

(19)



(11)

EP 3 770 312 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
27.01.2021 Bulletin 2021/04

(51) Int Cl.:
D04B 9/34 (2006.01) **D04B 7/26 (2006.01)**
D04B 15/06 (2006.01)

(21) Application number: **19187868.5**

(22) Date of filing: **23.07.2019**

(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

(72) Inventor: **Lee, Hsin-Chung**
New Taipei City (TW)

(74) Representative: **2K Patentanwälte Blasberg Kewitz & Reichel Partnerschaft mbB Schumannstrasse 27 60325 Frankfurt am Main (DE)**

(71) Applicant: **Pai Lung Machinery Mill Co., Ltd. New Taipei City (TW)**

(54) **WEFT KNITTING MACHINE CAPABLE OF CHANGING YARN POSITIONS**

(57) A weft knitting machine knitting structure (10) capable of changing yarn positions is provided. A facing yarn (30) and a bottom yarn (31) positioned below the facing yarn (30) are fed during knitting, the weft knitting machine knitting structure (10) comprises a plurality of sinkers (11) and a plurality of needles (12), the plurality of needles (12) are respectively arranged adjacent to one of the plurality of sinkers (11), and each of the plurality of sinkers (11) is guided to perform a linear displacement

movement (116). Each of the plurality of needles (12) is provided with a hook (121) and a latch (122) for performing a closing action relative to the hook (121). The machine comprises two needle tracks wherein one needle in the first needle track performs a normal plating and a needle in the second needle track performs an interchanged plating. A needle in the second needle track is closed before a needle in the first needle track.

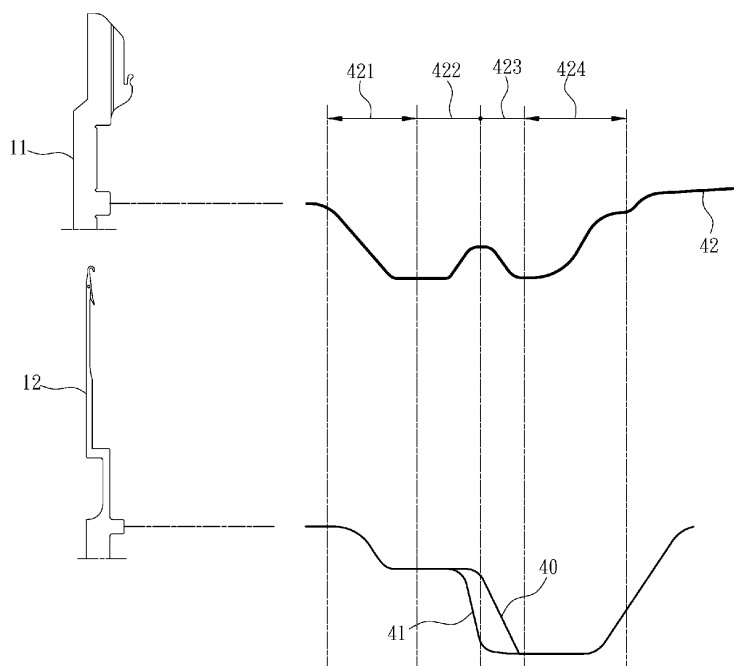


Fig. 4

EP 3 770 312 A1

Description**FIELD OF THE INVENTION**

[0001] The invention relates to a weft knitting machine knitting structure, in particular to a weft knitting machine knitting structure with changeable yarn positions.

BACKGROUND OF THE INVENTION

[0002] Plating, also known as yarn overlapping, refers to the simultaneous feeding of two differently colored yarns during knitting, causing a technical face and a technical back of a knitted fabric to appear differently colored. However, in order to increase the color or pattern change of the fabric, it has been proposed in the prior art to change the position of the two yarns fed during the knitting process so as to change the color of the plated on the technical face, and the fabric surface thereof is shown in Fig. 1. As such, the foregoing knitting techniques are known in the art as Jacquard.

[0003] In patents US 1,666,794, US 1,950,405, US 3,157,035, US 2,616,276, CN 104532458 A, WO 00/15890 A, etc., the positions of two yarns fed are changed by the structure of a yarn carrier itself or a collocation structure. However, since the yarn carrier is still at a distance from the position where the weft knitting machine performs knitting, even though the yarn carrier can immediately change the position of the yarn, a plurality of remotely located needles can still grab the yarns at the unchanged position, resulting in the problem of residual shadow on the fabric, as indicated at a after image 90 in Fig. 2.

[0004] In addition, there are also embodiments for accomplishing the need for yarn change through a variety of sinkers, such as disclosed in U.S. Patent No. 1,977,590 and CN Patent No. 2,249,253Y, but such an embodiment would result in a significant reduction in the number of needles that can be deployed per opening of the weft knitting machine and would not be suitable for the current industry's need for needle number.

SUMMARY OF THE INVENTION

[0005] The main purpose of the present invention is directed to solve the problem in the prior art that a yarn carrier used for knitting yarns would cause after images appeared on a fabric easily.

[0006] The secondary object of the present invention is directed to solve the practical problems deriving from the fact that yarn changes are required to be carried out in a variety of sinkers in conventional techniques.

[0007] In order to achieve the above object, the present invention provides a weft knitting machine knitting structure with changeable yarn positions, wherein a facing yarn and a bottom yarn positioned below the facing yarn are fed during knitting. The weft knitting machine knitting structure comprises a plurality of sinkers and a plurality

of needles. The plurality of sinkers is respectively arranged adjacent to one of the plurality of needles. Each of the plurality of sinkers comprises a belly, a nose connected with the belly, and a throat between the belly and the nose. Each of the plurality of sinkers is guided to perform a linear displacement movement, wherein the facing yarn is positioned above the nose and the bottom yarn is positioned in the throat in a process of the linear displacement movement. The plurality of needles respectively includes a hook and a latch for performing a closing action relative to the hook. Each of the needles is controlled to move in a first needle retracting track knitting a standard plating without changing positions of the facing yarn and the bottom yarn in the hook, or to move in a second needle retracting track knitting an interchanged plating with changing the positions of the facing yarn and the bottom yarn in the hook. In the second needle retracting track, the latch dials the bottom yarn to make the bottom yarn pushed by the nose of one of the plurality of sinkers when one of the plurality of sinkers adjacent to each of the plurality of needles does not restrict positions of the facing yarn and the bottom yarn. The time point for the latch of each of the plurality of needles generating the closing action in the second needle retracting track is earlier than the first needle retracting track.

[0008] In one embodiment, the weft knitting machine knitting structure comprises a needle guide plate guiding the plurality of needles in a first needle retracting track or the second needle retracting track, and a sinker guide plate guiding the plurality of sinkers to perform the linear displacement movement. Further, the weft knitting machine knitting structure comprises a needle selector for controlling each of the needles.

[0009] In one embodiment, each of the plurality of sinkers has only a single motion track, and the motion track cycles through a first retraction section, a first push-out section subsequent to the first retraction section, a second retraction section subsequent to the first push-out section, and a second push-out section subsequent to the second retraction section. The time point for the latch of each of the plurality of needles generating the closing action in the first needle retracting track is that one of the plurality of sinkers adjacent to the latch moves to the second retraction section, and the time point for the latch of each of the plurality of needles generating the closing action in the second needle retracting track is that one of the plurality of sinkers adjacent to the latch moves to the first push-out section.

[0010] In one embodiment, the top yarn and the bottom yarn are different in color.

[0011] Through the implementation of the invention and compared with the conventional application, the invention has the following characteristics: according to the weft knitting machine knitting structure disclosed by the invention, the change of the yarn position is carried out at the feeding points of the facing yarn and the bottom yarn, so that the knitting requirement for changing yarns

can be quickly performed, and the after image on the fabric is specifically avoided. Besides, the weft knitting machine knitting structure provided by the invention can achieve the purpose of quick yarn changing and knitting without greatly modifying the integral structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Fig. 1 is a schematic diagram of fabric surface when the yarn is changed correctly in the fabric.

Fig. 2 is a schematic diagram of the fabric with a residual shadow.

Fig. 3 is a structurally schematic view showing a weft knitting machine knitting structure according to one embodiment of the present invention.

Fig. 4 is a comparison diagram of tracks of a needle and a sinker according to one embodiment of the invention.

Fig. 5 is a schematic diagram of the action of a sinker according to one embodiment of the present invention.

Fig. 6 is a needle retracting action schematic diagram when a needle moves in a first needle retracting track according to an embodiment of the invention.

Fig. 7 is a schematic diagram showing the position of the top yarn and the bottom yarn during standard plating according to one embodiment of the invention.

Fig. 8 is a needle retracting action schematic diagram (1) when a needle moves in a second needle retracting track according to one embodiment of the invention.

Fig. 9 is a needle retracting action schematic diagram (2) when a needle moves in a second needle retracting track according to one embodiment of the invention.

Fig. 10 is a schematic diagram showing the positions of a top yarn and a bottom yarn in a hook during interchanged plating according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] The detailed description and technical contents of the present invention will now be described with reference to the drawings as follows:

Referring to Figs. 3, 4 and 5, the present invention provides a weft knitting machine knitting structure 10 with changeable yarn positions, which is provided on a needle bed 20 of a weft knitting machine, and the weft knitting machine is a circular knitting machine. The weft knitting machine knitting structure 10 comprises a plurality of sinkers 11 and a plurality of needles 12, wherein the plurality of sinkers 11 are arranged at equal intervals, and each of the plurality of sinkers 11 comprises a belly 111,

a nose 112 connected with the belly 111, and a throat 113 between the belly 111 and the nose 112. A yarn-bearing surface 114 of each of the plurality of sinkers 11 is located on a side of the nose 112 without facing the throat 113, and the yarn-bearing surface 114 is not limited by a plane and is able to be designed according to implementation requirements. On the other hand, A yarn-pushing surface 115 is located at an end of the nose 112, the yarn-pushing surface 115 is flat in this embodiment, but is not so limited and is able to be designed according to the implementation requirements. Further, each of the plurality of sinkers 11 of the present invention is guided by a sinker guide plate 13 to perform a linear displacement movement 116. Further, the linear displacement movement 116 is actually a one-dimensional movement.

[0014] Referring to Figs. 3, 4, 5 and 6, the plurality of needles 12 are disposed adjacent to one of the plurality of sinkers 11 respectively, that is, each of the plurality of needles 12 is disposed between any two of the plurality of sinkers 11 that are adjacent. Each of the plurality of needles 12 comprises a hook 121 and a latch 122 performing a closing action where is relative to the hook 121. Further, when each of the plurality of needles 12 moves to hook a yarn, the latch 122 performs opening relative to the hook 121 so that the yarn is able to enter the hook 121. Furthermore, when each of the plurality of needles 12 is retracted, the latch 122 performs the closing action in the direction towards the hook 121 due to the action of a previous knitted plating 50, closing the originally open portion of the hook 121. Further, the plurality of needles 12 of the present invention are arranged in a direction that the open portion of the hook 121 faces the throat 113 adjacent to one of the plurality of sinkers 11, as shown in Fig. 6. Further, the motion direction of the plurality of needles 12 of the present invention is perpendicular to the direction of the linear displacement movement 116, and the plurality of needles 12 are controlled by a needle guide plate 14 respectively for guiding each of the plurality of needles 12 to move in a first needle retracting track 40 or a second needle retracting track 41. Further, each of the plurality of needles 12 is controlled by a needle selector (not shown in the drawings). Furthermore, a time point for the latch 122 of each of the plurality of the needles 12 performing the closing action in the second needle retracting track 41 is earlier than in the first needle retracting track 40.

[0015] Referring to Figs. 3, 4 and 5, the weft knitting machine knitting structure 10 receives a facing yarn 30 and a bottom yarn 31 positioned below the facing yarn 30 that are fed by a yarn-feeding device (not shown in the drawings) during knitting. In one embodiment, the color of the facing yarn 30 is different color from the color of the bottom yarn 31. Specifically, herein presenting in-action of the plurality of needles 12 explains the relationship among each of the plurality of sinkers 11, the facing yarn 30 and the bottom yarn 31 for the moment. Thus, each of the plurality of sinkers 11 is guided by the sinker guide plate 13 to carry out the linear displacement move-

ment 116, and in the process of the linear displacement movement 116, the facing yarn 30 is always positioned above the nose 112, and the bottom yarn 31 is always positioned in the throat 113. Further, each of the plurality of sinkers 11 only performs one-dimensional movement.

[0016] With reference to Figs. 4, 6 and 7, the operation of each of the plurality of needles 12 is explained by illustrating the overall operation of the weft knitting machine knitting structure 10. Accordingly, when each of the plurality of needles 12 moves in the first needle retracting track 40, each of the plurality of needles 12 knits a standard plating without changing positions of the facing yarn 30 and the bottom yarn 31 in the hook 121, and the so-called "the standard plating" refers to a plating in which the facing yarn 30 is positioned above the bottom yarn 31 when viewing from a technical face of a fabric. Then referring to Figs. 8, 9 and 10, when each of the plurality of needles 12 of the present invention moves in the second needle retracting track 41 that one of the plurality of sinkers 11 adjacent to each of the plurality of needles 12 does not restrict positions of the facing yarn 30 and the bottom yarn 31, the latch 122 dials the bottom yarn 31 to make the bottom yarn 31 be pushed by the nose 112 of the plurality of sinkers 11, so as to change the positions of the facing yarn 30 and the bottom yarn 31 in the hook 121, then to knit an interchanged plating. The so-called "the interchanged plating" refers to a plating in which the facing yarn 30 is positioned under the bottom yarn 31 when viewing from the technical face of the fabric. Thus, the motion of the plurality of needles 12 in the first needle retracting track 40 or the second needle retracting track 41 determines whether the weft knitting machine knitting structure 10 of the present invention changes the position of the yarn.

[0017] Referring to Fig. 4, 6 and 7, each of the plurality of sinkers 11 of the present invention only comprises one motion track 42 that recurring operations of a first retraction section 421, a first push-out section 422 subsequent to the first retraction section 421, a second retraction section 423 subsequent to the first push-out section 422, and a second push-out section 424 subsequent to the second retraction section 423. Here, the retraction of the present invention is defined that each of the plurality of sinkers 11 moves in a direction opposing to the feeding point of the facing yarn 30 and the bottom yarn 31, so that the facing yarn 30 and the bottom yarn 31 are not restricted by the plurality of sinkers 11. Further, the push-out action of the present invention is defined that after the retraction each of the plurality of sinkers 11 moves toward the feeding point of the facing yarn 30 and the bottom yarn 31, so that the facing yarn 30 and the bottom yarn 31 are restricted by the plurality of sinkers 11 and unable to change position. Thus, each of the plurality of sinkers 11 in each section of the motion track 42 varies the position continuously, rather than being located at a single location. Referring to Figs. 4, 6 and 7, when each of the plurality of needles 12 moves in the first needle retracting track 40, the time point for the latch 122 gen-

erating the closing action is that one of the plurality of sinkers 11 adjacent to the latch 122 moves to the second retraction section 423. Thus, the facing yarn 30 and the bottom yarn 31 are hooked by the hook 121 in a state of being initially fed into the weft knitting machine knitting structure 10. Referring to Figs. 4, 8, 9 and 10, on the other hand, when each of the plurality of needles 12 moves in the second needle retracting track 41, the time point for the latch 122 generating the closing action is that one of the plurality of sinkers 11 adjacent to the latch 122 moves to the first push-out section 422. In detail, the time point for the latch 122 generating the closing action is not at the end point of the first push-out section 422, and is a stage that each of the plurality of sinkers 11 still does not restrict the position of the facing yarn 30 and the bottom yarn 31 in the first push-out section 422 instead. Therefore, when the latch 122 of each of the plurality of needles 12 performs the closing action, the bottom yarn 31 is dialed so that the bottom yarn 31 is diverged from the original position and is positioned on the displacement track of the nose 112 adjacent to one of the plurality of sinkers 11, and the plurality of sinkers 11 continuously performing a pushing action is allowing the yarn-pushing surface 115 to push the bottom yarn 31, so as to change the position of the bottom yarn 31 relative to the facing yarn 30 until the hook 121 of one of the plurality of needles 12 is hooked.

[0018] Accordingly, the present invention performs position change at the position where the facing yarn 30 and the bottom yarn 31 are fed into the weft knitting machine knitting structure 10 to perform jacquard knitting. Compared with the conventional, the yarn changing reaction time of the weft knitting machine knitting structure 10 is real-time, and the problem that patterns of a fabric appears after image due to slow yarn changing reaction speed of the conventional can be solved.

Claims

1. A weft knitting machine knitting structure (10) with changeable yarn positions, wherein a facing yarn (30) and a bottom yarn (31) positioned below the facing yarn (30) are fed during knitting, the weft knitting machine knitting structure (10) comprising:

a plurality of sinkers (11) respectively comprising a belly (111), a nose (112) connected with the belly (111), and a throat (113) between the belly (111) and the nose (112), wherein each of the plurality of sinkers (11) is guided to perform a linear displacement movement (116), wherein the facing yarn (30) is positioned above the nose (112) and the bottom yarn (31) is positioned in the throat (113) in a process of the linear displacement movement (116); and
a plurality of needles (12) respectively arranged adjacent to one of the plurality of sinkers (11),

- each of the plurality of needles (12) including a hook (121) and a latch (122) for performing a closing action relative to the hook (121), each of the plurality of needles (12) is controlled to move in a first needle retracting track (40) knitting a standard plating without changing positions of the facing yarn (30) and the bottom yarn (31) in the hook (121), or to move in a second needle retracting track (41) knitting an interchanged plating with changing the positions of the facing yarn (30) and the bottom yarn (31) in the hook (121), wherein in the second needle retracting track (41), the latch (122) dials the bottom yarn (31) to make the bottom yarn (31) pushed by the nose (112) of one of the plurality of sinkers (11) when one of the plurality of sinkers (11) adjacent to each of the plurality of needles (12) does not restrict positions of the facing yarn (30) and the bottom yarn (31), and wherein a time point for the latch (122) of each of the plurality of needles (12) generating the closing action in the second needle retracting track (41) is earlier than the first needle retracting track (40).
2. The weft knitting machine knitting structure (10) with changeable yarn positions according to claim 1, wherein the weft knitting machine knitting structure (10) comprises a needle guide plate (14) guiding the plurality of needles (12) in the first needle retracting track (40) or the second needle retracting track (41), and a sinker guide plate (13) guiding the plurality of sinkers (11) to perform the linear displacement movement (116).
3. The weft knitting machine knitting structure (10) with changeable yarn positions according to claim 2, wherein the weft knitting machine knitting structure (10) comprises a needle selector controlling each of the plurality of needles (12).
4. The weft knitting machine knitting structure (10) with changeable yarn positions according to claim 1, 2 or 3, wherein each of the plurality of sinkers (11) only comprises one motion track (42) that recurring operations of a first retraction section (421), a first push-out section (422) subsequent to the first retraction section (421), a second retraction section (423) subsequent to the first push-out section (422), and a second push-out section (424) subsequent to the second retraction section (423), and wherein the time point for the latch (122) of each of the plurality of needles (12) generating the closing action in the first needle retracting track (40) is that one of the plurality of sinkers (11) adjacent to the latch (122) moves to the second retraction section (423), and the time point for the latch (122) of each of the plurality of needles (12) generating the closing action in the second needle retracting track (41) is that one of the plurality of sinkers (11) adjacent to the latch (122) moves to the first push-out section (422).
5. The weft knitting machine knitting structure (10) with changeable yarn positions according to claim 4, wherein the facing yarn (30) and the bottom yarn (31) are different in color.
6. The weft knitting machine knitting structure (10) with changeable yarn positions according to claim 1 or 2 or 3, wherein the facing yarn (30) and the bottom yarn (31) are different in color.

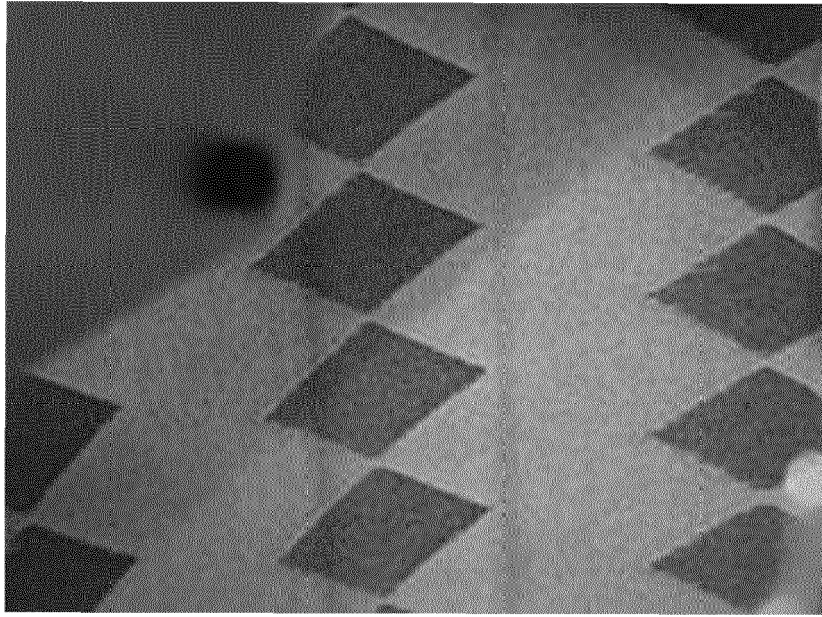


Fig. 1 PRIOR ART

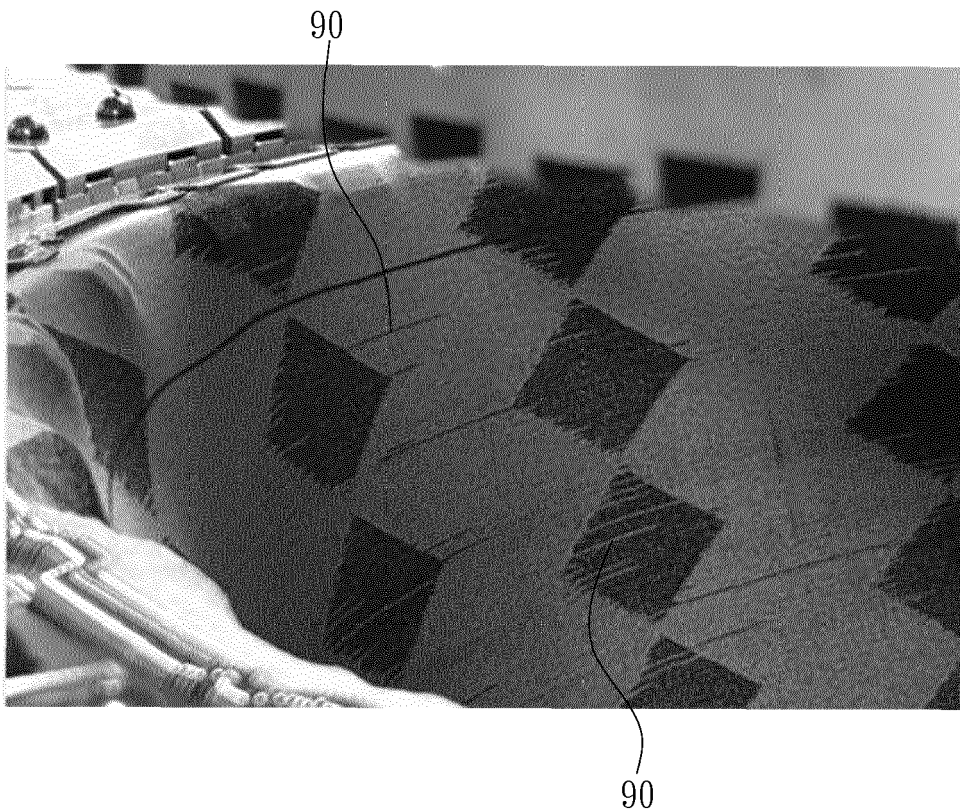


Fig. 2 PRIOR ART

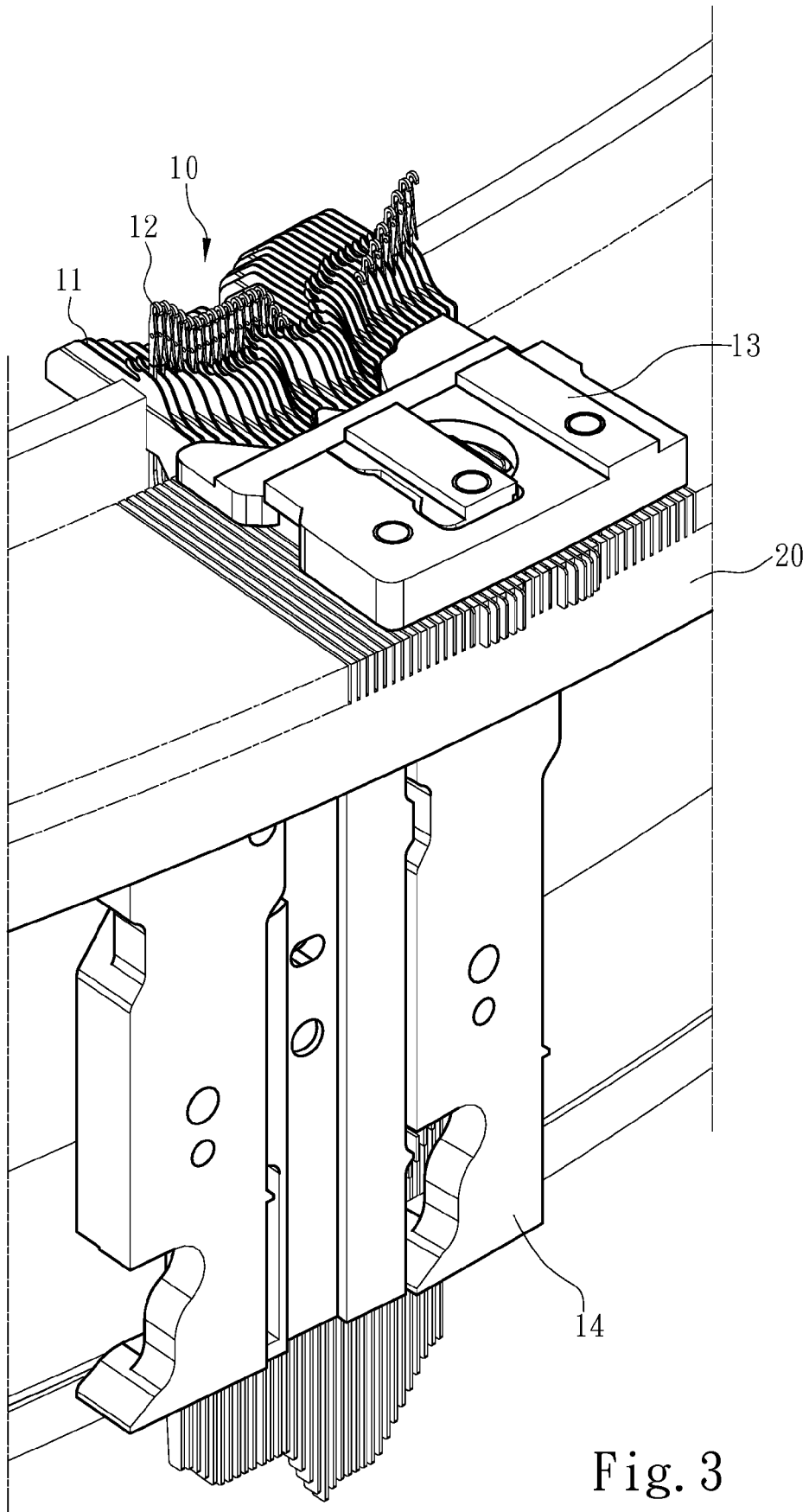


Fig. 3

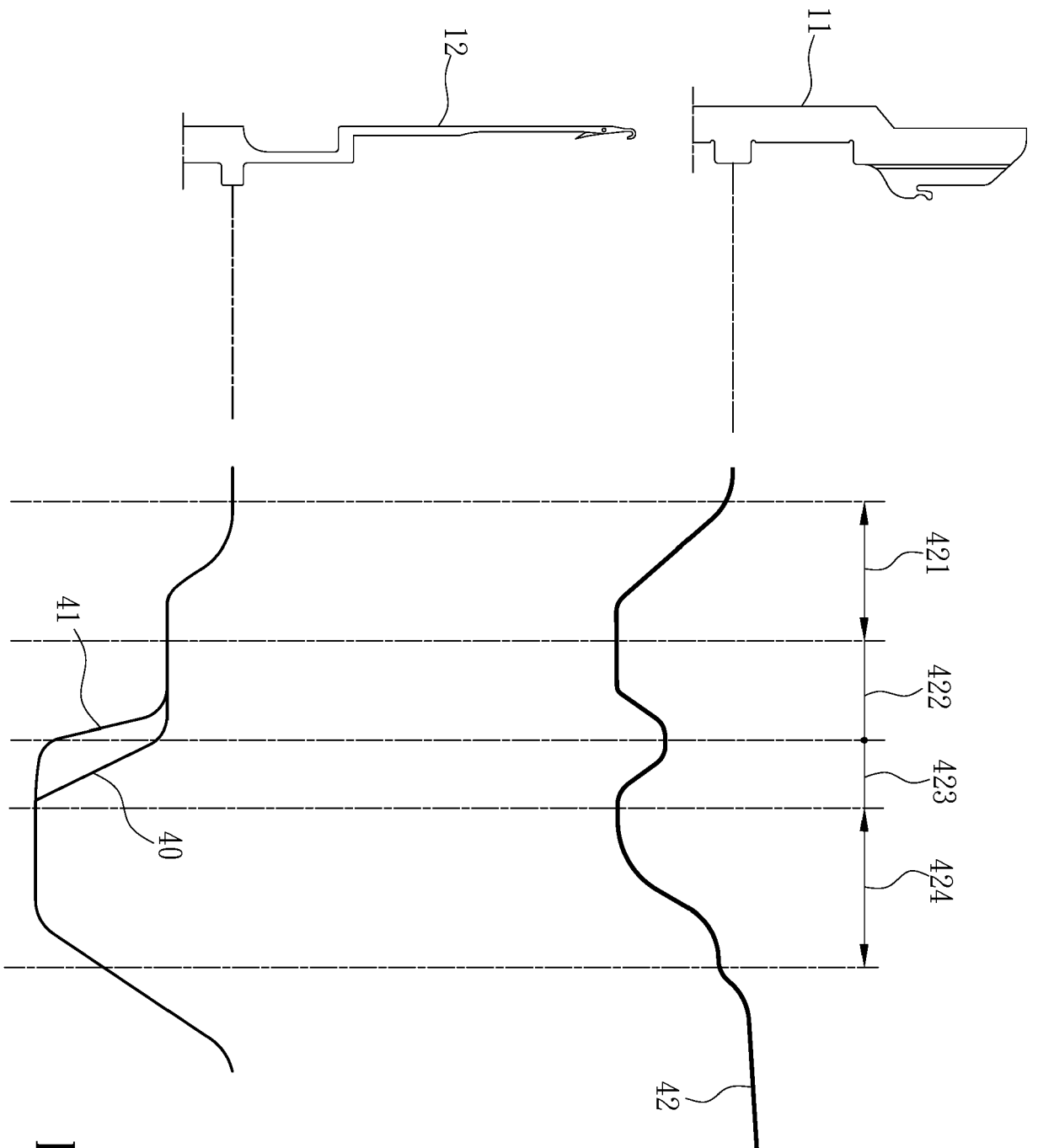


Fig. 4

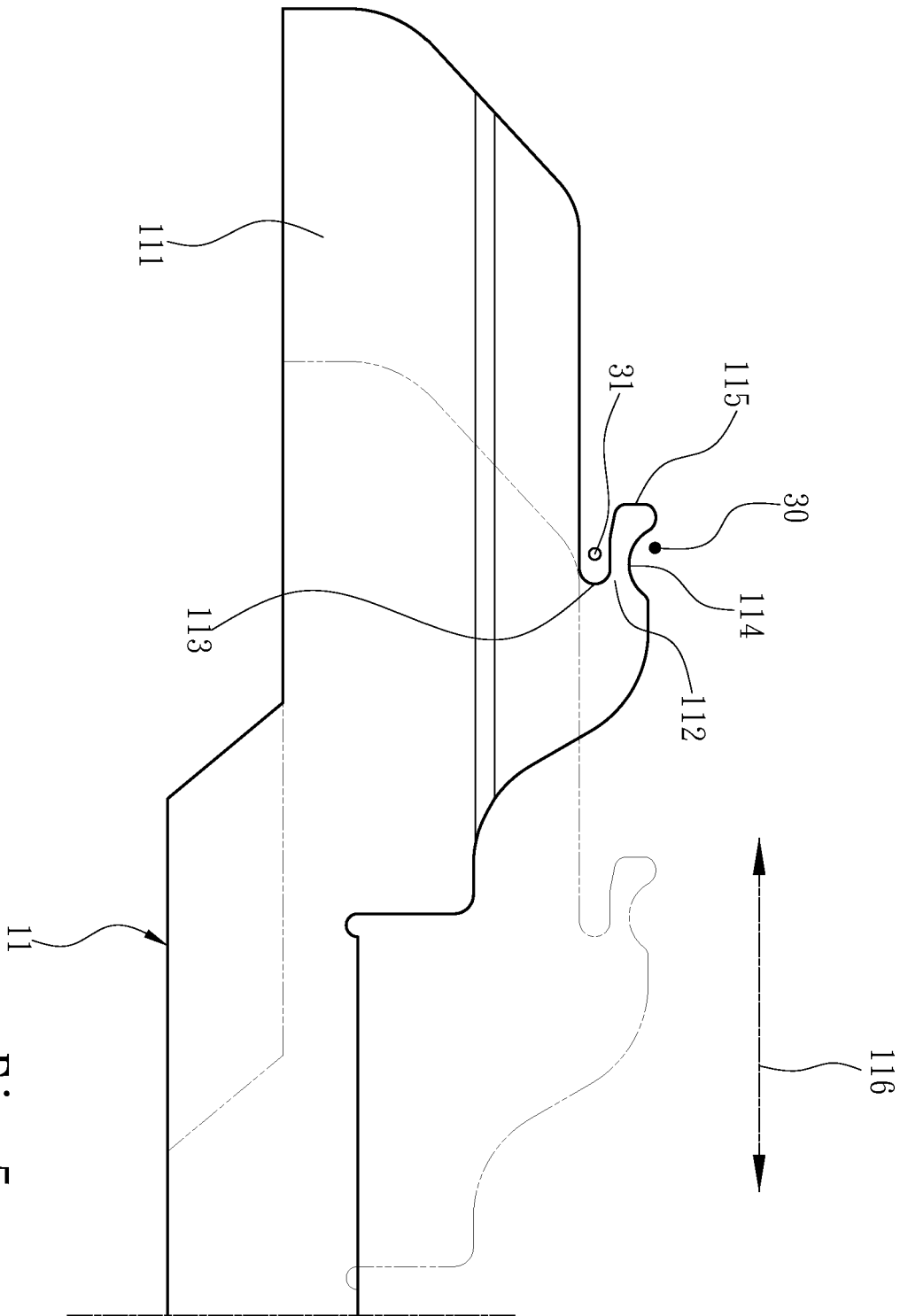


Fig. 5

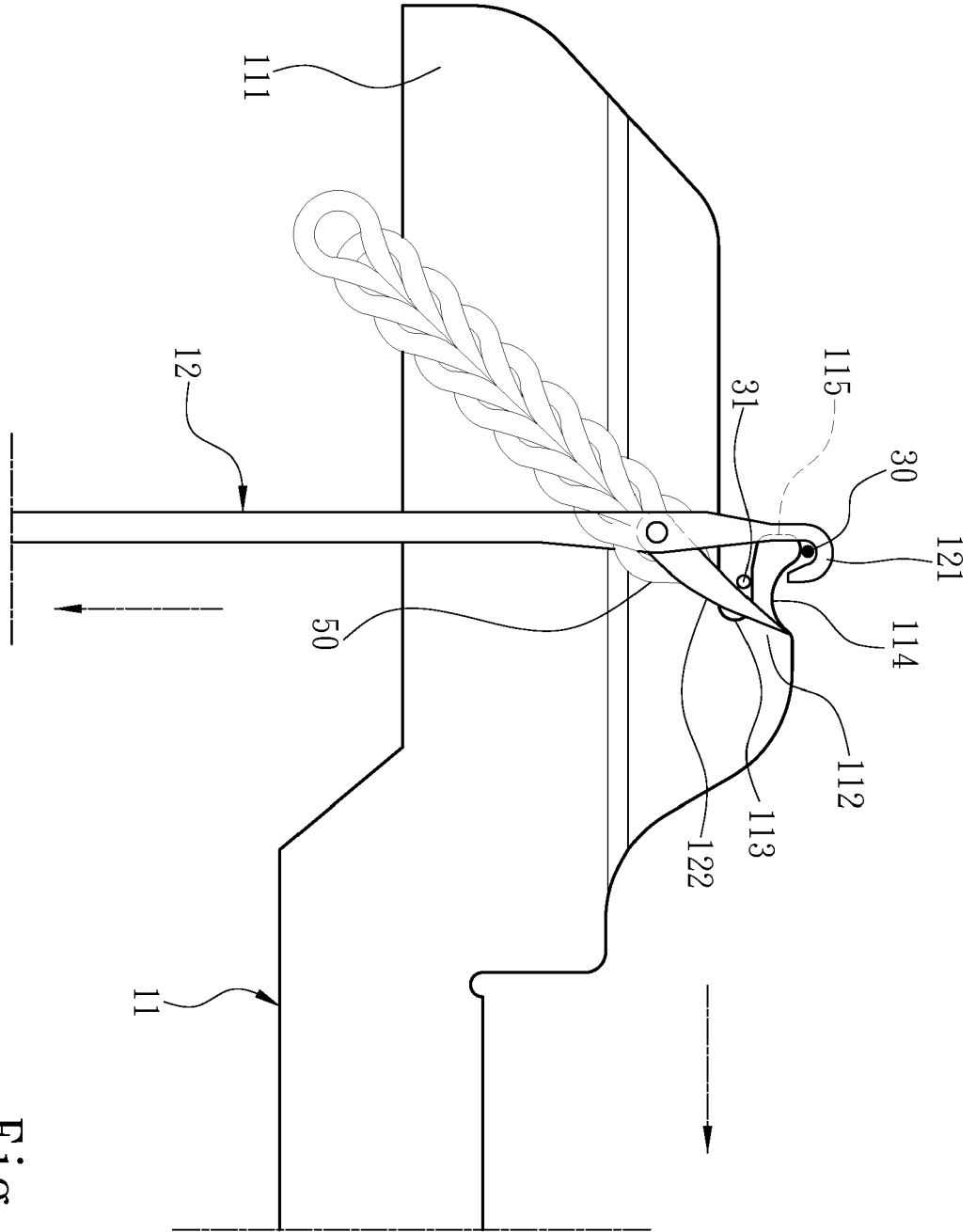


Fig. 6

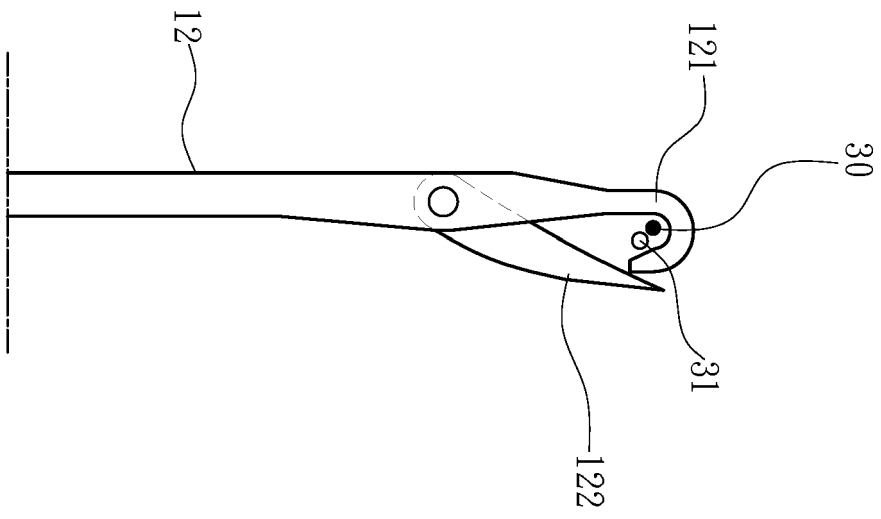


Fig. 7

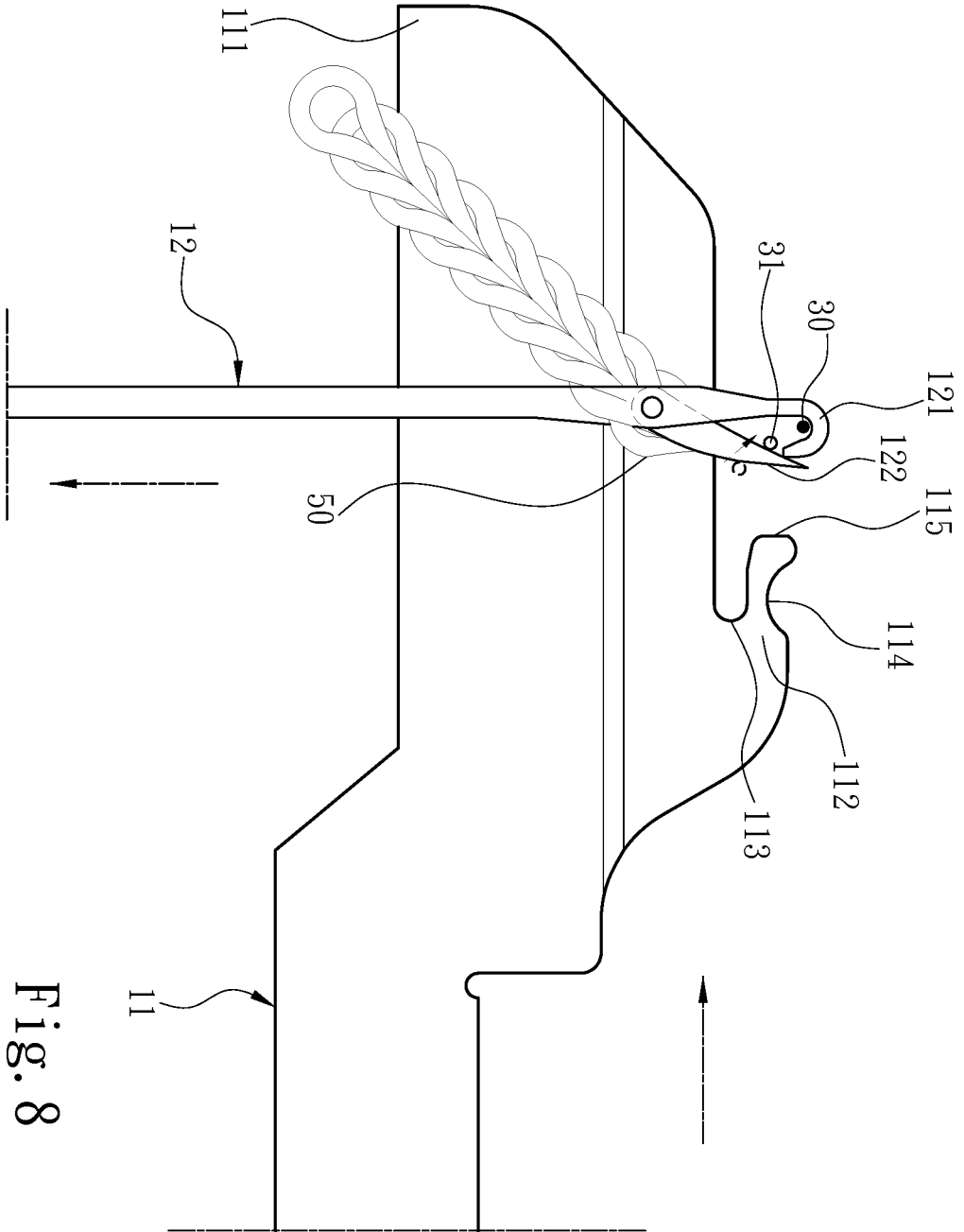
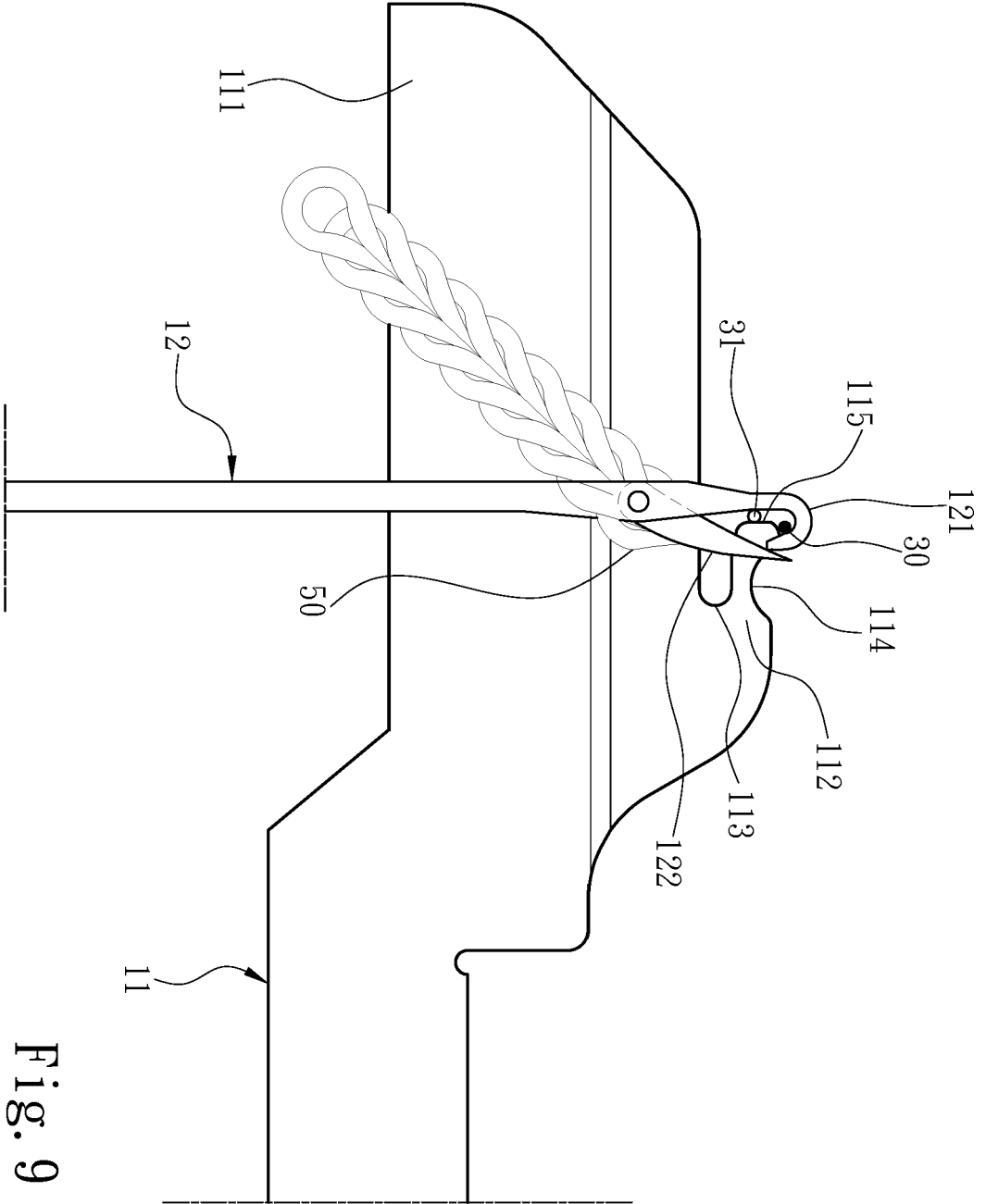


Fig. 8



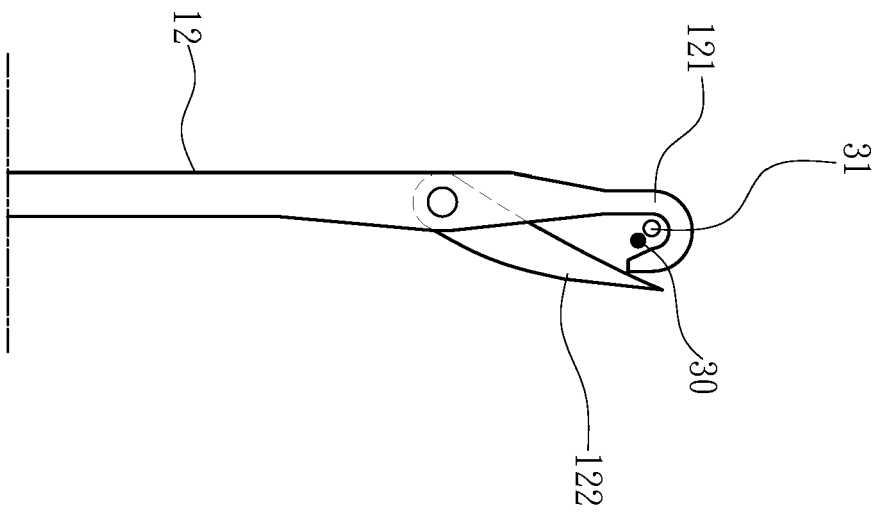


Fig. 10



EUROPEAN SEARCH REPORT

Application Number
EP 19 18 7868

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 9 834 871 B2 (PAI LUNG MACHINERY MILL CO LTD [TW]) 5 December 2017 (2017-12-05)	1,2,4-6	INV. D04B9/34 D04B7/26 D04B15/06
Y	* column 1, lines 15-27; figures 2-19 * * page 2, lines 55-57 * * column 3, line 50 - column 4, lines 8, 31-32 * * column 5, lines 11-45 - column 6, lines 18-30 * * column 7, lines 23-33, 63-67 - column 8, lines 1-15 *	3	
X	----- US 2 273 811 A (SAMUEL MISHCON) 24 February 1942 (1942-02-24) * page 1, column 1, lines 3,4;34;48-52; figures 3-5, 12 * * page 2, column 1, lines 29-31;47-54 * * page 2, column 2, lines 5-39 * * page 3, column 2, lines 59-63 - page 4, column 1, lines 1-3 *	1-3,5,6	
Y	----- US 4 328 686 A (BARBEE JACK C ET AL) 11 May 1982 (1982-05-11) * column 3, lines 26-30 * * column 6, lines 23, 35-68 - column 7, line 2 * * column 8, line 23 * * column 9, lines 31-62; figure 6 *	3	TECHNICAL FIELDS SEARCHED (IPC) D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 February 2020	Examiner Messai, Sonia
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 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 18 7868

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-02-2020

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
	US 9834871	B2	05-12-2017	NONE
	US 2273811	A	24-02-1942	NONE
15	US 4328686	A	11-05-1982	NONE
20				
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 1666794 A [0003]
- US 1950405 A [0003]
- US 3157035 A [0003]
- US 2616276 A [0003]
- CN 104532458 A [0003]
- WO 0015890 A [0003]
- US 1977590 A [0004]
- CN 2249253 Y [0004]