



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.05.2020 Bulletin 2020/20

(51) Int Cl.:
B65H 67/08 (2006.01) D01H 15/00 (2006.01)

(21) Application number: **19202627.6**

(22) Date of filing: **11.10.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **08.11.2018 IN 201841042122**

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(54) **BROKEN YARN PICKING ARRANGEMENT FOR RING SPINNING MACHINE**

(57) An auto piecing unit (1) for piecing broken yarns and its operation are described. The auto piecing unit (1) comprises a gripping arrangement (2) and a suction arrangement (4) connected on a mounting means (3) and a scribing arrangement (7). The gripping arrangement (2) holds a cop (5) wound with a broken yarn. The cop (5) is rotated in a direction opposite to a normal winding direction and moved vertically upwards and downwards. During a reverse rotation of the cop (5), the scribing arrangement (7) makes the linear and/or sideways movement to loosen and disentangle the broken yarn end. Upon loosening and disentangling the broken yarn, the suction arrangement (4) is positioned over the cop (5) to suck the broken yarn for a piecing operation.

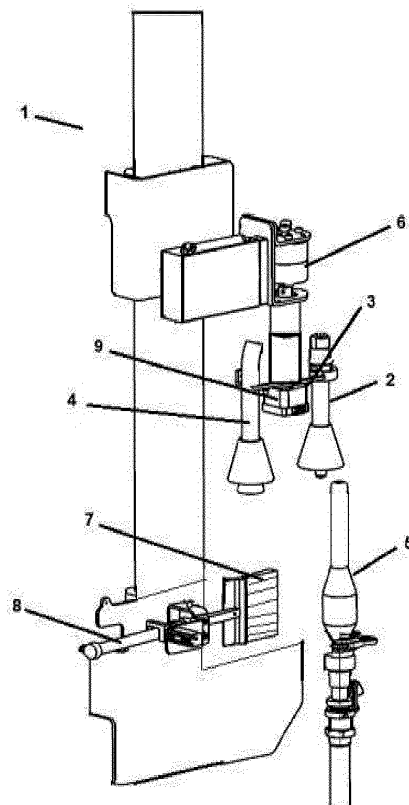


Figure 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to yarn picking arrangement for textile machines. Particularly, the invention relates to broken yarn picking arrangement for an automatic yarn piecing unit in ring spinning machines. More particularly, the invention relates to an arrangement to pick the broken yarn end which is entangled in the cop to enable automatic piecing operation in textile ring spinning machines.

BACKGROUND OF THE INVENTION

[0002] In textile spinning mills, the cotton is converted into yarn through a series of machines. The ring spinning machines are crucial machines as the resultant yarn is produced in it. Yarn breakages are frequent occurrences in said ring spinning machines which is a major concern to be addressed then and there. Yarn breakage has to be continuously monitored and broken yarn has to be pieced manually then and there by the workers. The yarn breakage phenomenon happens because of many parameters of yarn and spinning machine and the same is unavoidable. The spinning machines in mill sites are long and manual workers continuously monitors the yarn breakages and perform manual piecing of broken yarns round the clock walking along the pathway along the aisle of the ring frames. The workers walk along the machine frames which normally consists of more than 1600 spindles and about 75 meters long for a single spinning machine. Likewise many spinning machines are available depending upon the mill setup. After piecing the broken yarn manually, yarn spinning sequence will be restarted then and there to avoid production downtime and yarn wastage.

[0003] To overcome above problems, automatic piecing units are developed in the textile spinning industry. The automatic piecing unit is a movable unit in vehicle form with wheels / rails / guides. The said piecing unit stops in front of the respective spindle position which require piecing assistance. The piecing unit in general moves longitudinally over the machine frame aisles. Before initiating piecing operation, the piecing vehicle stops in front of the spindle and then the broken yarn end which is available in the spinning cop has to be found and picked. Normally in some types of yarns, the broken yarn gets entangled in the cop and it is not visible to naked eye. Also it is very difficult for the workers / automatic piecing unit to find and pick the entangled broken yarn end from the cop to perform subsequent piecing operation.

[0004] There exists a need to provide a solution for the above problem. The present invention provides an improved arrangement for picking the broken yarn end which is entangled in the spinning cop to enable automatic piecing in ring spinning machines.

OBJECTS OF THE INVENTION

[0005] The main object of the present invention is to provide an improved piecing unit for textile ring spinning machines.

[0006] Another object of the present invention is to provide an improved broken yarn picking arrangement in the automatic piecing unit of the textile ring spinning machines.

[0007] Another object of the present invention is to provide an improved broken yarn end picking arrangement from the spinning cop, which effectively finds and picks the entangled yarn end in the automatic piecing unit of the textile ring spinning machines.

SUMMARY OF THE INVENTION

[0008] This summary is provided to introduce aspects related to systems and methods for forecasting volume data, and the aspects are further described below in the detailed description. This summary is not intended to identify essential features of the claimed subject matter nor is it intended for use in determining or limiting the scope of the claimed subject matter.

[0009] In one non-limiting embodiment of the disclosure, an automatic piecing unit is disclosed. The automatic piecing unit assists in yarn piecing operation during yarn breakage incidents in ring spinning machines. The broken yarns for some types of yarn gets entangled in a spinning cop and is not found by the workers or automatic piecing units. The proper picking of the broken yarn end is necessary for successful piecing of the broken yarn ends. To enable the same, an auto piecing unit (1) according to the present invention is provided with a mechanism to pick the broken yarn end which is entangled in the cop, using gripping, scribing, and suction arrangements in the auto piecing unit (1) of ring frame.

[0010] In an embodiment, the auto piecing unit (1) is provided with a gripping arrangement (2) that is present in the form of a vertical pipe mounted in the auto piecing unit (1) through mounting means (3) present in the form of a bracket. The gripping arrangement (2) comprises a pneumatic inner gripper for gripping the cop (5) internally. Other end of the mounting means (3) is provided with a suction arrangement (4). Although the gripping arrangement (2) and the suction arrangement (4) are described to be present on a single element of the auto piecing unit (1) i.e. the mounting means (3), it is fairly possible that the gripping arrangement (2) and the suction arrangement (4) are mounted separately on the auto piecing unit (1). The suction arrangement (4) is in the form of a bell shaped mouth so as to surround the cop (5). The gripping arrangement (2) and suction arrangement (4) are capable of rotating / indexing in the range of 180 to 270 degrees, preferably 180 degrees, through an indexing arrangement (6), preferably a rotary actuator. The indexing arrangement (6) can also be a pneumatic, electric, hydraulic, linear actuator, and the like. Additionally, a scribing

ing arrangement (7) is provided in the auto piecing unit (1) which is capable of moving forward and/or sideways to brush or scribe the cop (5) having the broken yarn, to loosen and disentangle the broken yarn end. The scribing arrangement (7) includes bristles, Velcro, sponge, scriber, finger like part, or needle. The scribing arrangement (7) is mounted in the auto piecing unit (1) and is connected to a drive element (8). The drive element (8) is a linear/rotary drive element that operates using either of a pneumatic cylinder, hydraulic cylinder, screw rod, or the like.

[0011] In another non-limiting embodiment of the current disclosure, a sequence of steps performed for picking the entangled broken yarn end is disclosed. The gripping arrangement (2) moves forward through suitable drive means from the auto piecing unit (1). The auto piecing unit (1) applies brake to a broken yarn spindle through suitable braking means. The respective spindle rotation is thereby stopped. The gripping arrangement (2) then positions above the cop (5) having the broken yarn. Then the gripping arrangement (2) moves downwards and picks the cop (5) by internally gripping the cop (5). The cop (5) can also be gripped externally. Gripping force is provided by suitable pressure means from the auto piecing unit (1). Then the gripping arrangement (2) lifts the cop (5) upwards. Upon being lifted, the cop (5) is rotated in a reverse direction from that of a normal winding direction through a motor (9), preferably a stepper motor or a servo motor. The gripping arrangement (2) is moved vertically downwards and upwards through suitable drive means from the auto piecing unit (1).

[0012] In an embodiment, during reverse rotation of the cop (5), the scribing arrangement (7) provided in the auto piecing unit (1) moves forward and/or sideways of the cop (5) through the drive element (8). The front portion of the scribing arrangement (7) is provided with bristles, Velcro, sponge, scriber, finger like part, or needle for brushing or scribing the broken yarn wound on the cop (5) so that entangled yarn is loosened and disentangled. Then the gripping arrangement (2) is relieved with the gripping force so that it leaves the cop (5) in the spindle. The above combination of actions evolved through research from the inventors, resulted in loosening and disentangling of the broken yarn end from the cop (5), which was not possible earlier.

[0013] In an embodiment, the gripping arrangement (2) is rotated 180 degrees through the indexing arrangement (6) so that the suction arrangement (4) connected to other end of the mounting means (3) positions above the cop (5). Then suction force provided to the suction arrangement (4) assists in picking the disentangled broken yarn end easily and is sucked upwards inside a bell shaped mouth of the suction arrangement (4) for enabling subsequent piecing operation.

[0014] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawings, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0015] The accompanying drawings illustrate various embodiments of apparatus, methods, and embodiments of various other aspects of the disclosure. In some examples, one element may be designed as multiple elements or that multiple elements may be designed as one element. In some examples, an element shown as an internal component of one element may be implemented as an external component in another, and vice versa. Non-limiting and non-exhaustive embodiments are described with reference to the following drawings. The components in the figures are not necessarily to scale, emphasis instead being placed upon illustrating principles.

Figure 1 shows an isometric view of the broken yarn picking arrangement of the auto piecing unit according to the present invention in home position.

Figure 2 shows a side view of the broken yarn picking arrangement of the auto piecing unit according to the present invention in which the gripping arrangement and scribing arrangement are in working condition.

Figure 3 shows a side view of the broken yarn picking arrangement of the auto piecing unit according to the present invention in which the suction arrangement is in working condition after disentangling the broken yarn end from the cop.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Embodiments of the present disclosure will be described more fully hereinafter with reference to the accompanying drawings in which like numerals represent like elements throughout the several figures, and in which example embodiments are shown. Embodiments of the claims may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. The examples set forth herein are non-limiting examples and are merely examples among other possible examples.

[0017] Referring to figure 1, an automatic piecing unit (1) of the present invention is shown. The automatic piecing unit (1) is used for piecing broken yarns in a ring spinning machine. The automatic piecing unit (1) moves longitudinally along the aisle of the ring spinning machine. The ring spinning machine is capable of winding yarn onto a bobbin mounted to a spinning spindle, so called a cop (5). When yarn breakage occurs in a spinning sequence, thread of a broken yarn may get entangled in the cop (5) that may be spinning. To enable yarn piecing, an entangled yarn end has to be picked from the cop (5).

[0018] As shown in figure 1, the auto piecing unit (1) is provided with a gripping arrangement (2). The gripping

arrangement (2) is in the form of a vertical pipe mounted in the auto piecing unit (1) through mounting means (3) present in the form of a bracket. The gripping arrangement (2) grips and lifts the cop (5). Further, the gripping arrangement (2) may grip the cop (5) either internally or externally, preferably internally.

[0019] In one embodiment, the gripping arrangement (2) comprises a pneumatic inner gripper for gripping the cop (5) internally. The pneumatic inner gripper includes an elastic means such as diaphragm type and can also be of electric, hydraulic, or solenoid type. Other end of the mounting means (3) is provided with a suction arrangement (4). Although the gripping arrangement (2) and the suction arrangement (4) are illustrated and described to be present on a single element of the auto piecing unit (1) i.e. the mounting means (3), it is fairly possible that the gripping arrangement (2) and the suction arrangement (4) are mounted separately on the auto piecing unit (1). The suction arrangement (4) is in the form of a bell shaped mouth so as to surround the cop (5). The gripping arrangement (2) and the suction arrangement (4) are capable of rotating in the range of 180 to 270 degrees, preferably up to 180 degrees through an indexing arrangement (6), preferably a rotary actuator.

[0020] Additionally, a scribing arrangement (7) is provided in the auto piecing unit (1) which is capable of moving forward and/or sideways to scribe the cop (5) having the broken yarn, to loosen and disentangle an end of the broken yarn. The scribing arrangement (7) could also be referred as a brushing arrangement (7) capable of brushing the cop (5) having the broken yarn. The scribing arrangement (7) includes bristles, Velcro, sponge, scriber, finger like part, or needle. The said brushing / scribing arrangement (7) is mounted in the auto piecing unit (1) and is driven front and back by a drive element (8) that could be a linear drive element. Further, the drive element (8) could be a rotary drive element. The drive element (8) may operate using a pneumatic cylinder, a hydraulic cylinder, rotary cylinder, a screw rod, or the like.

[0021] Referring to figures 2 and 3, a sequence for picking an entangled end of the broken yarn is provided henceforth. The gripping arrangement (2) moves forward through suitable drive means from the auto piecing unit (1). The auto piecing unit (1) applies brake to the broken yarn's spindle through suitable braking means. The respective spindle rotation is thereby stopped. The gripping arrangement (2) then positions above the cop (5) having the broken yarn. Then the gripping arrangement (2) moves downwards and picks the cop (5) having the broken yarn by internally gripping the cop (5). The cop (5) can also be gripped externally. Gripping force applied to grip the cop (5) is provided by suitable pressure means from the auto piecing unit (1). Then the gripping arrangement (2) along with the cop (5) moves upwards. Upon being lifted, the cop (5) is rotated in a reverse direction from that of a normal winding direction through the gripping arrangement (2) provided with a motor (9), preferably a stepper motor or a servo motor. The gripping ar-

angement (2) is moved vertically downwards and upwards through suitable drive means from the auto piecing unit (1).

[0022] During reverse rotation of the cop (5), the scribing arrangement (7) provided in the auto piecing unit (1) moves forward and/or sideways of the cop (5) through the drive element (8). A front portion of the scribing arrangement (7) is provided with bristles, Velcro, sponge, scriber, finger like part, or needle for brushing or scribing the broken yarn cop (5) so that the entangled yarn is loosened and disentangled. Then, the gripping arrangement (2) is relieved with the gripping force so that it leaves the cop (5) on the spindle. The above actions result in loosening and disentangling of the entangled end of the broken yarn from the cop (5). The above arrangement according to the invention is suitable for disentangling entangled yarn ends in other textile machines like auto-coner and manual piecing operation in ring spinning machines also.

[0023] Then the gripping arrangement (2) is rotated to 180 degrees through the indexing arrangement (6) so that the suction arrangement (4) in the other end of the mounting means (3) positions above the cop (5) having the broken yarn. Then suction force provided to the suction arrangement (4) assists in picking a disentangled broken yarn end easily and sucking the disentangled broken yarn end upwards inside the bell shaped mouth of the suction arrangement (4) for enabling subsequent piecing operation in the drafting zone.

[0024] Thus, the above described auto piecing unit (1) for ring spinning machine frame provides an effective solution for picking of broken yarn ends which are entangled in the cops, in an efficient and effective manner.

[0025] In view of the present disclosure, which describes the present invention, all changes, modifications and variations within the meaning and range of equivalency are considered within the scope and spirit of the invention as defined by the appended claims. Moreover, the scope of the present application is not intended to be limited to the particular embodiments of the process, machine, means, methods and steps described in the specification. As one will readily appreciate from the disclosure, processes, machines, means, methods, or steps, presently existing or later to be developed that perform substantially the same function or achieve substantially the same result as the corresponding embodiments described herein may be utilized. Accordingly, the appended claims are intended to include within their scope such processes, machines, means, methods, or steps.

Claims

1. An auto piecing unit (1) for piecing broken yarns in a ring spinning machine, the auto piecing unit comprising:

a gripping arrangement (2) connected on a

- mounting means (3) for holding a cop (5), the gripping arrangement (2) moves downwards, grips and lifts the cop (5) upwards, after lifting the cop (5), the cop (5) is rotated in a direction opposite to a normal winding direction; a scribing arrangement (7) connected to a drive element (8) for performing at least one of linear movement and/or sideways movement during said reverse rotation of the cop (5), for loosening and/or disentangling a broken yarn wound over the cop (5); and a suction arrangement (4) positioned over the cop (5) to suck the broken yarn for a piecing operation.
2. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) grips the cop (5) either internally or externally, preferably internally, and lifts the cop (5).
 3. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) comprises a pneumatic inner gripper for gripping the cop (5) internally.
 4. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) is provided with a motor (9) for reverse rotation of the cop (5).
 5. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) is capable of moving vertically upwards and downwards.
 6. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) places the cop (5) on the spindle by relieving the gripping force, after the broken yarn end is loosened/disentangled.
 7. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) and the suction arrangement (4) are connected on opposite ends of the mounting means (3).
 8. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) comprises a vertical pipe mounted in the auto piecing unit (1) through the mounting means (3).
 9. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) and the suction arrangement (4) are capable of rotation through an indexing arrangement (6).
 10. The auto piecing unit (1) as claimed in claim 9, wherein the gripping arrangement (2) and the suction arrangement (4) are capable of rotating in the range of 180 to 270 degrees.
 11. The auto piecing unit (1) as claimed in claim 9, wherein the indexing arrangement (6) is preferably a rotary actuator.
 12. The auto piecing unit (1) as claimed in claim 1, wherein the gripping arrangement (2) is mounted separately in the auto piecing unit (1).
 13. The auto piecing unit (1) as claimed in claim 1, wherein the suction arrangement (4) is mounted separately in the auto piecing unit (1) connected to a suction source.
 14. The auto piecing unit (1) as claimed in claim 1, wherein the scribing arrangement (7) comprises at least one of bristles, Velcro, sponge, scriber, finger like part, and needle.
 15. The auto piecing unit (1) as claimed in claim 1, wherein the drive element (8) of the scribing arrangement (7) is a linear/rotary drive element that operates using one of a pneumatic cylinder, hydraulic cylinder, rotary cylinder, and a screw rod.
 16. A method of piecing broken yarns in a ring spinning machine, the method comprising:
 - positioning a gripping arrangement (2) above a cop (5) wound with the broken yarn, and gripping the cop (5), either internally or externally, using the gripping arrangement (2) and lifting the cop (5);
 - rotating the cop (5) in a direction opposite to a normal winding direction;
 - moving a scribing arrangement (7) in at least one of linear and/or sideways movement towards the cop (5) to loosen/disentangle the broken yarn end;
 - placing the cop (5) on the spindle; and
 - positioning a suction arrangement (4) over the cop (5) to suck the broken yarn for a piecing operation.

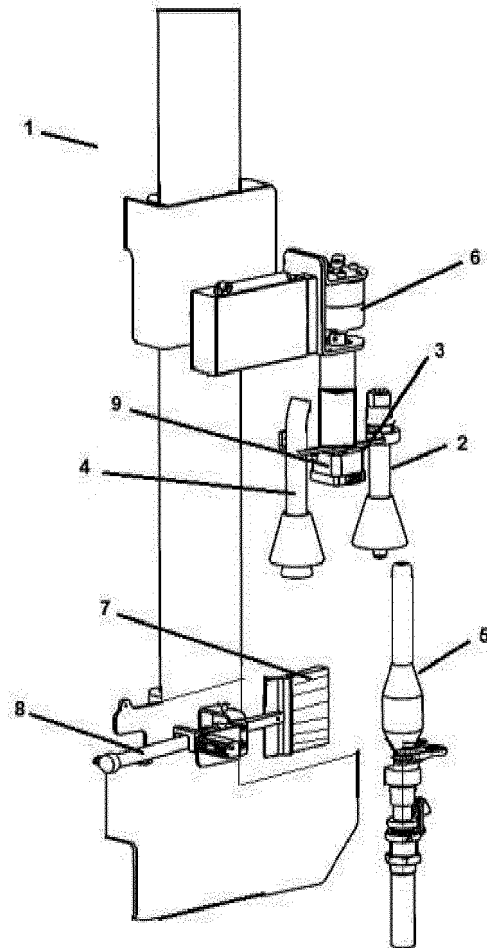


Figure 1

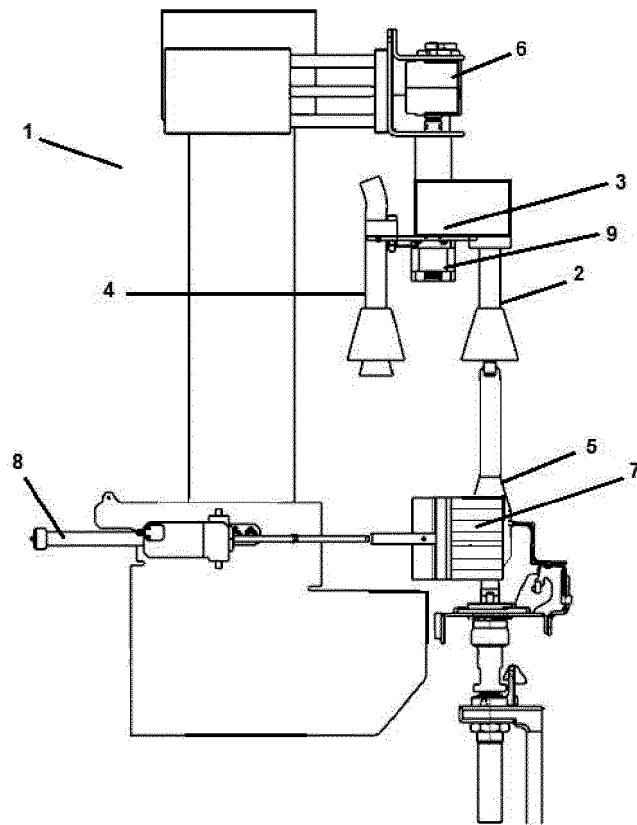


Figure 2

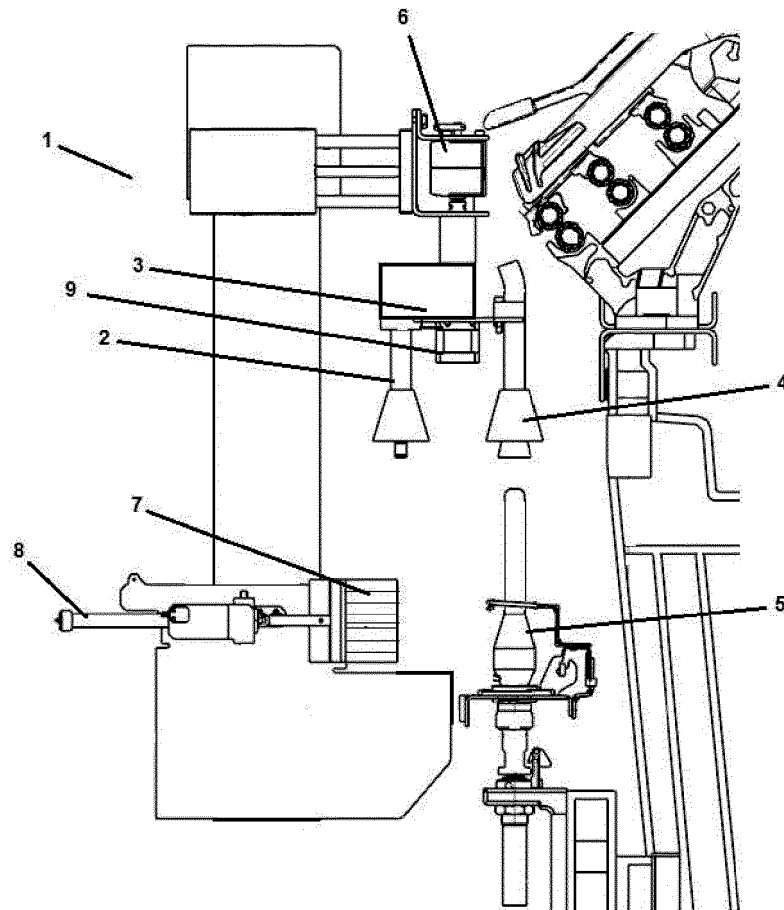


Figure 3



EUROPEAN SEARCH REPORT

Application Number
EP 19 20 2627

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DOCUMENTS CONSIDERED TO BE RELEVANT			
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A	DE 39 18 788 A1 (MURATA MACHINERY LTD [JP]) 14 December 1989 (1989-12-14) * column 3, line 34 - column 4, line 37; column 6, line 39 - column 7, line 35; claims; figures *	1-16	
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 March 2020	Examiner Clivio, Eugenio
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 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 19 20 2627

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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