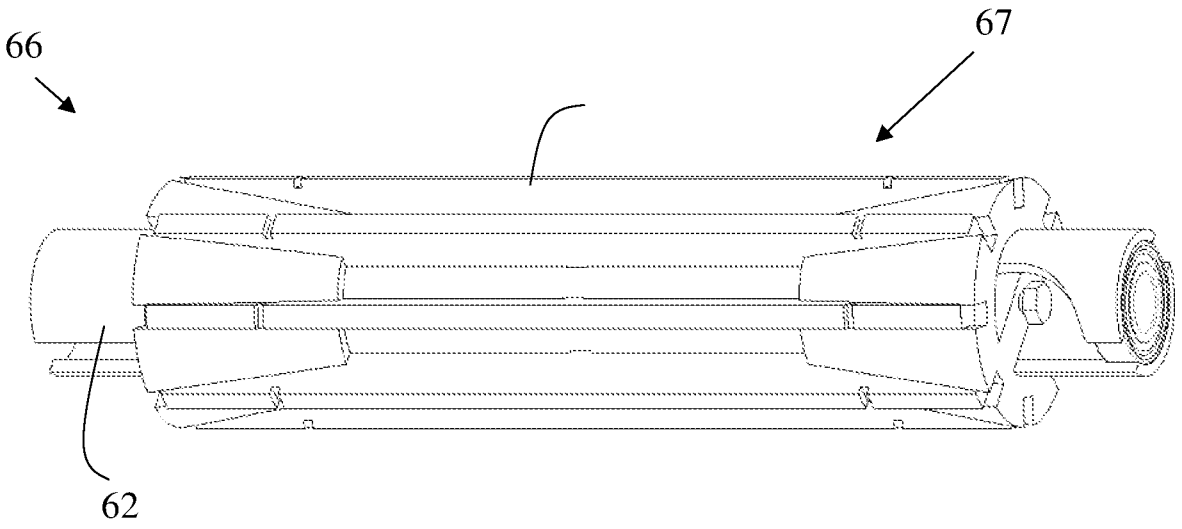

Fig. 4

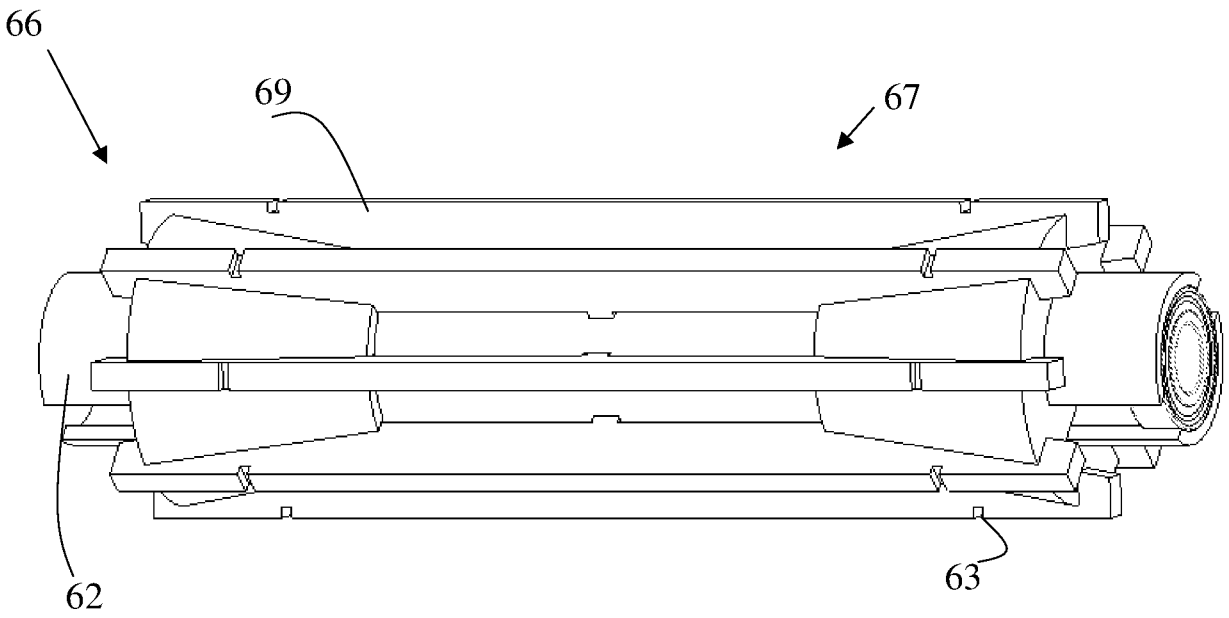

Fig. 5

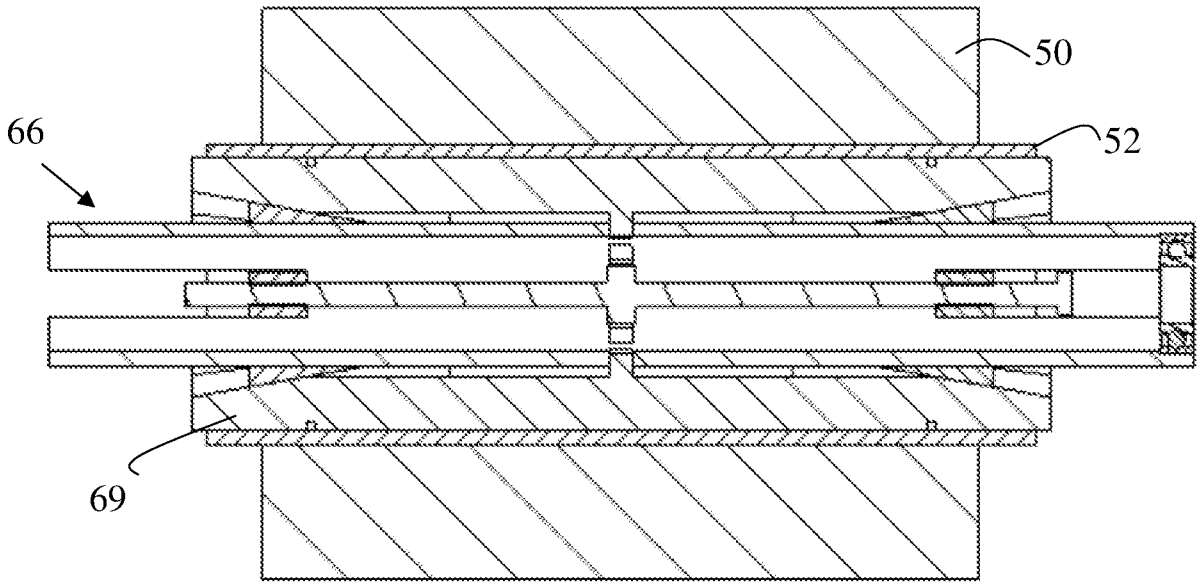

Fig. 6

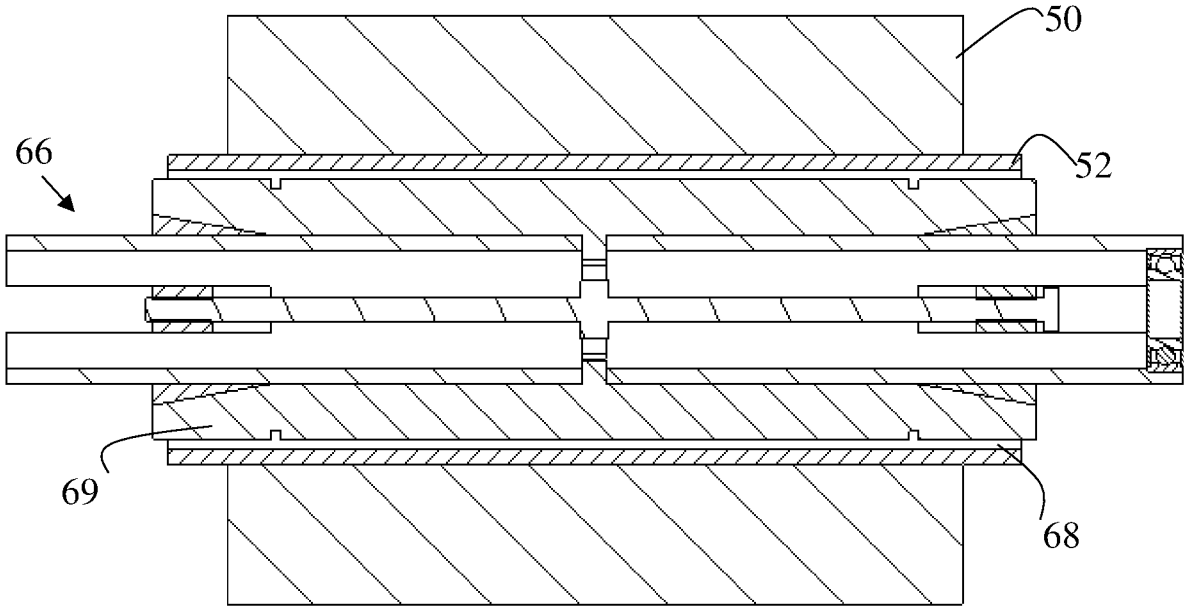

Fig. 7

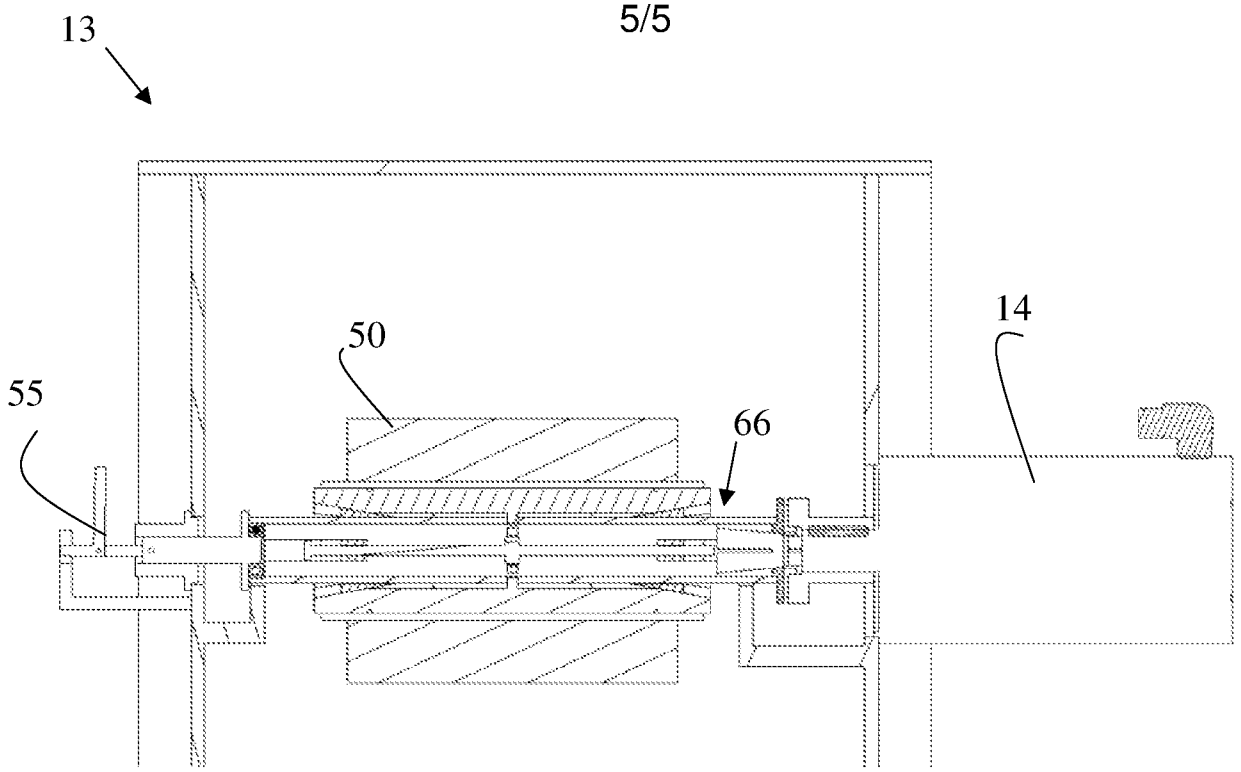

Fig. 8

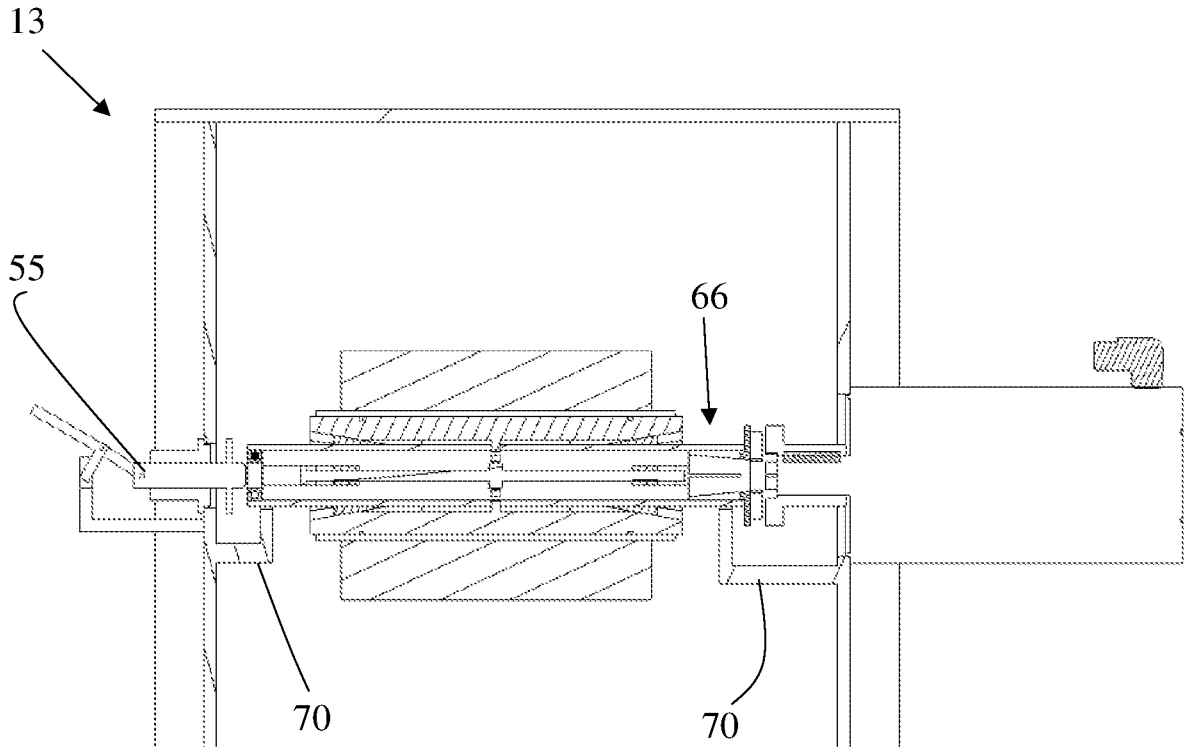

Fig. 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/051005

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B65H, D03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3353762 A (BASELICE LOUIS A), 21 November 1967 (1967-11-21); abstract; column 1, line 59 - column 2, line 3; column 3, line 23 - line 25; figures 1, 2, 4	1-4, 6-11
A	--	5
X	US 4850544 A (SNIJDERS WILLIBRORDUS M), 25 July 1989 (1989-07-25); abstract; column 3, line 28 - column 4, line 8; figures 1-4; all claims	12
A	--	13, 15

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25-11-2019	26-11-2019

Name and mailing address of the ISA/SE	Authorized officer
Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Katarina Ekman Telephone No. + 46 8 782 28 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2019/051005

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5671783 A (ZENONI PIETRO ET AL), 30 September 1997 (1997-09-30); abstract; column 3, line 66 - column 5, line 3; column 7, line 59 - column 8, line 12; figures 2, 3, 8, 9	12-15
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A	EP 0469527 A1 (ROY ELECTROTEX SPA), 5 February 1992 (1992-02-05); column 5, line 30 - line 43; figures 1, 2	12-15
	--	

International application No.
PCT/SE2019/051005

Continuation of: second sheet

International Patent Classification (IPC)

D03D 47/34 (2006.01)
B65H 59/38 (2006.01)
D03D 47/36 (2006.01)

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				JP	63160981	A 04/07/1988
US	5671783	A	30/09/1997	CN	1040562	C 04/11/1998
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				DE	69504789	D1 22/10/1998
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