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(54)

Presser device and sewing machine comprising said device

(57)

Presser device couplable with a sewing machine (10) having a control system and comprising a head (14) and a base (12) on which an article (50) to be sewn rests.

The presser device comprises a presser bar (24) couplable with the head (14), and a presser foot (26),

hinged through a pivot (28) on said presser bar (24) so as to vary the inclination of the presser foot (26) in respect to the presser bar (24).

The presser foot (26) is fit to push the article (50) in order to maintain said article under pressure on the base (12) even if the thickness of the article (50) varies.

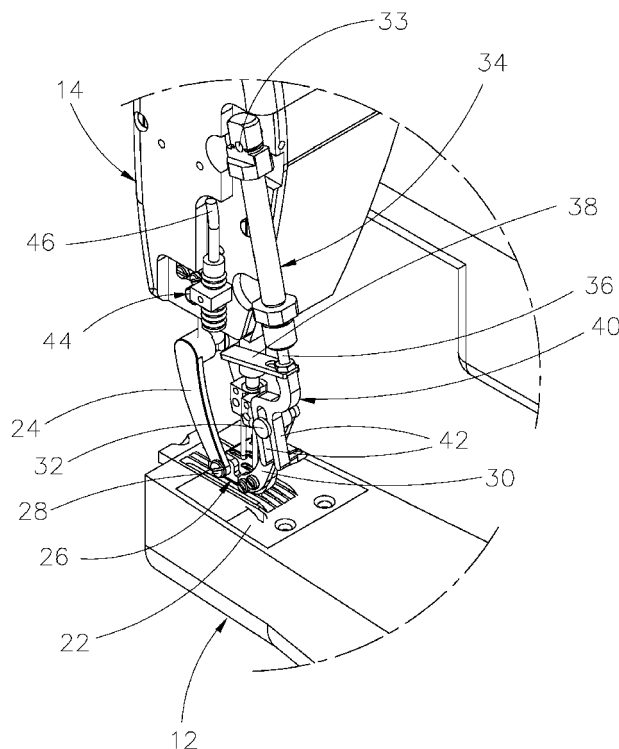


Fig. 2

Description

[0001] The present invention refers, in general, to a presser device and to a sewing machine comprising said device.

[0002] More particularly, the invention refers to a presser device and a sewing machine with a presser foot adapted to easily follow the variations of thickness in the fabric to be sewn.

[0003] As is known, in the industrial sector the sewing machines performing a mechanic sewing to sew together two or more articles made of fabric are usually conceived on the base of different constructive techniques according to the different sewing operations to be performed.

[0004] For instance, units with one or more needles are known to sew articles of clothing such as jeans trousers, trousers in general, various garments, shirts, technical tissues such as airbag, and so on.

[0005] In the most conventional configuration, said versions are provided with a base and an upper head which are connected to each other through an arm and an upright. One or more oscillating needles perforating the fabrics to be sewn with a thread are disposed on the head while the base is provided with a conveying device to convey the fabric articles to be sewn and includes means that cooperates with the needle for the formation of the stitches.

[0006] Besides, a presser foot is provided on the head, adjacent to the one or more needles, to keep the fabric pressed against the base in order to obtain a good sewing.

[0007] In the most conventional configuration, the presser foot is hinged on a presser bar that keeps the presser foot in its position and usually allows the presser foot to oscillate on following the development of the fabric or material to be sewn.

[0008] In case the fabric has slight variations of thickness, the presser foot follows these variations so that a jamming of the presser foot is avoided.

[0009] In case the fabric to be sewn has considerable variations of thickness, due for instance to a superimposition of two or more fabrics, the presser foot has difficulty in following the surface of the fabrics appropriately, which involves defects in the seam and provokes an imperfect superimposition of the fabric flaps and a consequent misalignment of the fabric edges to the prejudice of the quality of the so-obtained article of clothing.

[0010] For instance, when the presser foot has to follow a reduction of thickness, the resulting seam is irregular, the stitches being longer.

[0011] Since the presser foot is not able to follow the surface of the fabric to be sewn, the presser foot must extend its path and is lifted from the fabric for a fraction of time so that the presser foot does not keep the fabric on the base under pressure perfectly.

[0012] The patent documents EP2233628A2 and JP55086675 disclose a presser foot comprising projecting elastic means which permit to follow the variation of

the fabric thickness. But, such a system does not allow detecting the variation of the fabric thickness and to chose and control the pressure of the presser foot on the fabric.

[0013] The patent document JP5161771 discloses a control device of a presser foot wherein a sensor allows detecting the variation of the inclination of the presser foot. Such a system permits varying the pressure of the presser foot according to the inclination of said presser foot, by acting on the presser bar to which the presser foot is hinged. Nevertheless this feature does not allow controlling the pressure on the different portions of the presser foot with respect to the connection axis of the presser bar with the presser foot.

[0014] The patent document US2009/056607 discloses a presser foot on which an elastic element acts in order to press the front portion of the presser foot. The elastic element can be actuated or can be lifted, but it cannot control the pressure on the presser foot and, consequently, on the fabric in a continuous way. Besides, the presser foot does not show any device for detecting the variation of its inclination.

[0015] An aim of the invention is to remove the above mentioned disadvantages and other ones by carrying out a fabric presser device and a sewing machine through which it is possible to obtain an article of clothing of excellent quality as regards the seams.

[0016] A further aim of the invention is to carry out a fabric presser device and a sewing machine through which it is possible to obtain a seam in which the fabric flaps are superimposed perfectly without unwished misalignments of the fabric edges.

[0017] Another aim of the invention is to carry out a presser device and a sewing machine in which the presser device follows the variations of thickness of the processed fabric with a greater precision.

[0018] A further aim of the invention is to carry out a presser device and a sewing machine which allow a sewing on or ore more fabrics with seam stitches of the same length even in presence of variations of thickness in the processed fabric.

[0019] The above aims and other ones are achieved according to the invention by a presser device couplable with a sewing machine having a control system and comprising a head and a base on which an article to be sewn rests. The presser device comprises a presser bar couplable with the head and a presser foot hinged through a pivot on said presser bar so as to vary the inclination of the presser foot in respect to the presser bar, said presser foot being fit to push the article in order to maintain said article under pressure on the base.

[0020] In particular, the presser device is characterized by the fact of comprising detecting means to detect the inclination of the presser foot in respect to the presser bar, and pressing means suited to be actuated on the presser foot. The possibility of detecting the inclination of the presser foot in respect to the presser bar and consequently in respect to the base of the sewing machine

allows to detect a variation of thickness in the processed article as well as the intensity of said variation. Consequently, by detecting said thickness variation, the control system of the sewing machine may actuate other devices of the same sewing machine such as pressing means acting on the presser bar. The detecting means of the presser device according to the present invention are fit to detect a variation of the inclination of the presser foot more simply, regardless of the angle of inclination, so as to ascertain a thickness variation regardless of the texture of the fabric.

[0021] The pressing means are suited to be actuated on the presser foot but not on the pivot, and comprise pressure control means suited to vary the pressure on the presser foot in continuous way independently on the variation of the inclination of the presser foot. In this way, a portion of the presser foot on which portion the pressing means acts and which portion is placed in front of or behind the pivot through which the presser foot is hinged on the presser bar, may press the fabric in the sewing phase. This action is very useful when the thickness of the fabric to be sewn diminishes. Thus, unlike the systems of the prior art in which the presser foot is almost suspended over the fabric having a reduced thickness, the presser foot of the device according to the invention tilts following the conformation of the fabric and allows a sewing and a seam of good quality in which the dimensions of the stitches are uniform. Besides, the pressure control means allow controlling and varying the pressure of the presser foot on the fabric even if the presser foot does not vary its inclination.

[0022] Advantageously, the detecting means comprise a sensor which is connected with the control system of the sewing machine and an articulated mechanism which is connected with the presser foot and acts on the sensor so that the sensor detects a variation of the inclination of the presser foot. In this way, the oscillating movement of the presser foot puts in motion the articulated mechanism which in turn acts on the sensor. Consequently, the sensor may be disposed in a safe position which does not hinder the sewing operations.

[0023] In particular, the articulated mechanism of the presser device according to the invention may comprise:

- an arm, fixed at an end on the presser foot and comprising a cylinder on the opposite end;
- a tilting element, hinged on the head of the sewing machine;
- a fork element, fixed on an end of the tilting element and comprising, at the opposite end, a seat in which the cylinder of the arm moves;
- a plate, fixed on the tilting element and arranged next to the sensor.

[0024] Through this conformation and structure, by varying the inclination of the presser foot, the arm may rotate and provokes the translation of the cylinder in the seat obtained in the fork which acts as a guide so that it

causes a rotation of the tilting element in order to move the plate toward the sensor or to move the plate away from the sensor.

[0025] Besides, the tilting element may comprise a piston which comprises a rod, an end of which is fixed on the fork, and a casing in which the rod slides, said casing being hinged at an end on the head of the sewing machine.

[0026] In this way, the articulated mechanism which comprises also said piston, which is suitably controlled by the control system of the sewing machine, acts as a pressing means which may be actuated in case said control system deems it necessary, said control system being set appropriately by the user.

[0027] In other words, the articulated mechanism has a double function: when the piston rod is let free to translate in the body of the piston, the articulated mechanism actuates the sensor and acts as a sensor means; when the rod goes out of the piston body, the articulated mechanism puts the presser foot under pressure in a portion different from the portion on which the presser bar may act.

[0028] Advantageously, the fork may comprise two arms between which a seat is obtained, in which the cylinder of the arm moves.

[0029] It is intended that the aims and advantages of the invention are also reached through a sewing machine comprising a presser foot as previously summarily defined.

[0030] Besides, the aims and advantages of the invention are also achieved with a method for the sewing of a fabric having a variable thickness through a sewing machine comprising a presser bar on which a presser foot is hinged through a pivot which divides the presser foot in a fore portion and a rear portion, said fore portion touching the fabric before the rear portion. The method is characterized by the fact of detecting the inclination of the presser foot and/or the variation of the inclination of the presser foot and putting the fore portion of said presser foot under pressure in adjustable way independently on the inclination and/or the variation of the inclination of the presser foot (26) and of the thickness of the fabric.

[0031] Said measure allows that the length of the stitches is kept regular and uniform even if the thickness of the fabric to be sewn diminishes while the seams of the sewing machines of the prior art are not uniform. In this way, it is possible to obtain a seam and an article of clothing of good quality in which the fabric flaps are superimposed with precision without unwished misalignments of the fabric edges. Besides, it is possible to control and vary the pressure of the fore portion of the presser foot not only when the fabric thickness varies and so when the presser foot varies its inclination, but also before or after the variation of the fabric thickness.

[0032] Further features and details of the invention will be better understood from the following specification which is supplied as a non-limiting example as well as from the accompanying drawing, wherein:

Fig. 1 is an axonometric top view of a sewing machine according to the present invention, in a configuration of rest;

Fig. 2 shows a detail of Fig. 1;

Figures 3 to 7 are side views of a sewing machine during consecutive working phases while sewing a fabric having variations of thickness;

Fig. 8 is an axonometric top view of a sewing machine according to a variant of the invention.

[0033] With reference to the accompanying figures, in particular Fig. 1, number 10 denotes a sewing machine comprising a base 12 and a head 14 which are connected to each other through an upright 16 and an arm 18.

[0034] The base 12 comprises a main body 20 on which a needle plate 22 is disposed. The fabric to be sewn may slide on said needle plate 22.

[0035] As shown in Figures 2 to 7, the head 14 comprises a presser bar 24, movable in a vertical direction, on which an end of a presser foot 26 is hinged by means of a screw 28 on the lower part. An arm 30 is fixed on the opposite end of the presser foot 26 and extends vertically.

[0036] A cylinder 32 is fixed on the upper free end of the arm 30 and extends in a direction which is horizontal and perpendicular to the arm 30.

[0037] An end of a piston 34 is hinged on the head 14 by means of a pivot 33 so that the piston 34 is free to rotate relative to the head 14.

[0038] The piston 34 is controlled by a suitable control system which controls the working, for instance by applying a pressure in the inside of the piston 34 itself, and making a piston rod 36 go out, or letting the piston rod 36 free to move relative to the piston 34.

[0039] A fork 40 and a plate 38 are constrained to the free end of the rod 36, the plate 38 being orthogonal to the rod 36.

[0040] The fork 40 has two arms 42 which form a seat in which the cylinder 32 may slide to the ramification of the two arms 42 so as to hit the ramification. Thus, the fork 40 acts as a guide for the cylinder 32.

[0041] The head 14 comprises a sensor 44, for instance a proximity sensor, which detects the proximity of the plate 38 when the plate 38 is moved by rotating the piston 34. The sensor 44 communicates through a cable 46 with the control system.

[0042] With reference to the Figures 3 to 7, the working of the control device for the presser foot according to the invention is described below.

[0043] As shown in Fig. 3, an article 50 to be sewn rests on the base 12, which article comprises a base fabric 52 on which a fabric flap 54 is disposed and therefore, the article 50 to be sewn is thicker in the portion on which the fabric flap has been superimposed.

[0044] The presser foot 26 is kept in position by the presser bar 24 and rests on the base fabric 52 while the arm 30 keeps the fork 40 and, consequently, the piston 34 inclined in comparison to the head 14 through a form

coupling between the cylinder 32 and the arms 42.

[0045] In this configuration, the plate 38 is not disposed in the field of the sensor 44 and therefore, the sensor 44 does not detect the presence of the plate 38. Consequently, the control system does not act on the piston 34 which keeps its rod 36 free to translate in the inside of the piston 34 itself.

[0046] As the working proceeds, as visible in Fig. 4, the article 50 is sewn and translated on the base 12 so that the presser foot 26 is brought to engage the fabric flap 54. Thus, the presser foot 26 must rotate about the screw 28, in respect to the presser bar 24, so as to get on the fabric flap 54 without jamming.

[0047] When the inclination of the presser foot 26 varies, also the arm 30 constrained to the foot is compelled to rotate and makes the cylinder 32 rise in the seat obtained between the two arms 42 of the fork 40 and beat on the ramification of the arms 42.

[0048] Thus, the fork 40 is made rotate clockwise by inserting the piston rod 36 again and compelling, at the same time, the piston 34 to rotate clockwise. The rotation of the piston 34 brings the plate 38 in proximity of the sensor 44 which communicates this event to the control system.

[0049] In this way, the control system is thus informed of the fact that the presser foot 26 is about to go from the base fabric 52 to the fabric flap 54 with a consequent increase of thickness so that it is possible to actuate other elements of the sewing machine 10, for instance to begin counting the stitches or stitch fractions which the sewing machine makes on the fabric flap 54.

[0050] When the presser foot 26 overcomes the slope between the base fabric 52 and the fabric flap 54, as shown in Fig. 5, and is horizontal again, the arm 30 rotates the piston 34 in an anticlockwise direction by means of the coupling of cylinder 32 and arms 42 on increasing the angle of inclination in respect to the head 14. The plate 38 is thus taken away from the sensor 44 which communicates the event once again to the control system.

[0051] The control system is informed of the fact that the presser foot 26 is now on the fabric flap 54.

[0052] As the machining proceeds, as visible in Fig. 6, and a determined number of stitches or stitch fractions, effected by the sewing machine 10, has been reached, said number being fixed by the user on the base of the sewing requirements and the length of the fabric flap 54, the presser foot 26 is in proximity of the edge of the fabric flap 54 and therefore, the presser foot 26 is next to descend onto the base fabric 52.

[0053] Once the presser foot 26 has reached this position, the control system actuates the piston 34.

[0054] When the piston 34 makes the piston rod 36 go out, the piston 34 provokes the abutting of the fork 40 with the cylinder 32 so that the cylinder 32 is pressed against the article 50 and the piston 34 transmits this pressure to the presser foot 26 which, consequently, presses the fabric flap 54 with a higher pressure.

[0055] The pressure imposed by the piston 34 is maintained while the head of the presser foot 26 passes beyond the fabric flap 54 and descends onto the base fabric 52 and imposes a sudden rotation of the presser foot 26 around the screw 28 and allows the presser foot 26 to follow the thickness variation of the article 50 in the best way.

[0056] When the presser foot 26 is again in the horizontal position on the base fabric 52, the consequent rotation of the arm 30, which is integral with the presser foot 26, imposes the compression of the piston rod 36.

[0057] The overpressure in the piston 34 provoked by the compression of the piston rod 36 informs the control system which in turn frees the piston 34 so that the piston rod 36 is free to translate.

[0058] According to a variant of the invention, a sewing machine 110 may comprise a head 114 which in turn comprises a pressure control device 116 such as, for instance, a pneumatic piston which acts on a presser bar 124, similar to the above described presser bar 24, so that the presser foot, hinged on said presser bar 124, may be pressed with the wished force against the fabric to be sewn.

[0059] Advantageously, the device 116 may be actuated by the control system on the base of the above described detections of the sensor 44, for instance by increasing the pressure of the presser bar 124, when the presser foot is disposed on a thicker fabric, in order to further facilitate the machining and obtain a better sewing.

[0060] The control device of the presser foot as described has the advantage that it follows in the best way the thickness variations of the fabric being processed, even when the variations are considerable and/or sudden since the presser foot is loaded before beginning the descent from a greater thickness to a lesser thickness, which does not occur in the sewing machines of the prior art. Hence, the control device of the presser foot as described allows to obtain a better sewing in case more fabrics are superimposed, regardless of the number of superimposed fabrics, the resulting thickness and the relative thickness variation. This adjustment takes place automatically through the settings predefined by the user and managed by the control system of the sewing machine, by means of a suitable software. Accordingly, it is not necessary for the user to calibrate the presser device and the sewing machine whenever the number of fabrics and the relative thicknesses vary.

[0061] A technician of this sector may conceive changes or variants that are to be considered as included in the scope of protection of the present invention. For instance, the piston the rod of which presses on the arm constrained to the presser foot may be kept under pressure regardless of the control system, or according to other parameters than the number of stitches or stitch fractions processed by the sewing machine.

Claims

1. Presser device couplable with a sewing machine (10) having a control system and comprising a head (14) and a base (12) on which an article (50) to be sewn rests, said presser device comprising a presser bar (24) couplable with the head (14), and a presser foot (26), hinged through a pivot (28) on said presser bar (24) so as to vary the inclination of the presser foot (26) in respect to the presser bar (24), said presser foot (26) being fit to push the article (50) in order to maintain said article under pressure on the base (12), **characterized by** the fact of comprising:

- detecting means (30, 34, 38, 40, 44) to detect the inclination of the presser foot (26) in respect to the presser bar (24) and suited to detect a variation of the inclination of the presser foot (24);

- pressing means (30, 34, 40) suited to be actuated on the presser foot (26), said pressing means (30, 34, 40) not pressing the presser foot (26) on the hinging axis of the pivot (28), said pressing means (30, 34, 40) comprising pressure control means (34) suited to vary the pressure on the presser foot (26) in continuous way independently on the variation of the inclination of the presser foot (24).

2. Presser device according to claim 1, wherein the detecting means comprise a sensor (44) which is connected with the control system of the sewing machine (10), and an articulated mechanism (30, 32, 34, 38, 40) which is connected with the presser foot (26) and acts on the sensor (44) so that the sensor (44) detects a variation of the inclination of the presser foot (26).

3. Presser device according to claim 2, wherein the articulated mechanism comprises:

- an arm (30), fixed at an end on the presser foot (26) and comprising a cylinder (32) on the opposite end;

- a tilting element (34), hinged on the head (14) of the sewing machine (10);

- a fork element (40), fixed on an end of the tilting element (34) and comprising, at the opposite end, a seat in which the cylinder (32) of the arm (30) moves;

- a plate (38), fixed on the tilting element (34) and arranged next to the sensor (44);

so that by varying the inclination of the presser foot (26), the arm (30) rotates and forces the translation of the cylinder (32) in the seat obtained in the fork (40) so that it causes a rotation of the tilting element (34) in order to move the plate (38) toward the sensor (44) or to move the

plate (38) away from the sensor (44).

4. Presser device according to claim 3, wherein the tilting element comprises a piston (34) which comprises a rod (36), an end of which is fixed on the fork (40), and a casing in which the rod (36) slides, said casing being hinged at an end on the head (14) of the sewing machine (10). 5
5. Presser device according to claim 3 or 4, wherein the fork (40) comprises two arms (42) between which a seat is obtained in which the cylinder (32) of the arm (30) moves. 10
6. Sewing machine comprising a presser device according to any of the preceding claims. 15
7. Method for the sewing of a fabric having a variable thickness through a sewing machine (10) comprising a presser bar (24) on which a presser foot (26) is hinged through a pivot (28) which divides the presser foot (26) in a fore portion and a rear portion, the fore portion touching the fabric before the rear portion, said method being **characterized by** the fact of detecting the inclination of the presser foot (26) and/or the variation of the inclination of the presser foot (26) and putting the fore portion of the presser foot (26) under pressure in adjustable way independently on the inclination and/or the variation of the inclination of the presser foot (26) and of the thickness of the fabric. 20 25 30

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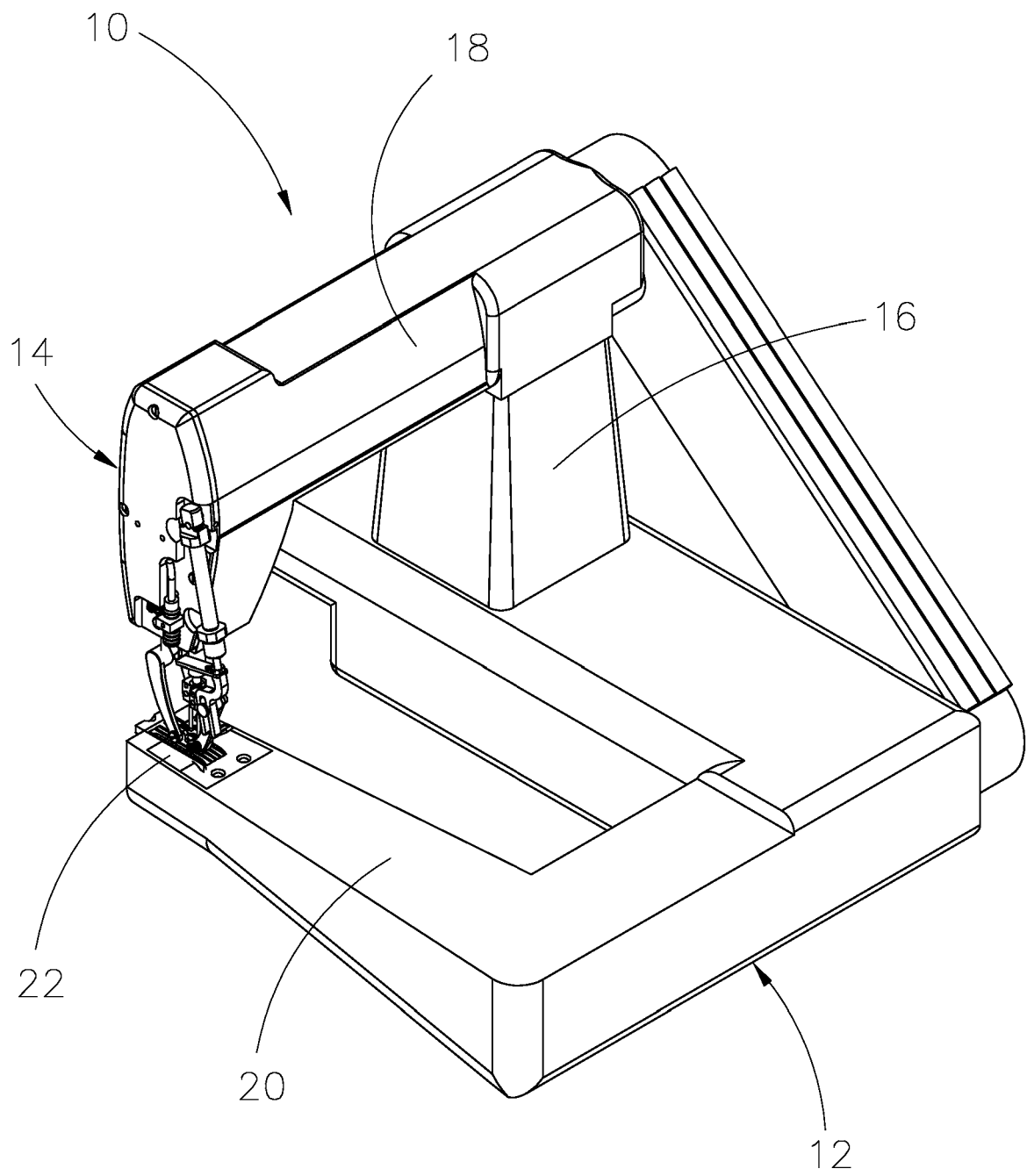


Fig. 1

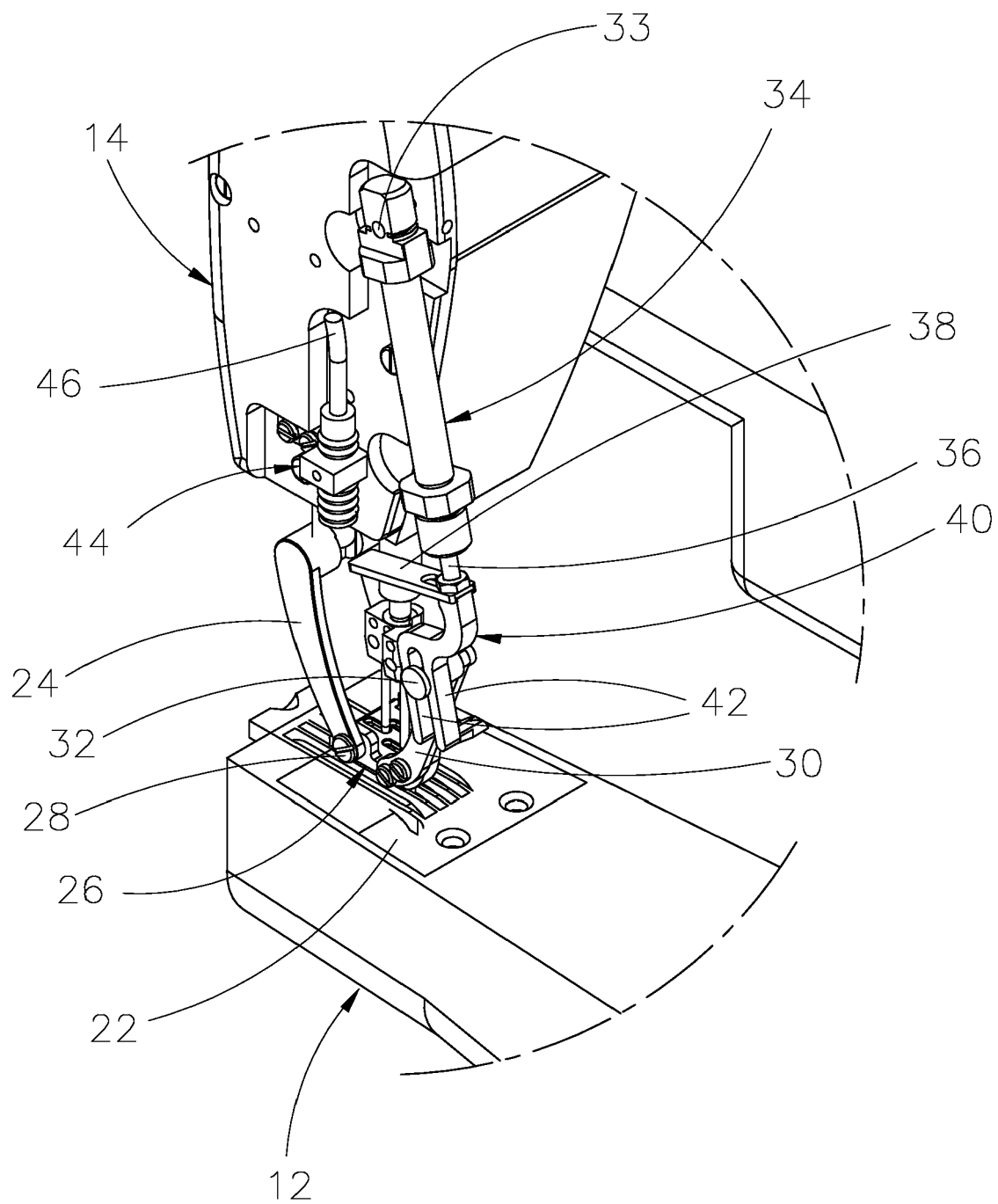


Fig. 2

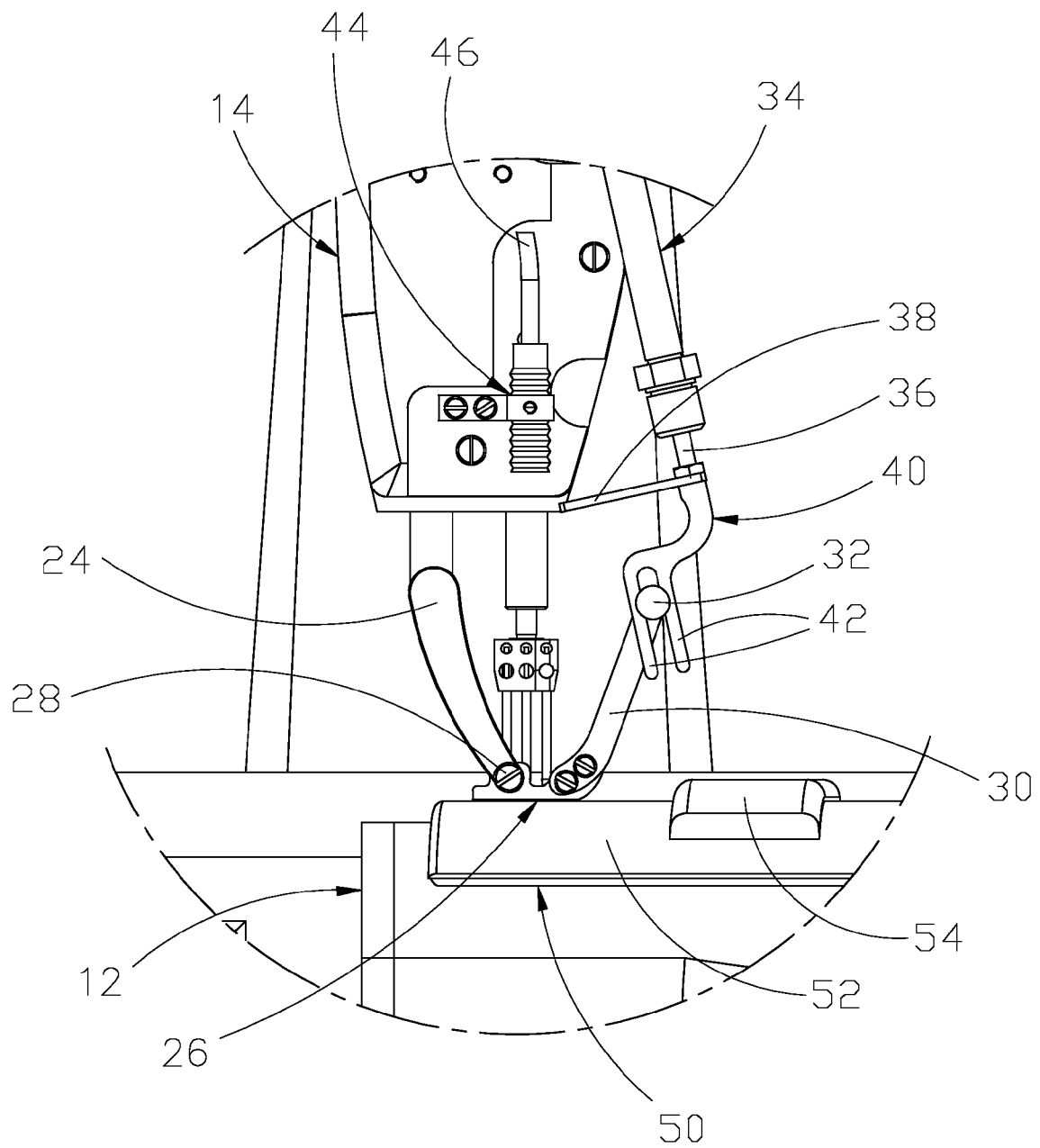


Fig. 3

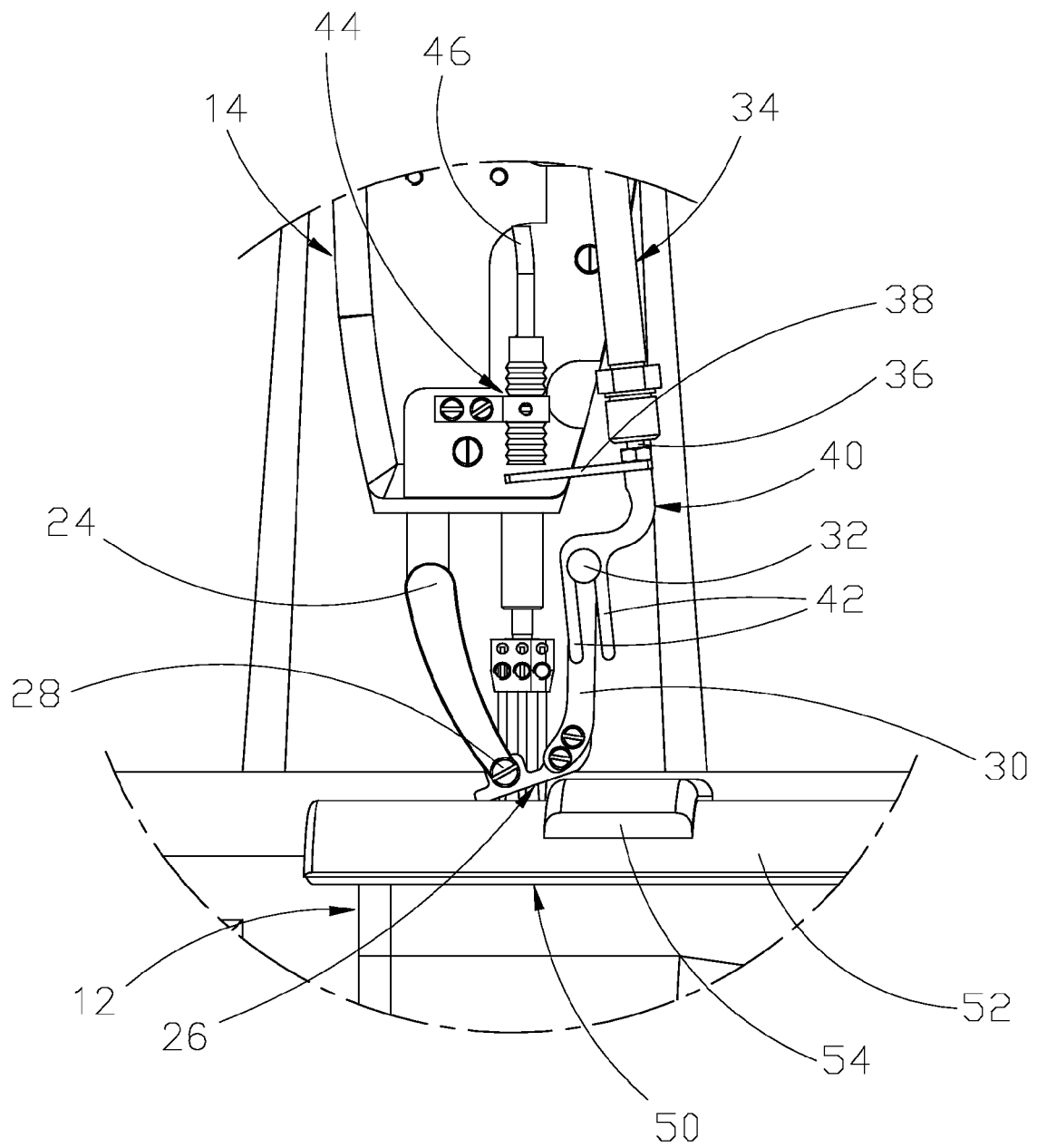


Fig. 4

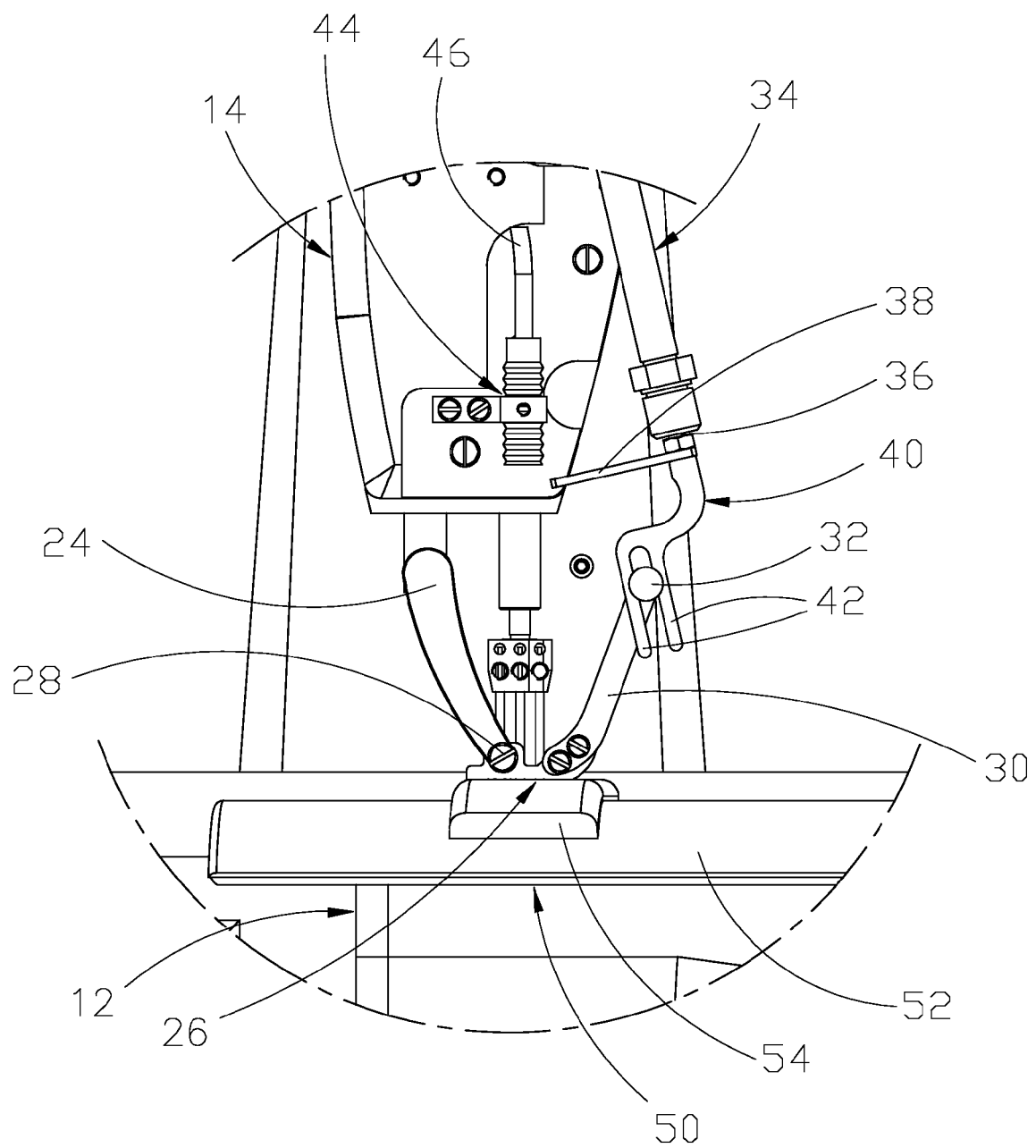


Fig. 5

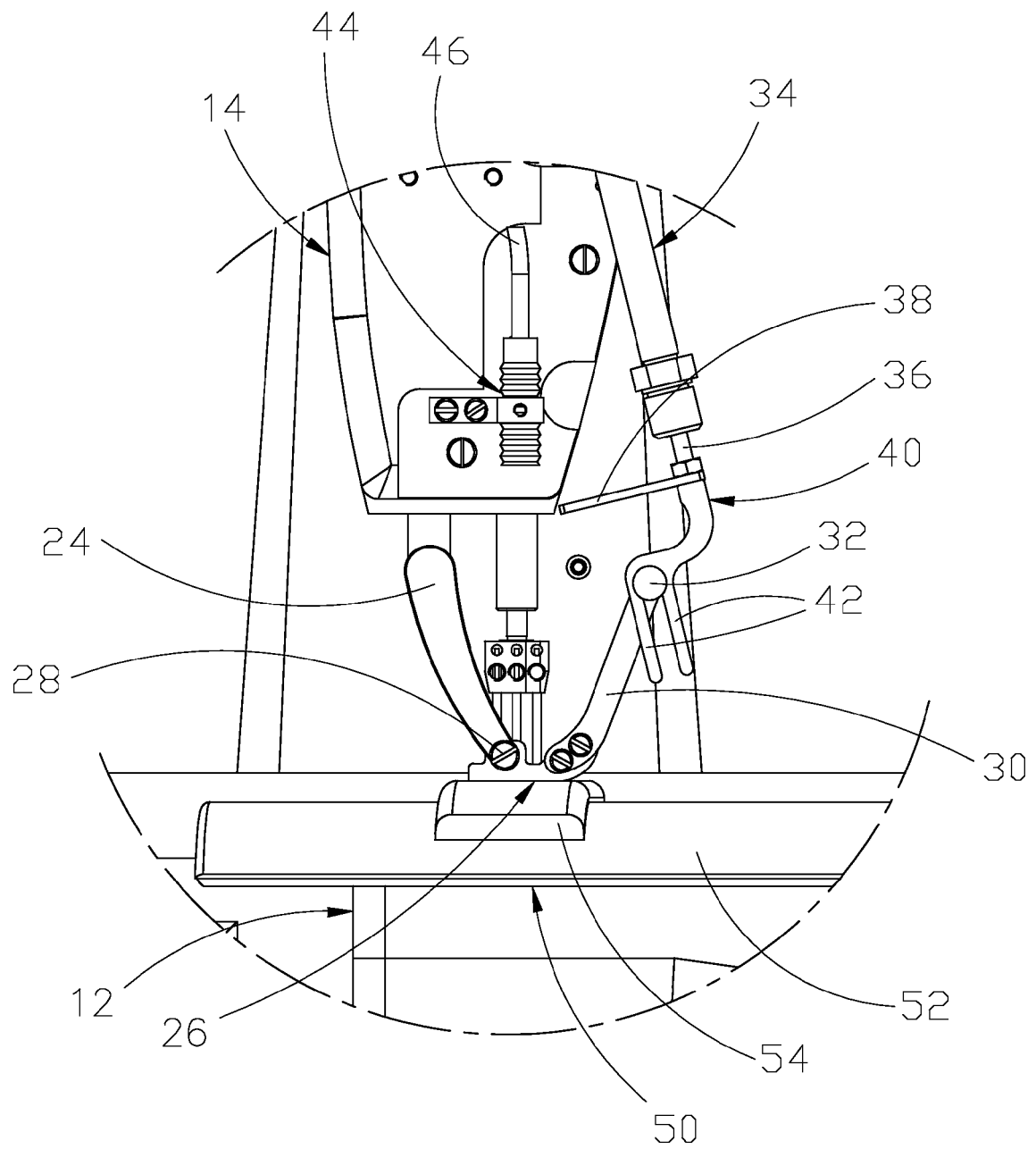


Fig. 6

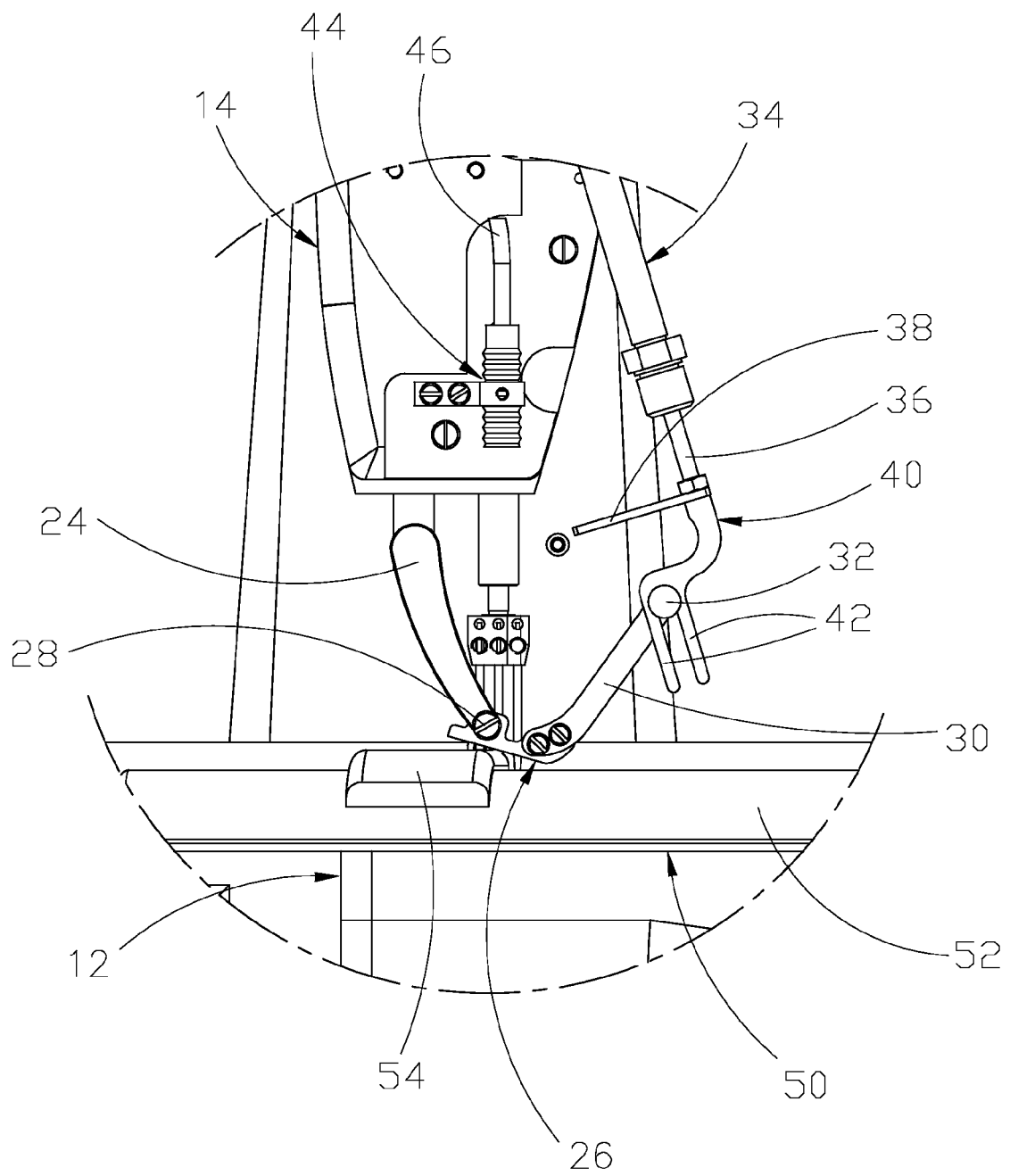


Fig. 7

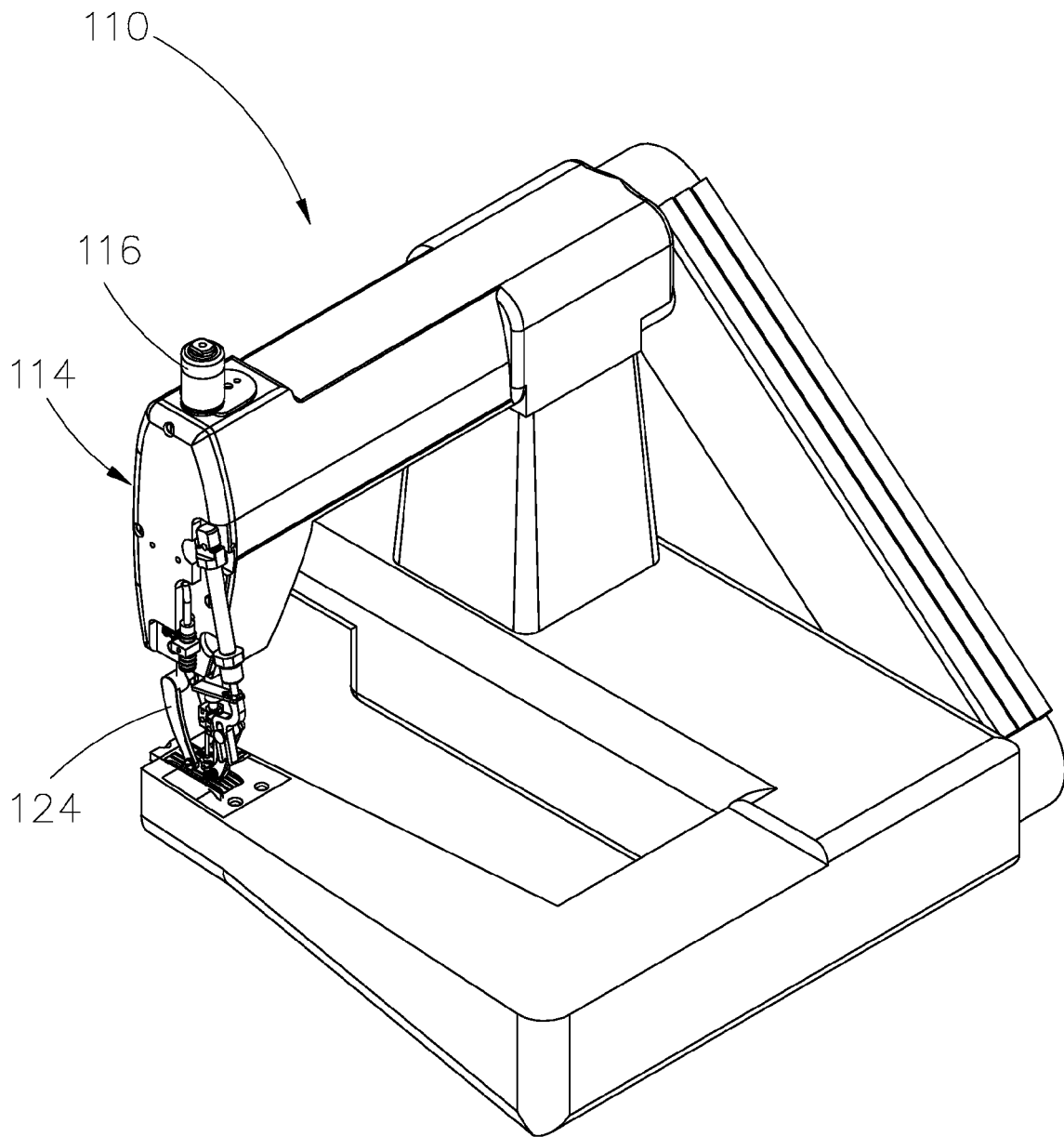


Fig. 8



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 8435

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 233 628 A2 (AISIN SEIKI [JP]) 29 September 2010 (2010-09-29) * paragraphs [0007], [0010] *	1-7	INV. D05B29/02 D05B29/08
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			D05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 November 2012	Examiner Zirkler, Stefanie
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			

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EPO FORM 1503 03.82 (P04C01)

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

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The members are as contained in the European Patent Office EDP file on
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