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(54) **Multifunction sewing machine designed to sew fabrics using different layouts and types of stitches**

(57) The invention concerns a sewing machine, preferably of the industrial type, with a base (1) designed to mechanically sew together two pieces of fabric by using different types of stitches thanks to the layout of means

(5, 6, 7, 27) driven and adjusted according to the machine operator's requirements. In particular these means (5, 6, 7, 27) can be positioned at desired distances one from the other to ensure the proper positioning of the stitches in the desired zones.

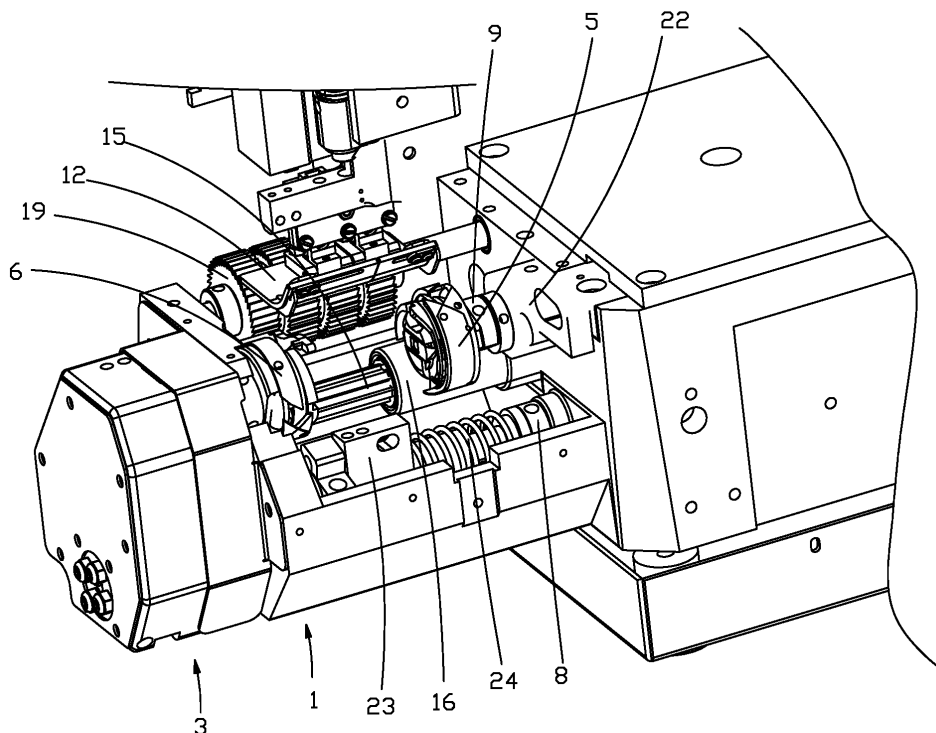


Fig. 9

Description

[0001] This invention refers to a sewing machine, preferably of the industrial type, designed to mechanically sew two pieces of fabric using different types of stitch and adjusting the layout of the stitches.

[0002] It is, therefore, a sewing machine with the special feature of being able to sew two pieces of fabric by at least two different types of stitch placed at the distances desired thanks to fast setting of the appliance.

[0003] As is known sewing machines, which mechanically sew together two or more pieces of fabric, are usually designed, at the industrial level, according to various structural techniques based on the different procedures they are designed to perform.

[0004] Well-known, for example, are units with one needle or multiple needles meant to sew garments such as, for example, jeans or casual pants in general, work garments, shirts or other garments.

[0005] In their most common form these versions are provided with an upper head where the needle is located, a system that feeds the pieces of fabric to be sewn and a base, positioned below the upper head, that includes means that contribute, together with the needle, to create the stitch.

[0006] Rotary motion in the upper head, driven by a shaft connected to the drive motor, is converted, by a cam, into reciprocating motion and then transferred to the needle support. The upper head also carries, in a position adjacent to the needle, a presser foot that functions to keep the pieces of fabric to be sewn pressed down towards the lower base.

[0007] The fabric feed system usually includes specific means that act on the fabrics to be sewn, moving them in one direction.

[0008] The base, positioned below the upper head, includes at least one crochet that is used, together with the needle, to complete the stitches.

[0009] Naturally all the previously described components that have the ability to perform rotary and traverse motions perform these motions in a synchronized manner.

[0010] The type of stitch to be made is of particular importance when designing and manufacturing sewing machines.

[0011] Obviously every different type of stitch requires different components and requires these to make different motions, consequently requiring use of different sewing machines for different stitches.

[0012] For example the known technique for making a knotted stitch requires a machine with a special constantly rotating crochet and with synchrony that calls for traverse motion of the needle that corresponds to two 360° rotations by the crochet.

[0013] Making a chain stitch, on the other hand, requires a machine with a crochet with a shape that is different from that for the knotted stitch, with reciprocating rotary and/or traverse motions and with synchrony that

calls for needle traverse motion corresponding to the crochet motion.

[0014] In addition the need to impart reciprocating motion to the crochet forces the manufacturer to create machines with a structure that is substantially different from those designed to sew with knotted stitches.

[0015] Another difference between the two types of machine is the fact that while the machine for sewing with knotted stitches has a spool with the thread inserted inside the crochet the machine for sewing with the chain stitch requires different mechanisms that may even be positioned outside the machine.

[0016] These important and substantial differences between the two different types of machine are due to the great diversity of shape and formation between the knotted stitch and the chain stitch.

[0017] According to known technique, therefore, two different sewing machines must necessarily correspond to these two different types of stitch.

[0018] This involves a considerable cost for the customer or for companies in the textile industry who are required to offer increasingly flexible and versatile services given, primarily, the fast variations in fashion.

[0019] The aim of the present invention is to overcome all the above-mentioned problems and others as well thanks to creation of a single machine that is able to sew either alternatively or in combination knotted stitches and/or double chain stitches.

[0020] These aims and advantages are all achieved, according to the invention, by a base for a sewing machine with a head that includes at least one presser foot and at least one sewing needle, which base is characterized by the fact that it includes at least one first crochet powered by drive components and at least one transmission system including at least one second crochet; said transmission system is designed to provide rotation to said second crochet through drive means connected to components included in the base; said transmission system is made mobile with respect to this base by drive and adjustment means.

[0021] The machine, including the base so designed, advantageously permits sewing two different types of stitches using a single structure where different elements can work depending on the type of stitch desired.

[0022] The object of this invention therefore makes it no longer necessary to purchase two different machines with the considerable economic savings this entails. In addition it is possible, thanks to the sewing machine in question, to determine the relevant layout of the sewing stitches by means of a fast and simple setting system: in fact the distance between needle and needle can be adjusted according to the needs of the machine operator by performing the desired caliber change.

[0023] Other characteristics and details of the invention can be better understood from the following description which is given as a non-limiting example, as well as from the accompanying drawings wherein:

- fig. 1 is an axonometric view from above of the sewing machine, including the base, that is the object of this invention;
- fig. 2 is an axonometric view from above of the sewing machine, including the base, with the transmission system traversed and moved away from the body of the machine, showing a protective casing for the space created between transmission system and base;
- fig. 3 is an axonometric view from above of the sewing machine, with the base, with the transmission system traversed and moved away from the body of the machine but without the casing in figure 2;
- fig. 4 is an axonometric view from above of the machine in figure 2 with the transmission system in an exploded drawing;
- fig. 5 shows figure 4 in an axonometric view from the opposite side with the transmission system exploded and the base without its cover casing;
- fig. 6 is an axonometric view of the transmission system;
- figures 7, 8 are axonometric side views of the base, object of the invention, including two reciprocating motion crochets respectively with claw drive means and with roller drive means;
- fig. 9 shows an axonometric side view of the base including two rotary motion crochets;
- fig. 10 is an axonometric view of the base including a rotary motion crochet and a reciprocating motion crochet;
- fig. 11 is an axonometric side view of the base in figure 2 showing a close-up of the needle-plate.

[0024] With reference to the attached figures No. 1 indicates the base of a sewing machine which also includes one head 2 with presser foot 12 and relevant upper sewing components such as, for example, thread-pulling means.

[0025] In particular base 1 permits the machine to perform two different types of stitch without important replacements of its component elements. In fact it is possible both to make knotted stitches and chain stitches both in combination and/or alternatively.

[0026] To achieve this result base 1 includes first crochet 5 and second crochet 6 with continuous rotary motion for the knotted stitches and two crochets, 7 and 27, with reciprocating motion to make the chain stitches.

[0027] The first crochet 5 is visible in the right position of figures 5 and 9 and is connected by pin 9 to known type of means 22 which permit it to move.

[0028] Likewise as in figure 7 crochets 7 and 27 are also coupled by support 23 to pin 8 designed to move,

in reciprocating motion, crochets 7 and 27, receiving its drive in its turn from known types of means. Support 23 and, consequently, crochets 7 and 27 can be longitudinally traversed thanks to spring system 24 visible in figure 9.

[0029] Second crochet 6 with continuous rotary motion placed at the left in figure 9 permits creation of knotted stitches in combination with chain stitches made by one or more of crochets 7 and 27 or in combination with other knotted stitches sewn by first crochet 5.

[0030] Said second crochet 6 receives motion from first pin 10 coupled to gear transmission system 3 and connected by two guides 14 to base 1 and being able to traverse in a right angle direction to the direction of sewing.

[0031] In particular, as shown in figure 4, said first pin 10 is connected to a first gear 11 which is coupled to a second gear 13. This second gear 13 is coupled to grooved connection shaft 15 which is made to rotate by grooved coupling 16.

[0032] Said grooved connection shaft 15 and said grooved coupling 16 are advantageously coupled together in a telescoping manner in order to ensure uninterrupted motion independent from the position of connection shaft 15, permitting the unit to traverse in a longitudinal direction.

[0033] Second rotary crochet 6, thanks to the predefined configuration of gear transmission system 3, can be totally operational no matter what position it is in: transmission system 3, in fact, has compartment 31 designed to hold circular element 17 which, suitably connected to base 1 of the machine, permits adjustment of the distance between this same transmission system 3 and said base 1.

[0034] It is also possible to insert a hexagonal wrench in profiled hole 18 located on circular element 17 which can be easily accessed by the machine operator as shown in figure 3.

[0035] Gear transmission system 3 moves longitudinally the desired dimension thanks to the action of the hexagonal wrench or other means. It also moves, as a consequence, rotary crochet 6 which can move to one of four openings 21 positioned on needle plate 20 and suitable for making fabric presser foot 12 cooperate with relevant crochets 6, 7 and 27 placed below needle plate 20.

[0036] Needle plate 20 can also be easily replaced with a similar plate with a number of openings 21 and distances between openings 21 different from those illustrated in figures 1, 2, and 3 irrespective of the types of crochets that must work. In this way it is possible to make, with easy settings of the positions of crochets 5, 6, 7 and 27, different types of stitches at different distances between each other.

[0037] Likewise circular element 17 can determine two or more positions of transmission system 3. In the case described here circular element 17 determines four different positions of system 3.

[0038] Thanks to such a base 1 it is possible to obtain, near opening 25, a knotted stitch or a chain stitch, also by removing the first rotary crochet 5 while near one of the openings 21 we can obtain another knotted or chain stitch. In this way we can achieve four different stitch types/layouts meaning one with one or more chain stitches, one with one or more knotted stitches, another with a knotted stitch and one or more chain stitches and, finally, one with one or more chain stitches and a knotted stitch in positions that are inverted compared to the previous one.

[0039] The drive mechanism for gear transmission system 3 also calls for pneumatic piston 30 controlled by the operator using a push-button or other means. When said piston 30 is activated transmission system 3 moves clearly away from base 1 so that the operator can, when he desires, change one or more spools of crochets 5 or 6. This pneumatic piston is opposed by elastic or spring means 28 that bring transmission system 3 back towards base 1 in order to return, when desired by the operator, to the working configuration.

[0040] This operation only takes place with the needle bar positioned at top dead center and with the machine stopped, offering total safety for the operator.

[0041] In addition base 1 also includes means 19 that facilitate forward feed of the fabrics to sew. In fact a base can be made both with feed rollers, as in figure 1, and with claw systems as in figure 7.

[0042] In addition base 1 is tubular in shape or has an irregular polygonal cross section that comes near to being a circular profile in order to make it easy to sew garments with similar shapes such as pants or whatever.

[0043] Casing 26 is advantageously present to permit changing the spool inside first rotary crochet 5 and second rotary crochet 6.

[0044] In addition gear system 3 is covered by casing 29 coupled to base 1 in this way casing 29 covers the opening formed between system 3 and base 1 when system 3 moves away from base 1, guaranteeing maximum safety for the operator.

[0045] A technician in the sector can also foresee several modifications or variations which are to be held to be included within the realm of protection of this application for an invention patent.

Claims

1. Base (1) for sewing machine with head (2) including at least one presser foot (12) and at least one needle for sewing, said base being **characterized by** the fact that it includes at least one first crochet (5, 7, 27) moved by drive components (9, 22, 8, 23) and at least one transmission system (3) including at least a second crochet (6); said transmission system (3) is designed to provide rotary motion to said second crochet (6) through drive mechanisms (10, 11, 13, 15) connected to components (16) included in

base (1); said transmission system (3) is made mobile with respect to said base (1) by traversing and adjusting means (14, 17, 18).

2. Base (1) for sewing machine according to the previous claim, **characterized by** the fact that said transmission system (3) includes a first connection shaft (15) operated by said components (16) included in base (1); said first connection shaft (15) is connected by at least one coupling means (11, 13) to a second drive shaft (10) to which said second crochet (6) is connected.

3. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that said adjusting means (17, 18) are an element (17) including a cavity (18) for inserting means for rotating said element (17); said element (17) is designed to move said transmission system (3) to the desired position.

4. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that at least first crochet (5) is coupled to rotating pin element (9) powered by drive means (22).

5. Base (1) for sewing machine according to at least one of the claims from 1 to 3, **characterized by** the fact that at least said first crochet (7, 27) is coupled to support (23) connected to shaft (8) powered by drive means designed to move at least said first crochet (7, 27) in reciprocating motion.

6. Base (1) for sewing machine according to the claim 5, **characterized by** the fact that said support (23) includes at least two crochets (7, 27) placed relatively at the desired distances.

7. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that it includes means (14, 28, 30) designed to drive said transmission system (3) to approach and/or remove said transmission system (3) to and from said base (1) in order to manage said second crochet (6).

8. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that said means (14, 28, 30) designed to move said transmission system (3) are a piston (30), elastic means (28) and guide pins (14).

9. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that it includes a removable needle plate (20) including openings (21, 25) for passage of the thread between said needle and at least one crochet (5, 6, 7, 27).

10. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that it includes

at least a first casing (29) coupled to said base (1) and designed to cover the opening that is formed between this transmission system (3) and said base (1).

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11. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that it includes at least a second cover casing (26).

12. Base (1) for sewing machines according to the previous claims, **characterized by** the fact that it includes means (19) for feeding the fabric to be sewn forward.

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13. Base (1) for sewing machine according to the previous claims, **characterized by** the fact that said feed means (19) are roller and/or claw means.

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14. Sewing machine inclusive of base (1) according to the previous claims.

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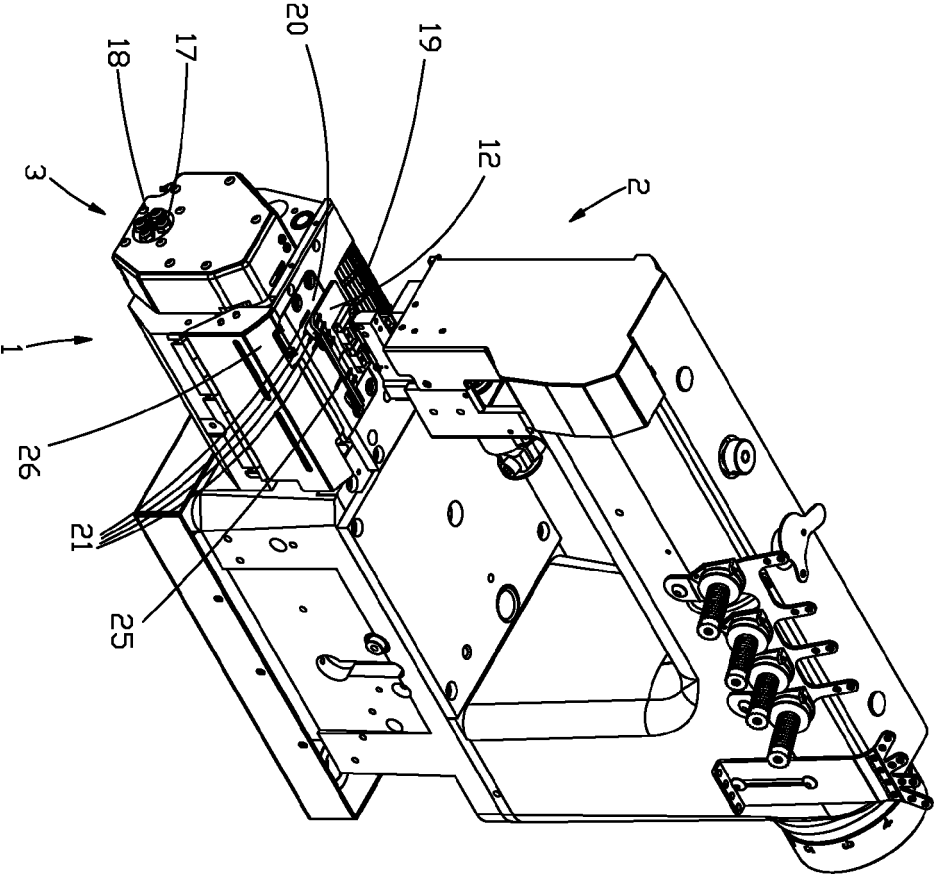


Fig. 1

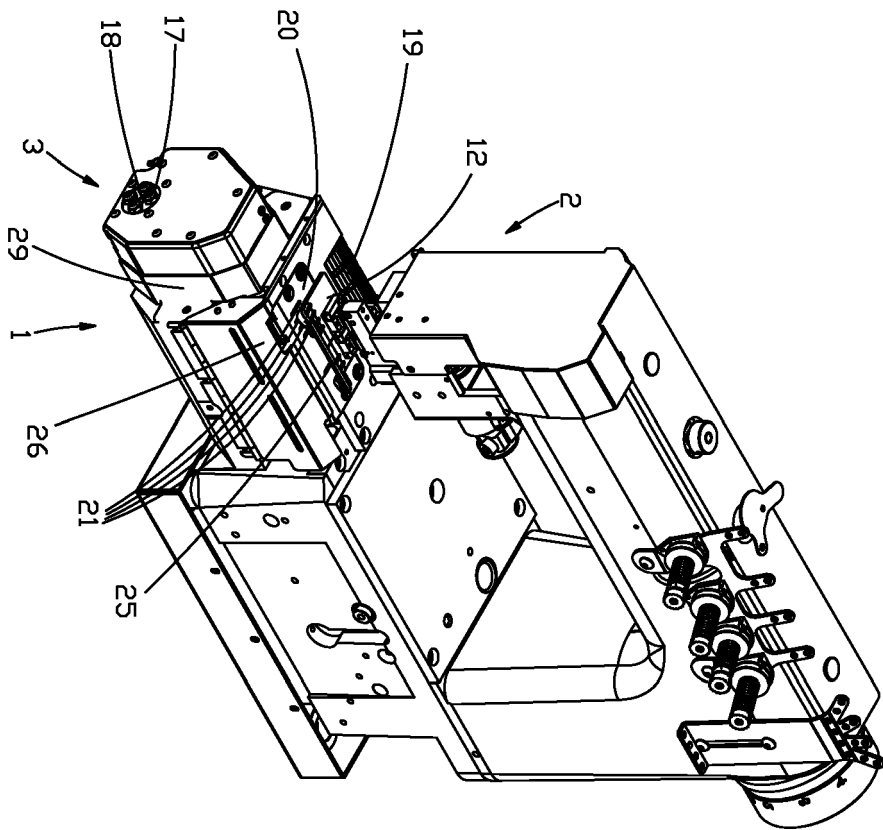


Fig. 2

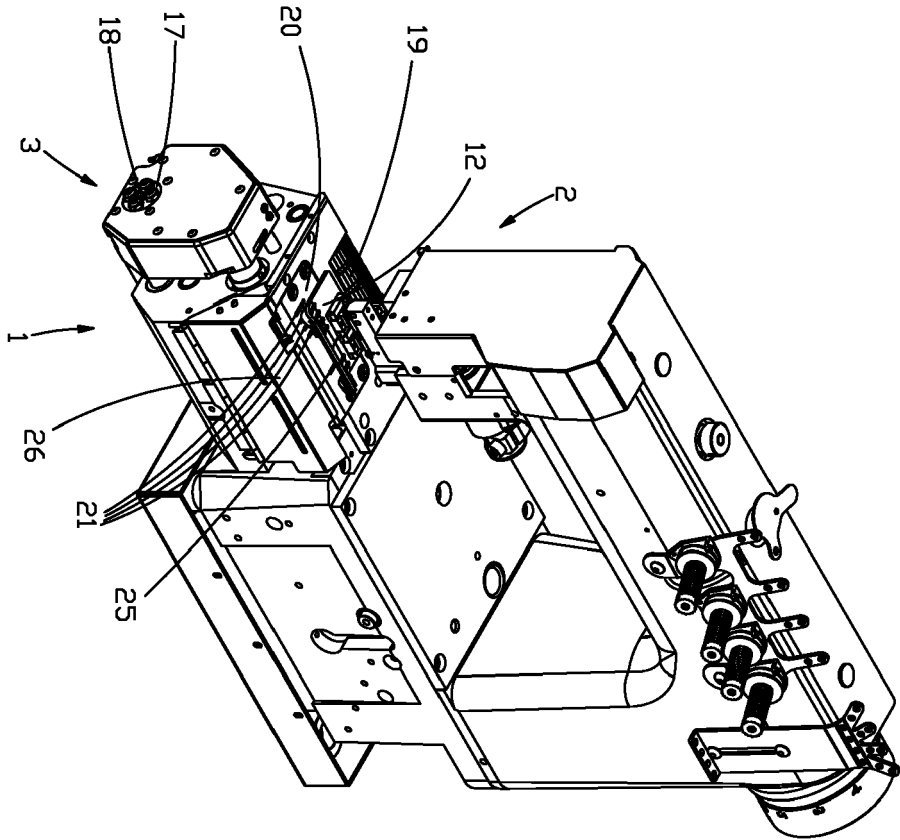


Fig. 3

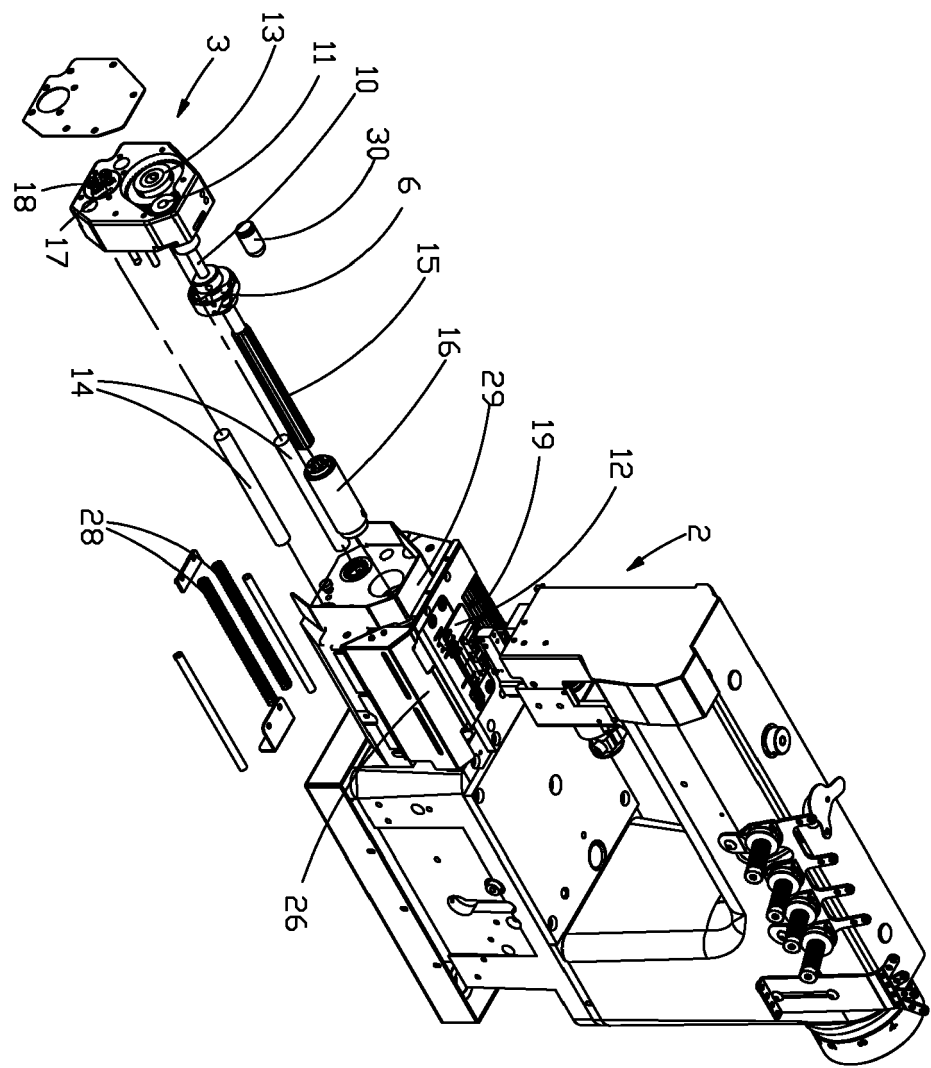


Fig. 4

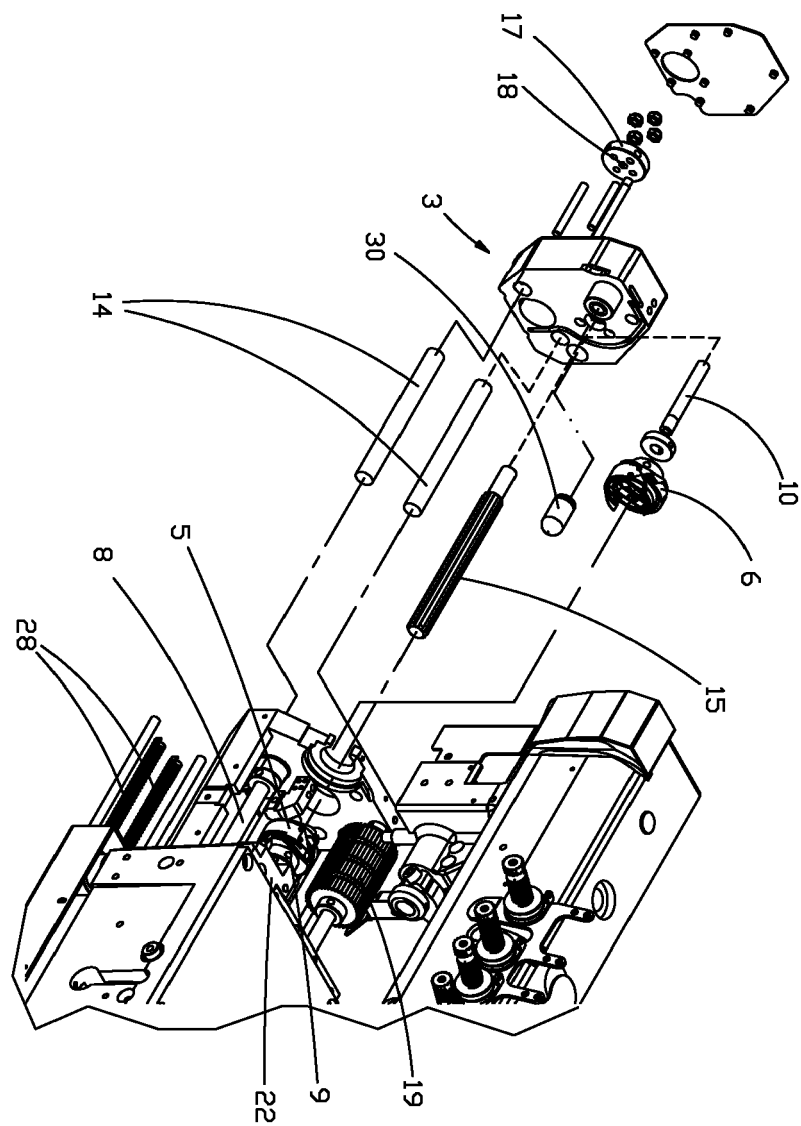


Fig. 5

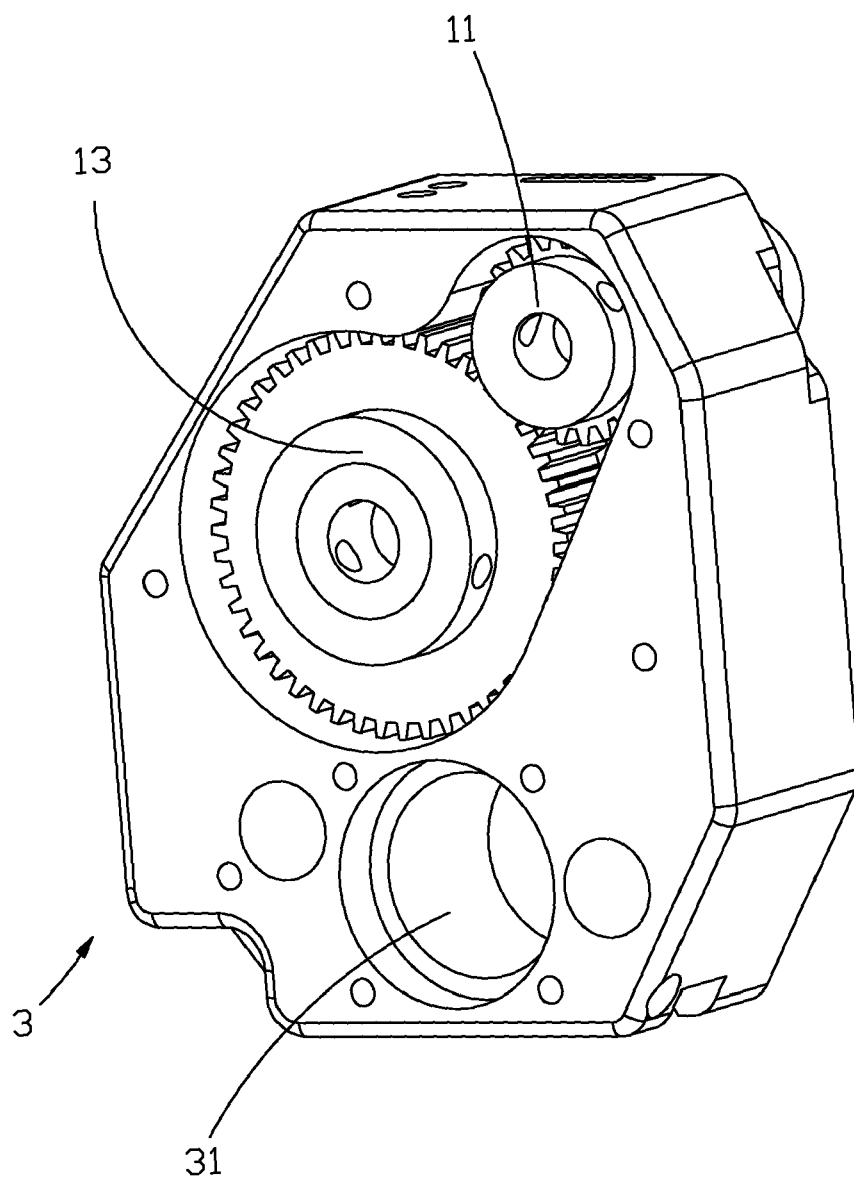


Fig. 6

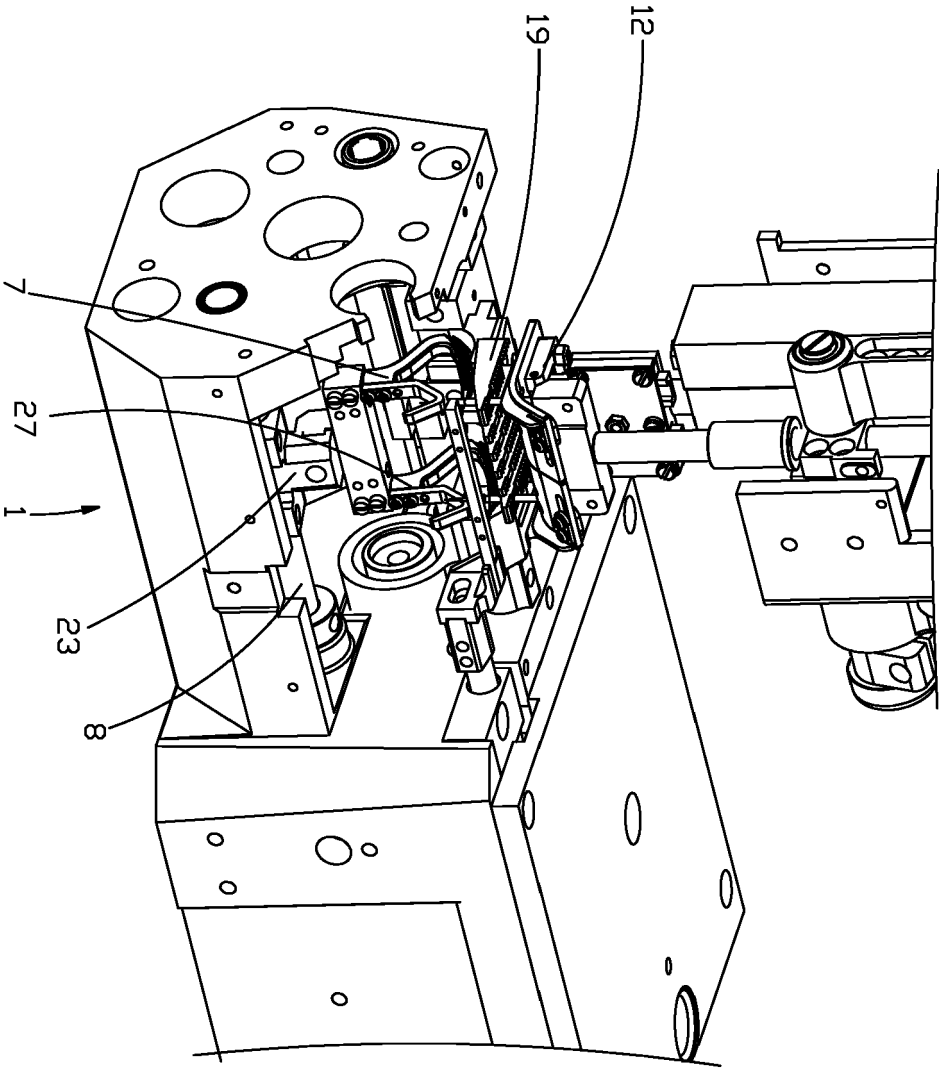


Fig. 7

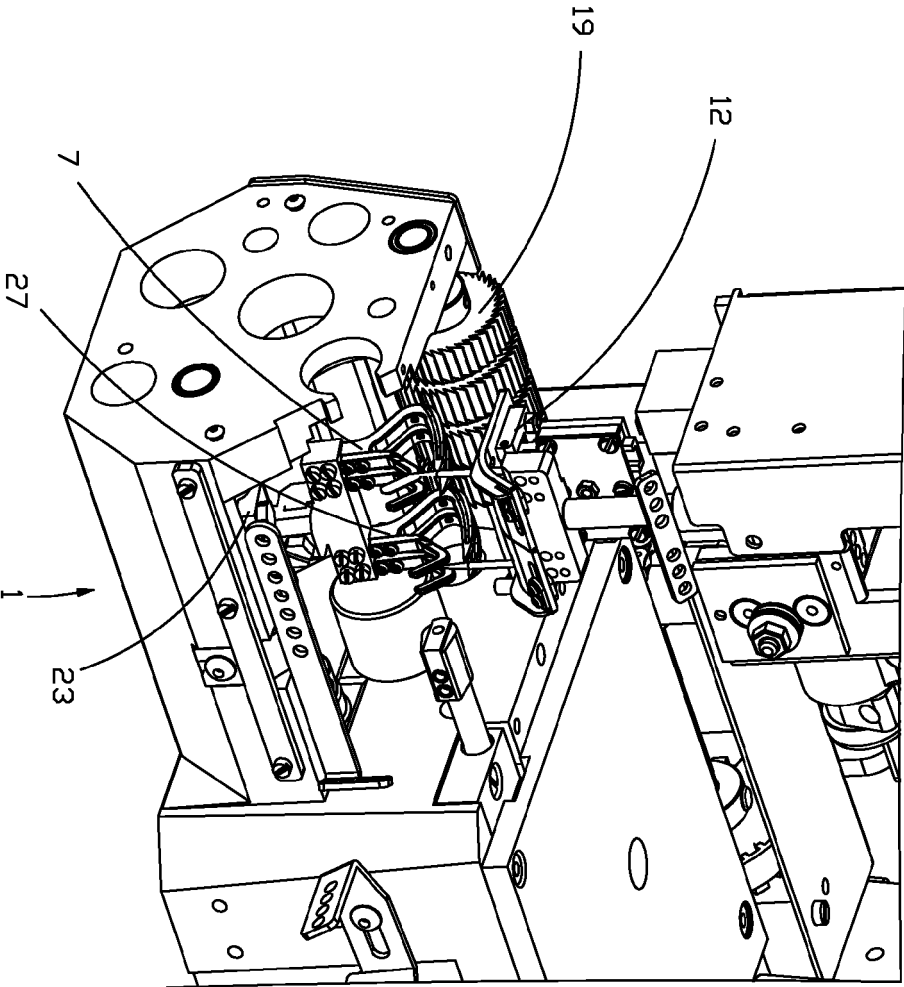
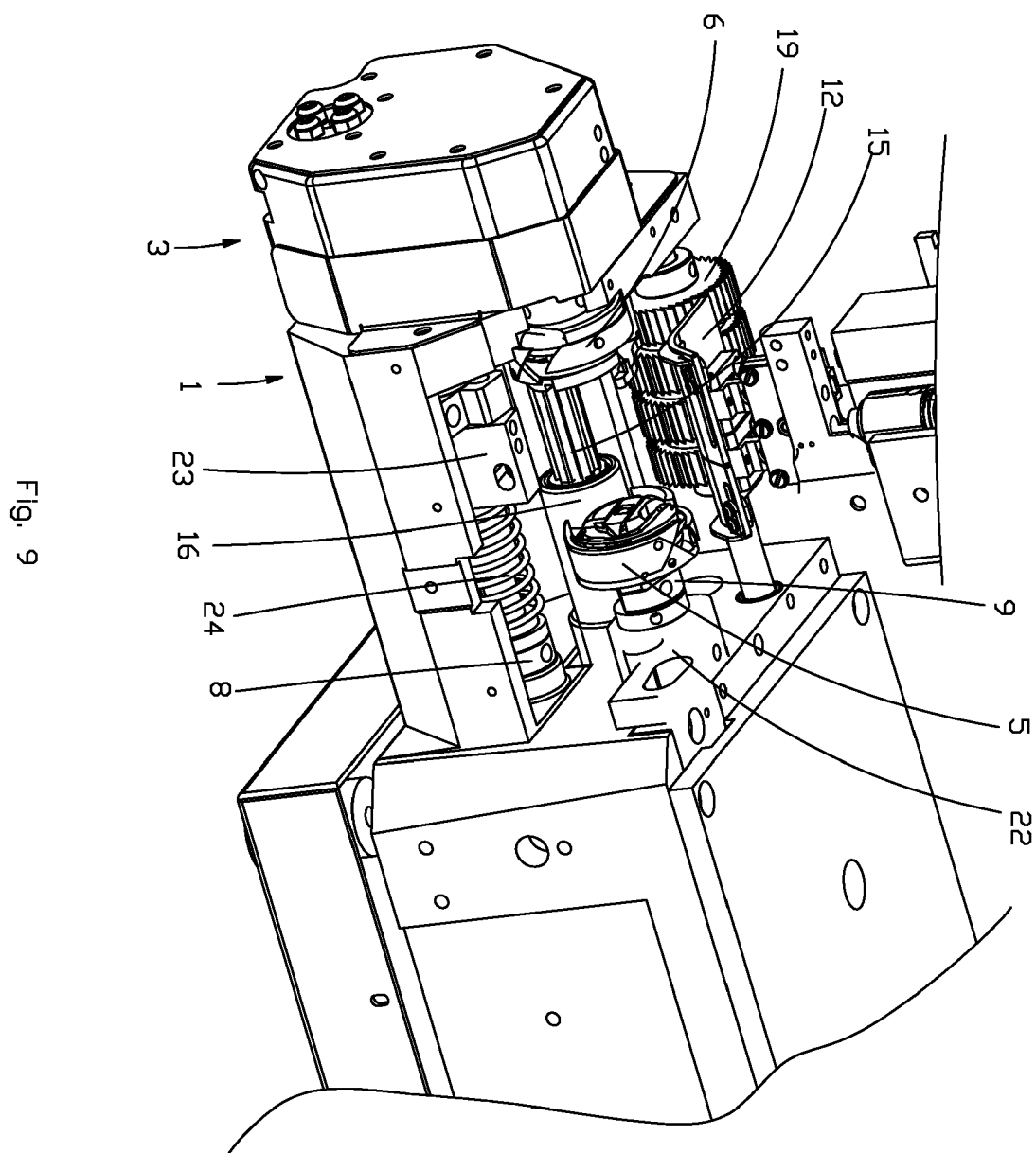


Fig. 8



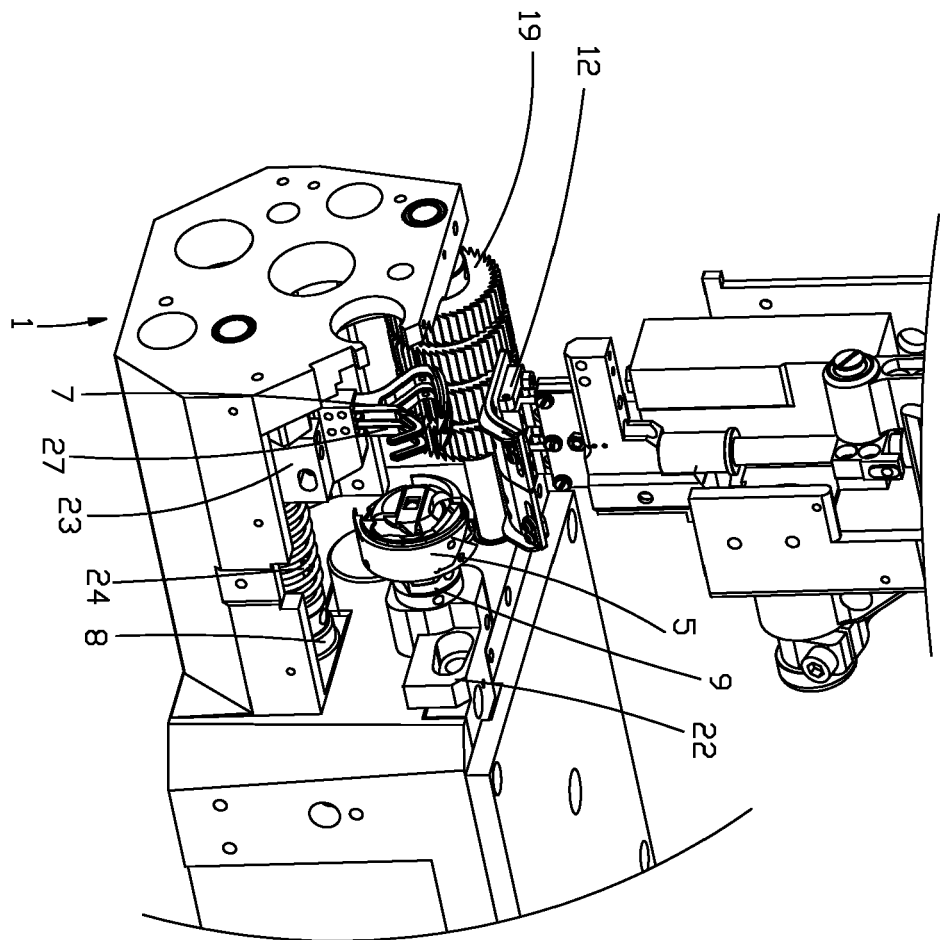


Fig. 10

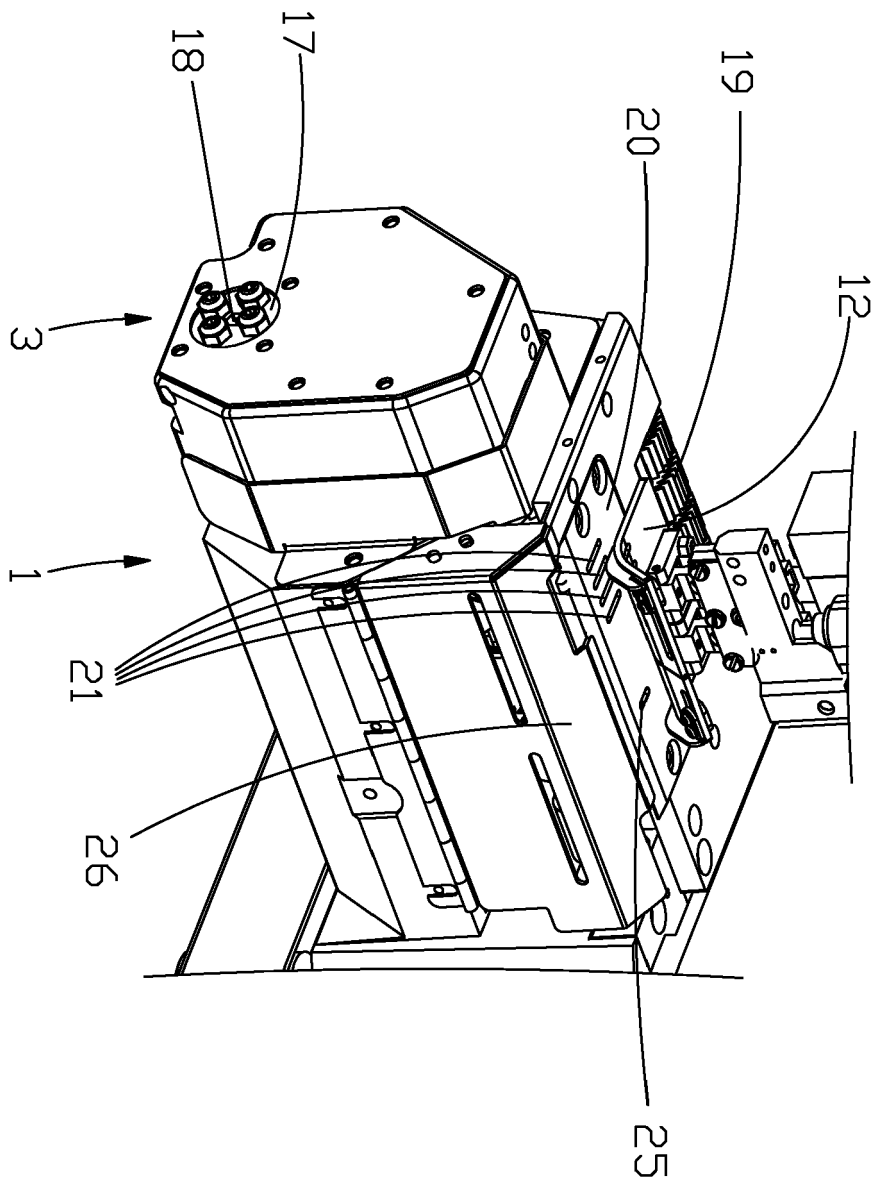


Fig. 11



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EUROPEAN SEARCH REPORT

Application Number
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The Hague		28 June 2007	Debard, Michel
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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