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(54) **MECHANISM FOR TRANSFERRING STITCHES FROM NEEDLES OF KNITTING MACHINE AND SEWING**

(57) A mechanism for the transfer of stitches (73) from the needles (10) of knitting machine for sewing. The invention relates to the elements that ensure transfer of a textile material such as a sock from the knitting needles (10) after being knitted in the knitting machine. The mechanism for the transfer of stitches comprises stripping el-

ements suitable to convey the stitch from the needle to a transfer element before conveying the stitch on a sewing station. The transfer element is configured to grip the head of the needle and to comprise a transfer end placed in front of the hook and lower than the open end of the hook.

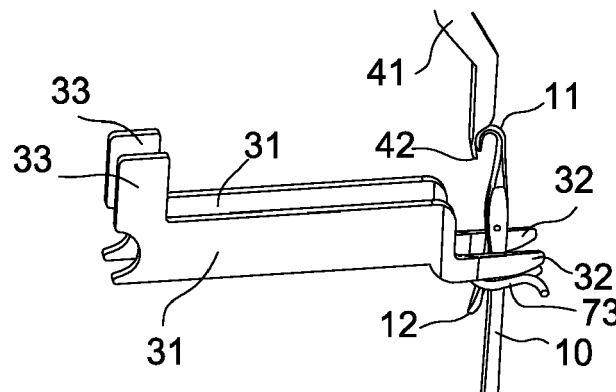


FIG.1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The invention is an improved version of the mechanism described in the patent numbered EP2377979, and in particular, it relates to the elements that ensure transfer of a textile material such as a sock from the knitting needles after being knitted in the knitting machine and the elements in the station where the open end of the textile material is sewn off.

2. Description of the Related Art:

[0002] Tubular textile products such as socks are manufactured by being knitted in cylindrical knitting machines. One end of the textile product, which has two open ends, is then moved away from the needles of the knitting machine and brought to the toe-closing station and sewed off therein. The transfer of the tubular textile product from knitting machine to toe-closing station can be carried out, for example, by means of an automatic mechanism as described in EP2377979.

[0003] As described in EP2377979, when sock-knitting process in knitting machine is completed, the knitted stitches on the last row are taken from the knitting needles one by one by means of transfer elements and stripping elements, and transferred to a toe-closing station, which is at a location distant from knitting needles.

[0004] The transfer elements described in EP2377979 (for example, as shown in Fig. 31 -38) include a front opening 1e, and the hooks of the knitting needles are inserted into this front opening prior to stitch transfer. In order to ensure this, the width of said front openings should be of a certain thickness. Otherwise, the hooks of the knitting needles cannot be inserted into transfer elements. Such a construction requires more precise positioning controls between the transfer elements and knitting needles, however it leads to disadvantages such as use of transfer elements that are thicker than required, thereby increased use of force for the movement of the heavier mass and cost increase. In addition, the transfer parts described in EP2377979 include material filler at the farthest end for attachment of knitting needle hooks, which is hard and costly to produce such a complex geometry.

[0005] On the other hand, the toe-closing station to which the stitches conveyed by the transfer elements are transferred comprises mainly a circular shaped structure where one-half can be opened and closed over another by a 180° rotation.

[0006] One-half circle contains various numbers of female threads arranged as a protrusion along this half circle, while the other one includes the same number of male threads arranged in the same manner as a protrusion along this half circle.

[0007] When one-half circle is closed over the other one, a form conformity is ensured between male threads and female threads. In the next step to take place after one-half circle is closed over the one, the stitches in one-half circle will be approached to the stitches in the other one, so that the stitches then can be sewn and the end of the textile material can be sewn off.

[0008] As is known from the application, the half circle, which typically bears the female thread, is closed (and opened) on the half circle bearing the male threads, and the stitches on the female threads are approached to the stitches in the male threads. Thus, the toe-closing process, i.e. the sewing process, is performed when the stitches approached each other are on the male threads. Therefore, the male threads comprises a specific form. Because the sewing needle should get very closer to stitch pairs that are approaching each other; otherwise, the sewing process of stitches approaching, otherwise sewing cannot be carried out. To summarize, the male threads comprises a running clearance at the point where they bear the stitch pairs so that the sewing needle can enter/exit the stitch pairs. This clearance may be in the form of a U-shaped or V-shaped channel in EP2377979 (for example, Fig. 30) or EP0942086 (for example, Fig. 76A, and 76B). However, for example, when the stitch pairs are relatively stretched, these known forms sometimes prevent the needle from finding the proper running clearance and may cause the seam to be made improperly, or even breaking of sewing needle. A top view of the V-shaped channel structure, stitch and sewing needle representing the known status of the art is shown in Fig. 30.

[0009] Even though the toe-closing process (sewing process) is performed on male threads in practice, theoretically, the half circle bearing the male threads can also be closed on the half circle bearing the female threads and in this case, the female threads can be configured to comprise the forms such as a U shape or V shape for sewing as mentioned above. To summarize, the threads in which the stitch pairs are sewn, i.e. toe-closing process is performed, comprise a form such as a U shape or V shape.

SUMMARY OF THE INVENTION

[0010] An objective of the invention is to provide efficient transfer of the textile material stitches, which are knitted in tubular shape, from the knitting needles.

[0011] An objective of the invention is to provide efficient sewing of the stitches transferred. To achieve the objectives, the invention is related to a mechanism that comprises a knitting machine having several knitting needles, of which each has a hook and a tongue that can approach to and move away from this hook by rotation; stripping elements to convey the stitch in each knitting needle to a sewing station, which can approach to and move away from knitting needles and move them along the needle axis by touching the stitch in each knitting

needle and a transfer apparatus including transfer elements, which can approach to and move away from the hooks of knitting needles and which comprise an end portion where the stitches are brought on when stripping elements move the stitches in the knitting needles towards the hooks.

[0012] Here, each transfer element is configured to grip at least partially an outer surface of the hook of each knitting needle, and each transfer element comprises of an end portion configured to remain between the needle and the hook when the needle tongue for is closed the stitch transfer.

[0013] In addition, with respect to the mechanism according to the invention, the cross-section of the first longitudinal threads bearing the stitch pairs of the sewing station, in which stitches conveyed by the transfer apparatus are sewn, is substantially formed in an L shape.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

In **Fig. 1**, a representative isometric view of the moment when stripping element starts to push the stitch downwards in the mechanism subject of the invention is given.

In **Fig. 2**, a representative isometric view of the moment when stripping element pushes the stitch downwards in the mechanism subject of the invention is given.

In **Fig. 3**, a representative isometric view of the moment when stripping element moves away from the stitch in the mechanism subject of the invention is given.

In **Fig. 4**, a representative isometric view of the moment when stripping element starts to move downwards in the mechanism subject of the invention is given.

In **Fig. 5**, a representative isometric view of the moment when stripping element approaches to the stitch and grips it from the bottom in the mechanism subject of the invention is given.

In **Fig. 6**, a representative isometric view of the moment when stripping element pushes the stitch upwards in the mechanism subject of the invention is given.

In **Fig. 7**, a representative isometric view of the moment when stripping element completely unhooks the stitch in the mechanism subject of the invention is given.

In **Fig. 8**, a representative isometric view of the moment when stripping element and the transfer element move away from the knitting needle in the mechanism subject of the invention is given.

In **Fig. 9**, a representative isometric view of the moment when the stitches are brought to sewing station in the mechanism subject of the invention is given.

In **Fig. 10**, a representative isometric view of the mo-

ment when the stitch is engaged with the thread in the sewing station by the upward movement of stripping and transfer elements in the mechanism subject of the invention is given.

In **Fig. 11**, a representative isometric view of the moment when the transfer element moves away from the thread by upward movement in the mechanism subject of the invention is given.

In **Fig. 12**, a representative isometric view of the moment when the transfer element moves away from the thread by radial movement in the mechanism subject of the invention is given.

In **Fig. 13**, a representative isometric view of the moment when a half circle is closed over another and the stripping element grips the stitch in the closed half circle from the bottom in the mechanism subject of the invention is given.

In **Fig. 14**, a representative isometric view of the moment when the stitch pair is brought side by side on the thread of half circle by stripping element in the mechanism subject of the invention is given.

In **Fig. 14A**, a partially enlarged view illustrating an end portion of the male thread in **Fig. 14** being inserted into the end housing of the female thread is given.

In **Fig. 15**, a representative isometric view of the moment when the stitch pair is sewed in the mechanism subject of the invention is given.

In **Fig. 16**, a front view of Fig. provides the front view of the stitch transferring given.

In **Fig. 17**, a front view of Fig. 6 is given.

In **Fig. 18**, a front view of the moment before the stitches are engaged to the threads of sewing station with stripping and transfer elements after being transferred from knitting needles is given.

In **Fig. 19**, a front view of the moment when the stitches are engaged to the threads of sewing station with stripping and transfer elements is given.

In **Fig. 20**, a front view of the moment when the transfer elements move away from the threads by upward movement after the stitches are engaged to the threads of sewing station is given.

In **Fig. 21**, a front view of the moment when the transfer elements move away from the threads by radial movement after the stitches are engaged to the threads of sewing station is given.

In **Fig. 22**, a front view of the moment when the stripping and transfer elements move away from the threads by downward movement is given.

In **Fig. 23**, a front view of the moment when a half circle is closed over another in the mechanism subject of the invention is given.

In **Fig. 24**, a front view of the moment when the stitch pair is brought side by side on the thread of half circle by stripping element in the mechanism subject of the invention is given.

In **Fig. 25**, a front view of the moment when the stripping and transfer elements move away from the sew-

ing station in the mechanism subject of the invention is given.

In **Fig. 26**, a front view of the moment when the half circle, which transfers stitches to the threads of the other half circle, returns back to initial position (open) is given.

In **Fig. 27**, a front view of the moment when the stitch pair is sewed in the mechanism subject of the invention is given.

In **Fig. 28**, a schematic view illustrating the structure of the transfer element is given.

In **Fig. 29**, a cross-section view of the male threads with stitch and sewing needle is given.

In **Fig. 30**, a cross-section view of the male threads of background art with stitch and sewing needle is given.

DETAILED DESCRIPTION OF THE INVENTION

[0015] The aforementioned and further advantages and features of the present invention will be understood by reference to the description of the preferred embodiment in conjunction with the accompanying drawings where the components are illustrated based on a proportion for explanation but not subject to the actual component proportion. Embodiments of the present invention are illustrated in detail along with the drawings. However, the technical features included by the present invention are not limited to certain embodiments hereby provided. Scope of the present invention shall be referred to the claims, which include all the possible replacements, modifications, and equivalent features.

[0016] In this detailed description, the mechanism subject of the invention is described only by examples, which do not have any limiting effect on a better understanding of the subject.

[0017] The invention relates to a mechanism that ensures transfer of, in particular, sock from the machine, in which it is manufactured by knitting, to a sewing station where toe sewing is applied.

[0018] As described in EP2377979, when the knitting process of the sock in sock manufacturing machines is completed, the toe of the sock is open and the last stitches **73** on the toe remain on a needle **10** of the knitting machine. Various numbers of stripping element **31** and transfer elements **41** are used to enable sewing of the sock toe as described in EP2377979. These elements are placed opposing each other inside two rackets (not shown in the drawings) facing each other.

[0019] **Fig. 1 - Fig. 8** show how the last stitches **73** remained on the knitting needles **10** are removed by means of stripping elements **31** and transfer elements **41** step by step. The steps of abovementioned process are substantially as described in EP2377979. In other words, the transfer elements **41** are approached to the hooks **11** of the knitting needles by pushing of drive end **43**, and the stripping elements **31**, by again pushing of drive end **33**, firstly grips the top of stitches **73** and then

move downwards to unhook them from knitting needle tongues **12**.

[0020] In this invention, the bottom of transfer elements **41** comprises of a curved form that is compatible with the outer surface of the needle hooks **11** and is clamped to be positioned on the outer surfaces of the hooks **11** so that it can preferably cover the outer surfaces of the hooks partially **11** when the transfer elements **41** approach to the hooks **11** for stitch **73** transfer. Abovementioned curved form at the bottom of each transfer element **41** is preferably configured to cover mainly the region at the top and the outer front surface of each needle hook.

[0021] The transfer ends **42** of the transfer elements **41** are positioned in front of the hooks **11** so as to partially cover the ends of the hooks **11** from outer side and so that they are held at a position slightly lower than the open end of the hook when the transfer elements **41** approach the hooks **11** for stitch **73** transfer.

[0022] The transfer ends **42** of the transfer elements **41** may preferably include a curved form toward the body of the knitting needles. In this way, when the knitting needle tongue **12** is closed in the next step (see **Fig. 17**), the stitch **73** can be transferred in a relatively safe manner.

[0023] As seen in **Fig. 3**, the stripping elements **31** return back slightly after unhooking the stitches **73** from needle tongues **12** by moving the stitches **73** downwards via the pressure applied by end portions **32**; and as seen in **Fig. 5**, it moves forward and grasps the stitches **73** from the bottom. In the next step, as seen in **Fig. 6**, it moves the stitches **73** upwards and meanwhile the needle tongues **12** are closed. In this case, the transfer end **42** remains between the needle hook **11** and the needle tongue **12**. When the stripping elements **31** moves upwards further, each stitch **73** is now transferred to the respective transfer element **41**.

[0024] In the next step, as seen in **Fig. 8**, the transfer elements **41** move away from the knitting needles **10** together with the stripping elements **31** to the sewing station where the toe-closing process is performed.

[0025] As seen in **Fig. 18**, after the transfer elements **41** and the stripping elements **31** are positioned under the jaw unit **50**, they move upwards as seen in **Fig. 19**, and then engaged to the first longitudinal threads and the second longitudinal threads supplied with an interval of 360° around the jaw unit. In an embodiment of the present invention, the first longitudinal threads are defined as the male threads **511**, and the second longitudinal threads are defined as the female threads **521**. The male threads **511** are fastened to the respective jaw by means of the male fixing portions **512** extending inward thereon, while the female threads **521** are likewise fastened to the respective jaw by means of female fixing portions **522** extending inward thereon.

[0026] **Fig. 9 - Fig. 12** show the steps of transfer of a stitch **73** to a male thread **511**. Each transfer element **41** comprises transfer lower bottom body **45** that slightly protrudes out the vertically extending body wherein there is a transfer channel **44** formed in a U-like shape. When

the transfer elements **41** and the stripping elements **31** move upwards together, each thread **511**, **521** are inserted into each transfer channel **44**, and the stitches **73** are released to the male extension portion **513** of the male threads **511** and to the female extension portion **523** of the female threads **521**. Afterwards, the transfer elements **41** and the stripping elements **31** move away from the male threads **511** and the female threads **521**. Each male thread **511** has an end portion **515**, and each female thread **521** has an end housing **524**.

[0027] As shown by **Fig. 28**, each transfer element **41** comprises a plate body **46**, and the transfer lower bottom body **45** slightly protrudes from the bottom portion of the plate body **46**. Therein, the transfer lower bottom body **45** has a transfer channel **44** which forms a first lateral plate **451**, a second lateral plate **452**, and a connection plate **453**, wherein the first lateral plate **451** and the second lateral plate **452** are arranged in parallel and spaced with each other. The two lateral sides of the connection plate **453** are connected with the first lateral plate **451** and the second lateral plate **452**, respectively. In an embodiment of the present invention, the first lateral plate **451** has a first bevel portion **454** on one end away from the plate body **46**. The second lateral plate **452** has a second bevel portion **455** formed corresponding to the first bevel portion **454**. The first bevel portion **454** and the second bevel portion **455** are inclined to face the lower-back direction on one side on which the transfer channel **44** is formed, respectively. The first bevel portion **454** and the second bevel portion **455** are formed in a symmetric profile. Also, the first bevel portion **454** and the second bevel portion **455** form a part of the curved form at the bottom of the transfer element **41**, so as to correspond to the curved form of the transfer end **42** for covering the outer surface of the hook **11**.

[0028] The plate body **46** has the drive end **43**, a body portion **461**, and an extension part **462**. The drive end **43** extends upward from the rear end of the body portion **461**, and the extension part **462** extends downward from the front end of the body portion **461** away from the drive end **43**. The bottom end of the extension part **462** is connected with the transfer lower bottom body **45**. A curve recess **463** is formed on one lateral side of the drive end **43** away from the body portion **461**. A third bevel portion **464** is formed on the outer side of the extension part **462**. A fourth bevel portion **465** is formed on the inner side of the extension part **462**. A shoulder portion **466** is formed on the junction between the extension part **462** and the transfer lower bottom body **45**.

[0029] As seen in **Fig. 23**, the jaw unit **50** comprises two half circles, one of which is fixed jaw **51** and the other is movable jaw **52**. In accordance with the preferred embodiment, the movable jaw **52** bearing the female threads **521** can be closed over the fixed jaw **51** bearing the male threads **511** and opened by a 180° rotation. As in **Fig. 23**, when the movable jaw **52** is closed over the fixed jaw **51**, the end portions **515** of the male threads **511** are inserted into the end housings **524** of the female threads

521 (as shown by **Fig. 14A**) for smoothly transferring the stitch **73** between the male thread **511** and the female thread **521**. Then, as seen in **Fig. 24**, the transfer elements **41** and the stripping elements **31** move upwards, push up the stitches in the female threads **521**, bring them next to the stitches borne by the male threads **511** and then move away from the jaw unit **50**.

[0030] In the next step, the movable jaw **52** opens and returns back to initial position, and then a sewing needle **80** sews each stitch **73** pair on the male thread **511**, and closes the open end of the textile material.

[0031] The cross section of the threads to which the stitch **73** pairs are engaged for sewing, male threads **511** are shown in this description, is substantially formed in an L shape. Therefore, as seen in **Fig. 29**, the male threads **511** comprise of a lateral extension **514** extending substantially perpendicular from the vertically-extending male extension portion **513**.

[0032] Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

Claims

1. A mechanism for transferring stitches from needles of knitting machine and sewing, comprising:

a knitting machine having a plurality of knitting needles (10), each knitting needle (10) has a hook (11) and a tongue (12) which moves toward and away from the hook (11) by rotation;

a plurality of stripping elements (31) convey a stitch (73) in each of the knitting needles (10) to a sewing station, the stripping elements (31) move toward and away from the knitting needles (10) and move the stitches (73) along a needle axis by touching the stitch (73) in each of the knitting needles (10); and

a transfer apparatus including a plurality of transfer elements (41), which move toward and away from the hook (11) of the knitting needles (10), the transfer elements (41) comprising a transfer end (42) onto where the stitches (73) are brought when the stripping elements (31) move the stitches (73) in the knitting needles (10) toward the hooks (11);

characterized in that:

each transfer element (41) is configured to grip at least partially an outer surface of the hook (11) of each knitting needle (10), and the transfer end (42) of each transfer element (41) is configured to remain between the a body of the knitting needle (10) and the corresponding hook (11) when the tongue (12) is closed for transferring

the stitch (73).

2. The mechanism according to claim 1, **characterized in that** a bottom portion of each transfer element (41) is formed in a curve shape, which is configured to cover mainly a region at a top surface and an outer front surface of each corresponding hook (11).
3. The mechanism according to claim 1, **characterized in that** the transfer end (42) of each transfer element (41) is positioned in front of the hook (11), so as to partially cover an end portion of the hook (11) from an outer side, so that the transfer end (42) of the transfer element (41) is held at a location lower than an open end of the corresponding hook (11) when the transfer element (41) approaches the hook (11) for transferring the stitch (73).
4. The mechanism according to claim 3, **characterized in that** the transfer end (42) of each transfer element (41) includes a curved form portion toward the body of the knitting needle (10).
5. The mechanism according to claim 4, **characterized in that** the transfer element (41) comprises a plate body (46) and a transfer lower bottom body (45) which slightly protrudes from a bottom portion of the plate body (46), with an U-like transfer channel (44) formed on the transfer lower bottom body (45).
6. The mechanism according to claim 5, **characterized in that** the transfer lower bottom body (45) has the transfer channel (44) which forms a first lateral plate (451), a second lateral plate (452), and a connection plate (453); the first lateral plate (451) and the second lateral plate (452) are arranged in parallel and spaced with each other; two lateral sides of the connection plate (453) are connected with the first lateral plate (451) and the second lateral plate (452), respectively.
7. The mechanism according to claim 6, **characterized in that** the first lateral plate (451) has a first bevel portion (454) on one end away from the plate body (46); the second lateral plate (452) has a second bevel portion (455) formed corresponding to the first bevel portion (454); the first bevel portion (454) and the second bevel portion (455) are inclined to face a lower-back direction on one side on which the transfer channel (44) is formed, respectively; the first bevel portion (454) and the second bevel portion (455) form the curved form portion.
8. The mechanism according to claim 7, **characterized in that** the plate body (46) has the drive end (43), a body portion (461), and an extension part (462); the drive end (43) extends upward from a rear end of the body portion (461), and the extension part (462)

extends downward from a front end of the body portion (461) away from the drive end (43); a bottom end of the extension part (462) is connected with the transfer lower bottom body (45); a curve recess (463) is formed on one lateral side of the drive end (43) away from the body portion (461); a third bevel portion (464) is formed on an outer side of the extension part (462); a fourth bevel portion (465) is formed on an inner side of the extension part (462); a shoulder portion (466) is formed on a junction between the extension part (462) and the transfer lower bottom body (45), and the shoulder portion (466) is on one side of the connection plate (453).

9. A sewing station mechanism for closing an open end of a textile material formed in a tubular shape, comprising:

a first half circle having a plurality of first longitudinal threads (511), an amount of the first longitudinal threads (511) being equal to half of an amount of stitches (73) at the last row of the open end of the textile material;

a second half circle having a plurality of second longitudinal threads (521), an amount of the second longitudinal threads (521) being equal to half of an amount of stitches (73) at the last row of the open end of the textile material, the second half circle being able to rotate for 180° to move toward and away from the first longitudinal threads (511) on the first half circle;

characterized in that:

a cross-sectional face of the first longitudinal threads (511) bearing stitch (73) pairs that are conveyed by the transfer apparatus and sewn is substantially formed in an L shape.

10. The mechanism according to claim 9, **characterized in that** the first longitudinal threads (511) with the L shaped cross-sectional face are male threads (511).
11. The mechanism according to claim 9, **characterized in that** a sewing process is performed on the first longitudinal threads (511) of the first half circle.
12. The mechanism according to claim 10, **characterized in that** the male threads comprise a vertically extending male extension portion (513) and a lateral extension portion (514) which substantially extends from the male extension portion (513).
13. The mechanism according to claim 10, **characterized in that** the second longitudinal threads are defined as female threads (521).
14. The mechanism according to claim 13, **characterized in that** each male thread (511) has a male fixing portion (512) extending inward thereon, a vertically-

extending male extension portion (513), and an end portion (515); each female thread (521) has a female fixing portion (522) extending inward thereon, a vertically-extending female extension portion (523), and an end housing (524); when the male thread (511) moves close to the corresponding female thread (521), the end portions (515) of the male thread (511) is inserted into the end housings (524) of the female thread (521) for smoothly transferring the stitch (73) between the male thread (511) and the female thread (521).

15. The mechanism according to claim 14, **characterized in that** one of the first half circle and the second half circle is a fixed jaw (51) and the other one is a movable jaw (52); the movable jaw (52) bears the female threads (521) and is closed over the fixed jaw (51) which bears the male threads (511) by a 180° rotation, such that the end portions (515) of the male threads (511) are inserted into the corresponding end housings (524) of the female threads (521).

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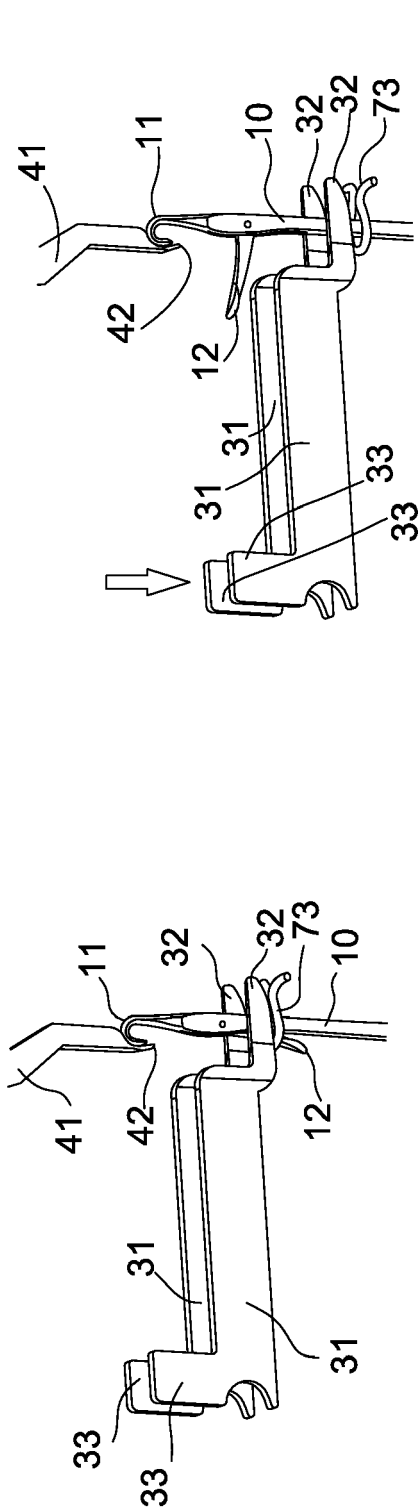


FIG. 1

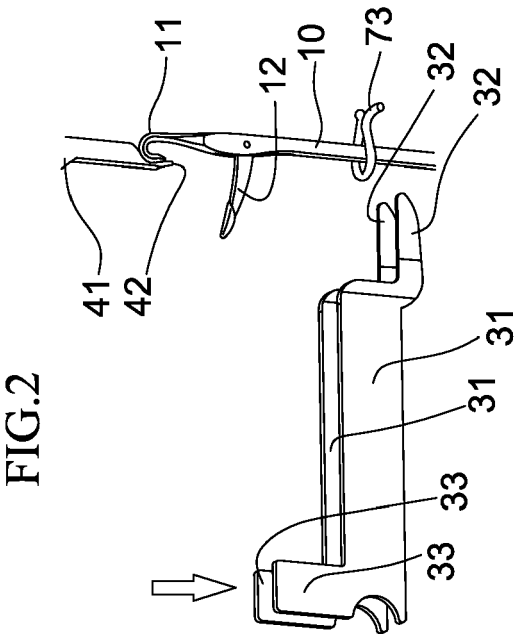


FIG. 2

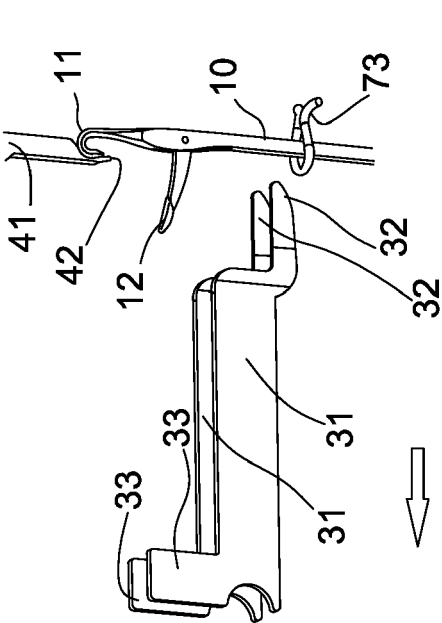
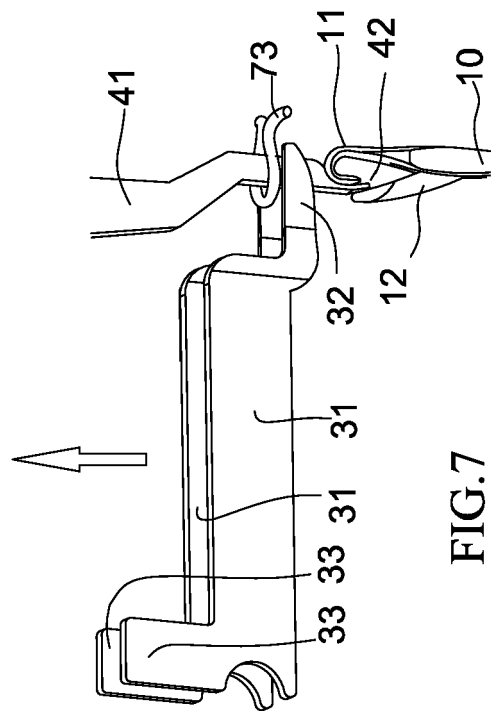
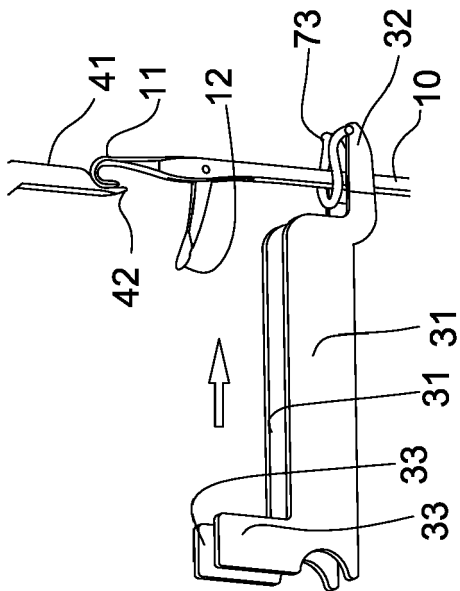
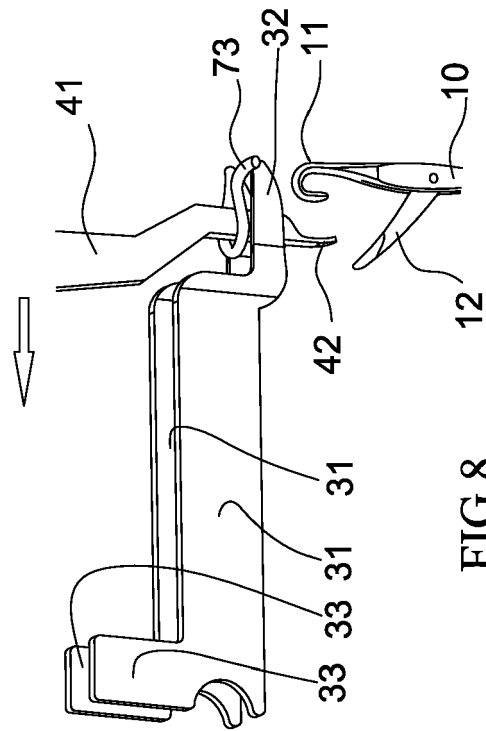
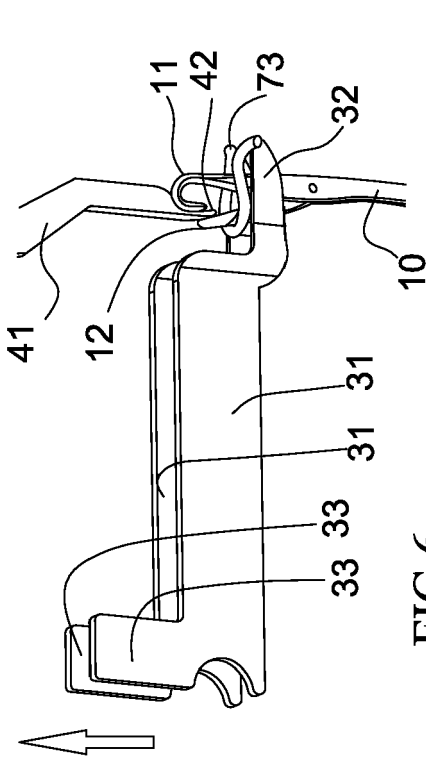
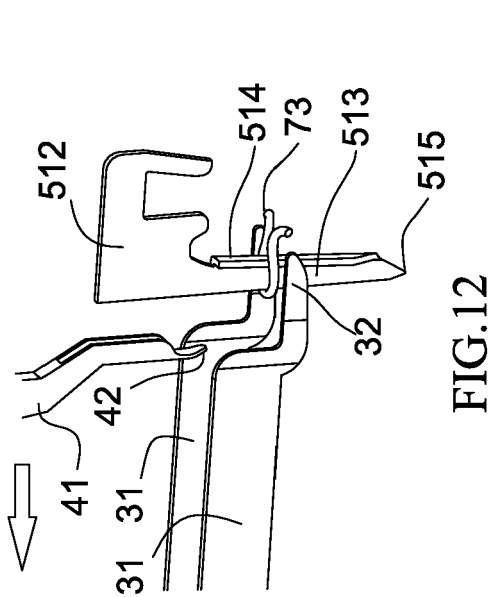
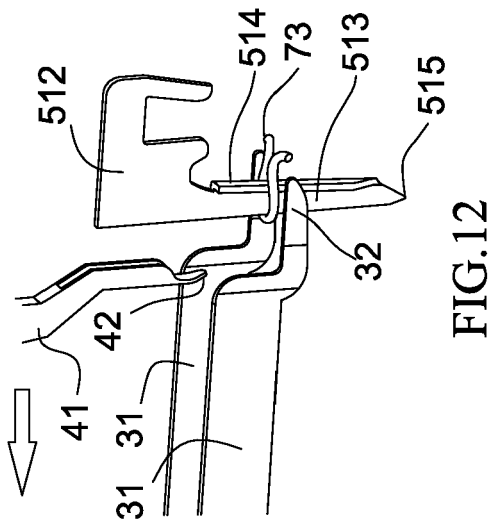
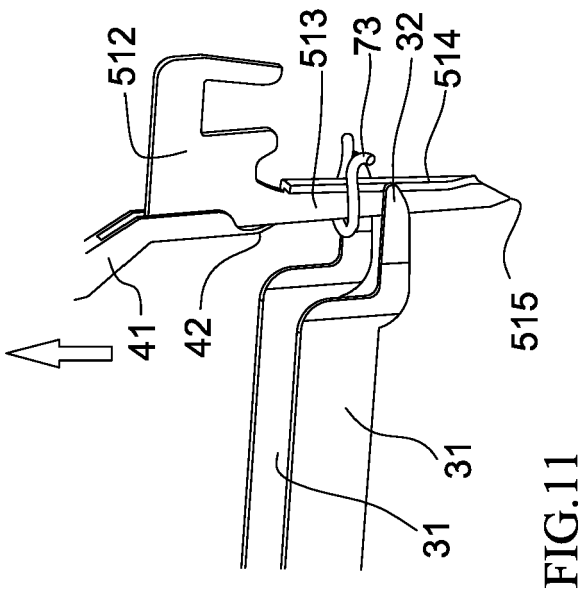
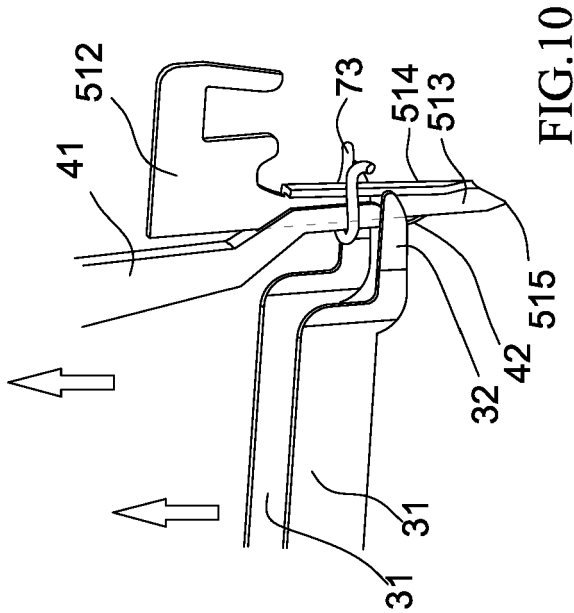


FIG. 3





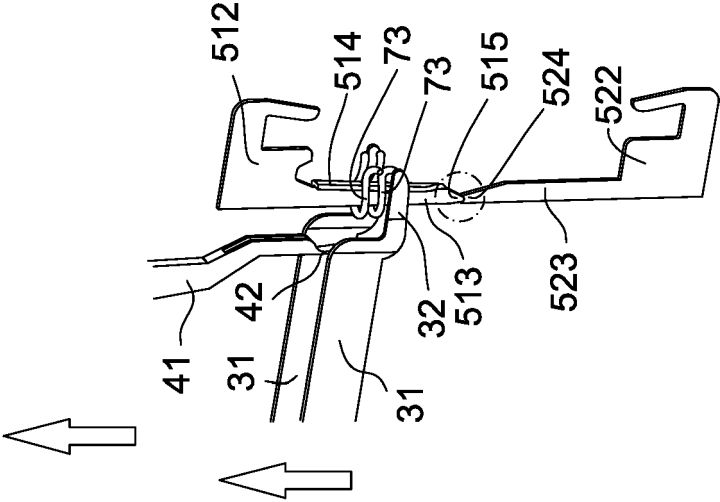


FIG. 14

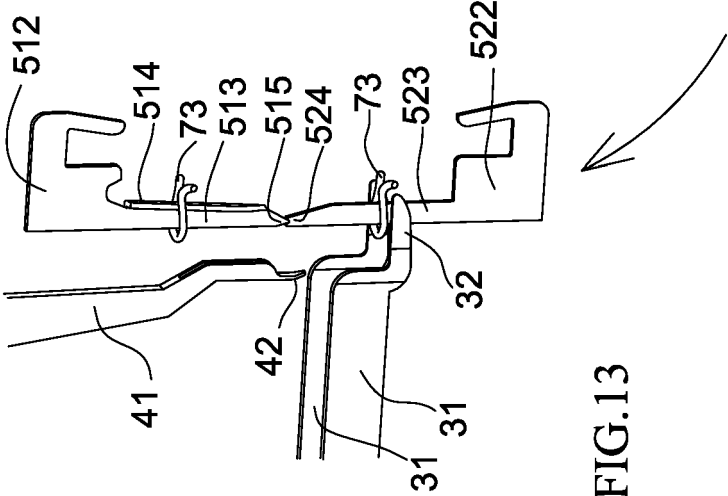


FIG. 13

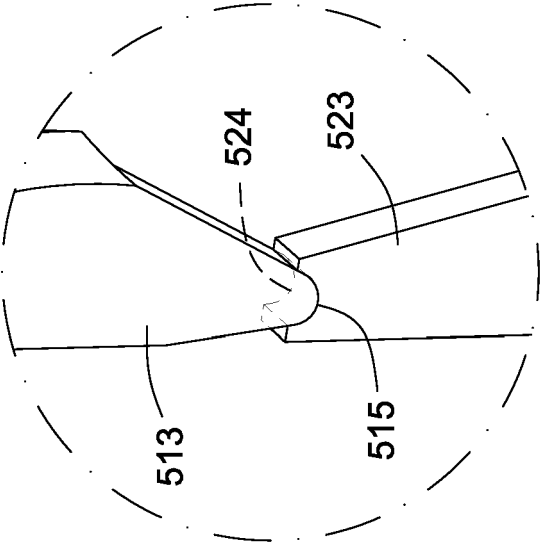


FIG. 14A

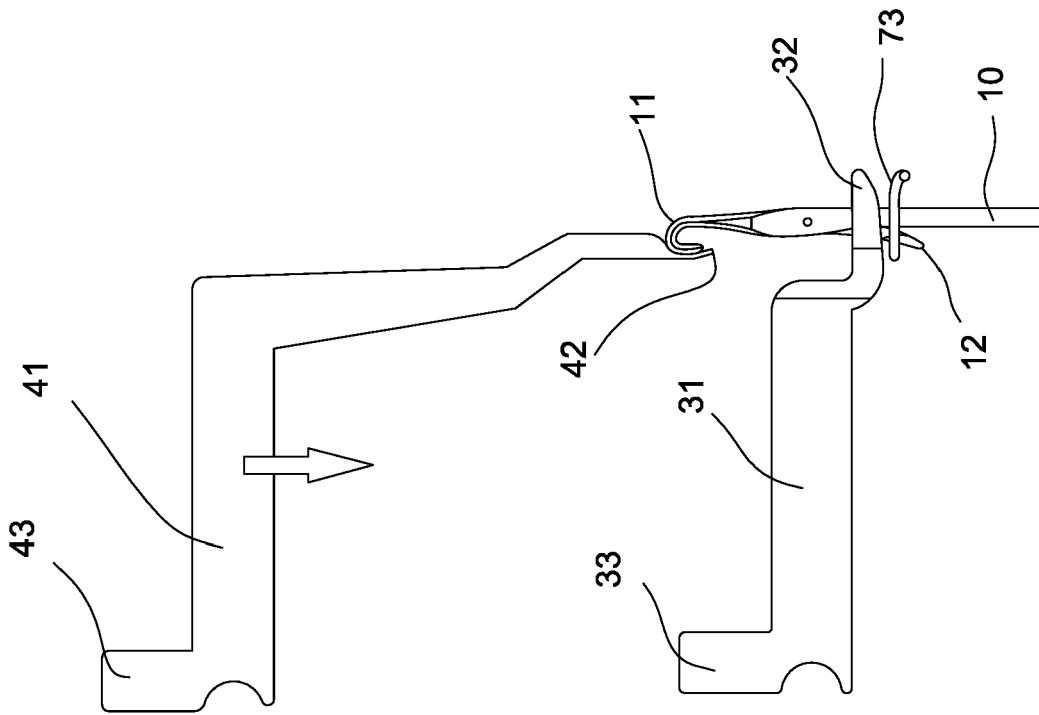


FIG.16

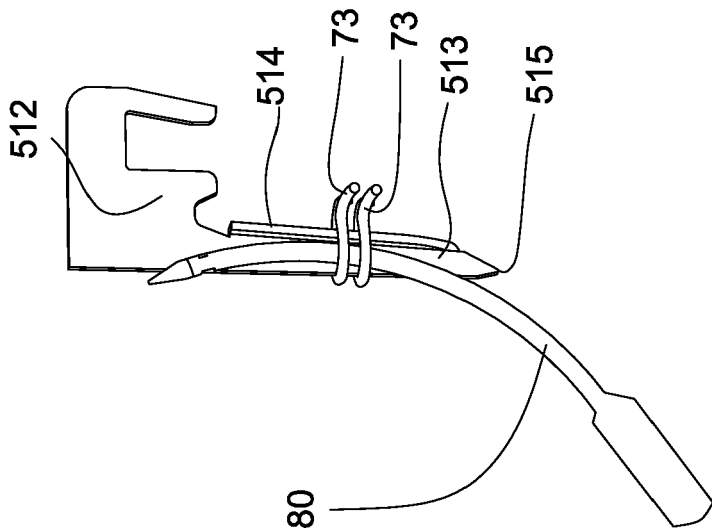


FIG.15

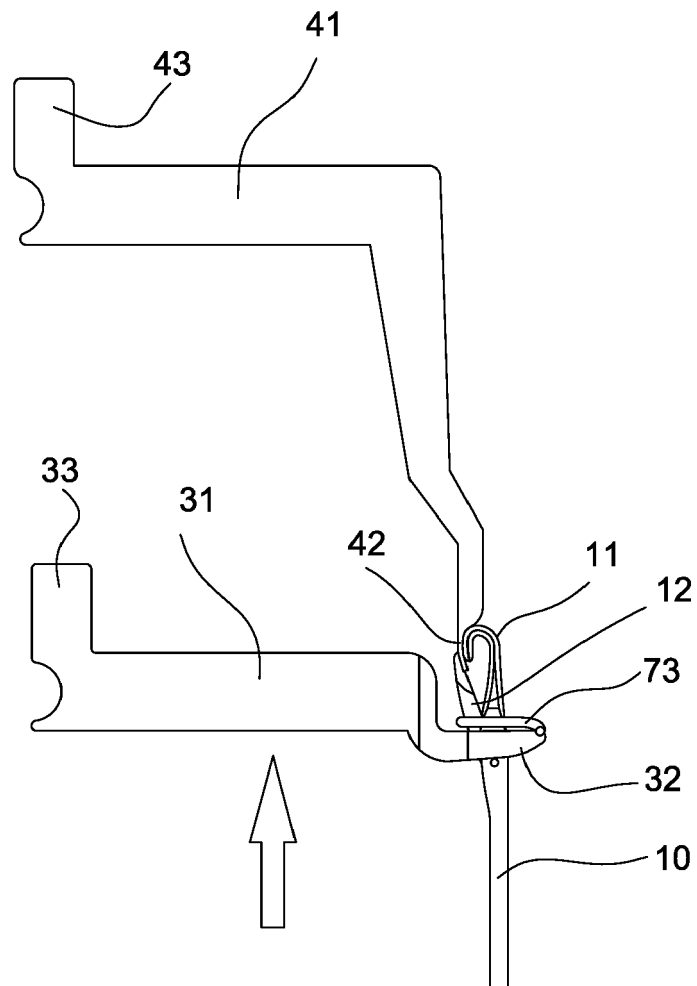


FIG.17

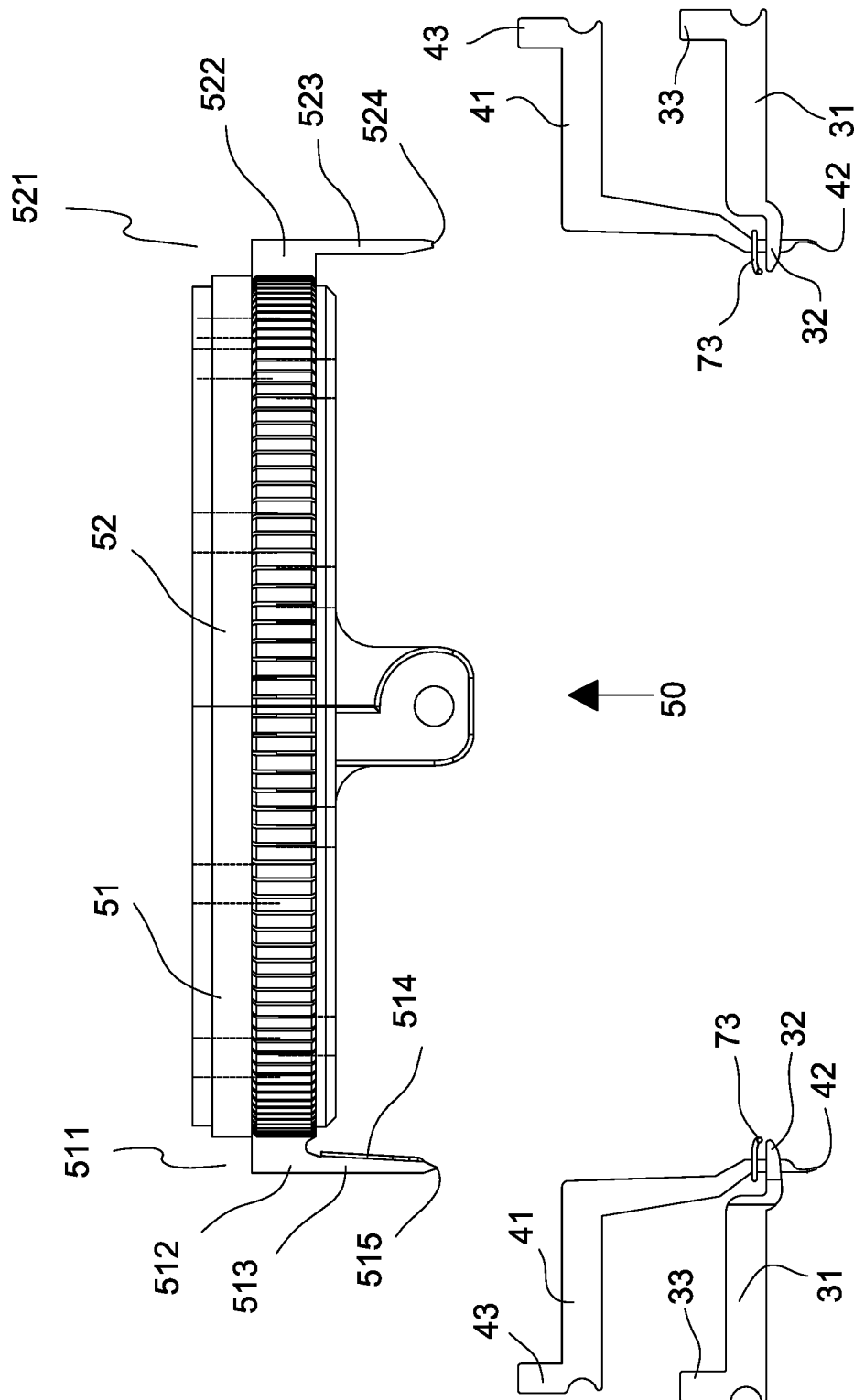


FIG.18

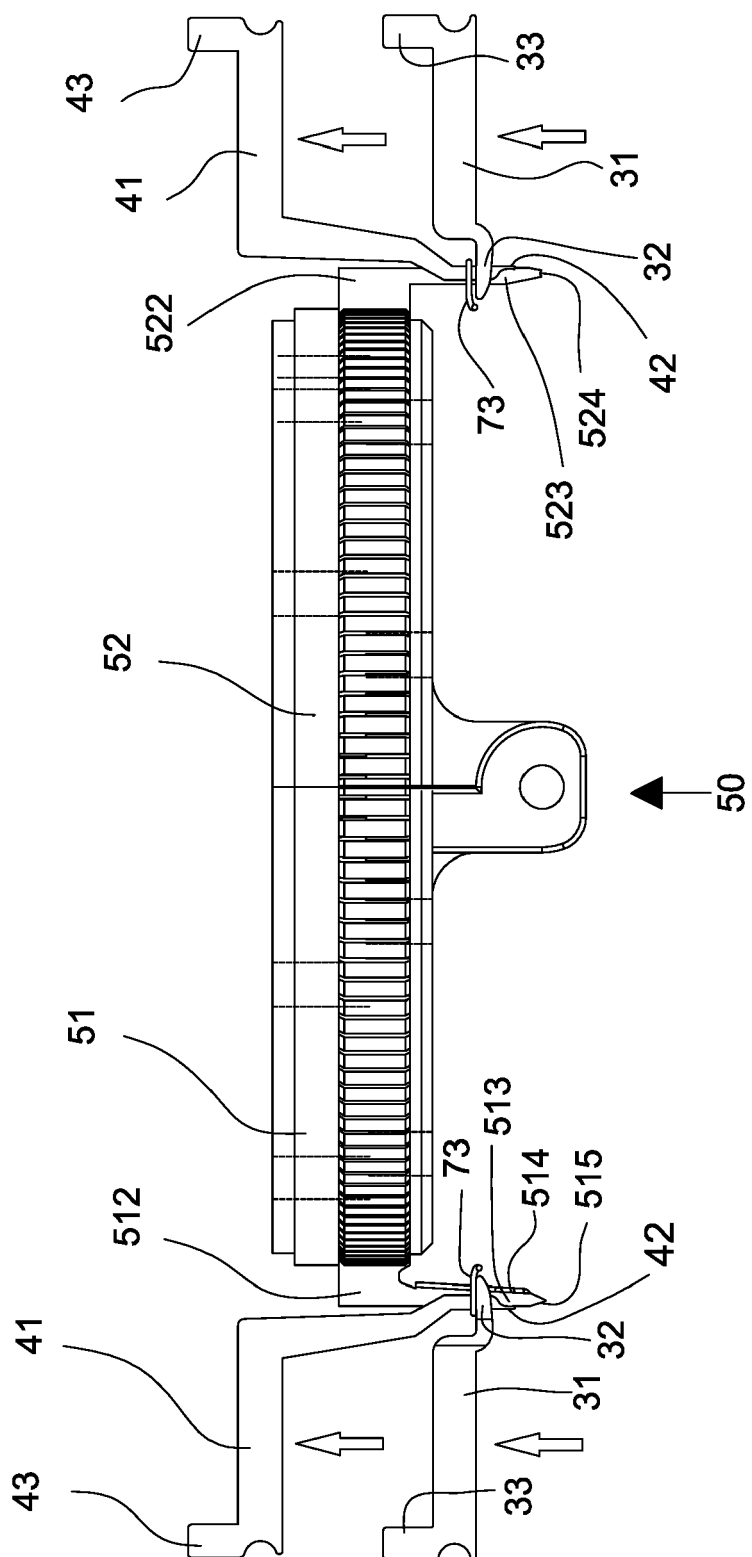


FIG. 19

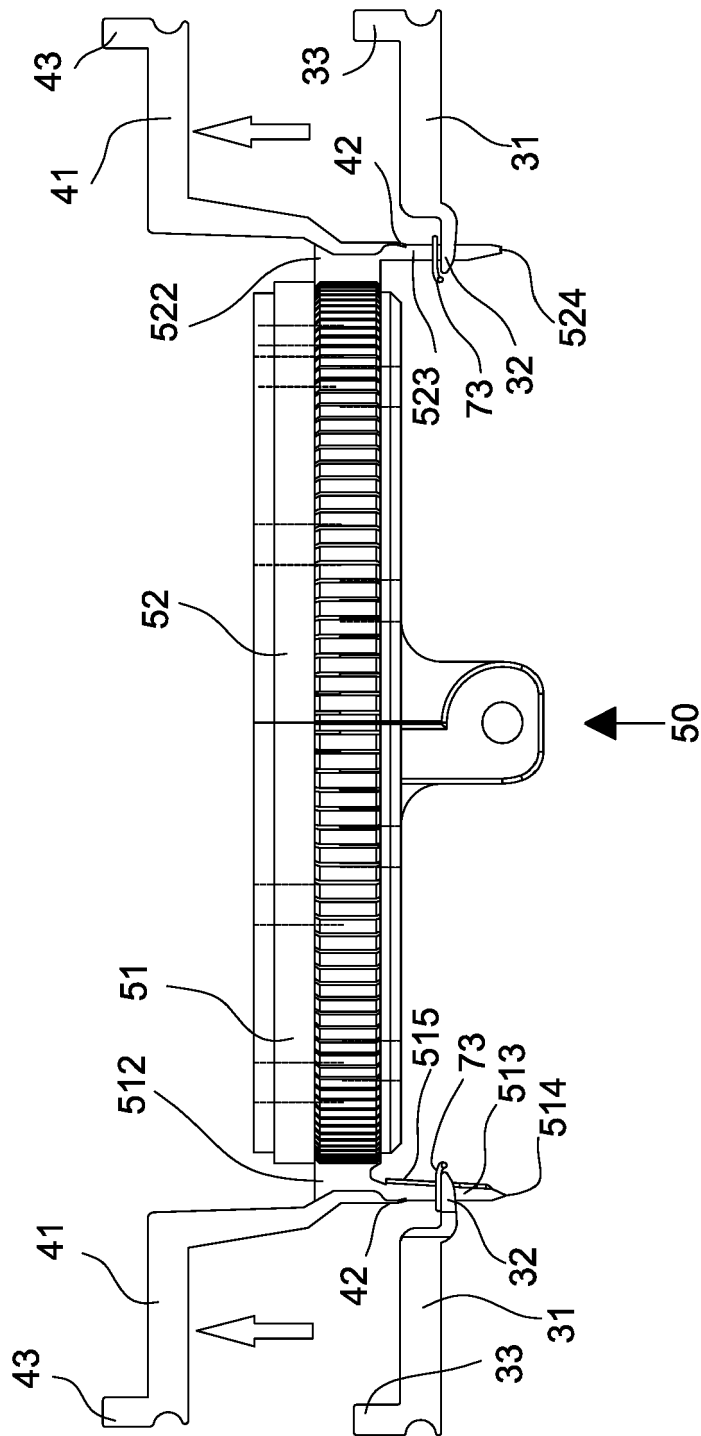


FIG. 20

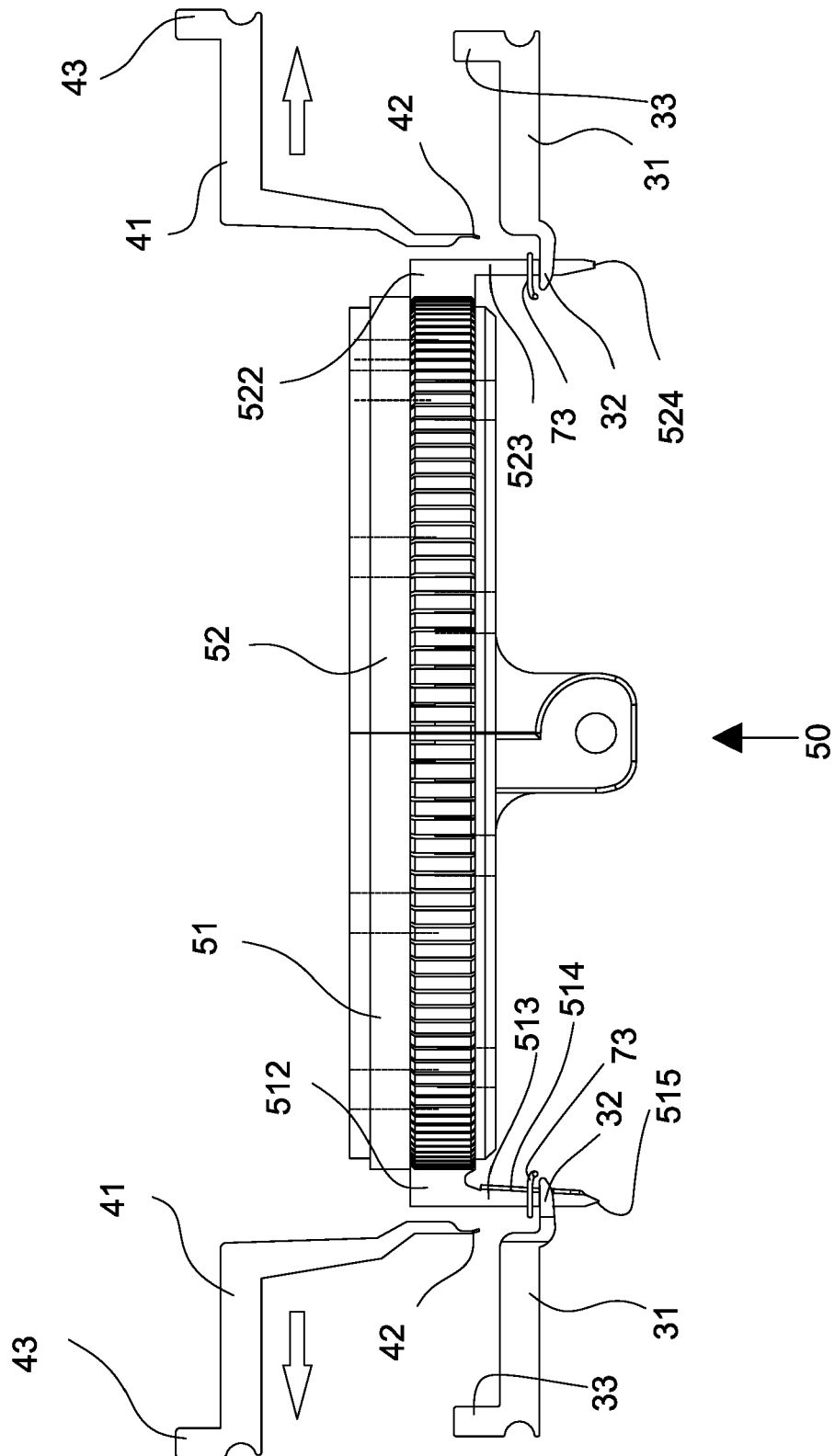


FIG. 21

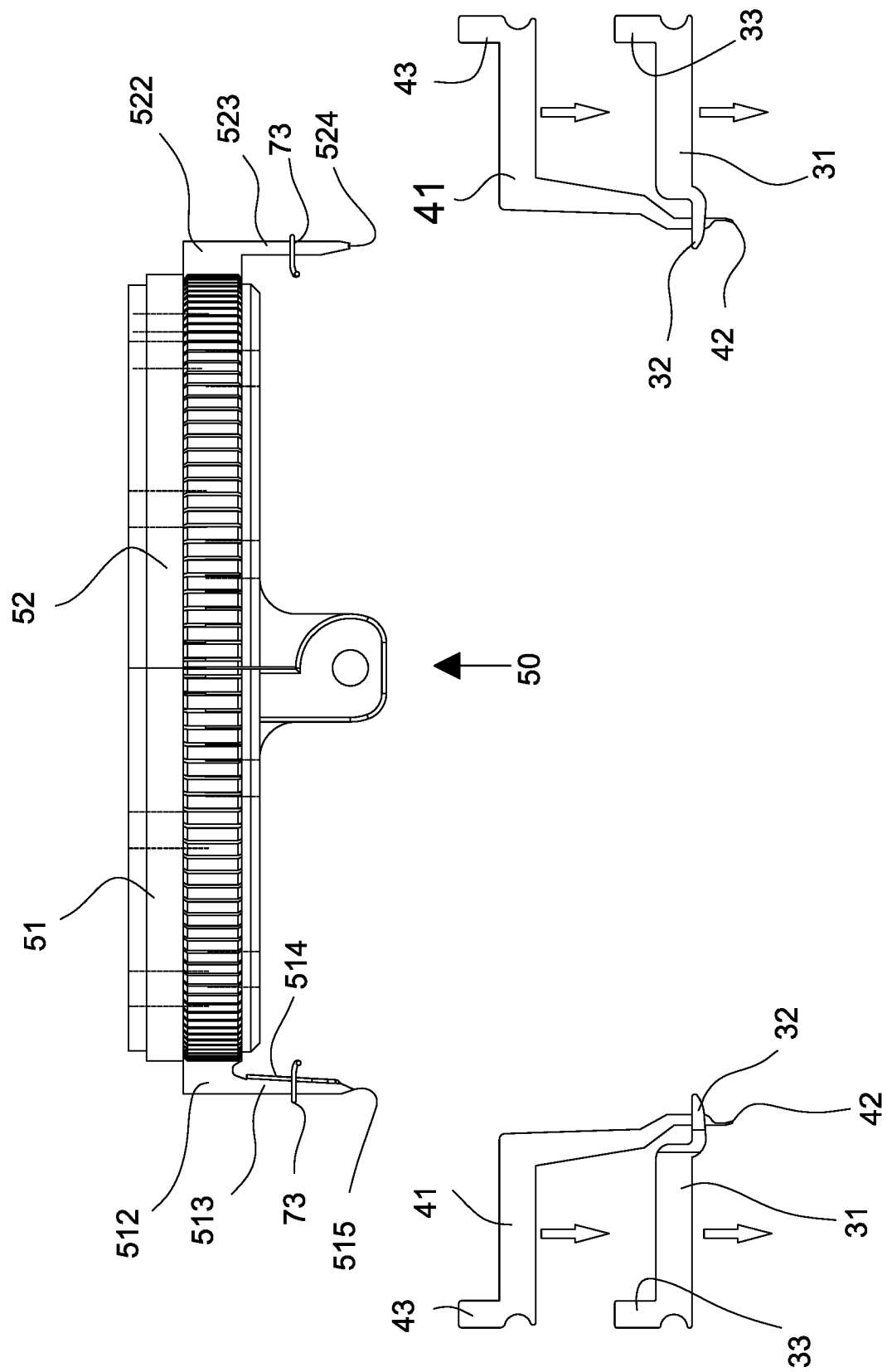


FIG. 22

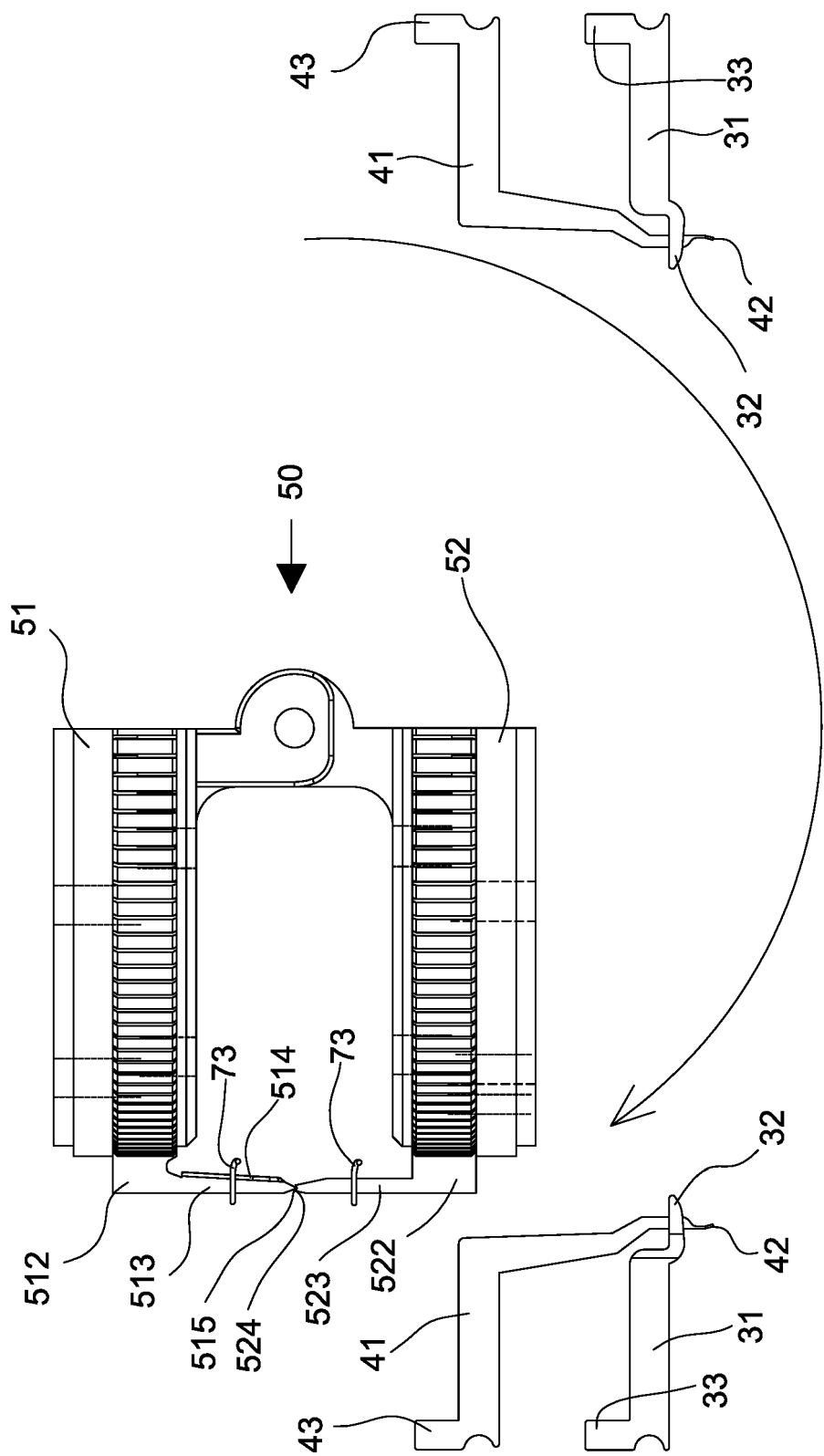


FIG.23

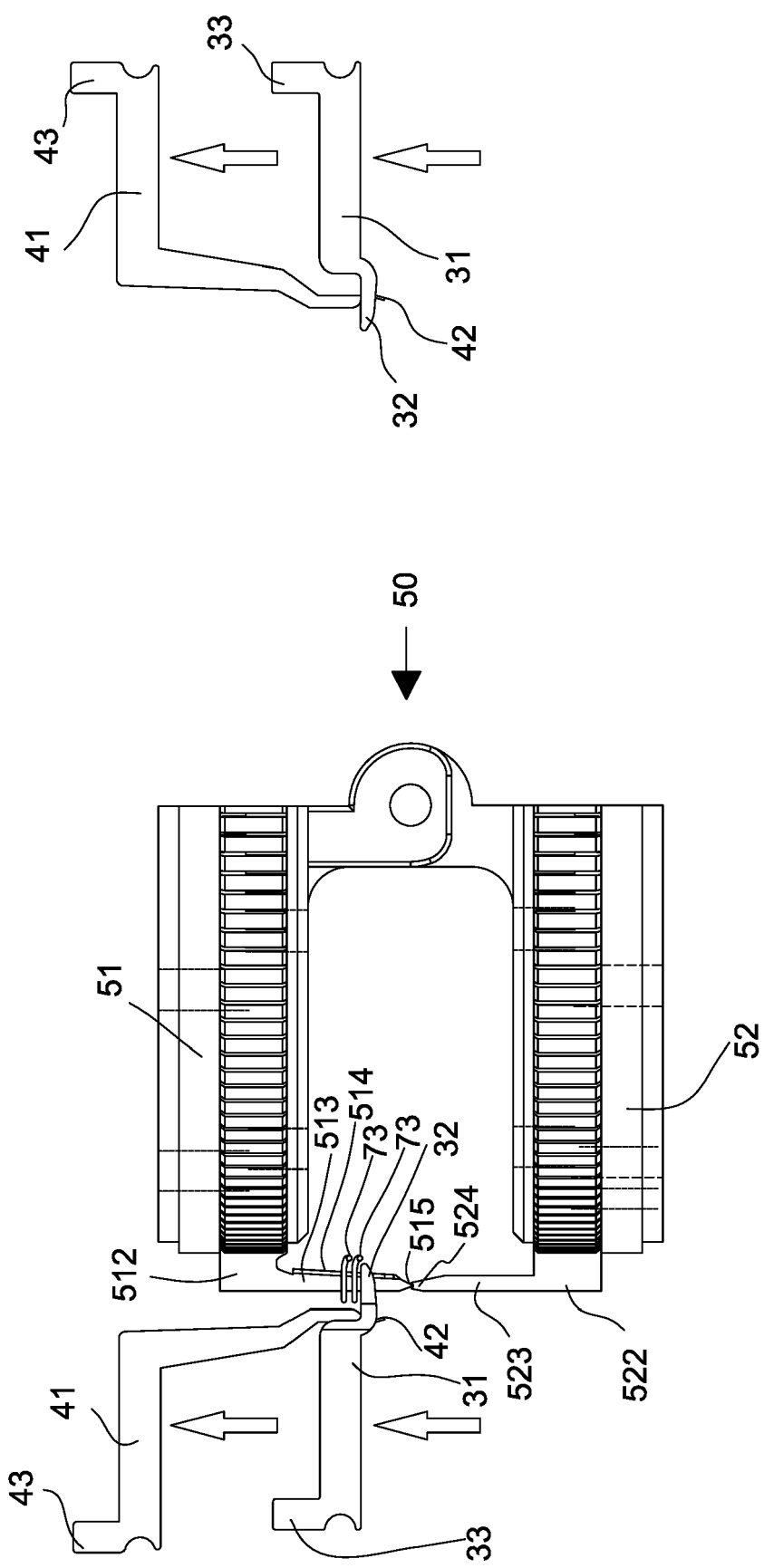


FIG.24

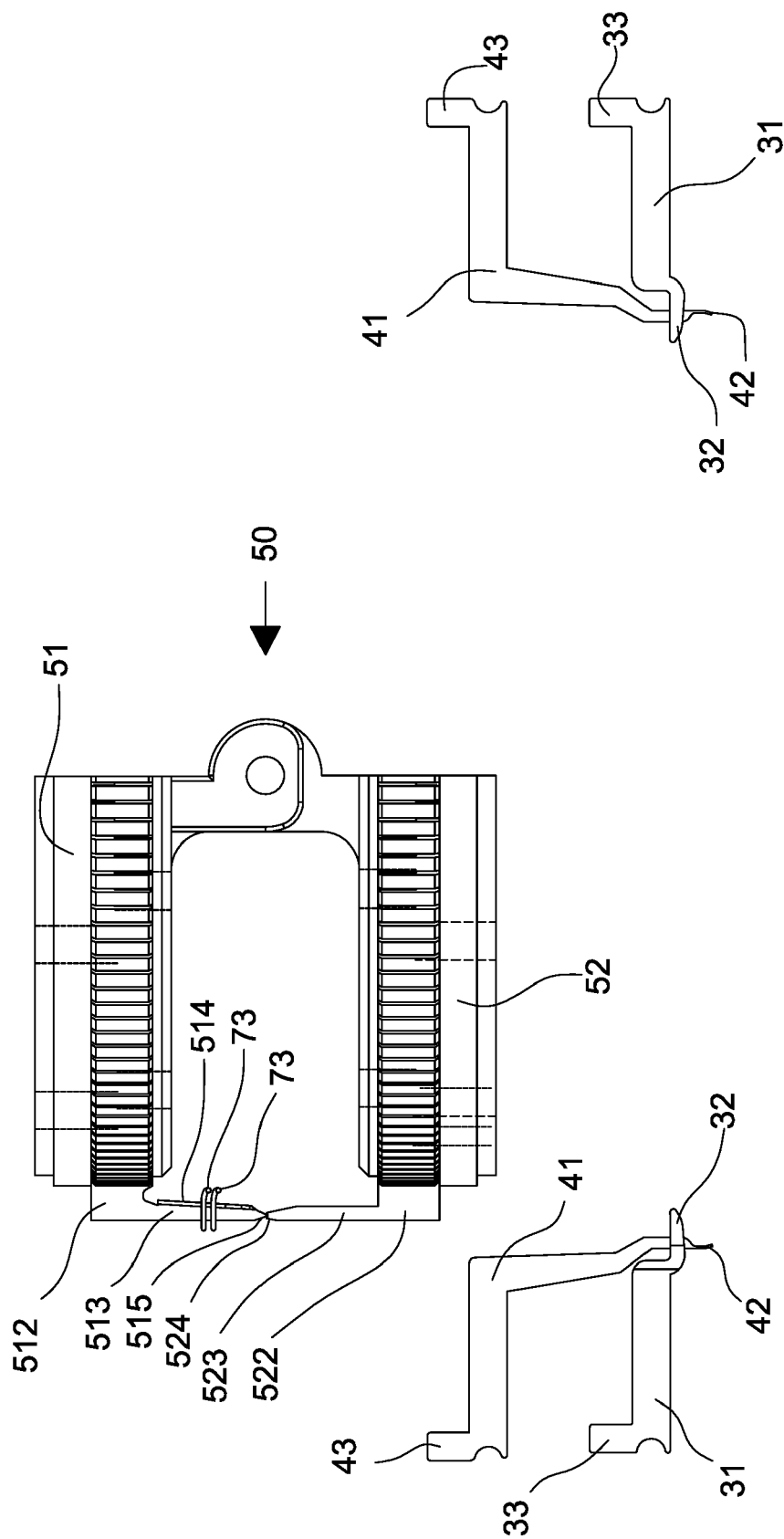


FIG. 25

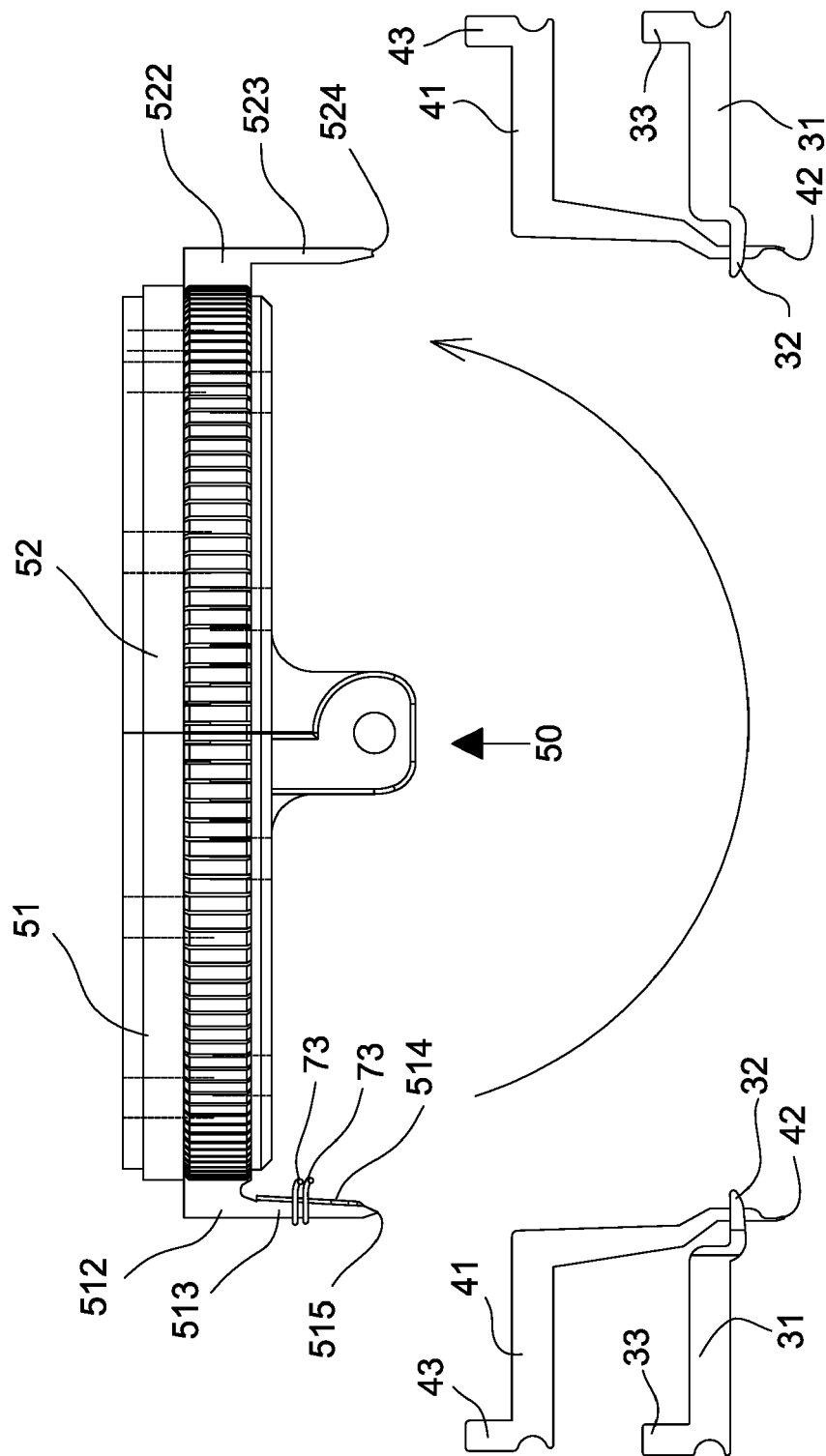


FIG.26

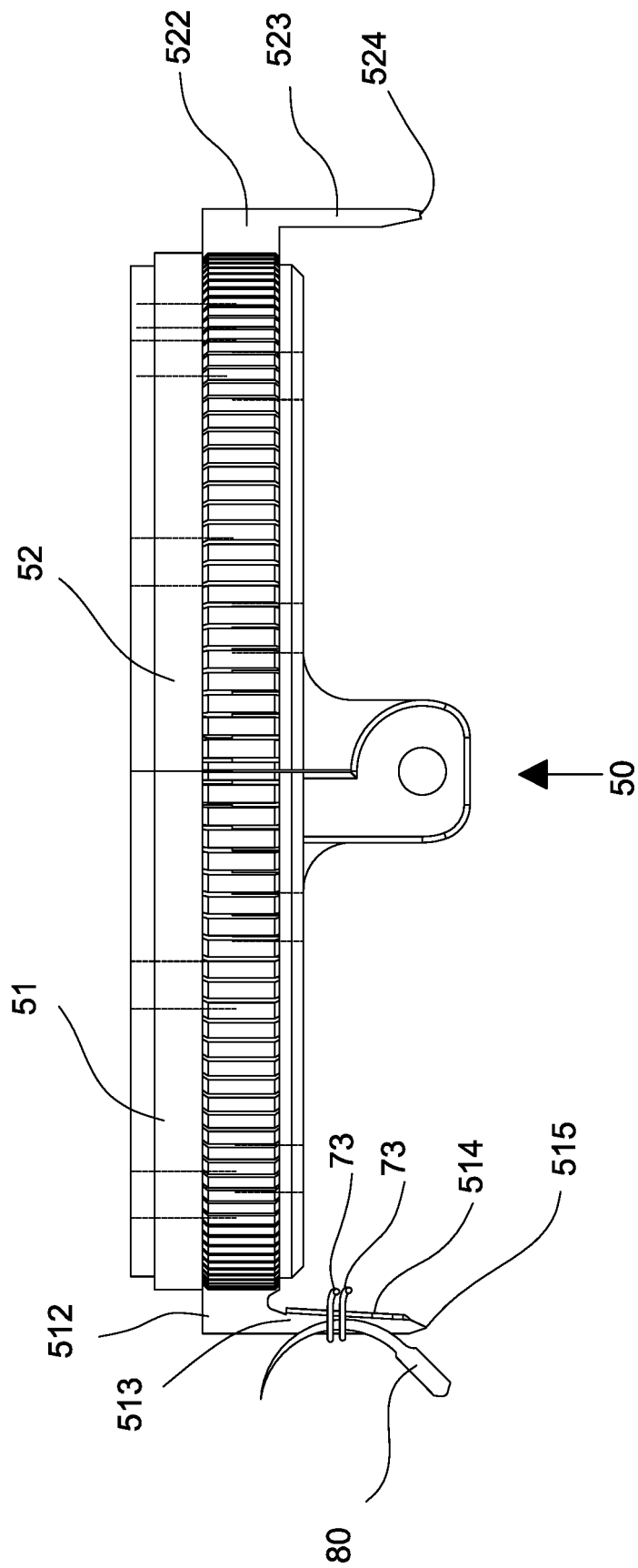


FIG.27

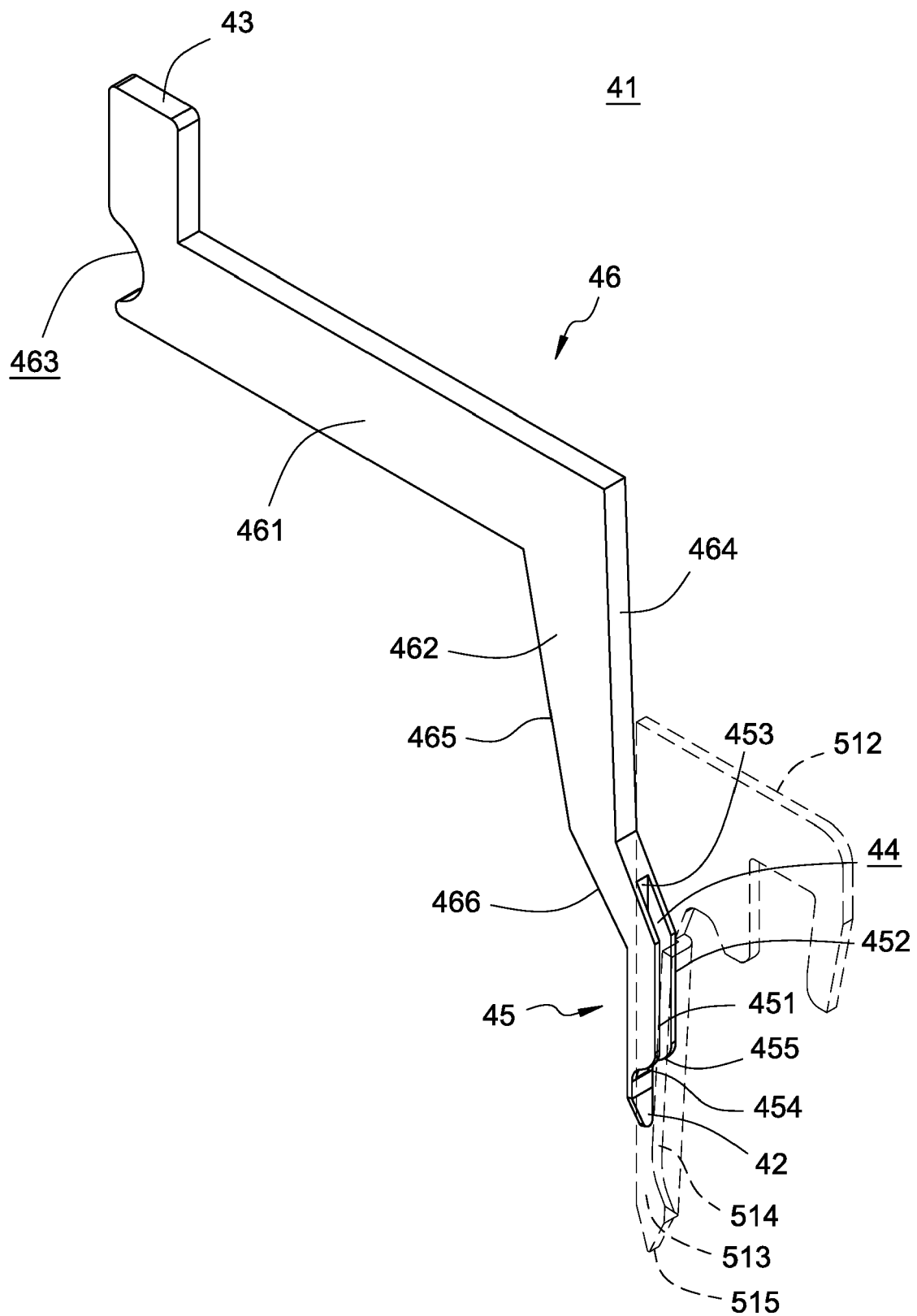


FIG.28

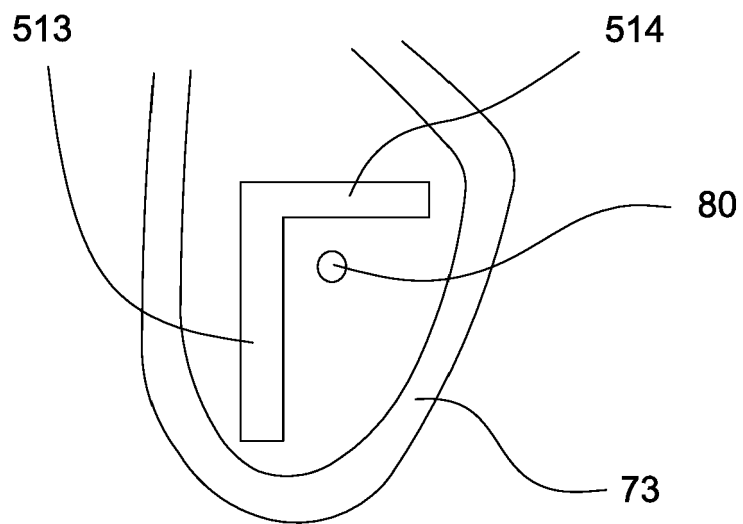


FIG. 29

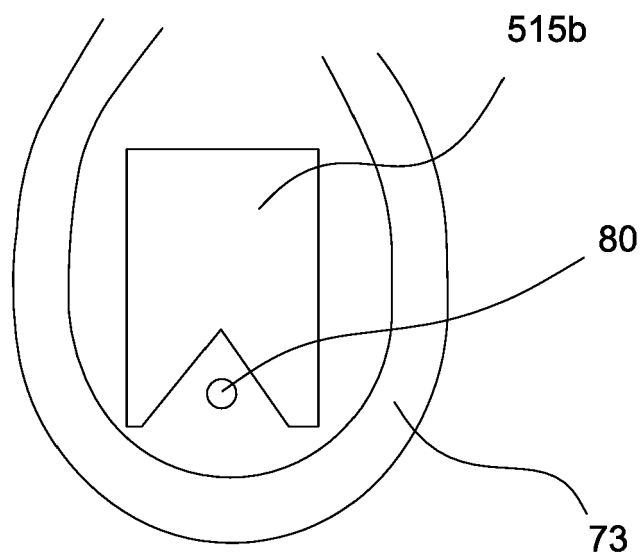


FIG. 30

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* column 1, line 8 - line 10 * * column 2, line 13 - line 19 * * column 2, line 32 - column 8, lines 6-13 * * column 2, line 20 - line 27 * * column 6, line 26 - line 32; figures 2, 33-34 * * column 7, line 41 - line 51 * * figures 3-26, 31-32 * -----	3-8	
Y	US 6 155 081 A (FRULLINI ALBERTO [IT] ET AL) 5 December 2000 (2000-12-05)	1,2	
A	* column 1, line 24 - line 42; figure 11a *	3-8	
Y	US 2006/144095 A1 (FRULLINI ALBERTO [IT] ET AL) 6 July 2006 (2006-07-06)	1,2	TECHNICAL FIELDS SEARCHED (IPC)
A	* figures 68-70 *	3-8	
A	US 2003/074929 A1 (JURGENS ERIC [DE]) 24 April 2003 (2003-04-24) * figures 4a, 4 * -----	3-8	D04B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 6 September 2019	Examiner Messai, Sonia
CATEGORY OF CITED DOCUMENTS		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	
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			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-8

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION **SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-8

A mechanism for transferring stitches from needles of knitting machine and sewing, comprising: a knitting machine having a plurality of knitting needles (10), each knitting needle (10) has a hook (11) and a tongue (12) which moves toward and away from the hook (11) by rotation; a plurality of stripping elements (31) convey a stitch (73) in each of the knitting needles (10) to a sewing station, the stripping elements (31) move toward and away from the knitting needles (10) and move the stitches (73) along a needle axis by touching the stitch (73) in each of the knitting needles (10); and a transfer apparatus including a plurality of transfer elements (41), which move toward and away from the hook (11) of the knitting needles (10), the transfer elements (41) comprising a transfer end (42) onto where the stitches (73) are brought when the stripping elements (31) move the stitches (73) in the knitting needles (10) toward the hooks (11); characterized in that: each transfer element (41) is configured to grip at least partially an outer surface of the hook (11) of each knitting needle (10), and the transfer end (42) of each transfer element (41) is configured to remain between the a body of the knitting needle (10) and the corresponding hook (11) when the tongue (12) is closed for transferring the stitch (73). This mechanism for transferring stitches does not comprise a single feature of the sewing station mechanism defined by independent claim 9 apart from stitches (73) to be dealt with.

2. claims: 9-15

A sewing station mechanism for closing an open end of a textile material formed in a tubular shape, comprising: a first half circle having a plurality of first longitudinal threads (511), an amount of the first longitudinal threads (511) being equal to half of an amount of stitches (73) at the last row of the open end of the textile material; a second half circle having a plurality of second longitudinal threads (521), an amount of the second longitudinal threads (521) being equal to half of an amount of stitches (73) at the last row of the open end of the textile material, the second half circle being able to rotate for 180° to move toward and away from the first longitudinal threads (511) on the first half circle; characterized in that: a cross-sectional face of the first longitudinal threads (511) bearing stitch (73) pairs that are conveyed by the transfer apparatus and sewn is substantially formed in an L shape. This sewing station mechanism does not comprise a single feature of the mechanism for transferring stitches defined



**LACK OF UNITY OF INVENTION
SHEET B**

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

by independent claim 1 apart from stitches (73) to be dealt with.

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

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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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06-09-2019

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

REFERENCES CITED IN THE DESCRIPTION

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