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(54) YARN LIFTING ARRANGEMENT FOR PIECING UNIT AND A METHOD THEREOF

(57) The present invention relates to broken yarn lifting arrangement to detach the broken yarn end from the spinning cop to enable automatic piecing operation in textile ring spinning machines. Accordingly, yarn lifting arrangement, comprising of a base plate having a first end and a second end. The first end connected to an actuating means provides the base plate working position in the forward motion and home position in the backward motion. The second end is a free end having an opening near to the free end configured to encircle a cop of a spindle in the working position. Said arrangement further comprises plurality of jet members with plurality of orifices configured to position around the contour of the opening, supplying air current in the working position to detach the tangled yarn end from the spinning cop and to lift the yarn upwards towards the drafting zone to enable effective automatic yarn piecing in the textile machine.

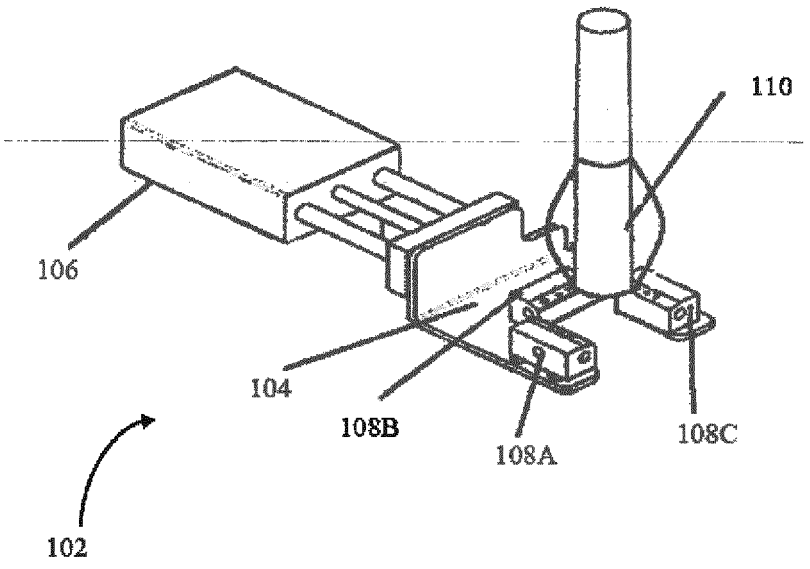

FIGURE 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to textile machines, particularly the invention relates to broken yarn lifting arrangement to detach the broken yarn end from the spinning cop to enable automatic piecing operation in textile ring spinning machines.

BACKGROUND OF THE INVENTION

[0002] Ring spinning machines are the most crucial machines in textile spinning mills. The said ring spinning machines delivers the final stage of cotton in spinning line, so called yarn. During ring spinning, yarn breakage occurs frequently, and it is to be continuously monitored and pieced by the manual labours. The yarn breakage occurs due to various parameters of yarn and machine and it is unavoidable. The broken yarn thread normally tangles with the wound yarn in the cop at any portion from top to bottom of the cop which cannot be adjudged precisely. In long spinning frame sites, manual labours continuously watch for yarn breakages and perform manual piecing of broken yarns. This has to be done for a machine frame normally consisting of more than 1600 spindles. Then, yarn spinning sequence has to be restarted then and there after yarn breakage in order to resume yarn spinning and to avoid wastage of yarn.

[0003] To overcome above problems, automatic piecing units are developed. The automatic piecing unit is in the form of a movable vehicle with wheels/rails. The said piecing vehicle stops at respective spindle units which require piecing attention. 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 position of ring spinning machine. Then the broken yarn end which is available in the spinning cop has to be found and detached from the cop and lifted above to enable piecing operation. The said detaching of yarn from spinning cop is not successfully done so far in any known type of automatic piecing units.

[0004] The present invention provides an improved arrangement for detaching the broken yarn end from the spinning cop to enable automatic piecing in ring spinning machines.

OBJECTIVE OF THE INVENTION

[0005] These objectives are provided to introduce a selection of concepts in a simplified form that are further described below in the detailed description. This objective are not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0006] The main object of the present invention is to provide an improved piecing unit for textile ring spinning machines.

[0007] Another object of the present invention is to provide a yarn lifting arrangement in the automatic piecing unit of the textile ring spinning machines.

[0008] Yet another object of the present invention is to provide an improved broken yarn end detaching arrangement in the automatic piecing unit of the textile ring spinning machines.

SUMMARY OF THE INVENTION

[0009] According to the invention, the automatic piecing unit is provided for textile ring spinning machines. The automatic piecing unit assists in yarn piecing operation during yarn breakage incidents in ring spinning machines. The proper picking / detaching of the broken yarn end from the spinning cop is necessary for the successful piecing of the broken yarn ends. To enable detaching of the broken yarn end, the present invention is provided with a yarn lifting arrangement in the automatic piecing unit. The lifting arrangement is placed in front of the ring rail slightly below the ring rail position such that it purges air towards the cop from plurality of orifices for lifting the broken yarn end from the cop. The jet members are provided around the spinning cop at the bottom portion of the cop preferably. The lifting arrangement is advantageously placed at any position in front of the cop from top to bottom as an embodiment. Then the detached yarn end is moved upwards into a controlled suction nozzle adjacent to the drafting unit to hold the yarn until piecing said yarn with the roving material delivering from drafting zone.

[0010] According to an aspect of the invention, a yarn lifting arrangement for an automatic yarn piecing unit, comprising of a base plate having a first end and a second end. The first end connected to an actuating means provides said base plate working position in the forward motion and home position in the backward motion. The second end is a free end having an opening near to the free end configured to encircle a cop of a spindle in the working position. Said yarn lifting arrangement further comprises plurality of jet members with plurality of orifices configured to position around the contour of the opening, supplying air current when the base plate is in working position to detach the tangled yarn end from the spinning cop and to lift the yarn upwards to enable yarn piecing in the textile machine.

[0011] According to another aspect of the invention, a method for lifting a yarn by a piecing unit, comprising the steps of, placing plurality of jet members around the contour of the opening of a base plate such that plurality of orifices projects to a cop of a spindle, applying and relieving spindle brake for a predetermined time, supplying air current through said plurality of jet members through the plurality of orifices for a predetermined time, and detaching the tangled yarn end from the cop through the air current from said jet members and lifting the yarn upwards to enable yarn piecing in textile machine.

[0012] Other aspects and advantages of the invention will become apparent from the following description, taken in conjunction with the accompanying drawing, illustrating by way of example the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a more detailed understanding of this invention, reference is made to the accompanying drawings in which:

Figure 1 illustrates the schematic view of the yarn lifting arrangement, according to the present invention;

Figures 2A and 2B illustrates the schematic views of the yarn lifting arrangement in home position and working position, according to an embodiment of the present invention;

Figure 3A illustrates the side view of the yarn lifting arrangement in which broken yarn is to be lifted, and figure 3B illustrates broken yarn lifted, according to the present invention; and

Figures 4 illustrates the schematic view of a jet member, figure 4A illustrates the top view of a jet member, and figure 4B illustrates the cross-sectional view of a jet member, according to the present invention.

[0014] Persons skilled in the art will appreciate that elements in the figures are illustrated for simplicity and clarity and may have not been drawn to scale. For example, the dimensions of some of the elements in the figure may be exaggerated relative to other elements to help to improve understanding of various exemplary embodiments of the present disclosure.

[0015] Throughout the drawings, it should be noted that like reference numbers are used to depict the same or similar elements, and features.

DETAILED DESCRIPTION OF THE INVENTION

[0016] The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of exemplary embodiments of the invention as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the embodiments described herein can be made without departing from the scope and spirit of the invention. In addition, descriptions of well-known functions and constructions are omitted for clarity and conciseness.

[0017] Automatic piecing unit is provided for textile ring spinning machines. The automatic piecing unit moves longitudinally along the aisle of the ring spinning machine. The ring spinning machine is capable of winding yarn onto a bobbin mounted to spinning spindle, so called cop. When yarn breakage occurs in the spinning sequence, the broken yarn thread is tangled in the spinning cop. To enable yarn piecing, the tangled yarn end has to be detached from the cop. Thus, automatic piecing unit assists in yarn piecing operation during yarn breakage incidents in ring spinning machines. The proper picking / detaching of the broken yarn end from the spinning cop is necessary for the successful piecing of the broken yarn ends. To enable the detaching of the broken yarn end, the present invention is provided with a yarn lifting arrangement in the automatic piecing unit.

[0018] Figures 1 and 2 illustrates the schematic view of the yarn lifting arrangement, according to the present invention. Accordingly, a yarn lifting arrangement (102) for an automatic yarn piecing unit (100), comprising of a base plate (104) having a first end and a second end. The first end connected to an actuating means (106) provides the base plate (104) working position in the forward motion and home position in the backward motion. The actuating means (106) is at least a pneumatic piston - cylinder actuator preferably or the like. The second end is a free end having an opening near to the free end configured to encircle a cop (110) of a spindle (112) in the working position. In a preferred embodiment said opening is in semicircular shape. Said yarn lifting arrangement (102) further comprises plurality of jet members (108) configured to position around the contour of the opening, supplying air current in the working position to detach the tangled yarn end from the spinning cop (110) and to lift the yarn upwards towards the drafting zone to enable effective automatic yarn piecing in the textile machine. The corresponding figure 3A illustrates the side view of the yarn lifting arrangement in the automatic piecing unit and winding cop of ring spinning machine in which broken yarn is to be lifted, and figure 3B illustrates broken yarn is lifted and sucked upwards into the top suction unit in front of the drafting zone of the ring spinning machine, according to the present invention.

[0019] The jet member (108) is a block having plurality of orifices (118B) on the tapered surface formed at an acute angle between the top face and the side facing said cop. The air purging hole of the orifices (118B) of the jet members (108) forms an acute angle with respect to the vertical. According to an embodiment of the invention, the acute angle between the orifice (118B) and the vertical is in the range of 15 degrees to 30 degrees, preferably 20 degrees. The diameter of the orifice (118B) is preferably 2mm. The block has a through hole (118A) along the horizontal axis parallel to line of position of the plurality of orifices (118B) such that air from a suction source is transferred to plurality of orifices (118B) through hole (118A). The block can also be provided with hole along the horizontal axis perpendicular to line of position of the plurality of orifices (118B). Figures 4 illustrates the schematic view of a jet member, and the corresponding figures 4A, 4B illustrates the top view and cross-sectional

view the of a jet member.

[0020] In a preferred embodiment, the number of jet members (108) in a yarn lifting arrangement (102) can be three. The jet members can also be a common unit according to an embodiment. The jet members are positioned on the contour of the opening at an included angle of 90 degrees between them. The first jet member (108B) is placed in front of the spinning cop in substantially parallel manner to the length of the ring spinning frame. The second and third jet members (108A, 108C) are placed in substantially perpendicular manner to the length of the ring spinning frame, one each at the sides of the spinning cop. According to the invention, each of the jet members (108A, 108B, 108C) are provided with plurality of orifices (118B) preferably three.

[0021] In the process of yarn lifting, the yarn lifting arrangement (102) is actuated to move forward to reach working position in which jet members (108) are positioned concentrically around the cop (110) of the spindle (112) in front of the ring rail of ring spinning machine (not shown) slightly below the ring rail position. In the next step, the cop (110) placed in the ring spinning spindle (112) is purged with air from the jet members (108). Thus, the broken yarn (116) end is lifted from the cop (110) and caught into the suction unit (114) which is provided with controlled suction so as to not unwind the already wound cop (110). Then the detached yarn end (112) is moved upwards into a controlled suction nozzle adjacent to the drafting unit to hold the yarn until piecing said yarn with the drafted roving material delivering from drafting zone.

[0022] According to an example embodiment of the invention, the jet members are worked in the following sequence to achieve successful detaching and lifting of the broken yarn end from the spinning cop. The jet members are positioned at a predetermined distance from spindle centre, along the contour of the opening. When the spindle brake (not shown) is applied for a predetermined period in the range of 0.1 to 1 second, for example 0.7 seconds, spindle stops rotating. During that time, the second and third jet members (side jets) are made to purge air jets through the plurality of orifices for a fraction of second in the range of 0.01 to 0.1 seconds, for example 0.05 seconds. Subsequently, spindle brake is relieved for a predetermined period in the range of 0.1 to 0.5 seconds, for example 0.2 seconds, rotating the spindle. During that time, the first jet member is made to purge air jet through the multiple / plurality of orifices for a fraction of second in the range of 0.01 to 0.1 seconds, for example 0.05 seconds. As a result of above said sequences, the broken yarn end is detached from the spinning cop irrespective of its position anywhere from top to bottom and directed upwards towards the drafting zone successfully. The yarn end detached and directed upwards by the action of the jet members are sucked by another controlled suction unit placed at the top of the automatic piecing unit in front of the drafting zone of the ring spinning machine (not shown). Thereby, the broken yarn is lifted to enable automatic piecing with the drafted material.

[0023] According to another example embodiment, the jet members are worked in the following sequence to achieve successful detaching and lifting of the broken yarn end from the spinning cop. Initially, the jet members are placed at a predetermined distance from spindle centre along the contour of the opening. The first jet member purges air jet when the spindle is applied brake for a predetermined time interval. Then, the spindle brake is relieved for a predetermined time interval in fraction of second. During that time, the second and third jet members purges air jet. As a result of the above said action, the broken yarn end is detached from the spinning cop and directed upwards to enable automatic piecing with the drafted material. The above sequence takes place irrespective of the ring rail position. The above sequences are example embodiments only. The three jet members are worked in any different sequences and any different time intervals. The jet members are not defined to three in total, it may also be more than three or less than three.

[0024] Generally, the lifting arrangement is placed in front of the ring rail slightly below the ring rail position such that it purges air towards the cop from plurality of orifices for lifting the broken yarn end from the cop. The lifting arrangement can be advantageously placed at any position in front of the cop from top to bottom as an embodiment. In a preferred embodiment, the lifting arrangement is positioned at the bottom portion of the spinning cop. Thus, the above described automatic piecing unit for ring spinning machine frame provides an effective broken yarn end lifting arrangement.

[0025] For exemplary the embodiment of this invention employs yarn lifting arrangement for an automatic yarn piecing unit. Various modifications to these embodiments are apparent to those skilled in the art from the description and drawings herein. Therefore, the description is not intended to be limited to the embodiment shown along with the accompanying drawings but is to be provided broadest scope consistent with the principles and novel and inventive features describe/disclosed or suggested herein. Any modifications, equivalent substitutions, improvements etc. within the spirit and principle of the present invention shall all be included in the scope of protection of the present invention.

Claims

1. A yarn lifting arrangement for a yarn piecing unit, comprising of:

a base plate having a first end and a second end,

said first end connected to an actuating means provides said base plate working position in the forward motion and home position in the backward motion,

said second end is a free end having an

opening near to the free end configured to encircle a cop of a spindle in working position; and

plurality of jet members with plurality of orifices, configured to position around the contour of the opening, supplying air current when the base plate is in working position to detach the tangled yarn end from the spinning cop and to lift the yarn upwards to enable yarn piecing in the textile machine.

2. The yarn lifting arrangement as claimed in claim 1, wherein said jet member is a block having plurality of orifices on the tapered surface, said orifices forms an acute angle with respect to the vertical, and the block has a through hole along the horizontal axis parallel and/or perpendicular to line of position of the plurality of orifices such that air from a suction source is transferred to plurality of orifices through hole.

3. The yarn lifting arrangement as claimed in claim 2, wherein said acute angle is in the range of 15 degrees to 30 degrees.

4. The yarn lifting arrangement as claimed in any of the preceding claims, wherein the number of jet members is three.

5. The yarn lifting arrangement as claimed in any of the preceding claims, wherein the number of orifices in the jet member is three.

6. The yarn lifting arrangement as claimed in claim 4, wherein the jet members are positioned on the contour of the opening of base plate with an included angle of 90 degrees between them.

7. The yarn lifting arrangement as claimed in claim 1, wherein said actuating means is a pneumatic piston - cylinder actuator.

8. The yarn lifting arrangement as claimed in claim 1, wherein at least two jet members are provided with air current initially and the third jet member is provided with air current after a predetermined time interval to lift the yarn upwards.

9. The yarn lifting arrangement as claimed in claim 1, wherein at least a jet member is provided with air current initially and the other jet members are provided with air current after a predetermined time interval to lift the yarn upwards.

10. The yarn lifting arrangement as claimed in claim 1, wherein the plurality of jet members are provided with air currents one by one at predetermined time intervals to lift the yarn upwards.

11. The yarn lifting arrangement as claimed in claim 1, wherein said jet members are provided with air current for predetermined time and said air current is provided and stopped intermittently.

12. The yarn lifting arrangement as claimed in claim 1, wherein said jet members are provided with air current when spindle brake is applied for a predetermined time.

13. The yarn lifting arrangement as claimed in claim 1, wherein said jet members are provided with air current when spindle brake is relieved for a predetermined time.

14. A method for lifting a yarn by a piecing unit, the method comprising;
placing plurality of jet members around the contour of the opening of a base plate such that plurality of orifices projects to a cop of a spindle;
applying and relieving spindle brake for a predetermined time;
supplying air current through said plurality of jet members through the plurality of orifices for a predetermined time; and
detaching the tangled yarn end from the cop through the air current from said jet members and lifting the yarn upwards to enable yarn piecing in textile machine.

15. The method of yarn lifting as claimed in claim 14, wherein at least two jet members are provided with air current initially and the third jet member is provided with air current after a predetermined time interval to lift the yarn upwards.

16. The method of yarn lifting as claimed in claim 14, wherein at least a jet member is provided with air current initially and the other jet members are provided with air current after a predetermined time interval to lift the yarn upwards.

17. The method of yarn lifting as claimed in claim 14, wherein the plurality of jet members are provided with air currents one by one at predetermined time intervals to lift the yarn upwards.

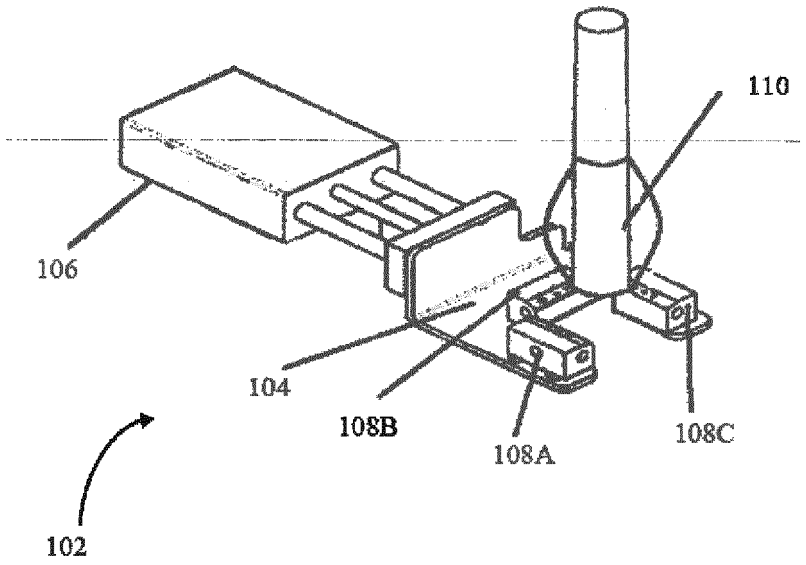

FIGURE 1

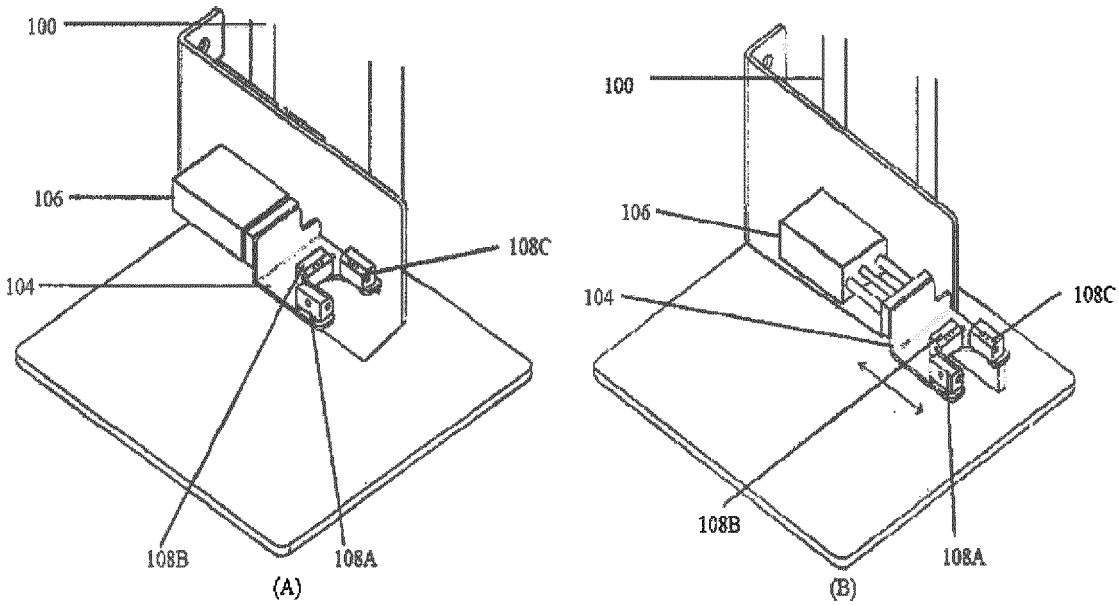

FIGURE 2

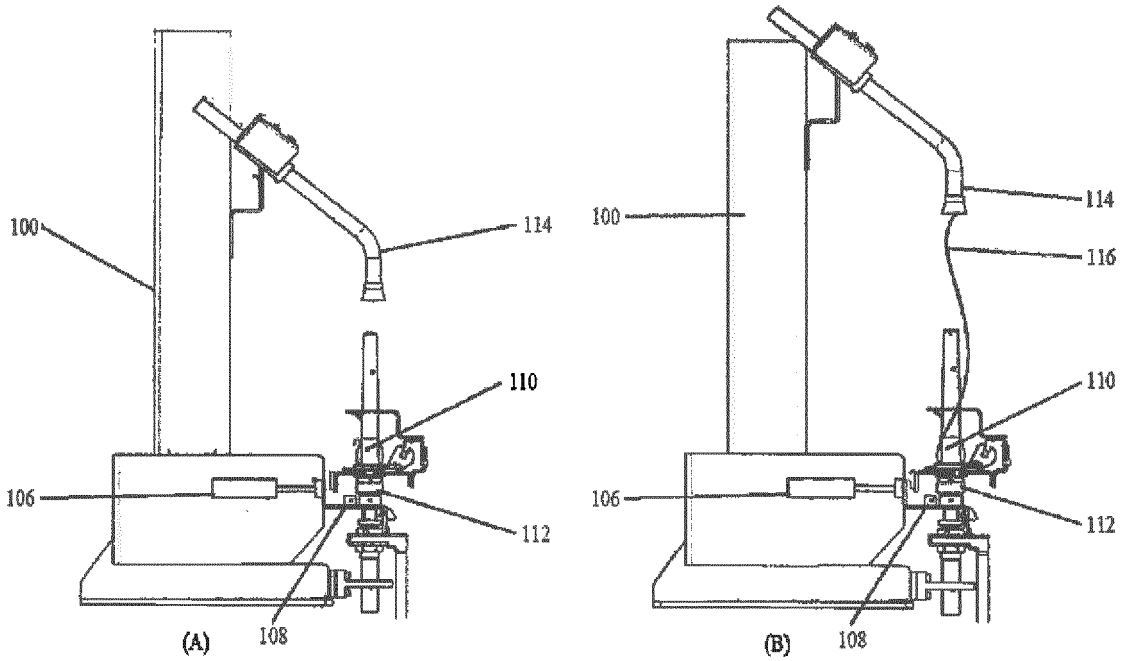

FIGURE 3

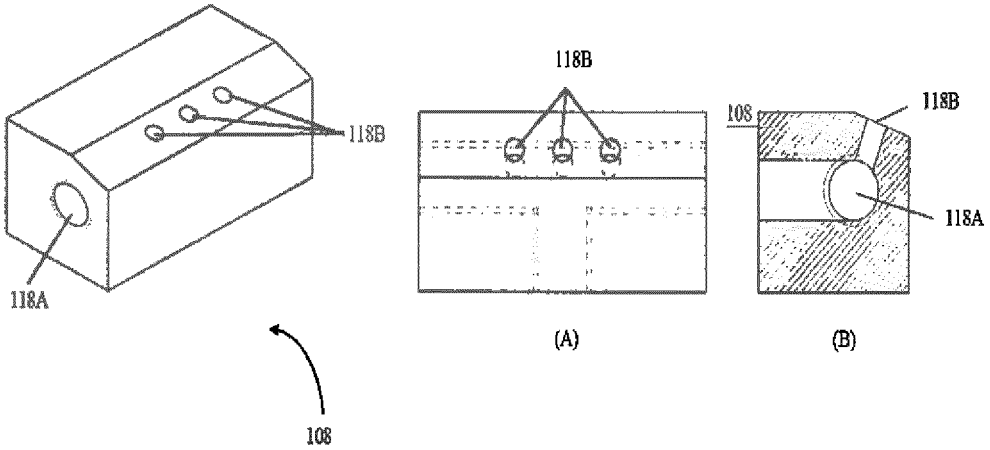

FIGURE 4

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 8570

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 September 2019	Humbert, Thomas

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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