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(54) WORK UNIT AND METHOD FOR FOLDING AND SEWING POCKETS

ARBEITSEINHEIT UND VERFAHREN ZUM FALTEN UND NÄHEN VON TASCHEN

UNITÉ DE TRAVAIL ET PROCÉDÉ DE PLIAGE ET DE COUTURE DE POCHES

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(56) References cited:
WO-A1-2018/202898
WO-A1-2019/105070
US-A- 4 813 362
US-A- 5 014 633
US-B1- 6 390 002

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Description

FIELD OF APPLICATION

[0001] The present invention relates to a processing method for folding and subsequently feeding and sewing pockets on respective panels of jeans or similar trousers.

[0002] More precisely, the method according to the invention involves integrating some of the technologies previously known in the prior art in a single solution, and in particular with the addition of a further workstation with respect to the usual three workstations.

[0003] Thanks to this new work system it is now possible to balance the production times of the individual steps and thus increase the efficiency of the automatic sewing unit.

[0004] The present invention is advantageously applied in the field of industrial sewing systems, in particular in that relating to the automatic folding and sewing of pockets or the like with respect to trouser panels or the like.

PRIOR ART

[0005] It is known that to perform the programmed sewing of pockets on base fabric, typically sewing preformed patch pockets of jeans, automatic units generally equipped with three workstations are used:

a) a first loading station with a special loading plate which moves from a rest position to a folding station, ready to take the material consisting of the base fabric and folded pocket, when this has already been prepared, and then move the set from the folding station to a sewing station;
b) a second folding station in which the base fabric is positioned, above a loading plane, and a pocket to be applied. In this station the peripheral edges of the pocket are folded, and the pocket is positioned on a base fabric, so that a double layer of material is thus ready to be loaded.
c) a third sewing station in which the folded pocket is applied/sewn onto the base fabric. The material already prepared is taken by the loading plate, when this reaches the sewing station, through a system of grippers present in a sewing head. The sewing head with the gripper system thereof blocks the material during the entire sewing step. The material is taken from the loading plate, which moves from the rest position thereof to the folding station and then to the sewing station. Here the sewing head with the gripper system thereof blocks the material during the sewing.

[0006] Normally, automatic units for the programmed sewing of pockets on base fabric are made according to two main types:

- **a first type,** which provides that the sewing head is located on one end of the working line, and that the loader is positioned on the opposite side, while the folding assembly is placed in an intermediate position between these ends of the working line, which is thus arranged in a central position with respect to the sewing head and the loader; the loader moves between the three stations present in the unit.

[0007] The first type of automatic unit made according to the known technique is used by performing six consecutive working steps:

F1.1) the operator in the folding station starts loading the material to be sewn on the loading plane and in the folding assembly, while the loader with the loading plate thereof is positioned at its rest point next to the folding station;
F1.2) the folding cycle is actuated while the loader remains positioned at the rest point thereof;
F1.3) the loader moves to the folding station at the end of step 1.2, and the loading plate thereof blocks the material to be loaded;
F1.4) the loader completely moves up to the sewing station, when the sewing machine has the sewing area thereof free, when the area is unloaded from the presence of any previously loaded material;
F1.5) the sewing head blocks the material which was just loaded by means of the inner gripper thereof and the loader raises the loading plate;
F1.6) the loader begins to return to its rest point with the loading plate raised. The sewing head lowers the outer gripper thereof and starts the sewing
cycle only when the loader has already removed the entire loading plate from the sewing head.

[0008] The loader returns to the rest point thereof passing through the material loading area.

[0009] Only at this point the operator can start the next working cycle, loading the material to be sewn on the loading plane and in the folding assembly.

[0010] The drawbacks encountered by using this first type of automatic assembly, can be calculated in terms of time by providing the example where the total preparation/loading cycle has a total duration of 8.5 seconds, which corresponds to the sum of the seconds which elapse from the 1st to the 6th step.

[0011] If the sewing head has a sewing cycle of:

A) 10 seconds - the loading cycle had already reached the end of the 3rd step (10 - (2+4+0.5) sec so it cannot perform the final part (there are two seconds from the 4th to the 6th step) and this limits the total efficiency of the automatic unit because the production cycle goes from 10 to 12 seconds;

B) 6 seconds - the sewing cycle ends earlier than the loading cycle, because the loading cycle has a duration of 8.5 seconds and this limits the total efficiency of the automatic unit because the production cycle goes from 6 seconds of sewing to 8.5 seconds.

[0012] The balance of this type of operation can only be found at 8.5 seconds (same time for the sewing and preparation cycle).

- **a second type,** which provides that the sewing head is on one side, that the folder is positioned on the opposite side and there is nothing in the middle between these two elements, since the sewing head uses the gripper system thereof or control system thereof of the movable material to pick up the prepared material in the folding assembly.

[0013] The second type of automatic unit made according to the known technique is used by performing four consecutive working steps:

F2.1) the operator starts loading the material to be sewn onto the loading plane and in the folding assembly while the grippers of the sewing head are positioned at the rest point thereof;

F2.2) the folding cycle is actuated while the grippers of the sewing head are positioned in the area of the sewing head;

F2.3) only when the sewing machine has finished the previous sewing cycle or when the sewing area thereof is free from the presence of any material, the grippers of the sewing head move into the area of the folding assembly at the end of the second step and block the material to be loaded;

F2.4) the grippers of the sewing head move into the area of the sewing head and the sewing machine starts sewing.

[0014] Only at this point the operator can start loading the sewing material on the loading plane and in the folding assembly at the end of the 4th step.

[0015] The drawbacks encountered when using this second type of automatic unit can also be calculated in terms of time, assuming, for example, that the sewing cycle is:

a) 10 seconds - the loading cycle had already reached the end of the 2nd step but must now wait until the sewing cycle is finished in order to continue with its final part (3rd and 4th step). In this case (10 - (2+4)) = 4 seconds wait. At this point the 3rd step is performed which is 1 second and the 4th step of another second before the sewing cycle can start, thus 2 + 4 + 4 + 1 + 1 = 12 seconds. This limits the total efficiency of the automatic unit because the total production cycle goes from 10 seconds of sewing to 12 seconds.
b) 6 seconds - the loading cycle had already reached the end of the 2nd step but must now wait until the sewing cycle is finished in order to continue with its final part (3rd and 4th step).
c) In this case (6 - (2+4)) = 0 second wait At this point the 3rd step is performed which is 1 second and the 4th step of another second before the sewing cycle can start, thus 2 + 4 + 0 + 1 + 1 = 8 seconds.

[0016] This limits the total efficiency of the automatic unit because the total production cycle goes from 6 seconds of sewing to 8 seconds.

[0017] In this second case it is not possible to find the balance of this type of operation, because even with the smaller sewing cycle of the first two preparation steps, at least another 2 seconds are always added for the third and fourth steps and the efficiency is ultimately reduced in the total production time.

[0018] Summarizing the total production time in the traditional automatic units for sewing pockets on a base fabric, it is divided between two preparation and sewing steps.

[0019] These two steps (preparation and loading) are sequential and one prejudices the start of the execution of the next step, i.e. in this way the operating mode does not allow to optimize the working times, to the detriment of the overall productivity of the plant.

[0020] WO 2018/202898 A1 discloses a system for ironing and sewing pockets on a piece of cloth comprising a plate suitable for supporting a pocket to be sewn, an ironing station for ironing the pocket supported by the plate, a loader suitable for taking the pocket to a sewing station, and a moving device connected to the plate in order to move the plate to the ironing station and from the ironing station to a transfer station, where the pocket is transferred from the plate to the loader.

[0021] WO 2019/105070 A1 discloses a multi-head pocket setter machine being capable of sewing a plurality of stitches with different colors on a pocket; the multi-head pocket setter machine comprises a frame and two or more heads spaced apart in a front-rear direction on the frame; each head respectively comprising a needle for sewing a stitch on the pocket, further comprising a first feeding device which is provided between the two or more heads and is used for moving cloth material from a front side head to a rear side head, the first feeding device comprising a first feeding plate slidable relative to the frame in a front-rear direction, the frame having a working surface for carrying the cloth material, the first feeding plate (30) being located above the working surface, the multi-head pocket setter machine has a feeding state, and when in the feeding state, the first feeding plate being in a lowest position to drive the cloth material between the first feeding plate and the working surface to move.

DESCRIPTION OF THE INVENTION

[0022] The present invention is intended to provide a processing method for folding and sewing fabric flaps, in particular for folding and sewing pockets on respective panels of jeans or similar trousers, which is able to optimize the working steps, thus creating a condition capable of eliminating the drawbacks highlighted above.

[0023] This object is achieved by using an automatic sewing unit equipped with four workstations as defined in claim 1.

[0024] The invention aims in particular to combine in a single automatic unit in which the traditional working steps are changed and in particular an intermediate material exchange station is included, maintaining the folding and sewing steps of the pocket on the respective panel on the sides of the kinematic chain, in order to optimize production times.

[0025] The method according to the invention, as defined in claim 5, provides for reversing the position of the loading station with respect to the folding station, so that the loading plate is located in an intermediate station and subsequently moving the material from the intermediate station to a material exchange station placed in the vicinity of the sewing head.

[0026] At this point according to the invention it is provided that the sewing head is on the opposite side of the folding assembly. The gripper system of the sewing head and the loading plate can be moved longitudinally with respect to the working front.

[0027] The grippers of the gripper system move towards a material exchange station, and the same movement is also performed by the loading plate in the intermediate station. Thanks to the intermediate material exchange station, the material is exchanged faster with respect to a normal cycle and this helps reduce loading times and streamline overall working times.

[0028] As mentioned, the main advantage of this new solution consists in the fact that the total production time is now divided between four independent steps, a first step of loading and preparing the material in the folding assembly, a second step of moving the material to an intermediate station waiting for the sewing assembly to be free, a third step of simultaneously moving the material from the intermediate station to the exchange station and the gripper system of the sewing head to reach the exchange station and then a fourth step of moving the material from the exchange station to the sewing station.

[0029] These four movements are carried out consecutively and in parallel with each other, and therefore perfectly compensated with each other, with the advantage that greater efficiency and simplicity of operation are obtained.

[0030] This is achieved by a processing method which differentiates the first step (loading the material into the folding assembly, folding pocket flaps on a fabric base), from the second (moving the material from the folding station to an intermediate station), and the last two steps, where the third step (moving the material from the intermediate station to the material exchange station) allows the loading plate to perform a shorter and therefore faster movement, and here meet the gripper system of the sewing head which has moved into this station.

[0031] A fourth step involves moving the material from the material exchange station to the sewing head by means of the grippers of the sewing head, the characteristics of which are described in the main claim.

[0032] The dependent claims of the present solution outline advantageous embodiments of the invention.

[0033] As will be seen below, according to a preferred embodiment of the invention, using the method in question it can be noted that, compared to the previous methodologies, over a time of 9 seconds of sewing, the previous production time and the current one with the new technology is considerably reduced and the real gain is about 25%.

ILLUSTRATION OF THE DRAWINGS

[0034] Further characteristics and advantages of the invention will become apparent from reading the following description of an embodiment of the invention provided by way of non-limiting example, with the aid of the figures illustrated in the appended tables of drawings, in which:

- figure 1 depicts a front perspective view of a four-station folding and sewing unit of fabric flaps according to the invention as a whole;
- figure 2 shows a schematic plan view thereof;
- figure 3 is a schematic plan view of the gripper system present in the sewing head, fixed on the support thereof;
- figures 4 to 6 show views of the gripper system forming part of the sewing assembly during three distinct operating steps along the axis parallel to the front of the machine;
- the pairs of figures 7-7' to 16-16' refer to views of operating steps performed in progressive succession, where each pair of figures is formed by a front anterior view of the machine and a respective plan view of the same machine.

DESCRIPTION OF AN EMBODIMENT OF THE INVENTION

[0035] Referring to the attached figures, and initially in particular to figures 1 and 2, the number 10 generally refers to a work unit for folding and sewing fabric flaps, in particular for folding and sewing pockets on respective panels of jeans or similar trousers.

[0036] According to the embodiment depicted in figures 1 and 2, the work unit 10 is provided with a loading plane 11, placed on one side of the machine, adjacent to a sewing plane 12 placed on the other side of the machine, and comprises four operating stations, i.e., in operating order, a folding station 13, an intermediate station 14, a fabric exchange station 15 and a sewing station 16.

[0037] Furthermore, the work unit 10 comprises two forms of fabric retention/feeding which, still in operating order, are the following: a loading and feeding plate 18, a sewing gripper system comprising an outer jig 19.

[0038] A folding assembly 20 is present at the folding station 13 and a sewing assembly 22 is present at the sewing station 16, with a gripper assembly comprising an outer sewing jig 19, in whose central part a window is obtained in which an inner jig 29 is comprised.

[0039] In turn, the sewing gripper system with outer jig 19 is placed on a carriage 23 capable of making horizontal movements (right-left) along an axis X parallel to the front of the machine, horizontal movements (forward-backward) along an axis Y on a transverse axis with respect to the axis X parallel to the working front and vertical movements (up-down) along an axis Z orthogonal to the sewing plane.

[0040] Furthermore, as shown in figure 3, the carriage 23 on which the sewing gripper system with outer jig 19 moves is divided into two half-parts 24 and 25, and in particular the half-part 25 is slidable with respect to the half-part 24 by means of an actuator 26, and the half-part 24 is in turn connected posteriorly to a guide 27, arranged horizontally parallel to the axis X, for the horizontal sliding of the sewing gripper system comprising an outer jig 19 according to multiple strokes.

[0041] It follows that the sewing gripper system with outer jig 19, in addition to being subject to movements along both the axis Y and along the axis Z, is subject to two horizontal movements along the axis X, the first along the guide 27 (figure 5) and the second due to the sliding of the half-part 25 of the carriage 23 with respect to the half-part 24 by means of the actuator 26 (figure 6).

[0042] The loading and feeding plate 18, which in the pauses between one working cycle and the other is positioned in the intermediate station 14, is mounted on a vertical arm 28 which can slide along an upper guide not shown as in itself known, to perform movements from one end of the machine to the other along the axis X parallel to the working front.

[0043] More precisely, the loading and feeding plate 18 can make movements along the axis X to bring each base fabric, with the flap of fabric thereof to be sewn, from the folding station 13 to the exchange station 15 in which the sewing gripper system with outer jig 19, in the central part of which a window is obtained in which an inner jig 29 is comprised, moves a certain distance towards the loading and feeding plate 18 to pick up the fabric and bring it to the sewing area.

[0044] According to a feature of the invention, the material exchange station 15 and the intermediate station 14 are arranged between the sewing station 16 and the folding station 13.

[0045] This system allows to work according to the following operating steps:

M1) The operator starts loading the material to be sewn on the loading plane 11, i.e., at the station 13 of the folding assembly 20 while the loading plate 18 is positioned in the middle of the intermediate station 14 (Fig. 7-7');

M2) The folding cycle is actuated while the loading plate 18 is still positioned in its point of departure in the intermediate station 14 (Fig. 7-7');

M3) The loading plate 18 moves into the area of the folding assembly 20 at the end of the second step and blocks the material to be loaded (Fig. 8-8');

M4) the loading plate 18 now moves from the folding station 13 to the intermediate station 14, and at this point the folding station 13 has the loading plane 11 free, thus the operator can already start loading the new material to be sewn onto the loading plane 11 and onto the folding plate 17 in the folding assembly 20 of the station 13 (Fig. 9-9');
M5) the loading plate 18 moves into the exchange area 15, at the end of the previous sewing cycle when the sewing machine 22 and the sewing gripper system with outer jig 19 placed in the sewing station 16 are free of any material. Then the loading plate 18 remains stopped in the material exchange area 15 and waits for the sewing gripper system with the outer jig 19, in the central part of which a window is obtained in which an inner jig 29 is comprised, to move towards the material exchange station 15 so as to take the material, by means of the action of the actuator 26 (Fig. 10-10').
M6) through the gripper system with the inner sewing jig 29, the sewing head 22 blocks the material inside the loading jig 18, in the material exchange station 15, the loading plate 18 rises and autonomously moves towards the intermediate station 14 while staying with the sewing gripper system with the outer jig 19 raised and the inner jig 29 lowered is ready to move towards the sewing head 22, with the outer sewing jig 19 closing as soon as possible first against the loading plane 11 and then against the sewing plane 12 (Fig. 11-11', 12-12', 13-13', 14-14', 15-15').
M7) the sewing gripper system with the outer jig 19 and inner jig 29 remain lowered, and while blocking the material move from the material exchange station 15 to the sewing station 16, when the sewing gripper system with the outer jig 19 returns to the point of origin of the sewing or rest programs thereof, subsequently the sewing begins (Fig. 16-16').

[0046] According to the invention, with the described operating method and with the modifications made, the best combination between the two previously described operations has been obtained, maximizing the efficiency of the system.

[0047] With respect to the first known solution, the position of the loading plate 18 is moved to a position in which the mechanics thereof with the carriage and the movement belt can move along the axis X, parallel to the front of the machine, the vertical arm 28 and be able to raise the loading plate 18 without any particular interfering with the folding assembly 20 and the gripper system present in the carriage 23 of the sewing head 22.

[0048] Furthermore, in the development of the automatic unit, it has been estimated that the central area has sufficient space for the two intermediate stop and material exchange stations.

[0049] With respect to the second known solution, the gripping point of the material by the sewing gripper system with the outer jig 19 and inner jig 29 has been modified, which starting from the point of origin of the sewing or rest programs placed in the sewing machine 22 (figure 4) moves beyond the normal rest point or point of origin of the sewing programs, (figure 5) forming a mechanical system on the carriage 23 divided into two half-parts 24 and 25, with the half-part 25 sliding with respect to the part 24 by means of an actuator 26, (figure 6) so that the sewing gripper system with the outer jig 19 and inner jig 29 picks up the material in a nearer area, in the material exchange station 15, instead of in the distant station 13 of the folding assembly 20.

[0050] The main advantage of this new solution is that the total production time is divided into three sequences of movements:

- folding the material and moving it to the intermediate station 14.
- moving the material from the intermediate station 14 to the exchange area 15, placed near the sewing head 22, with a reduced stroke of the loading plate 18 while the sewing gripper system, with the outer jig 19 and inner jig 29, is already moving towards the material exchange station 15.
- taking the material by means of the sewing gripper system with the outer jig 19 and inner jig 29 present in the sewing head 22 from the loading plate 18 and simultaneous early release of the loading plate 18 which moves towards the intermediate station 14, or, if necessary, can already start a movement towards the station 13 and the folding assembly 20. Movement of the sewing gripper system with the outer jig 19 and inner jig 29 present in the sewing head to the point of origin of the sewing program and immediate commencement of the sewing itself.

[0051] With respect to the first and second solutions belonging to the known technique, a better balance is obtained and efficiency is optimized because:

- the station 13 with the folding assembly 20 is freed much more quickly from the loading plate 18 and therefore the operator can increase his efficiency by reducing the wait time between one step and the other of preparing the folded material;
- the preparation cycle is not affected in any way by the duration of the sewing cycle, as the loading plate 18 can move to the intermediate station 14;
- the sewing head can already prepare to receive the material in the central material exchange area, reducing the feed stroke of the loader;
- when exchanging the material, the synchronous movement of the sewing gripper system with outer jig 19 and inner jig 29 and the loading plate 18 allow greater efficiency by moving a system in the opposite direction, reducing

downtime.

- Movement of the sewing gripper system with the outer jig 19 and inner jig 29 to the point of origin of the sewing head and immediate start of the sewing cycle.
- the loader with the loading plate 18 works with a reduced movement and only up to the material exchange area 15, operating in only three of the four stations present in the unit, and does not reach the sewing head.

[0052] Below two examples are now described comparing the first solution belonging to the prior art and the new operating methodology, with a sewing cycle of 9 seconds in both cases.

[0053] In the first solution belonging to the prior art, the first part of the loading cycle arrives from the 1st step to the end of the 3rd step (assuming the following times 2+4+0.5 = 6.5 sec) but cannot perform the second part (from the 4th to the 6th step) because the sewing machine is still working, and, while the area of the folder 13 remains occupied, the operator waits until the sewing cycle is finished to be able to place the material on the loading plane and the loader has a wait time of 9 seconds - 6.5 seconds = 2.5 seconds.

[0054] At this point the second step of the loading cycle begins (from the 4th to the 6th step with the start of the sewing cycle) which requires an additional 2 seconds to have the loader in the rest position and allow the operator to perform the new loading cycle 9 + 2 = 11 seconds. Therefore, the production cycle goes from 9 seconds of sewing to a total of 9 + 2.5 + 2 = 13.5 seconds.

[0055] Using instead the production cycle according to the invention, the first part of the loading cycle arrives from the 1st step to the end of the 4th step (2+4+0.5+0.5 = 7 seconds), after which the operator can already start performing the new loading cycle, even if the previous loading cycle is not finished.

[0056] The loading waits for the sewing machine to finish its sewing cycle previously set at 9 seconds, therefore 9 - 7 = 2 sec.

[0057] At this point, the loading plate 18 and the sewing head with the sewing gripper system, with the outer jig 19 and inner jig 29, move simultaneously to the material exchange point and the second part of the loading cycle begins, from the 5th to the end of the 7th step with the start of the sewing cycle, and this takes only 1.0 second to free the loading plate 18 again, which can then return to its intermediate position in advance.

[0058] Adding the times 7 + 2 + 1.0 = 10.0 seconds to have the loading ready to perform a new loading cycle.

[0059] If the time required in the remaining part of the operating cycle comprising the sewing is checked, the result is 1.0 second (5th - 7th step) + 9 seconds sewing = total 10.0 seconds.

[0060] In this case there is a balance between the two steps:

- first part loading steps (2+4+0.5+0.5) 7 seconds + wait time (10.0 -7) = 10.0 seconds;
- second part loading steps (0.5+0.5) seconds + sewing 9 seconds = 10.0 seconds.

[0061] Therefore, the production cycle goes from 9 seconds of sewing to a total of 9 + 1.0 = 10.0 seconds.

[0062] In this case it is clear how with respect to the previous methodology, with a time of 9 seconds of sewing, the previous production time and the current one with the new technology is greatly reduced and the real gain is 25%, that is 10.0 sec. compared to 13.5 sec.

[0063] Furthermore, the increase in efficiency increases even if there is a very short sewing time, and the time limit for balancing the two steps in the new operating methodology is 5.5 seconds of sewing.

[0064] Making a further comparison between the first solution belonging to the prior art, and the new methodology according to the invention, for a sewing time of 5.5 seconds, the result is as follows.

[0065] The first solution belonging to the prior art, provides a first fixed preparation step of about 6.5 seconds, there are no wait times, so the loading plate 18 can immediately perform the second loading step of another 2 seconds, therefore a total of 8.5 seconds.

[0066] Using the new methodology according to the present invention, the first preparation step is fixed at about 7 seconds, the second preparation step is 5.5 sewing + (0.5 + 0.5 + 0.5) = 7 seconds.

[0067] In this case it is clear how with respect to the previous methodology, with a time of 5.5 seconds of sewing, the previous production time and the current one with the new technology is greatly reduced and the real gain also in this case is about 20%, that is 7.0 sec VS 8.5 sec.

[0068] Finally, thanks to the new technology according to the invention, the following hourly productions can be achieved:

- Known art with single head (3600 / 13.5) = 266 x 80% efficiency = 213/2 = 106 trousers per hour;
- New technique according to the invention, single head (3600 / 10.5) = 342 x 80% efficiency = 274/2 =137 trousers per hour;
- Known art with double head (3600 / 8.5) = 423 x 80% efficiency = 338/2 =169 trousers per hour;
- New technique according to the invention, double head (3600 / 7) = 514 x 80% efficiency = 411/2 = 205 trousers

per hour;

[0069] As can be seen, the arrangement of the components according to the invention allows to optimize working times and practical operating results, with a much higher production yield with respect to the traditional standards.

[0070] The invention has been described in the foregoing with reference to a preferential embodiment thereof. However it is clear that the invention is susceptible to numerous variants which fall within the scope of the appended claims.

Claims

1. A work unit (10) for folding and sewing pockets on respective panels of jeans or similar trousers, said unit comprising a loading plane (11), placed on one side of the work unit (10) and adjacent to a sewing plane (12) placed on the other side of the work unit, wherein on said loading plane (11) adjacent to said sewing plane (12) there is a folding assembly (20) and a loading and feeding plate (18); a sewing gripper system with an outer jig (19), whose central part is provided with a window in which an inner jig (29) is comprised, is placed at a sewing head (22); wherein said loading and feeding plate (18) and said sewing gripper system with outer jig (19) and inner jig (29) comprise means for the movement thereof between four operating stations, namely a folding station (13), placed at said folding assembly (20), an intermediate station (14), wherein said loading and feeding plate (18) stops at pauses, a material exchange station (15), wherein the sewing gripper system with outer jig (19) and inner jig (29) moves towards the loading and feeding plate (18) for taking up material to be sewn and a sewing station (16) placed at said sewing head (22), **characterized in that** said sewing gripper system with outer jig (19) and inner jig (29) is placed on a carriage (23) capable of making horizontal movements on a guide (27) along a horizontal axis parallel to the front of the work unit, so as to be brought from one side towards said loading and feeding plate (18) at said material exchange station (15) and from the other side towards said sewing head (22) placed at the sewing station (16), **in that** said carriage (23) on which the sewing gripper system with outer jig (19) and inner jig (29) moves along said guide (27) is further divided into a first half-part (24) and a second half-part (25), wherein the second half-part (25) is slidable with respect to the first half-part (24) by means of an actuator (26), and the first half-part (24) is in turn connected to a back side of said guide (27), arranged horizontally parallel to said X-axis, for the horizontal sliding of the sewing gripper system (19) with multiple strokes, and **in that** the sewing gripper system with the outer jig (19) and inner jig (29) is subject to movements both along a vertical axis and along a horizontal Y-axis orthogonal to said X-axis parallel to the front of the work unit, and in particular is subject to multiple horizontal movements along said X-axis, the first along said guide (27) and the second due to the sliding of the second half-part (25) of the carriage (23) with respect to the first half-part (24) by means of the actuator (26).

2. The work unit (10) according to claim 1, **characterized in that** the loading and feeding plate (18), which at the pauses between one work cycle and the other is positioned in the intermediate station (14), is mounted on a vertical arm (28) sliding along a guide to make movements from one end of the machine to the other along said X-axis parallel to the working front.

3. The work unit (10) according to any one of the preceding claims, **characterized in that** the loading and feeding plate (18) can make movements along said X-axis to bring each base fabric, with the flap of fabric thereof to be sewn, from the folding station (13) to the material exchange station (15) in which the sewing gripper system with outer jig (19) and inner jig (29) move from a rest point thereof, or point of origin, a certain distance towards the loading and feeding plate (18) for picking up the fabric and bring it to the sewing station (16) .

4. The work unit (10) according to any one of the preceding claims, **characterized in that** the material exchange station (15) and the intermediate station (14) are arranged between the sewing station (16) and the folding station (13).

5. A method for operating a work unit (10) according to any one of the preceding claims, comprising the following work steps:

   M1) The operator starts loading the material to be sewn on the loading plane (11), i.e., at the folding station (13) of the folding assembly (20) while the loading and feeding plate (18) is positioned in the middle of the intermediate station (14);
   M2) The folding cycle is actuated while the loading and feeding plate (18) is still positioned in the point of departure thereof in the intermediate station (14);
   M3) The loading and feeding plate (18), passing with the vertical mobile support (28) thereof, crosses the loading area and moves into the area of the folding assembly (20) at the end of the second step and blocks the material

to be loaded;
M4) the loading and feeding plate (18) moves from the folding station (13) to the intermediate station (14), and at this point the folding station (13) has the loading plane (11) free, thus the operator can already begin to load the new material to be sewn onto the loading plane (11) and in the folding plate (17) in the folding assembly (20) of the station (13);
M5) the loading and feeding plate (18) moves into the material exchange station (15), at the end of the previous sewing cycle when the sewing head (22) and the sewing gripper system with outer jig (19) and inner jig (29) stopped in the sewing station (16) are free of any material and begin to move towards the exchange area by means of the actuator (26); in this step the loading and feeding plate (18) remains stopped in the material exchange station (15) exclusively for the time that the sewing gripping system with outer jig (19) and inner jig (29) move towards the material exchange station (15) to take the material.
M6) through the gripper system with the inner sewing jig (29), the sewing head (22) blocks the material inside the loading and feeding plate (18), in the material exchange station (15), the loading and feeding plate (18) rises and autonomously moves towards the intermediate station (14) staying in the raised position while the sewing gripper system with the outer jig (19) and inner jig (29) is ready to move towards the sewing head (22) by means of the action of the actuator (26), with the outer sewing jig (19) closing first against the loading plane (11) and then against the sewing plane (12);

the sewing gripper system with outer jig (19) and inner jig (29) remain lowered while, blocking the material, they move further from the material exchange station (15) to the point of origin or rest of the same in the sewing station (16) to allow the start of the sewing cycle.

Patentansprüche

1. Arbeitseinheit (10) zum Falten und Nähen von Taschen auf jeweilige Bahnen von Jeans oder ähnlichen Hosen, die Einheit umfassend eine Ladeebene (11), die auf einer Seite der Arbeitseinheit (10) und einer Nähebene (12) benachbart angeordnet ist, welche auf der anderen Seite der Arbeitseinheit angeordnet ist, wobei an der Ladeebene (11) benachbart der Nähebene (12) eine Faltbaugruppe (20) und eine Lade- und Zufuhrplatte (18) vorhanden ist; wobei ein Nähgreifersystem mit einer äußeren Einspannvorrichtung (19), deren Mittelteil mit einem Fenster versehen ist, in welchem eine innere Einspannvorrichtung (29) enthalten ist, an einem Nähkopf (22) angeordnet ist; wobei die Lade- und Zufuhrplatte (18) und das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) Mittel für die Bewegung davon zwischen vier Betriebsstationen umfassen, nämlich einer Faltstation (13), die an der Faltbaugruppe (20) angeordnet ist, einer zwischenliegenden Station (14), wobei die Lade- und Zufuhrplatte (18) in Pausen anhält, einer Materialaustauschstation (15), wobei sich das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) zum Aufnehmen von Material, das genäht werden soll, zur Lade- und Zufuhrplatte (18) hin bewegt, und einer Nähstation (16), die am Nähkopf (22) angeordnet ist, **dadurch gekennzeichnet, dass** das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) auf einem Schlitten (23) angeordnet ist, der zum Ausführen von horizontalen Bewegungen auf einer Führung (27) entlang einer horizontalen X-Achse parallel zur Vorderseite der Arbeitseinheit imstande ist, um von einer Seite zur Lade- und Zufuhrplatte (18) an der Materialaustauschstation (15) und von der anderen Seite zum Nähkopf (22), der an der Nähstation (16) angeordnet ist, verbracht zu werden, dass der Schlitten (23) auf dem sich das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) entlang der Führung (27) bewegt, ferner in ein erstes Halbteil (24) und ein zweites Halbteil (25) aufgeteilt ist, wobei das zweite Halbteil (25) bezüglich des ersten Halbteils (24) mithilfe eines Stellglieds (26) gleitbar ist und das erste Halbteil (24) seinerseits mit einer Rückseite der Führung (27) verbunden ist, die horizontal parallel zur X-Achse angeordnet ist, zum horizontalen Gleiten des Nähgreifersystems (19) mit mehrfachen Hüben, und dass das Nähgreifersystem mit der äußeren Einspannvorrichtung (19) und inneren Einspannvorrichtung (29) Bewegungen sowohl entlang einer vertikalen Z-Achse als auch entlang einer horizontalen Y-Achse, die senkrecht zur X-Achse parallel zur Vorderseite der Arbeitseinheit steht, ausgesetzt ist und insbesondere mehrfachen horizontalen Bewegungen entlang der X-Achse ausgesetzt ist, die ersten entlang der Führung (27) und die zweiten aufgrund des Gleitens des zweiten Halbteils (25) des Schlittens (23) bezüglich des ersten Halbteils (24) mithilfe des Stellglieds (26).

2. Arbeitseinheit (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Lade- und Zufuhrplatte (18), die bei den Pausen zwischen einem Arbeitszyklus und dem nächsten in der zwischenliegenden Station (14) positioniert ist, auf einem vertikalen Arm (28) angebracht ist, der entlang einer Führung zum Ausführen von Bewegungen von einem Ende der Maschine zum anderen entlang der X-Achse parallel zur Arbeitsvorderseite gleitet.

3. Arbeitseinheit (10) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Lade- und Zufuhrplatte (18) Bewegungen entlang der X-Achse zum Verbringen jeden Grundstoffs, mit dem zu nähenden Stoffstück davon, von der Faltstation (13) zur Materialaustauschstation (15) ausführen kann, in welcher sich das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) vom Ruhepunkt davon, oder Ursprungspunkt, über eine bestimmte Distanz zur Lade-und Zufuhrplatte (18) zum Aufnehmen des Stoffs und Verbringen desselben zur Nähstation (16) bewegt.

4. Arbeitseinheit (10) nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Materialaustauschstation (15) und die zwischenliegende Station (14) zwischen der Nähstation (16) und der Faltstation (13) angeordnet sind.

5. Verfahren zum Betreiben einer Arbeitseinheit (10) nach einem der vorhergehenden Ansprüche, die folgenden Arbeitsschritte umfassend:

M1) die Bedienungsperson beginnt, das Material, das genäht werden soll, auf die Ladeebene (11) zu laden, d.h. an der Faltstation (13) der Faltbaugruppe (20), während die Lade- und Zufuhrplatte (18) in der Mitte der zwischenliegenden Station (14) positioniert ist;
M2) der Faltzyklus wird in Gang gesetzt, während die Lade- und Zufuhrplatte (18) immer noch an ihrem Abfahrtspunkt in der zwischenliegenden Station (14) positioniert ist;
M3) die Lade- und Zufuhrplatte (18) quert, mit ihrer vertikalen mobilen Stütze (28) laufend, den Ladebereich und bewegt sich in den Bereich der Faltbaugruppe (20) am Ende des zweiten Schritts und blockiert das Material, das geladen werden soll;
M4) die Lade- und Zufuhrplatte (18) bewegt sich von der Faltstation (13) zur zwischenliegenden Station (14), und an diesem Punkt hat die Faltstation (13) die Ladeebene (11) frei, weswegen die Bedienungsperson bereits beginnen kann, das neue Material, das genäht werden soll, auf die Ladeebene (11) und in die Faltplatte (17) in der Faltbaugruppe (20) der Station (13) zu laden;
M5) die Lade- und Zufuhrplatte (18) bewegt sich in die Materialaustauschstation (15), am Ende des vorhergehenden Nähzyklus, wenn der Nähkopf (22) und das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29), die in der Nähstation (16) angehalten sind, frei von jeglichem Material sind und beginnen, sich mithilfe des Stellglieds (26) zum Austauschbereich zu bewegen; in diesem Schritt verbleibt die Lade- und Zufuhrplatte (18) ausschließlich für die Zeit angehalten in der Materialaustauschstation (15), in der sich das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) zur Materialaustauschstation (15) zum Aufnehmen des Materials bewegt;
M6) durch das Greifersystem mit der inneren Einspannvorrichtung (29) blockiert der Nähkopf (22) das Material innerhalb der Lade- und Zufuhrplatte (18), in der Materialaustauschstation (15) hebt sich die Lade-und Zufuhrplatte (18) an und bewegt sich zur zwischenliegenden Station (14), wobei sie in der angehobenen Position verbleibt, während das Nähgreifersystem mit der äußeren Einspannvorrichtung (19) und inneren Einspannvorrichtung (29) bereit ist, sich mithilfe der Einwirkung des Stellglieds (26) zum Nähkopf (22) zu bewegen, wobei sich die äußere Näheinspannvorrichtung (19) zuerst an der Ladeebene (11) und dann an der Nähebene (12) schließt;

wobei das Nähgreifersystem mit äußerer Einspannvorrichtung (19) und innerer Einspannvorrichtung (29) abgesenkt bleibt, während es sich, das Material blockierend, weiter von der Materialaustauschstation (15) zum Ursprungs- oder Ruhepunkt desselben in der Nähstation (16) bewegt, um den Beginn des Nähzyklus zu ermöglichen.

Revendications

1. Unité de travail (10) pour le pliage et la couture de poches sur des panneaux respectifs de jeans ou de pantalons semblables, ladite unité comprenant un plan de chargement (11), placé d'un côté de l'unité de travail (10) et adjacent à un plan de couture (12) placé de l'autre côté de l'unité de travail, dans lequel sur le plan de chargement (11) adjacent audit plan de couture (12) se trouve un ensemble de pliage (20) et une plaque de chargement et d'alimentation (18) ; un système de préhension de couture avec un gabarit externe (19), dont la partie centrale est pourvue d'une fenêtre dans laquelle est compris un gabarit interne (29), est placé au niveau d'une tête de couture (22) ; dans lequel ladite plaque de chargement et d'alimentation (18) et ledit système de préhension de couture à gabarit externe (19) et gabarit interne (29) comprend des moyens assurant son mouvement entre quatre postes de traitement, soit un poste de pliage (13), placé au niveau dudit ensemble de pliage (20), un poste intermédiaire (14) dans lequel la plaque de chargement et d'alimentation (18) s'arrête lors des pauses, un poste d'échange de matériau

(15), dans lequel le système de préhension de couture à gabarit externe (19) et gabarit interne (29) se déplace vers la plaque de chargement et d'alimentation (18) pour attraper le matériau à coudre et un poste de couture (16) placé au niveau de ladite tête de couture (22), **caractérisé en ce que** ledit système de préhension de couture à gabarit externe (19) et gabarit interne (29) est placé sur un chariot (23) capable d'effectuer des mouvements horizontaux le long d'un guide (27) selon un axe X horizontal parallèle à l'avant de l'unité de travail, de façon à être amené, depuis un côté, vers ladite plaque de chargement et d'alimentation (18) au niveau du poste d'échange de matériau (15) et, depuis l'autre côté, vers ladite tête de couture (22) placée au niveau du poste de couture (16),
en ce que ledit chariot (23) sur lequel le système de préhension de couture à gabarit externe (19) et gabarit interne (29) se déplace le long dudit guide (27) est par ailleurs divisé en une première demi-partie (24) et une seconde demi-partie (25), dans lequel la seconde demi-partie (25) peut être entraînée à coulissement par rapport à la première demi-partie (24) au moyen d'un actionneur (26), et la première demi-partie (24) est à son tour reliée à un côté postérieur dudit guide (27), disposé horizontalement de façon parallèle audit axe X, pour le coulissement horizontal du système de préhension de couture (19) avec des courses multiples, et **en ce que** le système de préhension de couture à gabarit externe (19) et gabarit interne (29) est susceptible d'effectuer des mouvements à la fois selon un axe Z vertical et selon un axe horizontal Y orthogonal audit axe X parallèle à l'avant de l'unité de travail, et est en particulier susceptible d'effectuer des mouvements multiples horizontaux selon ledit axe X, les premiers le long dudit guide (27) et les seconds grâce au coulissement de la seconde demi-partie (25) du chariot (23) par rapport à la première demi-partie (24) sous l'effet de l'actionneur (26).

2. Unité de travail (10) selon la revendication 1, **caractérisée en ce que** la plaque de chargement et d'alimentation (18) qui, lors des pauses entre un cycle de travail et l'autre, est positionnée au niveau du poste intermédiaire (14), est montée sur un bras vertical (28) coulissant le long d'un guide pour effectuer des mouvements d'une extrémité de la machine à l'autre selon ledit axe X parallèle à l'avant de l'unité de travail.

3. Unité de travail (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la plaque de chargement et d'alimentation (18) peut effectuer des mouvements selon ledit axe X pour apporter chaque tissu de base, avec son rabat de tissu à coudre, du poste de pliage (13) au poste d'échange de matériau (15) dans lequel le système de préhension de couture à gabarit externe (19) et gabarit interne (29) se déplace d'un point de repos, ou point d'origine, sur une certaine distance en direction de la plaque de chargement et d'alimentation (18) pour saisir le tissu et l'apporter au poste de couture (16).

4. Unité de travail (10) selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le poste d'échange de matériau (15) et le poste intermédiaire (14) sont disposés entre le poste de couture (16) et le poste de pliage (13).

5. Procédé d'exploitation d'une unité de travail (10) selon l'une quelconque des revendications précédentes, comprenant les étapes de travail suivantes :

M1) l'opérateur commence à charger le matériau à coudre sur le plan de chargement (11), c'est-à-dire au niveau du poste de pliage (13) de l'ensemble de pliage (20) alors que la plaque de chargement et d'alimentation (18) est positionnée au milieu du poste intermédiaire (14) ;
M2) le cycle de pliage est actionné alors que la plaque de chargement et d'alimentation (18) est encore positionnée à son point de départ au niveau du poste intermédiaire (14) ;
M3) la plaque de chargement et d'alimentation (18), passant avec son support mobile vertical (28), traverse la zone de chargement et se déplace dans la zone de l'ensemble de pliage (20) à la fin de la deuxième étape et bloque le matériau à charger ;
M4) la plaque de chargement et d'alimentation (18) se déplace du poste de pliage (13) au poste intermédiaire (14), et à ce stade le poste de pliage (13) voit son plan de chargement (11) libéré, ce qui permet à l'opérateur de déjà commencer à charger le nouveau matériau à coudre sur le plan de chargement (11) et dans la plaque de pliage (17) de l'ensemble de pliage (20) du poste (13) ;
M5) la plaque de chargement et d'alimentation (18) se déplace vers le poste d'échange de matériau (15), à la fin du cycle de couture précédent quand la tête de couture (22) et le système de préhension de couture à gabarit externe (19) et gabarit interne (29) arrêtés au poste de couture (16) sont libres de tout matériau et commencent à se déplacer vers la zone d'échange au moyen de l'actionneur (26) ; à cette étape, la plaque de chargement et d'alimentation (18) reste arrêtée au poste d'échange de matériau (15) exclusivement pour la durée pendant laquelle le système de préhension de couture à gabarit externe (19) et gabarit interne (29) se déplace vers le poste d'échange de matériau (15) pour prendre le matériau
M6) à travers le système de préhension de couture à gabarit interne (29), la tête de couture (22) bloque le

matériau dans la plaque de chargement et d'alimentation (18), au niveau du poste d'échange de matériau (15), la plaque de chargement et d'alimentation (18) se soulève et se déplace de façon autonome vers le poste intermédiaire (14) en restant en position soulevée alors que le système de préhension de couture à gabarit externe (19) et gabarit interne (29) est prêt à se déplacer vers la tête de couture (22) sous l'action de l'actionneur (26), le gabarit de couture externe (19) se fermant tout d'abord contre le plan de chargement (11) puis contre le plan de couture (12) ;

le système de préhension de couture à gabarit externe (19) et gabarit interne (29) restant abaissé tandis que, tout en bloquant le matériau, il continue à s'éloigner du poste d'échange de matériau (15) vers son point d'origine ou de repos au niveau du poste de couture (16) pour permettre le commencement du cycle de couture.

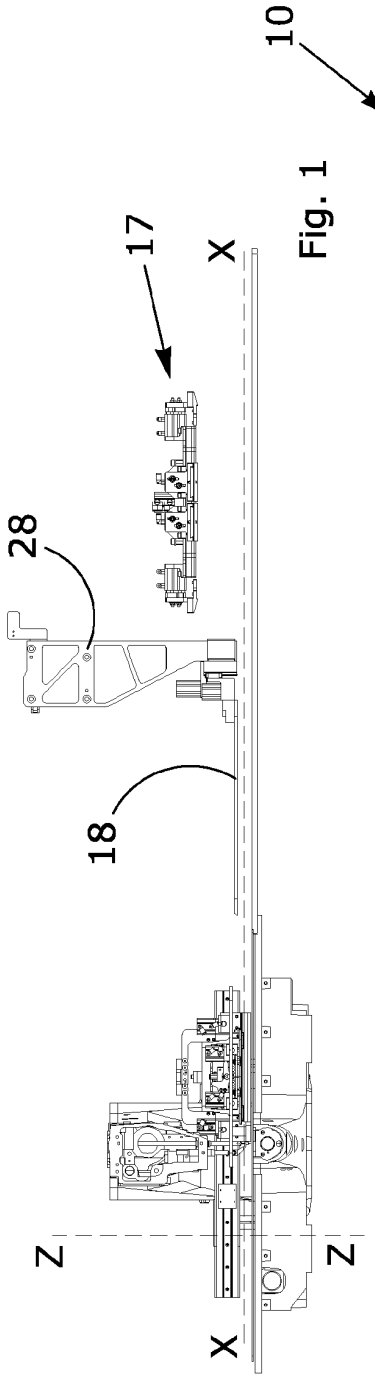
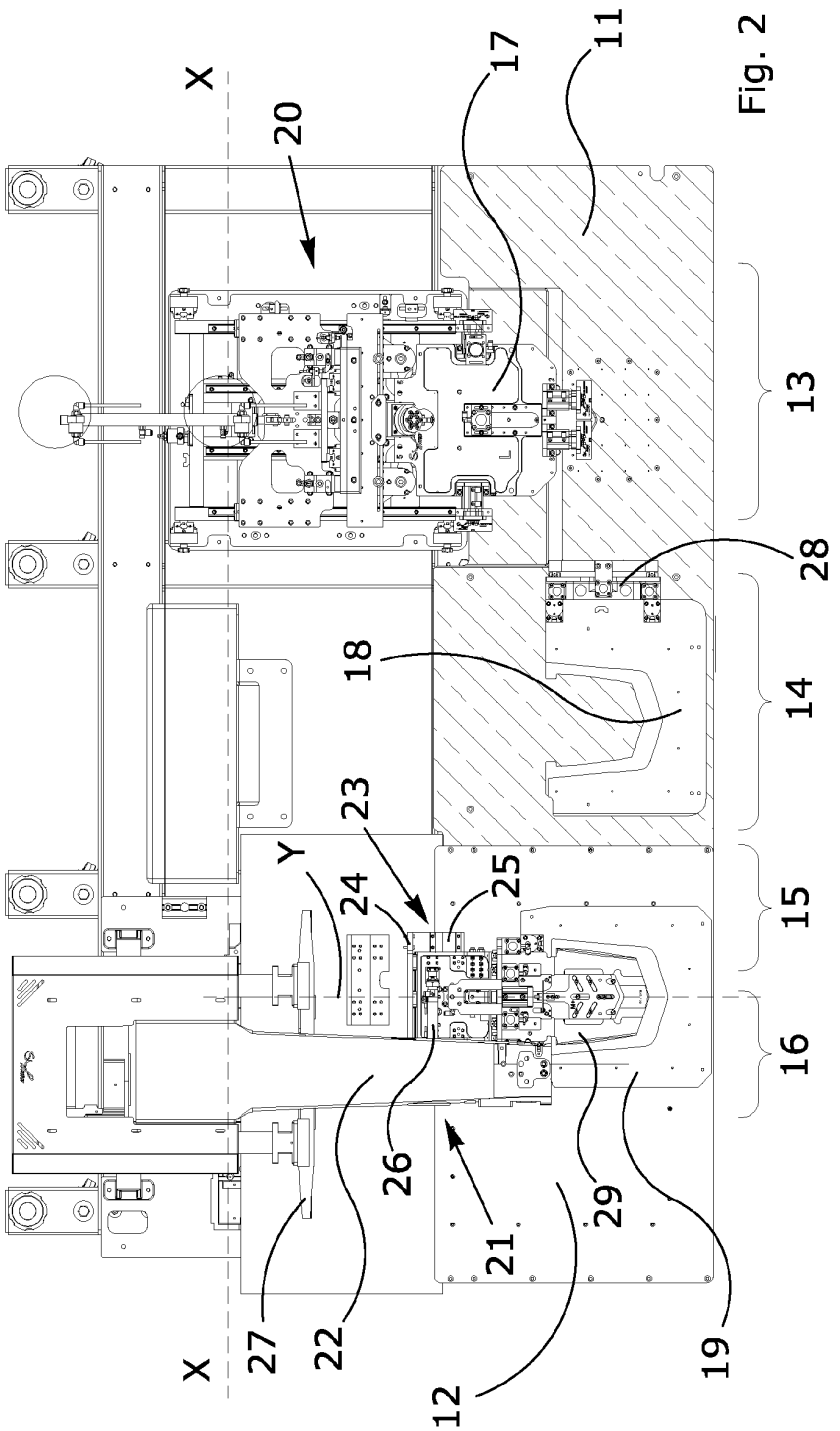

10
17
X
28
18
Z
Z
X

Fig. 1


X
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X

Fig. 2

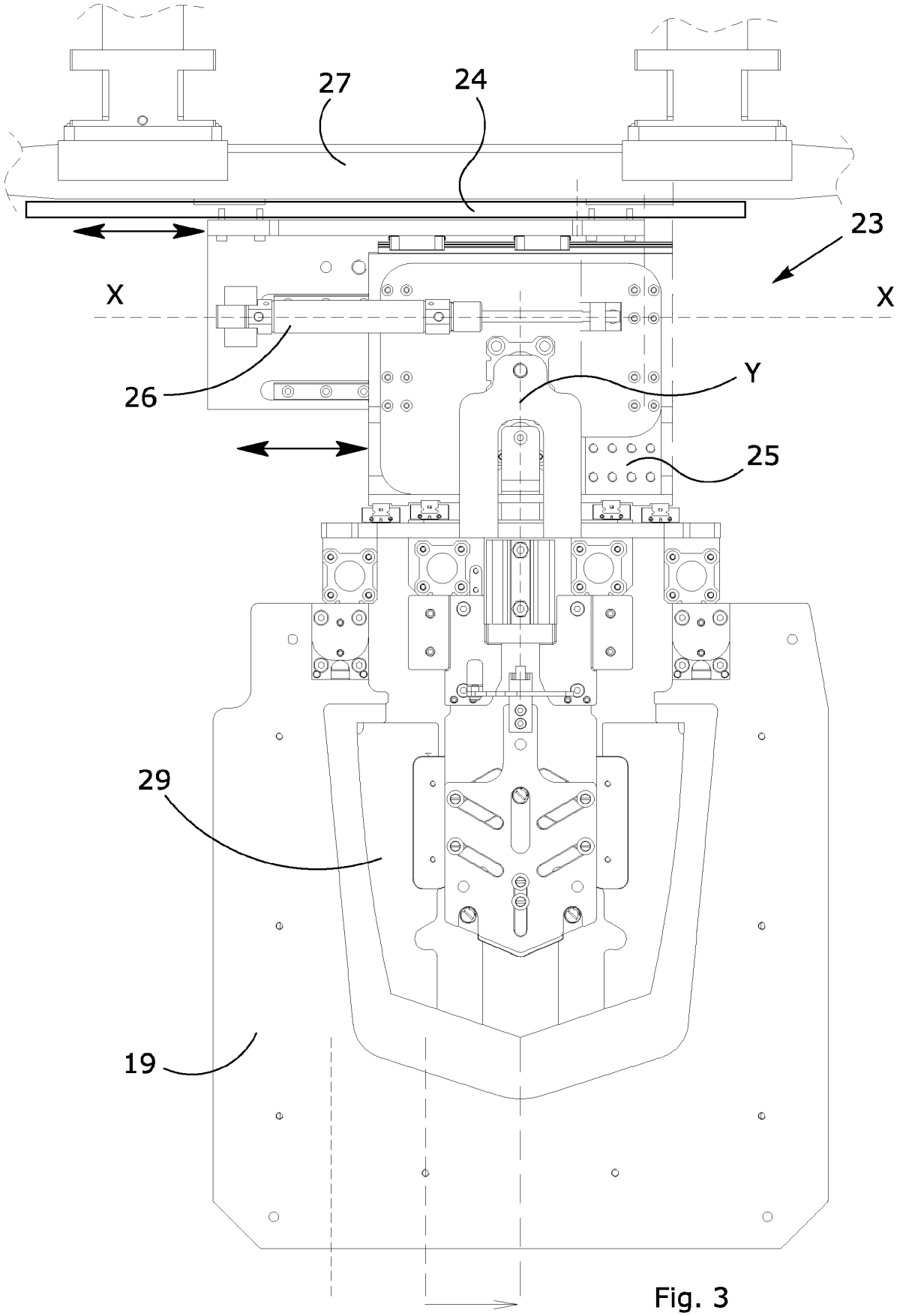

Fig. 3

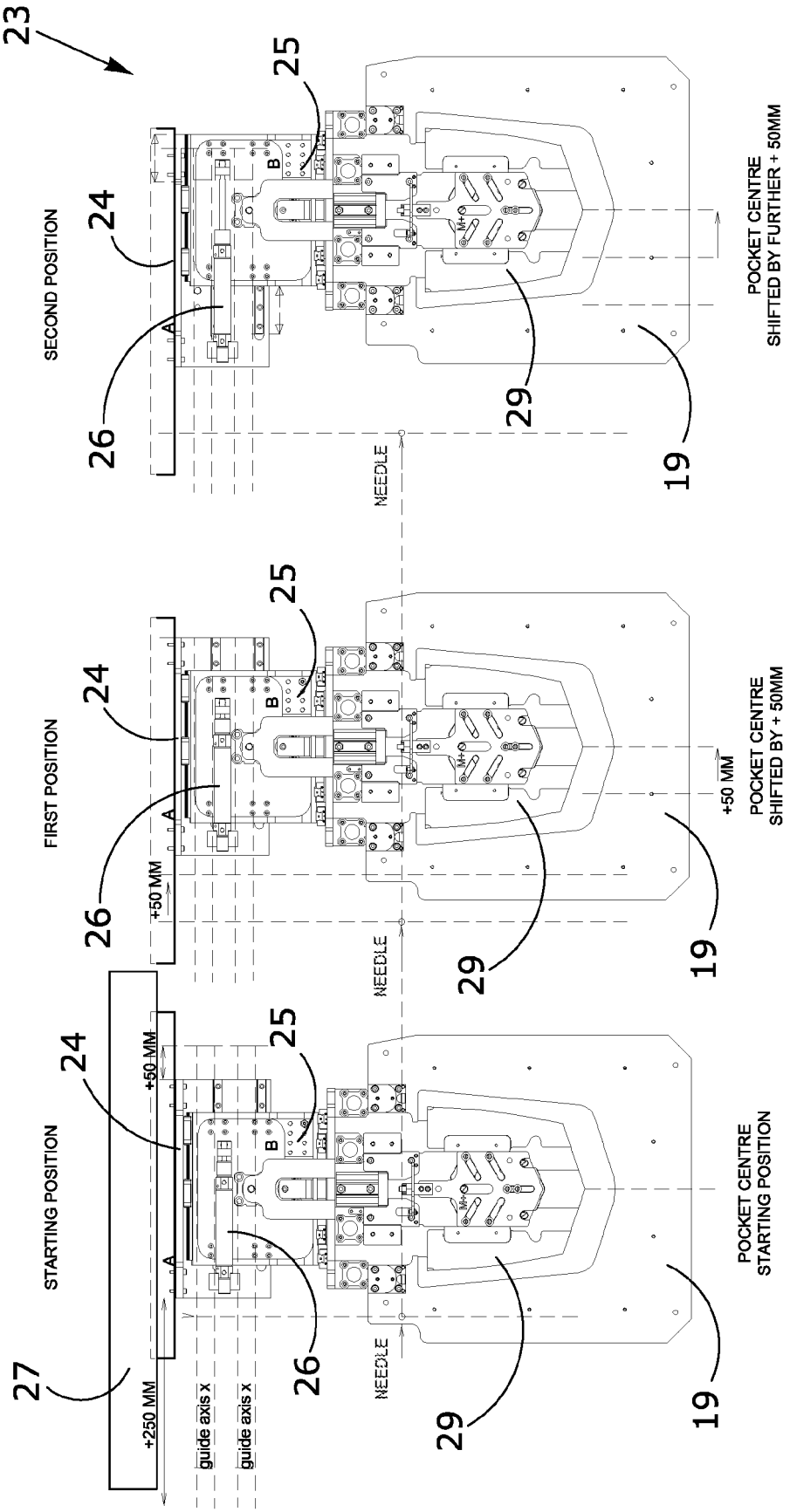

Fig. 6

Fig. 5

Fig. 4

STEP M1-M2

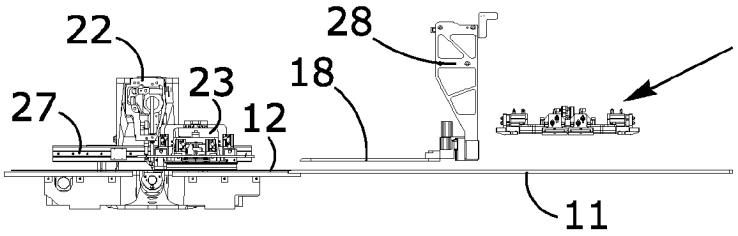

Fig. 7

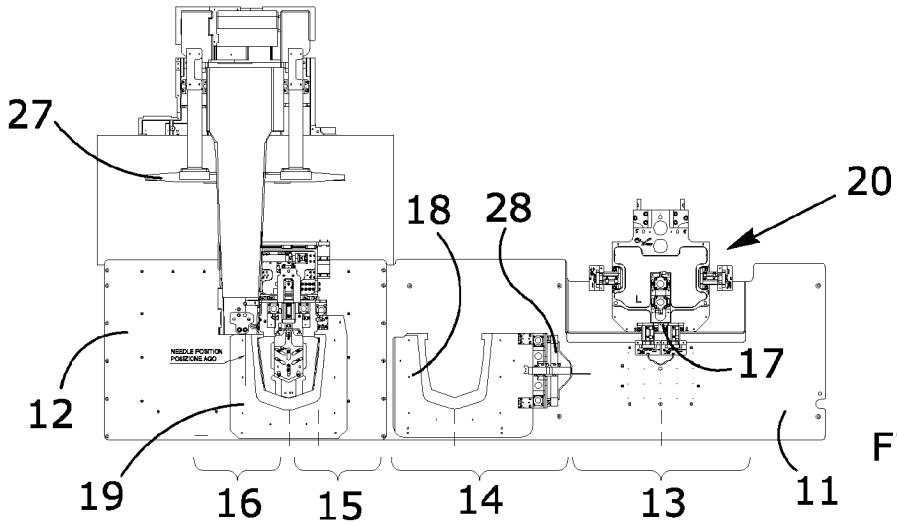

Fig. 7'

STEP M3

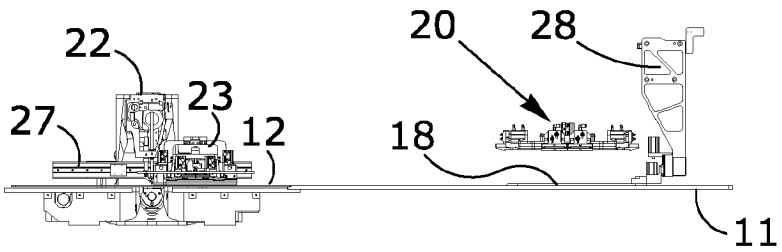

Fig. 8

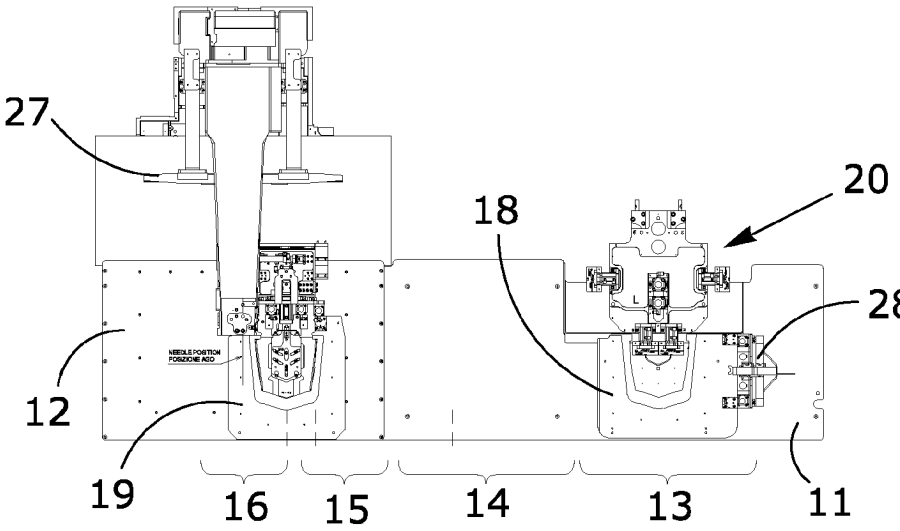

Fig. 8'

STEP M4

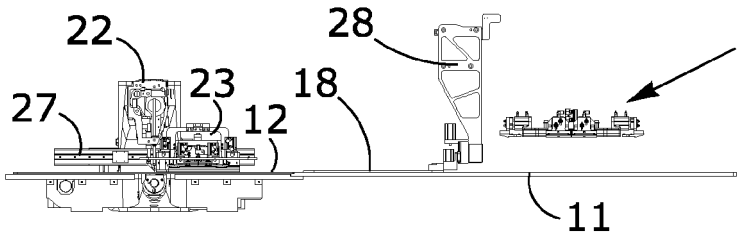

Fig. 9

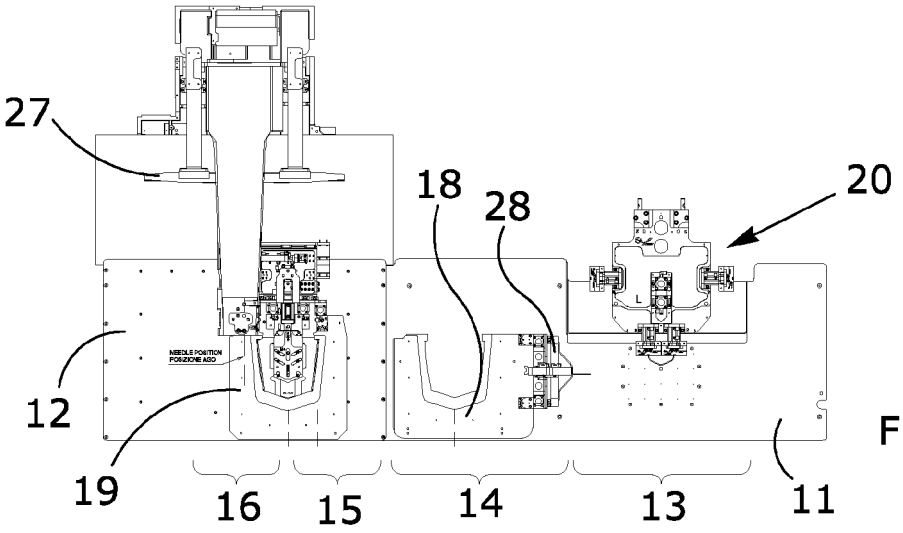

Fig. 9'

STEP M5

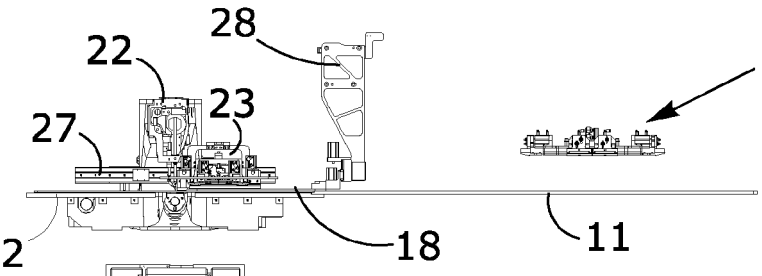

Fig. 10

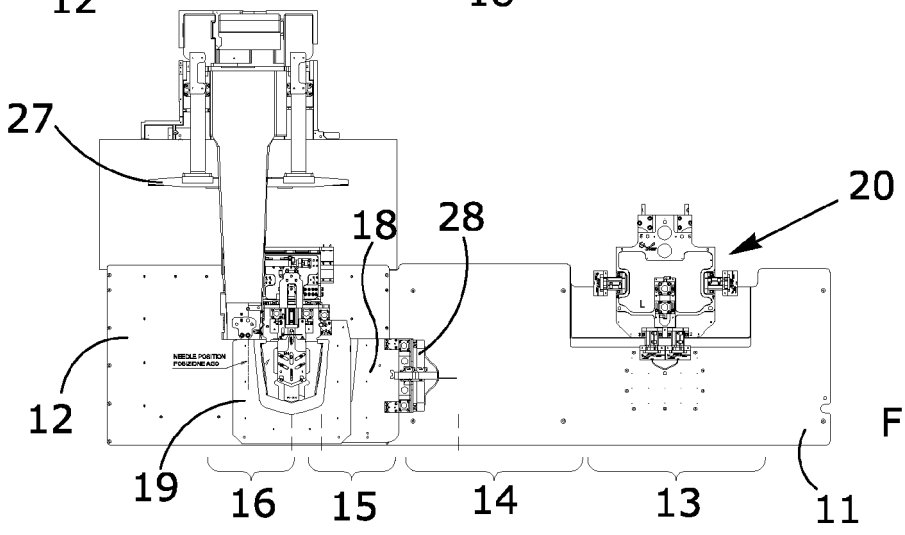

Fig. 10'

STEP M6

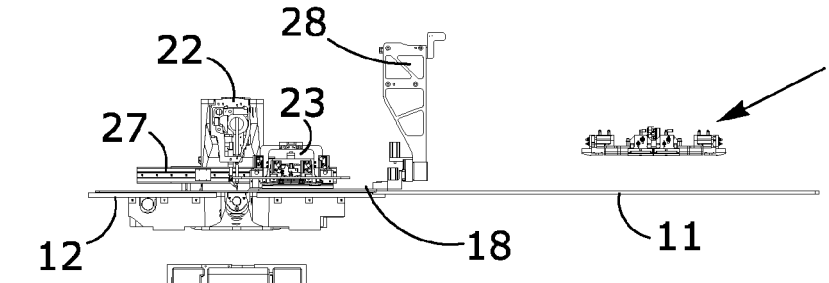

Fig. 11

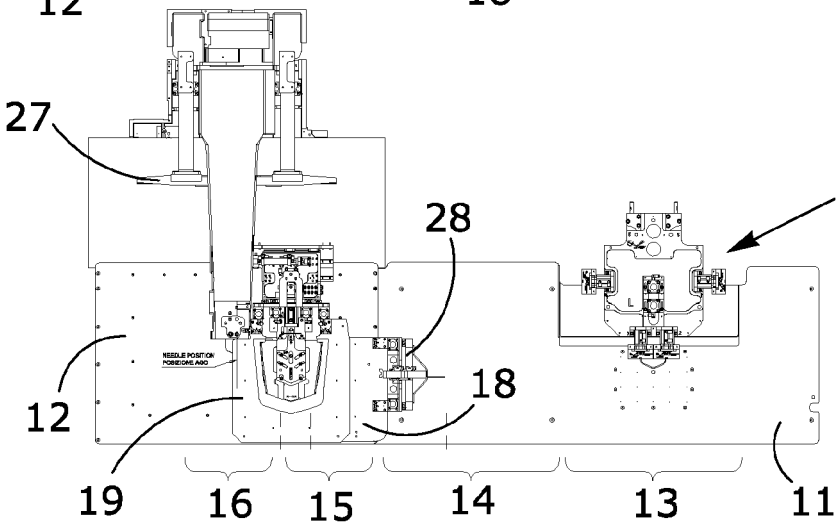

Fig. 11'

STEP M6

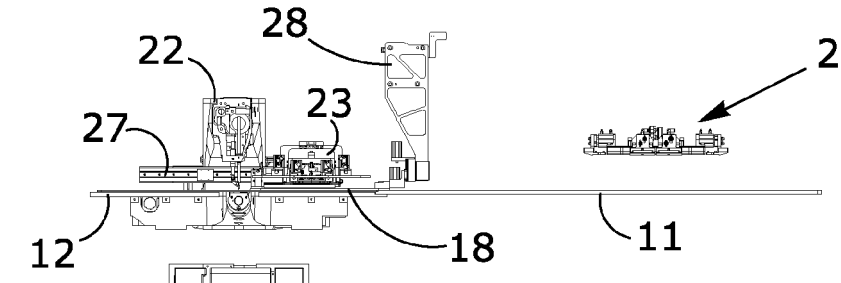

Fig. 12

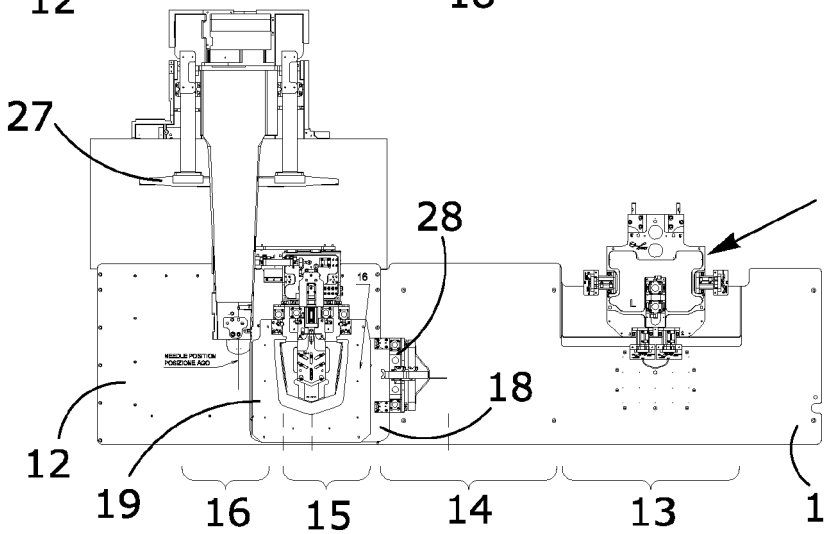

Fig. 12'

STEP M6

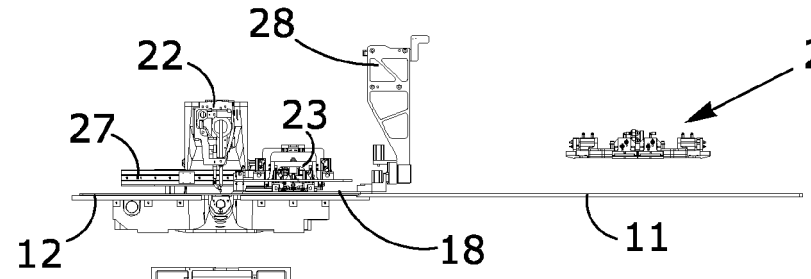

Fig. 13

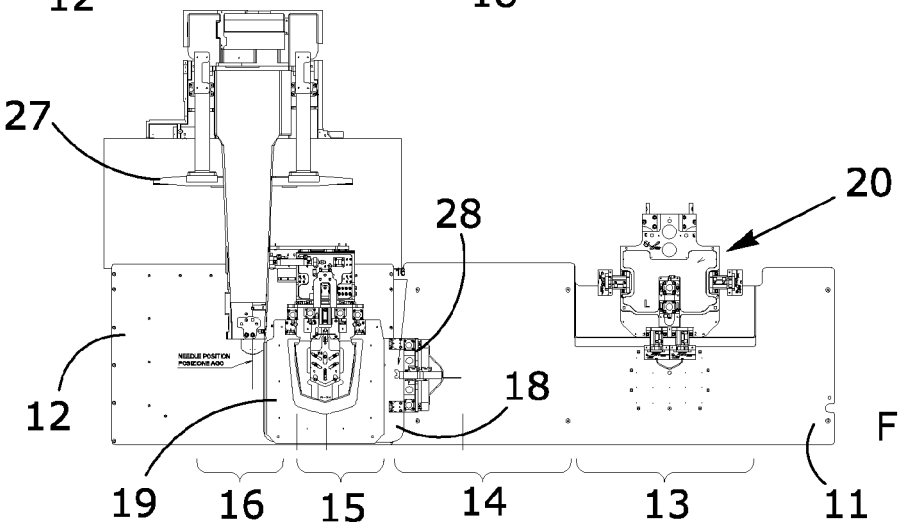

Fig. 13'

STEP M6

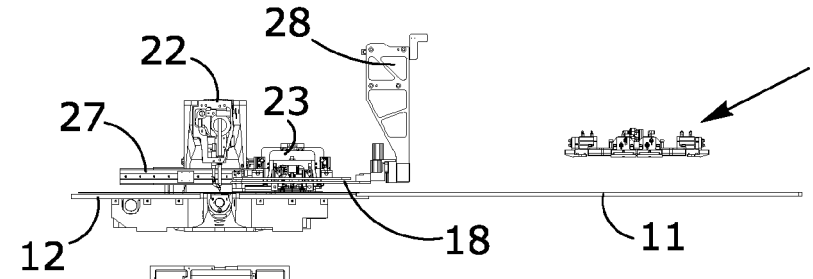

Fig. 14

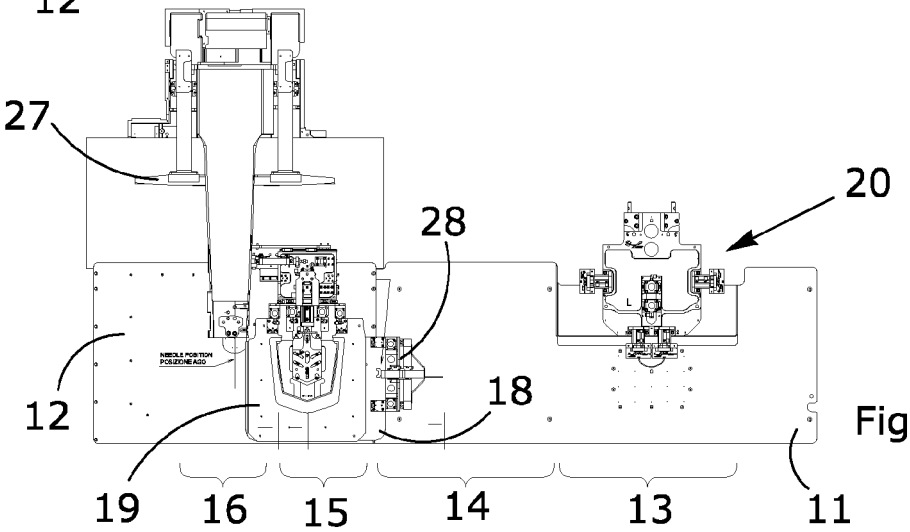

Fig. 14'

STEP M7

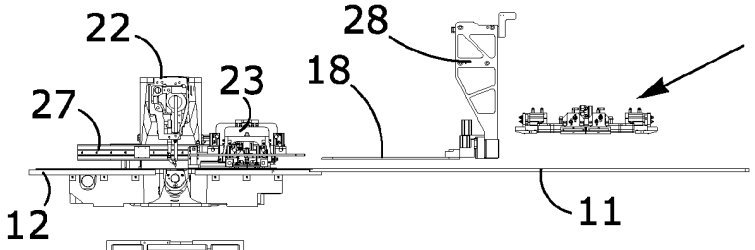

Fig. 15

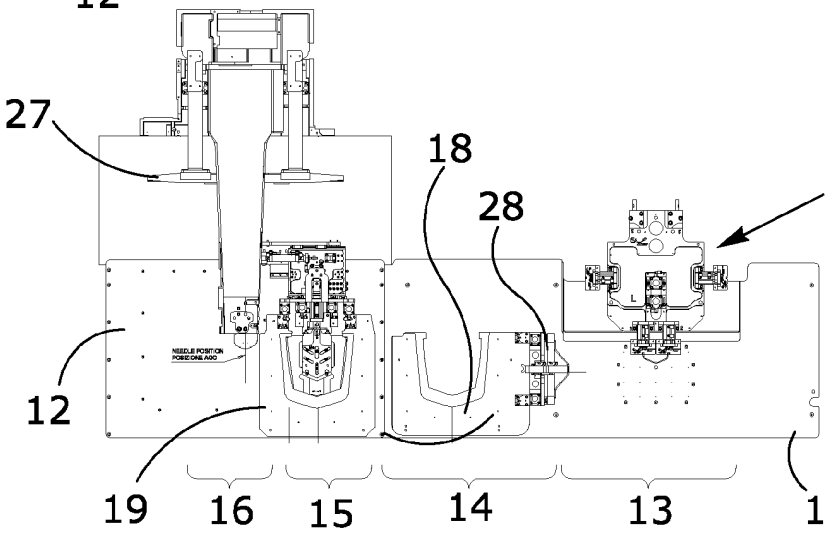

Fig. 15'

STEP M7

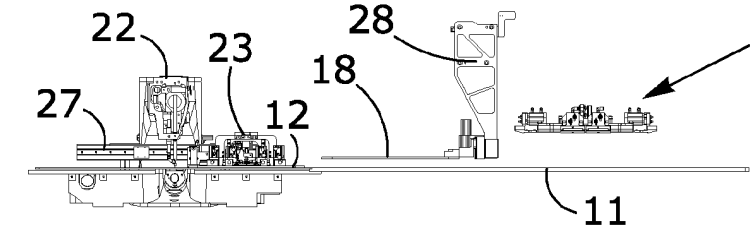

Fig. 16

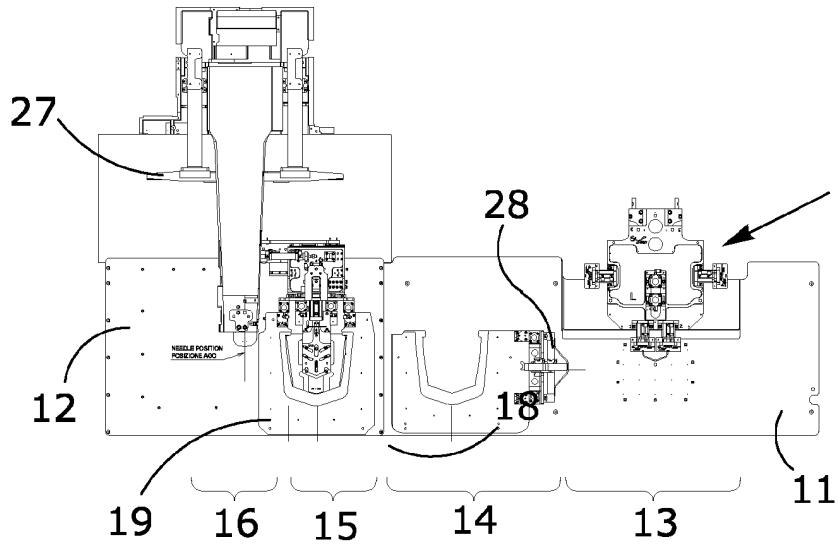

Fig. 16'

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2018202898 A1 **[0020]**
- WO 2019105070 A1 **[0021]**