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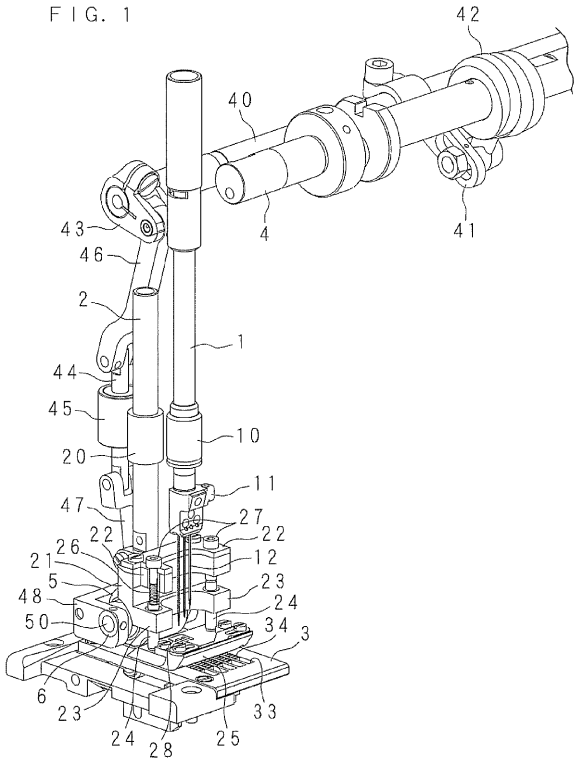
(54) **Feeding device of sewing machine**

(57) A feed roller 5 which rotates about a supporting shaft 50 extending in parallel with a needle plate 3 is supported by a presser base 21 attached to a lower end of a presser bar 2. The feed roller 5 descends by fall of the presser bar 2, sandwiches cloth for sewing between itself and a driven roller 30 provided in a corresponding position of the needle plate 3, intermittently rotates, and feeds the cloth for sewing. Repeated rotation of a feed drive shaft 40 is transmitted to the feed roller 5 via a swinging arm 43, an upper link 46, a feed transmission shaft 44, a lower link 47 and a transmission bracket 48, and the feed roller 5 rotates only while the feed drive shaft 40 rotates in one direction.

FIG. 1



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Description

[Technical Field]

[0001] The present invention relates to a feeding device of a sewing machine, which feeds cloth for sewing placed on a needle plate provided over a sewing machine bed.

[Related Art]

[0002] Sewing by a sewing machine is performed by placing cloth for sewing on a needle plate provided over a sewing machine bed, pressing the cloth for sewing with a presser metal which descends to the needle plate, and intermittently feeding it in synchronization with a vertical movement of a needle. The presser metal hangs from a sewing machine arm located above the sewing machine bed, and is attached to a tip portion of a presser bar which allows for a rise and fall operation and adjustment of pressure by a user. A user of a sewing machine places cloth for sewing on the needle plate in a state where the presser metal is raised, and lowers the presser metal to hold the cloth for sewing.

[0003] Cloth for sewing is generally fed by a movement of feed teeth arranged within a sewing machine bed (for example, refer to Japanese Patent No. 367902). By transmission from a feeding mechanism provided in the sewing machine bed, the feed teeth perform an elliptic movement in a face perpendicular to the needle plate, and repeats a motion of projecting from the needle plate, performing a feed movement in one direction, retracting below the needle plate and performing a return movement in an opposite direction. Thus, the cloth for sewing can be fed by an action of the feed teeth performed during the feed movement.

[Summary of the Invention]

[0004] In the conventional sewing machine as described above, cloth for sewing sandwiched between the needle plate and the presser metal is fed by the feed teeth which project from the needle plate and perform the feed movement. There is a problem that since the feed teeth are pressed against a lower face of cloth for sewing pressed from above by the presser metal, for example, at the time of sewing soft cloth, shapes of the feed teeth remain in the sewn cloth, thereby a finish quality of a sewn product deteriorates.

[0005] Although this problem is alleviated by changing pressure of the presser metal and adjusting pressure of the feed teeth, in this case, it is necessary to properly adjust the pressures according to cloth for sewing. For example, at the time of sewing slippery cloth for sewing, feed becomes irregular by slipping of the cloth for sewing sandwiched between the presser metal and the feed teeth, and therefore, a finish quality of a sewn product will deteriorate in another meaning.

[0006] The present invention has been made with the aim of solving the above problems, and it is an object of the present invention to provide a feeding device of a sewing machine which is capable of reliably and properly feeding cloth for sewing irrespective of a type of cloth for sewing.

[0007] A feeding device of a sewing machine according to the present invention is a feeding device of a sewing machine comprising a sewing machine bed having an upper surface over which a needle plate is provided, and a sewing machine arm which is located above the sewing machine bed and hangs and supports a needle bar and a presser bar towards the needle plate, the feeding device feeding cloth for sewing placed on the needle plate in synchronization with a vertical movement of the needle bar, characterized by comprising: a presser base attached to a lower end of the presser bar; a feed roller supported by the presser base so as to rotate about a shaft extending in parallel with the needle plate; driving means for intermittently driving the feed roller to rotate; and a driven roller supported by a lower part of the needle plate so as to rotate about a shaft extending in parallel with the feed roller; wherein the feed roller sandwiches the cloth for sewing between itself and the driven roller which is exposed to the needle plate by fall of the presser bar, and feeds the cloth for sewing.

[0008] In the feeding device of the sewing machine according to the present invention, since the feed roller which descends with the presser bar rotates in a state where cloth for sewing is sandwiched between the feed roller and the driven roller located on the needle plate, and feeds the cloth for sewing, there is no possibility that a trace caused by feed may remain in the sewn cloth, a proper feed can be reliably performed by adjustment of pressure by the feed roller according to a type of cloth for sewing, and thereby sewing of good quality can be realized simply.

[0009] A feeding device of a sewing machine according to the present invention is characterized in that the driving means has: a feed drive shaft which is supported in the sewing machine arm, and repeatedly rotates according to rotation of a sewing machine main shaft; a feed transmission shaft which penetrates the sewing machine arm, and vertically moves by transmission from the feed drive shaft; and a one-way clutch which transmits a movement in one direction of the feed transmission shaft to the feed roller.

[0010] Since the feed roller is driven by transmission from the feed drive shaft which repeatedly rotates within the sewing machine arm, the feed roller attached to the presser base can be driven intermittently with a simple configuration.

[0011] A feeding device of a sewing machine according to the present invention is characterized in that the driving means has: a feed motor which is fixed and supported outside the sewing machine arm; and a transmitting mechanism which transmits rotation of the feed motor to the feed roller.

[0012] Since a dedicated feed motor is provided and the feed roller is driven to rotate by the feed motor, a feed rate of cloth for sewing fed by rotation of the feed roller can be appropriately adjusted by control of the feed motor.

[0013] A feeding device of a sewing machine according to the present invention is characterized by further comprising: an auxiliary presser metal which is mounted on the presser base so as to vertically move, and is located in front of the feed roller; and biasing means for biasing the auxiliary presser metal downward.

[0014] Since the auxiliary presser metal which is biased downward is arranged in front of the feed roller, the auxiliary presser metal can press cloth for sewing placed on the needle plate, can feed it to a sewing position stably, and can allow for reliable stewing.

[0015] A feeding device of a sewing machine according to the present invention is characterized by further comprising an auxiliary feed tooth which is provided in the sewing machine bed, projects from the needle plate, sandwiches cloth for sewing between itself and the auxiliary presser metal, and feeds the cloth for sewing towards the feed roller.

[0016] Since the auxiliary feed tooth is provided which projects from the needle plate, sandwiches cloth for sewing between the auxiliary feed tooth and the auxiliary presser metal, and feeds the cloth for sewing, feed to a sewing position can be reliably performed. Moreover, by increasing or decreasing a feed rate fed by the auxiliary feed tooth, an extension degree of cloth for sewing between the auxiliary feed tooth and the feed roller can be changed, and thereby cloth with high stretchability can be sewn satisfactorily.

[Brief Description of the Several Views of the Drawings]

[0017]

FIG. 1 is a perspective view showing a feeding device of a sewing machine according to Embodiment 1.
FIG. 2 is a sectional side view of the feeding device shown in FIG. 1.
FIG. 3 is a perspective view showing a feeding device of a sewing machine according to Embodiment 2.

[Detailed Description of the Invention]

[0018] The present invention will be described in detail hereunder, based on the drawings showing Embodiments thereof. FIG. 1 is a perspective view showing a feeding device of a sewing machine according to Embodiment 1, and FIG. 2 is a sectional side view of the feeding device shown in FIG. 1.

[0019] The illustrated feeding device is provided in the sewing machine comprising a needle bar 1, a presser bar 2 and a needle plate 3. The needle bar 1 and the presser bar 2 are arranged forward and backward (right and left in FIG. 2) in order within a sewing machine arm (not shown), and are supported by respective support bushes 10, 20 so as to slide upward and downward.

[0020] Three needles 12 are attached via a needle guard 11 to a lower end of the needle bar 1 which projects below the support bush 10. An upper part of the needle bar 1 which projects above the support bush 10 is connected to a needle bar drive mechanism (not shown) provided in the sewing machine arm. The needle bar drive mechanism is a known mechanism in which rotation of an arm shaft 4 provided in the sewing machine arm is transmitted to the needle bar 1, and the needle bar 1 and the needles 12 attached to the lower end of the needle bar 1 are raised and lowered for a predetermined stroke, and a description of a configuration and a movement thereof is omitted.

[0021] A presser base 21 is fixed to a lower end of the presser bar 2 which projects below the support bush 20. The presser base 21 laterally extends in a front part of the presser bar 2, as shown in FIG. 1, and at end parts of lateral both sides thereof, presser arms 22, 22 extending forward and support arms 23, 23 extending downward are integrally provided adjacent to each other.

[0022] Lower parts of the support arms 23, 23 branch off into back lower parts and front parts respectively, as shown in FIG. 2, and a feed roller 5 is supported via a supporting shaft 50 by end parts of the branched back lower parts. Although only the support arm 23 provided on one side of the presser base 21 is shown in FIG. 2, the support arm 23 provided on another side of the presser base 21 also has the same shape. The supporting shaft 50 of the feed roller 5 is provided over rear end parts of the support arms 23, 23 provided on both sides. The feed roller 5 is rotatable about the supporting shaft 50 provided as a center, and is intermittently driven to rotate in one direction by transmission from a feed drive shaft 40 juxtaposed to the arm shaft 4, as described later.

[0023] On the other hand, a supporting shaft 24 is inserted into an end part of the support arm 23 extending forward, and is supported by the end part so as to slide upward and downward. As shown in FIG. 1, the similar supporting shaft 24 is also inserted into an end part of the support arm 23 provided on another side, and is supported by the end part so as to slide upward and downward. An auxiliary presser metal 25 is attached to lower end parts of the supporting shafts 24, 24 so as to correspond to auxiliary feed teeth 34 mentioned later.

[0024] Upper end parts of the supporting shafts 24 are biased downward by compression springs 26 held by the presser arm 22 which the compression springs 26 face upward. The compression springs 26 are held in holding holes which penetrate the presser arm 22 upward and downward, as shown in FIG. 2, and are in a resilient contact with lower end parts of adjustment screws 27 screwed into upper end parts of the holding holes and with upper end parts of the supporting shafts 24. FIG. 1 illustrates a state where the presser arm 22 located on the left side is fractured and the compression spring 26 is interposed. The adjustment screws 27 are operated

from above the presser arm 22 so as to adjust the biasing forces of the compression springs 26.

[0025] The presser bar 2 which supports the presser base 21 can be raised and lowered by appropriate means, such as a lever operation, and the feed roller 5 and the auxiliary presser metal 25 supported by the presser base 21 also can be raised and lowered. As shown in FIGS. 1 and 2, the auxiliary presser metal 25 is in a block-shape having a boat form, and a needle hole 28 penetrates the auxiliary presser metal 25 between the supporting shafts 24, 24 provided on both sides, as shown in FIG. 1. The needle hole 28 is provided in order to allow for insertion of the needles 12 which descend with the needle bar 1.

[0026] The needle plate 3 is provided over an upper surface of a sewing machine bed (not shown) located below the sewing machine arm. The needle plate 3 has an anteroposterior length including fall positions of the needle bar 1 and the presser bar 2, and the feed roller 5 and the auxiliary presser metal 25 which descend with the presser bar 2 contact upper surfaces of a back part and a front part of the needle plate 3, as shown in FIGS. 1 and 2. The needles 12 which descend with the needle bar 1 pass through a needle hole (not shown) provided in the needle plate 3 corresponding to the needle hole 28, and can enter the sewing machine bed provided on a lower part of the needle plate 3. Note that the needle bar 1 and the needles 12 shown in FIGS. 1 and 2 are in a rise position.

[0027] A driven roller 30 is attached to the back part of the needle plate 3 corresponding to a fall position of the feed roller 5. As shown in FIG. 2, the driven roller 30 is rotatably supported by a supporting shaft 32 laterally extending in parallel with the needle plate 3 through a bracket 31 projecting from a lower face of the needle plate 3. Apart of the driven roller 30 is exposed on an upper side of the needle plate 3, and contacts and rolls the feed roller 5 which descends as mentioned above. When cloth for sewing is placed on the needle plate 3, the cloth for sewing is sandwiched also between the feed roller 5 and the driven roller 30.

[0028] The feed roller 5 rotates by transmission from the feed drive shaft 40 provided in the sewing machine arm. The feed drive shaft 40 is juxtaposed to the arm shaft 4, and is supported in the sewing machine arm. A swinging lever 41 is fixed in the middle of the feed drive shaft 40, and is connected to an eccentric ring 42 fitted onto the middle of the arm shaft 4. The arm shaft 4 is a rotary shaft which rotates in one direction by transmission from a sewing machine main shaft. The eccentric ring 42 reciprocates based on eccentricity according to rotation of the arm shaft 4, and the reciprocation is transmitted to the feed drive shaft 40 via the swinging lever 41. By the transmission, the feed drive shaft 40 repeatedly rotates about a center axis in an angular range corresponding to the eccentricity of the eccentric ring 42. A one end part of the feed drive shaft 40 extends even close to back positions of the needle bar 1 and the presser bar 2, and a swinging arm 43 is fixed to the one end part of the feed drive shaft 40.

[0029] In the sewing machine arm, a feed transmission shaft 44 is provided at the back position of the presser bar 2. The feed transmission shaft 44 is a short sliding shaft which is supported by a support bush 45 so as to slide upward and downward, and an upper end part of the feed transmission shaft 44 extending into the sewing machine arm is connected to the swinging arm 43 fixed to the one end part of the feed drive shaft 40 via an upper link 46. Thus connected feed transmission shaft 44 reciprocates upward and downward according to repeated rotation of the feed drive shaft 40.

[0030] On the other hand, a lower end part of the feed transmission shaft 44 extending outside the sewing machine arm is connected to a transmission bracket 48 via a lower link 47. As shown in FIG. 1, the transmission bracket 48 is a flat U-shaped member which is open on one side, is fitted onto the support arms 23, 23 of the presser base 21 in a state where the open side faces the front, and is connected to end parts of the supporting shaft 50 of the feed roller 5 which project on the respective sides. As shown in FIGS. 1 and 2, one-way clutches 6 are incorporated into the projecting end parts of the supporting shaft 50 respectively, and the transmission bracket 48 is connected via the one-way clutches 6 provided on the respective sides.

[0031] By the above configuration, the transmission bracket 48 swings about the supporting shaft 50 of the feed roller 5 provided as a center according to the reciprocation of the feed transmission shaft 44 transmitted via the lower link 47. This swing is transmitted to the supporting shaft 50 of the feed roller 5 via the one-way clutches 6. Thereby, the feed roller 5 rotates only during the swing in one direction of the transmission bracket 48 by the upward movement or the downward movement of the feed transmission shaft 44, and can intermittently feed cloth for sewing sandwiched between the feed roller 5 and the driven roller 30. Since the feed roller 5 rotates by transmission from the arm shaft 4 provided in the sewing machine arm, and the needle bar 1 and the needles 12 also vertically move by transmission from the arm shaft 4, feed of cloth for sewing by rotation of the feed roller 5 is performed in synchronization with the vertical movement of the needles 12, and the cloth for sewing can be sewn by the vertical movement of the needles 12 and a movement of a looper (not shown) provided below the needle plate 3.

[0032] Since cloth for sewing is sandwiched between the feed roller 5 and the driven roller 30 and is fed by friction therebetween, for example, even at the time of sewing soft cloth, there is no possibility that a trace caused by the feed may remain in the sewn cloth, and thereby an excellent finish quality can be realized.

[0033] Cloth for sewing can be reliably fed by increase of pressure for sandwiching between the feed roller 5 and the driven roller 30, and for example, even at the time of sewing slippery cloth, deterioration of a finish qual-

ity of a sewn product resulting from poor feed can be prevented. The pressure for sandwiching cloth for sewing can be adjusted by increasing or decreasing a spring force of a compression spring (not shown) for pressing and biasing the presser bar 2 downward, and by changing pressure of the feed roller 5. The adjustment is the same as adjustment of pressure to be performed for a presser metal provided in the conventional sewing machine. Note that much more reliable feed can be realized by coating surfaces of the feed roller 5 and the driven roller 30 using a material with a high friction coefficient.

[0034] As shown in FIG. 1, a plurality of feed holes 33 long forward and backward are provided in the front part of the needle plate 3 which the auxiliary presser metal 25 contacts, and a plurality of auxiliary feed teeth 34 are provided in lower parts of the feed holes 33 so as to project or retract, respectively. By transmission from a feeding mechanism (not shown) provided in the sewing machine arm, the auxiliary feed teeth 34 repeat a known motion of projecting from the needle plate 3 through the feed holes 33, performing a feed movement backward, retracting below the needle plate 3 and performing a return movement forward.

[0035] The auxiliary feed teeth 34 sandwich cloth for sewing between themselves and the auxiliary presser metal 25, and intermittently feed the cloth for sewing while projecting from the needle plate 3 and performing the feed movement. Although the auxiliary feed teeth 34 have non-slip teeth on upper surfaces thereof which act on cloth for sewing, since the auxiliary presser metal 25 which sandwiches cloth for sewing between itself and the auxiliary feed teeth 34 moves upward against the spring forces of the compression springs 26 for biasing downward and alleviates pressure of the auxiliary feed teeth 34, there is no possibility that shapes of the auxiliary feed teeth 34 may remain in the sewn cloth.

[0036] Feed by the auxiliary feed teeth 34 is performed to assist feed of cloth for sewing to fall positions of the needles 12 for sewing. A feed rate thereof can be adjusted by an operation of the feeding mechanism separately from a feed rate added by the feed roller 5. The adjustment is performed in order to prevent extension of cloth for sewing by feed and improve a quality of a sewn product, for example at the time of sewing cloth for sewing with high stretchability.

[0037] FIG. 3 is a perspective view showing a feeding device of a sewing machine according to Embodiment 2. Although FIG. 3 is illustrated as a perspective view from the back of the sewing machine contrary to FIG. 1, Embodiment 2 is the same as Embodiment 1 shown in FIGS. 1 and 2 except driving means of the feed roller 5, and reference numerals common to FIGS. 1 and 2 are given to corresponding component members, and descriptions and movements thereof are omitted.

[0038] In Embodiment 2, the feed roller 5 is driven to rotate by a dedicated feed motor 8. The feed motor 8 is fixed to a rear surface of a tip part of a sewing machine arm 7 via a supporting bracket 80. The supporting bracket 80 has a support plate which vertically rises from the rear surface of the sewing machine arm 7, and the feed motor 8 is mounted on the support plate.

[0039] The feed motor 8 projects towards the tip part of the sewing machine arm 7, and has an output shaft extending in parallel with the supporting shaft 50 of the feed roller 5 and a drive pulley 81 is fitted and fixed to the output shaft. The supporting shaft 50 of the feed roller 5 projects from the support arm 23 provided on one side of the presser base 21, a driven pulley 51 is fitted and fixed to the projecting end part, and the driven pulley 51 and the drive pulley 81 are connected to each other via a transmission belt 82 suspended therebetween.

[0040] The feed motor 8 is a stepping motor which is intermittently driven for a predetermined period, and rotation of the feed motor 8 is transmitted to the feed roller 5 via the drive pulley 81, the transmission belt 82 and the driven pulley 51, and thereby the feed roller 5 rotates. Therefore, the feed movement similar to that in Embodiment 1 can be performed by drive of the feed motor 8 in synchronization with a vertical movement of the needle bar 1 and the needles 12. Note that since the drive pulley 81 and the driven pulley 51 are synchronous pulleys comprising teeth in outer circumferences thereof and the transmission belt 82 is a synchronous belt comprising teeth in an inner surface thereof, rotation of the feed motor 8 is transmitted to the feed roller 5, without slip, and thereby the more reliable feed movement can be performed.

[0041] An air cylinder 83 is fixed to the supporting bracket 80. The air cylinder 83 is located above a front side of the feed motor 8 and has an output rod extending below, and a supporting member 84 is mounted on a lower end of the output rod. The supporting member 84 is a U-shaped member which is open on the downside thereof, and a tensioning pulley 85 located inside transmission belt 82 is attached close to open end parts extending so as to sandwich both sides of the transmission belt 82.

[0042] The air cylinder 83 is usually in a shown projection position. At this time, the tensioning pulley 85 does not contact the transmission belt 82, and the transmission belt 82 is in a state where it is suspended between the drive pulley 81 and the driven pulley 51. Tension of the transmission belt 82 is lost when the feed roller 5 moves upward by rise of the presser bar 2. The air cylinder 83 raises the tensioning pulley 85 via the supporting member 84, according to the upward movement of the feed roller 5. The tensioning pulley 85 contacts a corresponding portion of the transmission belt 82, pulls up it, maintains tension of the transmission belt 82, and prevents the transmission belt 82 from separating from the drive pulley 81 or the driven pulley 51.

[0043] Note that a transmitting mechanism which transmits rotation of the feed motor 8 to the feed roller 5 is not limited to the belt transmission mechanism comprising the drive pulley 81, the driven pulley 51 and the transmission belt 82, and other transmitting mecha-

nisms, such as a gear transmission mechanism, may be used.

Claims

1. A feeding device of a sewing machine comprising a sewing machine bed having an upper surface over which a needle plate (3) is provided, and a sewing machine arm (7) which is located above the sewing machine bed and hangs and supports a needle bar (1) and a presser bar (2) towards the needle plate (3), the feeding device feeding cloth for sewing placed on the needle plate (3) in synchronization with a vertical movement of the needle bar (1), **characterized by** comprising:

   a presser base (21) attached to a lower end of the presser bar (2);
   a feed roller (5) supported by the presser base (21) so as to rotate about a shaft (50) extending in parallel with the needle plate (3);
   driving means for intermittently driving the feed roller (5) to rotate; and
   a driven roller (30) supported by a lower part of the needle plate (3) so as to rotate about a shaft (32) extending in parallel with the feed roller (5);
   wherein the feed roller (5) sandwiches the cloth for sewing between itself and the driven roller (30) which is exposed to the needle plate (3) by fall of the presser bar (2), and feeds the cloth for sewing.

2. The feeding device of the sewing machine according to Claim 1, wherein the driving means has:

   a feed drive shaft (40) which is supported in the sewing machine arm (7), and repeatedly rotates according to rotation of a sewing machine main shaft (4);
   a feed transmission shaft (44) which penetrates the sewing machine arm (7), and vertically moves by transmission from the feed drive shaft (40); and
   a one-way clutch (6) which transmits a movement in one direction of the feed transmission shaft (44) to the feed roller (5).

3. The feeding device of the sewing machine according to Claim 1, wherein the driving means has:

   a feed motor (8) which is fixed and supported outside the sewing machine arm (7); and
   a transmitting mechanism (51, 81, 82) which transmits rotation of the feed motor (8) to the feed roller (5).

4. The feeding device of the sewing machine according to any one of Claims 1 to 3, further comprising:

   an auxiliary presser metal (25) which is mounted on the presser base (21) so as to vertically move, and is located in front of the feed roller (5); and biasing means (26) for biasing the auxiliary presser metal (25) downward.

5. The feeding device of the sewing machine according to Claim 4, further comprising an auxiliary feed tooth (34) which is provided in the sewing machine bed, projects from the needle plate (3), sandwiches cloth for sewing between itself and the auxiliary presser metal (25), and feeds the cloth for sewing towards the feed roller (5).

FIG. 1

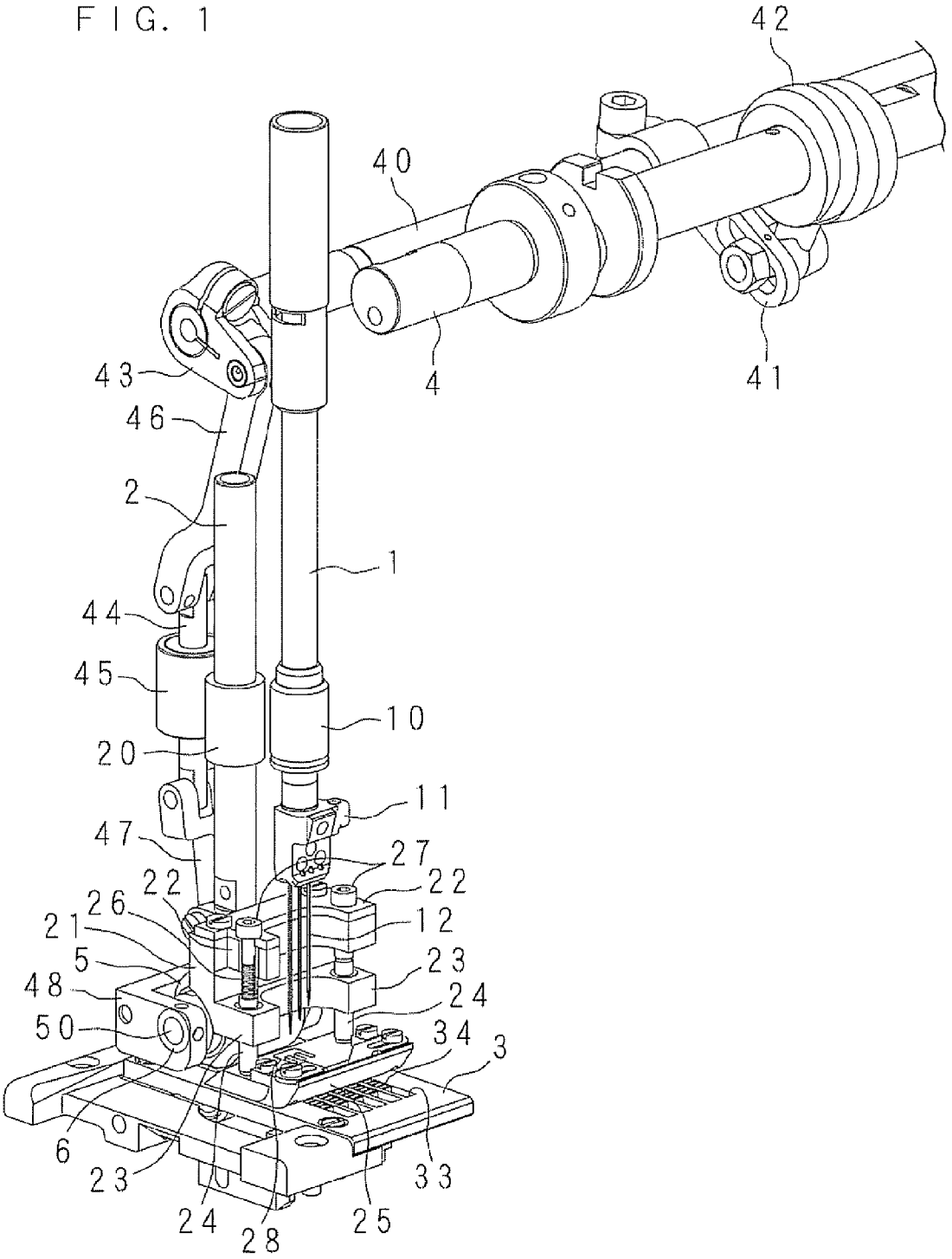
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FIG. 2

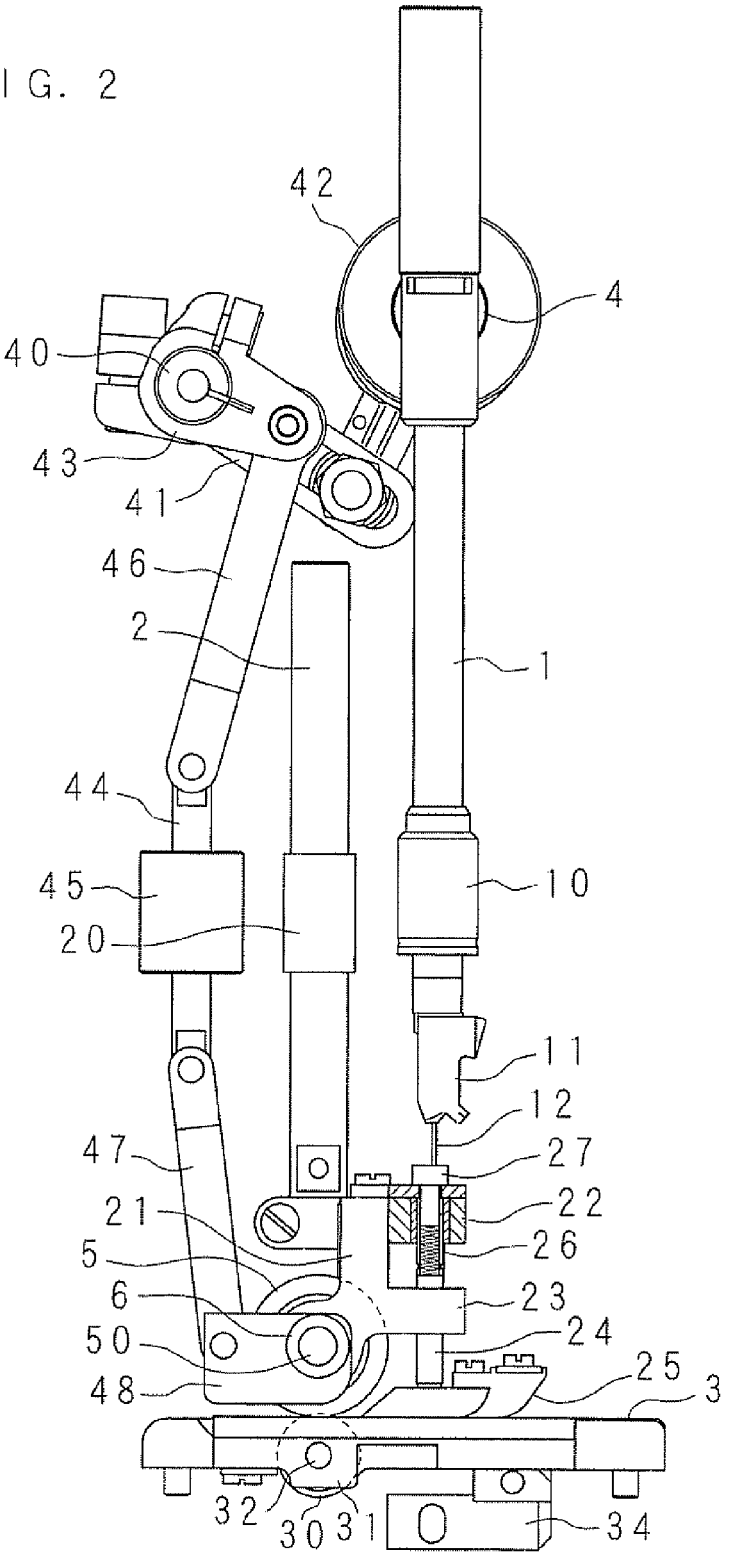
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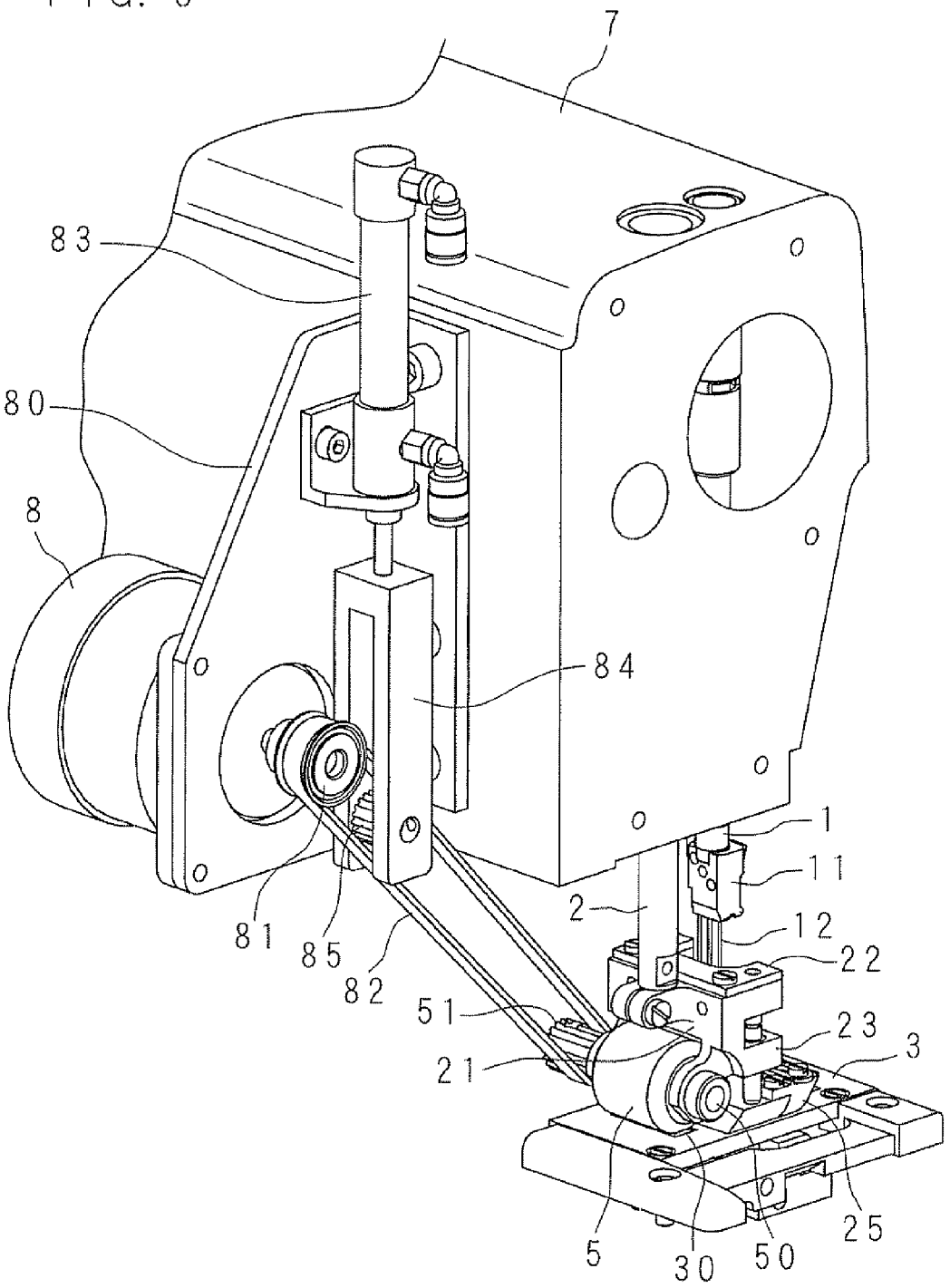
FIG. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 11 19 0688

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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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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 March 2012	Herry-Martin, D

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 19 0688

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

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