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Amended claims in accordance with Rule 137(2) EPC.

(54) Device and method for removing socks from support form

(57) A method and an automatic device for removing pairs of men's socks (SI, S2) from support forms (11A, 11B) in a steam-ironing apparatus. The forms (11A, 11B) with the socks, from a drying station (14), are step moved in an indexed manner to a removal station (15) where the socks (SI, S2) of each pair are removed simultaneously from the support forms (11A, 11B). The support forms (11A, 11B) which are placed alongside one another in relation to each pair of socks (S1, S2), are moved from bottom to top along a sloped guide (18), to an upper position where a gripping device (22) retains the pair of socks (SI, S2) by the foot, after detensioning the foot of the socks in respect to the foot portion of the forms. The socks (SI, S2) are removed by making a first partial removal by a downward movement of the support forms (11A, 11B) retaining the socks (S1, S2) by the gripping device (22); subsequently, the removal of the pair of socks (SI, S2) is completed by an upward movement of the gripping device (22) maintaining the socks (SI, S2) in an extended condition alongside one another.

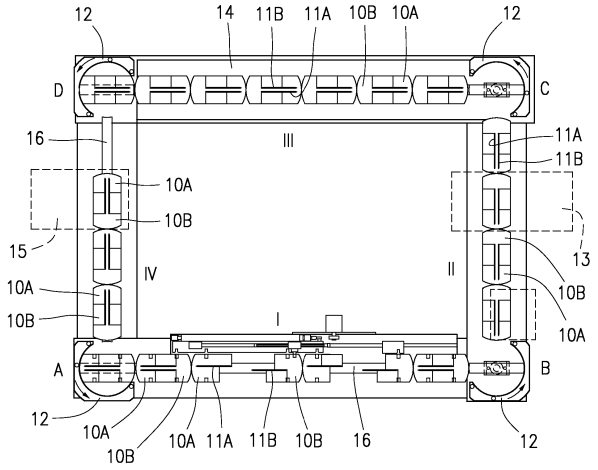

Fig. 1

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention refers to a method and to an automatic device for removing pairs of men's socks from respective supporting forms in a steam-ironing apparatus, and in particular refers to a method and to a device for removing single pairs of socks maintaining the socks of each pair alongside one another and perfectly paired in a condition that is suitable for subsequent packaging thereof.

STATE OF THE INVENTION

[0002] In the course of a manufacturing process for knitwear products, in particular men's socks, the socks are subjected to various finishing operations; in particular, the socks have to be ironed on suitable supporting forms step, moving the socks in an indexed manner along a work path from a boarding station of the socks on the forms, to a steam-ironing station, through a drying station and to a removal station of the finished socks. Apparatuses for ironing socks are for example known from US 1.062.510, US 3.491.516 and EP 1.604.057.

[0003] In a preceding application of the same Applicant, which has not yet been published, an apparatus is further disclosed for steam-ironing pairs of men's socks, wherein the single pairs of socks are moved along a quadrangular work path, maintaining each pair of socks alongside one another whilst they are step moved in an indexed manner to an ironing station, through a drying chamber and to a removal station of the pairs of socks from the single supporting forms.

[0004] Devices for automatically removing socks from respective supporting forms are moreover known from US 3,054,542, US 3,319,851, US 3,353,726; according to these devices, single socks are removed from respective supporting forms by means of a gripping device that is movable along a vertical or sloped guide, maintaining the forms stationary in a lower position.

[0005] Devices of this type, in addition to entailing low productivity, have the drawback of requiring successive selection and pairing of similarly ironed socks, for packaging; the devices of this type prove to be completely unsuitable for simultaneously removing each time that socks that are paired together.

[0006] In turn, US 3,481,516, which constitutes the nearest prior art to the present invention, illustrates an apparatus for treating socks comprising a removing device for removing single socks from respective supporting forms, wherein the forms are movable along a sloped guide, to an upper position where the single socks are taken from a gripping device to enable the single socks to be removed by a simple downward movement of the supporting forms.

[0007] Nevertheless, during steam ironing and subsequent drying, the socks tend to stick to the supporting forms as they shrink; thus during removal, the foot of the sock, because of the adhesion thereof to the foot of the supporting form cannot always be removed, i.e. disengaged and run freely on the form; consequently the socks may be damaged and the removing device has to be stopped in turn to remove the damaged socks manually, with a consequent arrest of the entire ironing apparatus and loss of productivity.

[0008] In order to overcome these drawbacks, US 3,481,516 suggests using contact rollers with the leg part of the sock, that tend to move the leg part of the sock in a direction opposite to the descending movement of the supporting form; using rollers, in combination with a descending movement of the forms, nevertheless does not enable the socks to be removed in a perfectly extended condition.

OBJECTS OF THE INVENTION

[0009] The main object of the present invention is to provide an automatic method and device for removing pairs of men's socks from respective supporting forms, in an apparatus for steam ironing, which are suitable for overcoming the drawbacks of the apparatus previously known.

[0010] In particular, one object of the present invention is to provide a method and a device for removing pairs of men's socks from respective supporting forms, by which the socks can be removed perfectly paired in a condition of minimum tension.

[0011] A further object of the invention is to provide a device for removing pairs of men's socks, by which it is possible to reduce tension inside the socks, before removing, to enable smooth running of the pairs of socks along the supporting forms.

[0012] A still further object of the invention is to provide a device for removing pairs of men's socks, of any highly improved and simplified shape and size, suitable for sequentially removing single pairs of men's socks whilst they are step advanced in an indexed manner, in conditions of being alongside one another, along a work path of an automatic ironing apparatus.

SHORT DESCRIPTION OF THE INVENTION

[0013] These and other objects and advantages of the invention are achievable by the method according to claim 1 for removing pairs of men's socks from supporting forms in steam ironing apparatuses, and by the removing device according to claim 5.

[0014] According to a first aspect of the invention a method has been provided for removing a pair of men's socks from a pair of support forms that extend vertically from a pair of shuttles; wherein the socks and the support forms comprise a leg-shaped part and a foot-shaped part; wherein shuttles with the forms are movable along a sloped path between a lower position and an upper position wherein the foot of the socks are clamped by a

gripping device and wherein the socks are removed by moving the support forms from the upper position to the lower position along said sloped path, characterised by the steps of: detensioning the foots of the socks by pulling socks by the gripping device; partially removing the pair of socks by a downward movement of the shuttles with the support forms along said sloped path, retaining the foots of the pair of socks with the gripping device; and completing the removal of the pair of socks by moving the gripping device upwards, to maintain the socks extended one another alongside.

[0015] According to another aspect of the invention a device has been provided for conjointly removing pair of men's socks from supporting forms, by the method referred to above, characterised by comprising: a slide movable along said sloped path, the slide being configured for releasably engaging, a pair of shuttles by retaining the shuttles with the socks supporting forms in a side by side condition; a sock gripping device in a position above the sloped path; and control actuators connected to the shuttle engaging slide and to the gripping device, the control actuators being operationally connected to a control unit and selectively drivable for moving the slide along said sloped path, respectively for opening/closing the gripping device and moving the same gripping device with respect to the support forms for the pair of socks.

SHORT DESCRIPTION OF THE DRAWINGS

[0016] These and further features of the method and of the device for the removal of men's socks according to the invention, will be clearer from the following description, with reference to the attached example of the drawings, wherein:

Fig. 1 is an illustrative diagram of an apparatus for automatic ironing of men's socks, comprising a device for removing pairs of socks according to the invention:
Fig. 2 is a side view of the removing device for the socks, with a form in a lowered position;
Fig. 3 is a top view of figure 2;
Fig. 4 is a top view similar to the top view of figure 2, with the form in a raised position;
Fig. 5 is a top view of figure 4;
Figs 6 to 9 show different operative conditions of the gripping device for the socks;
Fig. 10 is a side view, with the gripping device in the condition of figure 9;
Fig. 11 shows a first sock removal step;
Fig. 12 shows a second sock removal step.

DESCRIPTION OF THE INVENTION

[0017] In figure 1 there is schematically shown, by way of example, a top view of an apparatus for ironing men's socks, of a previous patent application of the same applicant; the apparatus comprises a quadrangular path along which in a step manner a plurality of pairs of shuttles 10A, 10B are moved and provided with a first support form 11A and respectively with a second support form 11B for pair of socks that have to be steam ironed.

[0018] The quadrangular path for the single pairs of shuttles 11A, 11B, in the example, extends along four branches I, II, III and IV arranged at 90°, which at the corners A, B, C and D converge to a rotational device 12 for the pairs of shuttles, to maintain the pairs of forms 11A, 11B always oriented in a movement direction, both along the branch I where the shuttles 10A, 10B of each pair of shuttles are spaced apart from one another and to enable the single pairs of socks to be boarded, and along the remaining branches II, III and IV where the shuttles 10A, 10B of each pair of shuttles together the forms 11A, 11B are brought close alongside one another whilst they are step moved through a sock ironing station 13, a drying station 14, and a sock removing station 15 comprising a device according to the present invention; as explained below, the sock removing device is configured for simultaneously removing the two socks of each pair of socks from respective support forms, whereas the other pairs of shuttles 10A, 10B move in a step manner along a guiding rail 16 of the quadrangular path.

[0019] The sock removing device is shown in figures 2 to 5, whereas the operative method thereof is shown in the remaining figures 6 to 12.

[0020] As shown in figures 2 to 5, at the station 15 of figure 1, wherein the socks of each pair coming from the drying station 14 are simultaneously removed, the guiding rail 16 comprises a movable rail section 16', having a length the same as or little more than the shifting step of each pair of shuttles 11A, 11B next to one another approached.

[0021] The movable section 16' of the guiding rail for the shuttles is connected to a slide 17 movable along two guide bars 18 fixed to a plate 19; the two guide bars 18 define a sloped path, with respect to a vertical direction of the forms 11A, 11B, of an angle substantially corresponding to the angle between the part F relative to the foot and the part L relative to the leg of each support form 11A, 11B for the pair of socks.

[0022] The slide 17 is operatively connected to a first control actuator, for example to a pneumatic cylinder 20 or linear actuator of another type, to be moved, together with the shuttles 10A, 10B and the forms 11A, 11B, along the sloped path defined by the guide bars 18, from bottom to top, and in the opposite direction, between a lowered position shown in figures 2 and 3 and a raised sock gripping and removal position, shown in figures 4 and 5.

[0023] The slide 17 is configured for engaging, in a disengageable manner, each pair of shuttles 10A, 10B during the ascent and descent along the sloped path; it is thus provided with a centring device 21, actuated by a spring system that lock the two shuttles 10A, 10B between themselves and the movable section 16' of the guide rail, as shown in figures 4 and 5.

[0024] The sock removal device further comprises a

gripping device 22 in a position above the sloped path for the slide 17.

[0025] The gripping device 22 comprises a base member 22' on which two jaws 23 are hinged, suitably configured for gripping the part of both foot of the socks S1, S2 of each pair, in the condition of figures 10 and 11.

[0026] In particular, as shown in figure 10, the two jaws 23 extend over the entire length of the foot and are suitable for gripping pairs of socks S1, S2 of different shapes and/or dimensions; they are thus configured with a rear part 23A that extends to the heel and a fore part 23B that extends forwards for the remaining part of the foot of the socks. The two jaws 23 are fixed to a respective rotational axis 24, operatively connected to a first actuator 25, to rotate in a controlled manner between an open condition shown in figure 6, a closed and sock gripping condition shown in figure 9, and in two intermediate operative positions shown in figure 7 for centring the forms 11A, 11B in relation to the gripping device 22, and in figure 8 for inserting the gripping device 22 into the clamping position.

[0027] The base member 22' in turn is hinged on a horizontal axis 26, parallel to the planes of the forms 11A, 11B; it is further operatively connected to a second linear actuator 27, for vertically moving, in a controlled manner, the entire gripping device 22 between a raised position wherein the jaws 23 of the gripper are open, as shown in figure 6, or to a higher position where the socks are completely removed as in fig. 12, and a lowered position, shown in figures 9 and 10, wherein the two jaws 23 are closed and both gripping the socks on the two forms 11A, 11B.

[0028] A partition 28 is further fixed to the base member 22', consisting of a flat metal sheet, in an intermediate position between the two jaws 23; the partition 28 extends downwards to be inserted between the two forms 11A, 11B, as shown in figures 8 and 9 and as explained below.

[0029] The partition 28 is provided with a lining 28' suitably conformed for permitting frictionless free sliding, in the direction for the introduction between the two forms 11A, 11B, conversely exerting friction in an opposite direction to enable the socks to be removed. The lining 28' consists, for example of a layer of 'artificial sealskin', consisting of a synthetic fabric provided with oriented textile fibres such as to permit a frictionless sliding in one direction, preventing sliding in the opposite direction. The separating partition 28 between the two forms 11A, 11B, extends substantially over the entire length of the two jaws 23 of the gripper, ending beyond the point 23' in which the front ends of the two jaws come into contact with the socks S1, S2 to be removed from the two support forms 11A, 11B.

[0030] With reference to the various figures, the method will now be disclosed for operating the sock removal device, according to the method of the present invention.

[0031] The pairs of shuttles 10A, 10B, with the forms 11A, 11B that arrive in sequence at the sock removing station 15 of any ironing apparatus, are initially in the condition of figures 2 and 3; in this condition the two shuttles 10A, 10B and the two forms 11A, 11B with the socks are alongside one another at the sloped path, in the totally lowered position in which the movable rail section 16' is aligned to the fixed rail 16.

[0032] In these conditions, the centring device 21 of the carriage 17 hooks and locks the two shuttles 10A, 10B preventing them from sliding on the movable rail section 16'; the two forms 11A, 11B with the pair of socks, are placed alongside and are suitably spaced apart from one another, as shown.

[0033] At this point the assembly consisting of the two shuttles 10A, 10B, of the two forms 11A, 11B, and of the movable rail section 16', is lifted by the actuator 20, along the sloped path defined by the two guide bars 18 for the slide 17, in the direction of the arrow F2 of figure 4.

[0034] The assembly of the pair of shuttles 10A, 10B with the pair of support forms 11A, 11B of the socks S1, S2, is thus moved from bottom to top, up to the upper position shown in figures 4 and 5. In these conditions the gripping device 22 is moved near the forms 11A and 11B, with the two jaws open as shown in figure 6.

[0035] The longitudinal edges of the two jaws 23 have slanting internal surfaces 23" that diverge from one another; thus by closing the two jaws against the intermediate partition 28, as shown in figure 7, the slanting inner surfaces 23" enable the forms 11A, 11B to be correctly centred with respect to the partition 28 and the gripping device.

[0036] The two jaws 23 are then slightly reopened to enable the gripping device 22 to be lowered to frictionless insert the intermediate partition 28, between the two socks S1, S2 on the two forms 11A, 11B, as shown in figure 8.

[0037] By selectively acting by the various actuators, in particular the actuator 25, the two jaws 23 can now be closed against the two forms 11A and 11B and the socks S1, S2; by so doing, the two socks S1, S2 are gripped on the outer side by the two jaws 23 against the intermediate baffle 28.

[0038] Once the socks S1, S2 have been gripped, it is possible to reduce stretching of the foots of the socks with respect to the foot part F of the two forms 11A and 11B; this can be obtained by slightly raising the gripping device 22, with a millimetric movement, for example of 1 or 2 mm according to the arrow F1 of figure 10, so as to reduce the internal tensions at the feet of the socks, to overcome the resistance to removal caused by the heels of the forms.

[0039] After the stretching of the foots of the socks S1, S2 has been reduced, simultaneous removal of the pair of socks from the two forms 11A, 11B is made possible, by sequentially acting by the two successive steps shown in figures 11 and 12, driving selectively the various actuators by means of a suitable control unit.

[0040] During the first removal step shown in figure 11, the socks S1, S2 are partially removed by a top-to-bottom movement of the forms 11A, 11B, driving the descent of

the slide 17 along the sloped path, by means of the linear actuator 20 as indicated by the arrow F3 in figure 11.

[0041] During this first removal step, the foots of the socks S1, S2 is retained by the gripping device 22, whereas the legs of the socks can be partially removed from the respective form 11A, 11B without being subjected to any tension, during the descending movement of the slide 17 with the shuttles 10A, 10B supporting the form 11A, 11B.

[0042] Upon ending of the descent movement of the two forms, a second sock removal step is made possible.

[0043] During this second step, as shown in figure 12, the gripping device 27 is raised by being moved upwards in the vertical direction indicated by the arrow F4, so as to complete the removal of the socks S1, S2, retaining the socks in a hanging condition alongside one another; thus each pair of socks can be laid down onto a conveyer belt, in a perfectly paired condition, which is suitable for subsequent packaging.

[0044] From what has been said and shown in the attached drawings it will be understood that a method and a device for removing men's socks of the type having a long leg have been disclosed; nevertheless, the method and the device disclosed are also suitable for men's socks with one leg shorter than the previous one; it is thus understood that what has been said and shown in the drawings has been given as an illustration of the general features of the invention and of a preferred embodiment. Changes can thus be made to the method and to the device without departing from the claims.

Claims

1. A method for removing a pair of men's socks (S1, S2) from a pair of support forms (11A, 11B) that extend vertically from a pair of shuttles (10A, 10B);
   wherein the socks (S1, S2) and the support forms (11A, 11B) comprise a leg-shaped part (L) and a foot-shaped part (F);
   wherein the shuttles (10A, 10B) with the forms (11A, 11B) are movable along a sloped path (18) between a lower position and an upper position wherein the foot of the socks by a gripping device (22); and
   wherein the socks (S1, S2) are removed by moving the support forms (11A, 11B) from the upper position to the lower position along said sloped path, **characterised by** the steps of:

   detensioning the foot of the socks (S1, S2) by pulling the socks by the gripping device (22);
   partially removing the pair of socks (S1, S2) by a downward movement of the shuttles (10A, 10B) with the support forms (11A, 11B) along said sloped path, retaining the foot of the socks (S1, S2) with the gripping device (22); and
   completing the removal of the pair of socks (S1, S2) by moving the gripping device (22) upwards to maintain the socks (S1, S2) extended one another alongside.

2. The method for removing a pair of men's socks (S1, S2) according to claim 1, **characterised by** the fact of detensioning the foot of the socks (S1, S2) by upward pulling.

3. The method for removing a pair of men's socks (S1, S2) according to claim 1, **characterised by** the fact of aligning the support forms (11A, 11B) of the socks to the gripping device 22, before the partial removal of the socks (S1, S2).

4. The method for removing a pair of men's socks (S1, S2), according to claim 1, **characterised by** the fact of ending the removal of the pair of socks (S1, S2), by moving the gripping device (22) upwards in a direction parallel to the legs of the support forms (11A, 11B).

5. A device for removing pair of men's socks (S1, S2) from support forms (11A, 11B) by the method of claim 1, **characterised by** comprising:

   a slide (17) that is movable along said sloped path (18), the slide (17) being configured for releasing engaging, a pair of shuttles (10A, 10B), retaining the shuttles (10A, 10B) and the sock (S1, S2) supporting forms (11A, 11B) in a condition alongside one another;
   socks gripping device (22) in a position above the sloped path (18); and
   control actuators (20, 25, 27) operatively connected to the shuttle engaging slide (17) and to the gripping device (22), the control actuators (20, 25, 27) being operationally connected to a control unit and being selectively drivable, for moving the slide (17) along said sloped path (18), respectively for opening/closing the gripping device (22) and moving the gripping device (22) parallel to the support forms (11A, 11B) for the pair of socks.

6. The device for removing a pair of men's socks (S1, S2) according to claim 5, **characterised in that** the gripping device (22) comprises a pair of jaws (23) hinged on a base element (22), and an intermediate partition (28) that is insertable between the support forms (11A, 11B) placed alongside the pair of socks (S1, S2).

7. The device for removing a pair of men's socks (S1, S2) according to claim 6, **characterised in that** the jaws (23) of the gripping device (22) extend longitudinally to the foot (F) of the support forms (11A, 11B) for the pair of socks.

8. The device for removing a pair of men's socks (S1, S2) according to claim 6 **characterised in that** the jaws (23) have, on the internal side, a slanted longitudinal edge (23 "), wherein the slanted internal edges (23") of the jaws (23) are divergent from one another.

9. The device for removing a pair of men's socks (S1, S2) according to claim 5, **characterised in that** the gripping device (22) is supported for rotating according to a horizontal axis (26) that is parallel to the planes of the forms (11A and 11B).

10. The device for removing a pair of socks (S1, S2) according to claim 6, **characterised in that** the intermediate partition (28) of the gripping device (22) comprises a lining (28') configured for allowing frictionless sliding and insertion of the intermediate partition (28) between the forms (11A, 11B), preventing sliding in the opposite direction.

Amended claims in accordance with Rule 137(2) EPC.

1. A method for removing a pair of men's socks (S1, S2) from a pair of support forms (11A, 11B) that extend vertically from a pair of shuttles (10A, 10B);
wherein the socks (S1, S2) and the support forms (11A, 11B) comprise a leg-shaped part (L) and a foot-shaped part (F);
wherein the shuttles (10A, 10B) with the forms (11A, 11B) are movable along a sloped path (18) between a lower position and an upper position wherein the foot of the socks is clamped by a gripping device (22); and
wherein the socks (S1, S2) are removed by moving the support forms (11A, 11B) from the upper position to the lower position along said sloped path, **characterised by** the steps of:

   detensioning the foot of the socks (S1, S2) by pulling the socks by the gripping device (22);
   partially removing the pair of socks (S1, S2) by a downward movement of the shuttles (10A, 10B) with the support forms (11A, 11B) along said sloped path, retaining the foot of the socks (S1, S2) with the gripping device (22); and
   completing the removal of the pair of socks (S1, S2) by moving the gripping device (22) upwards to maintain the socks (S1, S2) extended one another alongside.

2. The method for removing a pair of men's socks (S1, S2) according to claim 1, **characterised by** the fact of detensioning the foot of the socks (S1, S2) by upward pulling.

3. The method for removing a pair of men's socks (S1, S2) according to claim 1, **characterised by** the fact of aligning the support forms (11A, 11B) of the socks to the gripping device (22), before the partial removal of the socks (S1, S2).

4. The method for removing a pair of men's socks (S1, S2), according to claim 1, **characterised by** the fact of ending the removal of the pair of socks (S1, S2), by moving the gripping device (22) upwards in a direction parallel to the legs of the support forms (11A, 11B).

5. A device suitable for simultaneously removing pair of man's socks (S1, S2) from support forms (11A, 11B) by the method of claim 1, the device comprising sock support forms (11A, 11B) having a foot-shaped part (F) and a leg-shaped part (L) vertically extending from shuttles (10A, 10B) movable between a lower position and a raised position along a sloped path (18);
a sock gripping device (22) positioned above the sloped path (18); and
first and second actuators (20, 25) to move the shuttles (10A, 10B) and support forms (11A, 11B) along the sloped path (18), respectively to open/close the sock gripping device (22),
characterised by comprising:

   a slide (17) movable along the sloped path (18), the slide (17) being configured for releasably engaging a pair of shuttles (10A, 10B) and for retaining the pair of shuttles (10A, 10B) with a pair of sock support forms (11A, 11B) close one another alongside; and
   a third actuator (27) for vertically moving the sock gripping device (22);
   said actuators (20, 25, 27) being operatively connected to a control unit, and selectively drivable for moving the slide (17), opening/closing the sock gripping device (22) and respectively for moving the gripping device (22) parallel to the sock support forms (A, B) for detensioning the foots and a complete removal of pair of socks (S1, S2).

6. The device for removing a pair of men's socks (S1, S2) according to claim 5, **characterised in that** the gripping device (22) comprises a pair of jaws (23) hinged on a base element (22), and an intermediate partition (28) that is insertable between the support forms (11A, 11B) placed alongside the pair of socks (S1, S2).

7. The device for removing a pair of men's socks (S1, S2) according to claim 6, **characterised in that** the jaws (23) of the gripping device (22) extend longitudinally to the foot (F) of the support forms (11A, 11B)

for the pair of socks.

8. The device for removing a pair of men's socks (S1, S2) according to claim 6 **characterised in that** the jaws (23) have, on the internal side, a slanted longitudinal edge (23"), wherein the slanted internal edges (23") of the jaws (23) are divergent from one another.

9. The device for removing a pair of men's socks (S1, S2) according to claim 5, **characterised in that** the gripping device (22) is supported for rotating according to a horizontal axis (26) that is parallel to the planes of the forms (11A and 11B).

10. The device for removing a pair of socks (S1, S2) according to claim 6, **characterised in that** the intermediate partition (28) of the gripping device (22) comprises a lining (28') configured for allowing frictionless sliding and insertion of the intermediate partition (28) between the forms (11A, 11B), preventing sliding in an opposite direction.

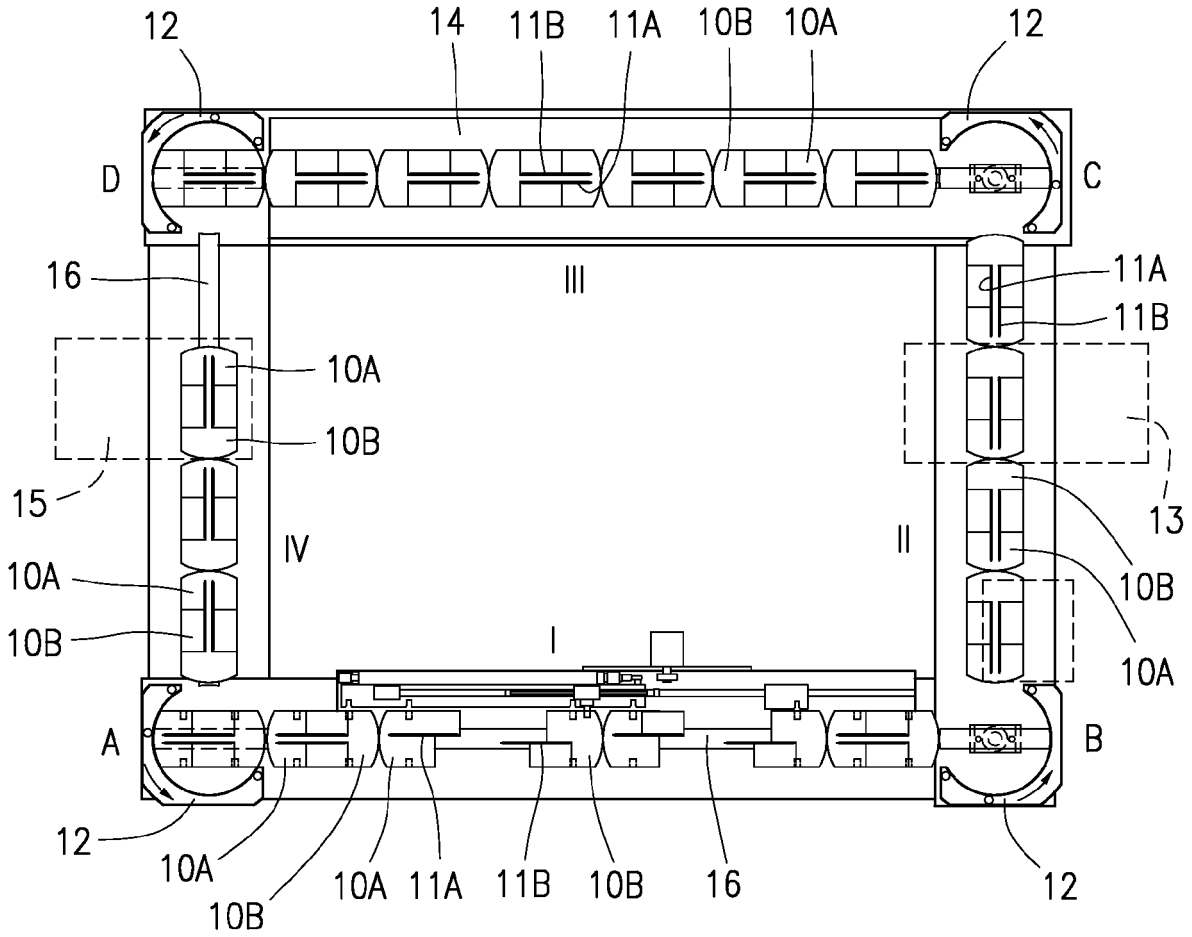
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Fig. 1

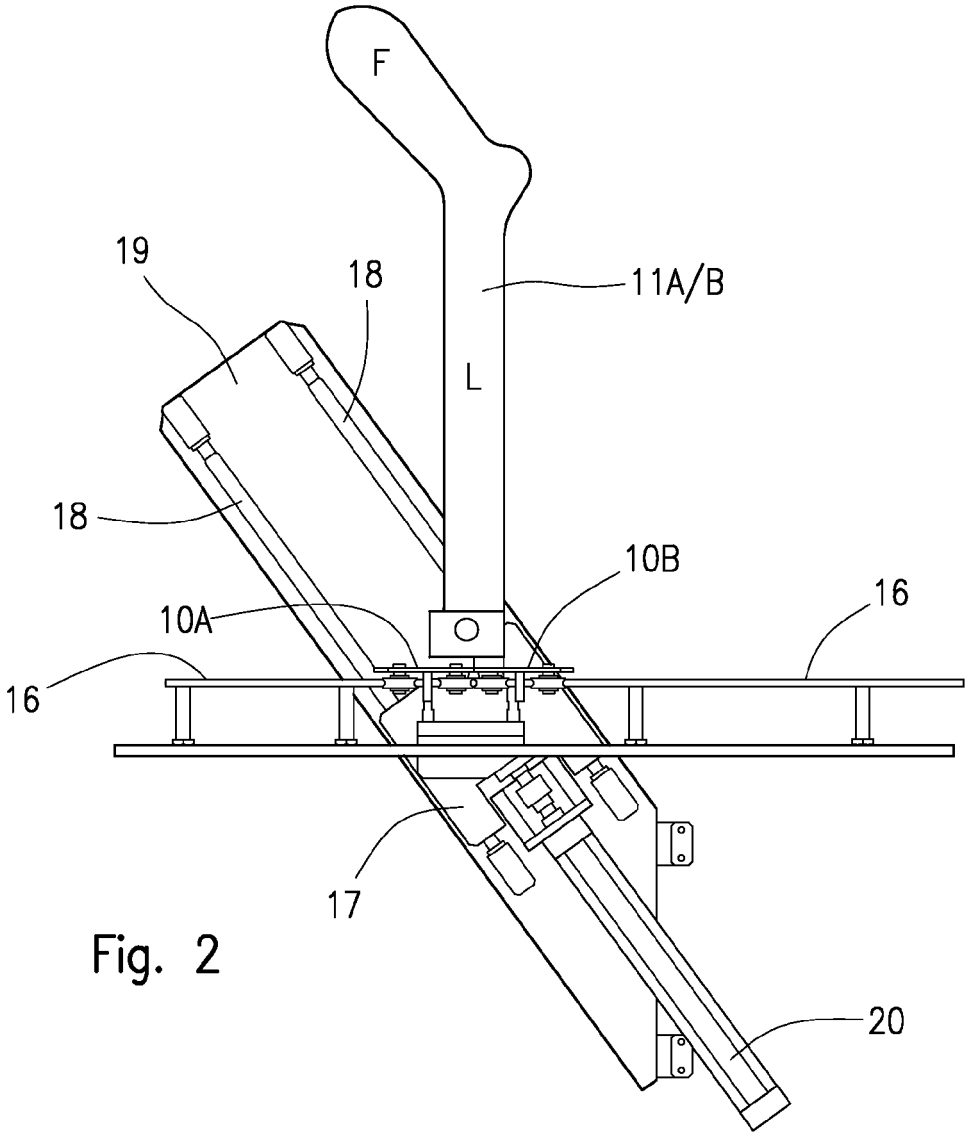
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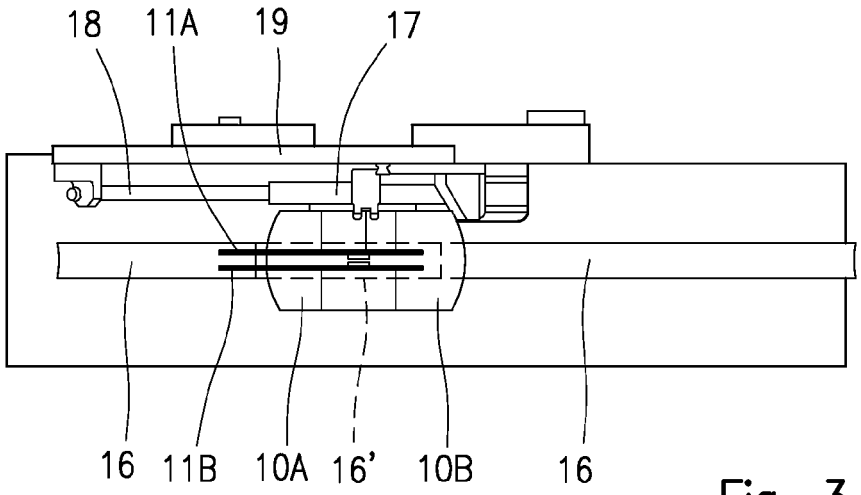
Fig. 2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11A
19
17
16
11B
10A
16'
10B
16

Fig. 3

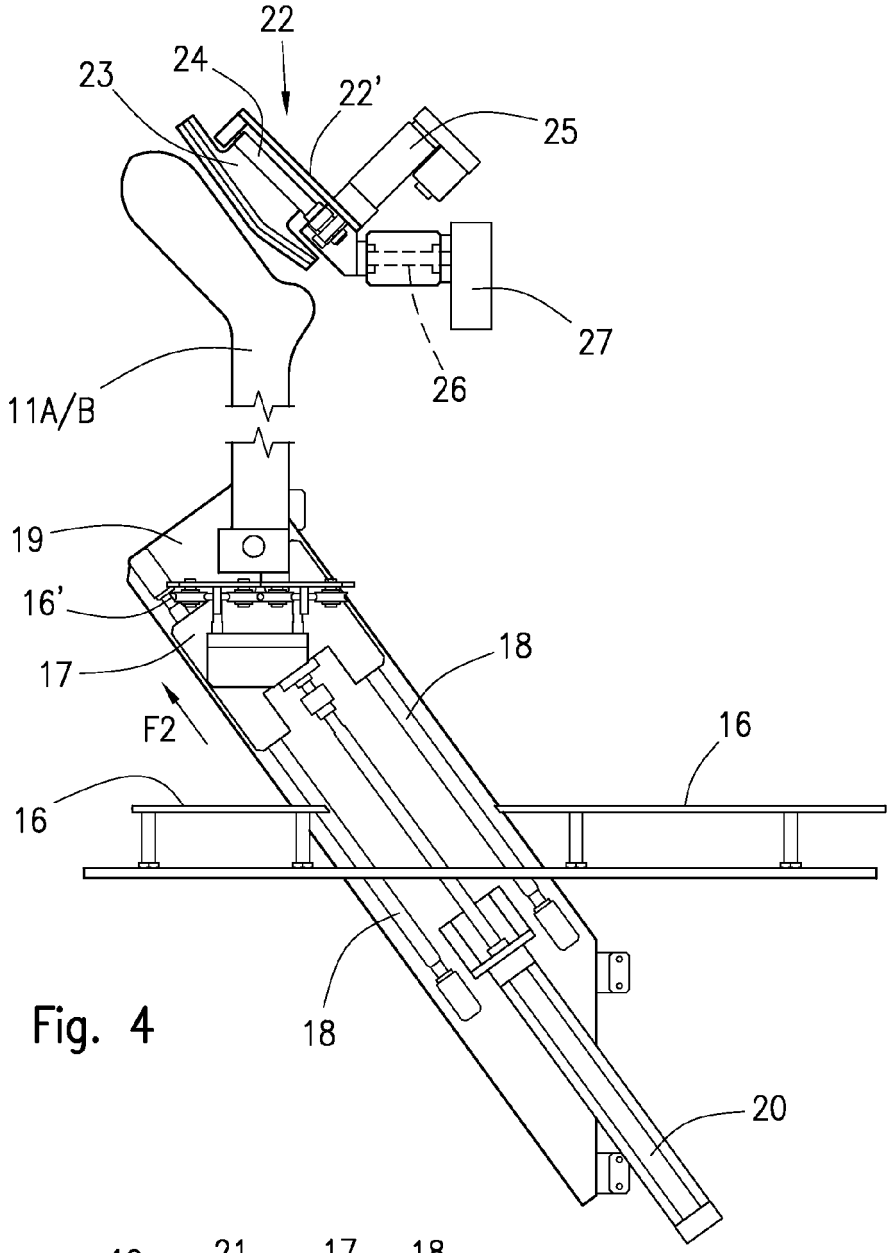

22
24
23
22'
25
27
26
11A/B
19
16'
17
F2
18
16
16
18
20

Fig. 4

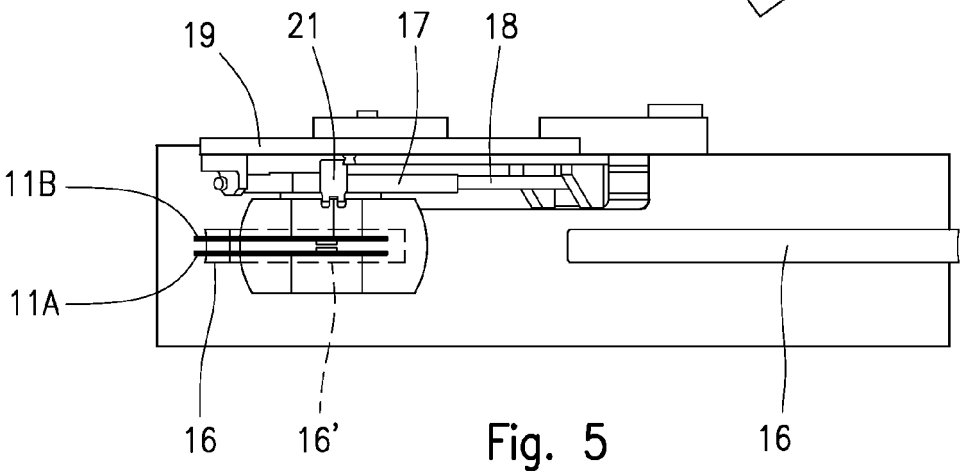

19
21
17
18
11B
11A
16
16'
16

Fig. 5

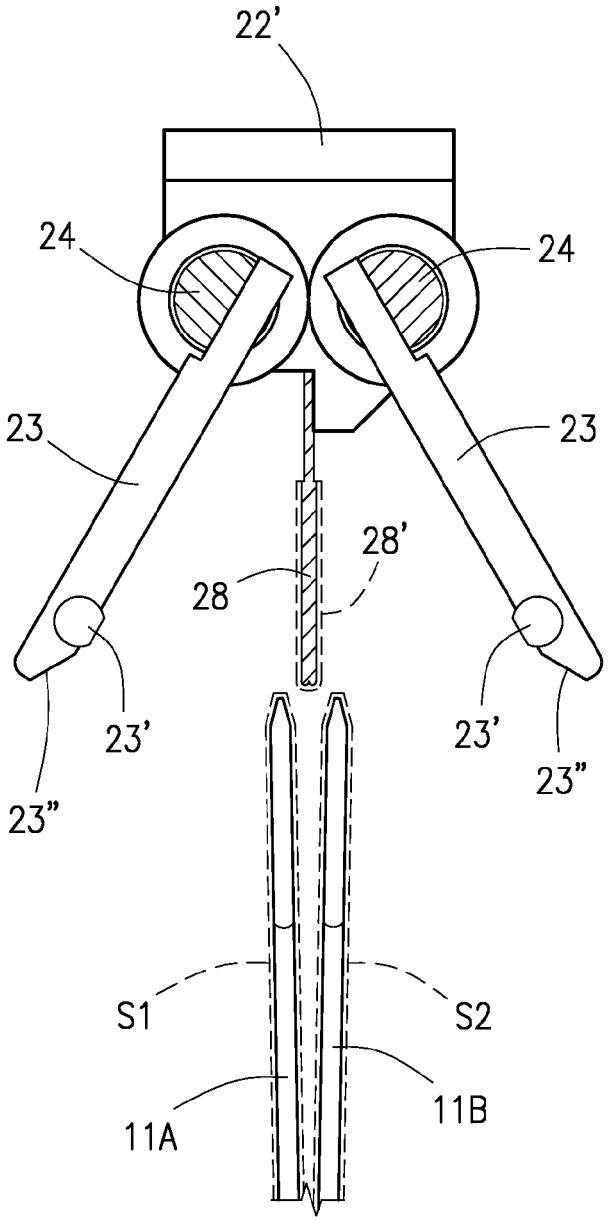

22'
24
24
23
23
28'
28
23'
23'
23"
23"
S1
S2
11A
11B

Fig. 6

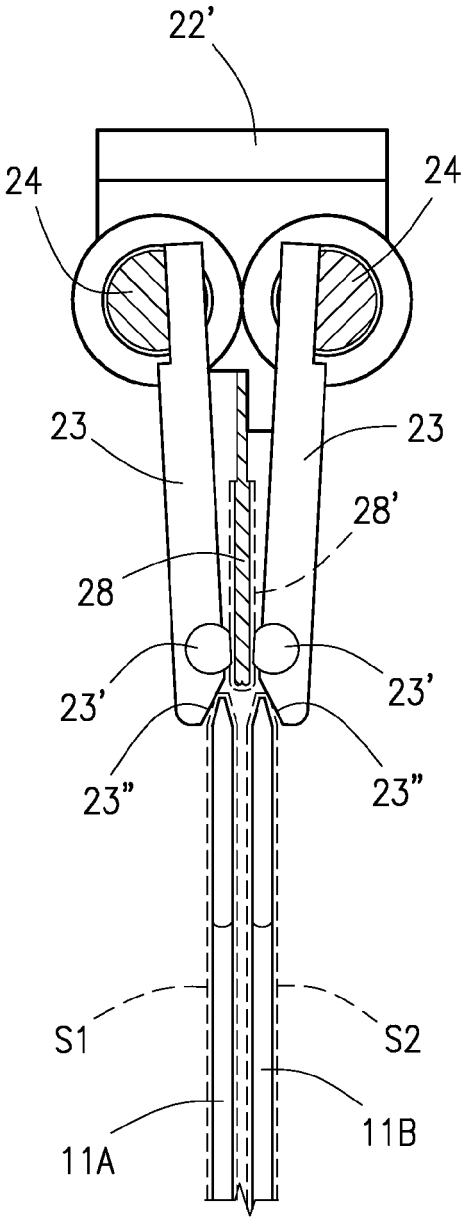

22'
24
24
23
23
28'
28
23'
23'
23"
23"
S1
S2
11A
11B

Fig. 7

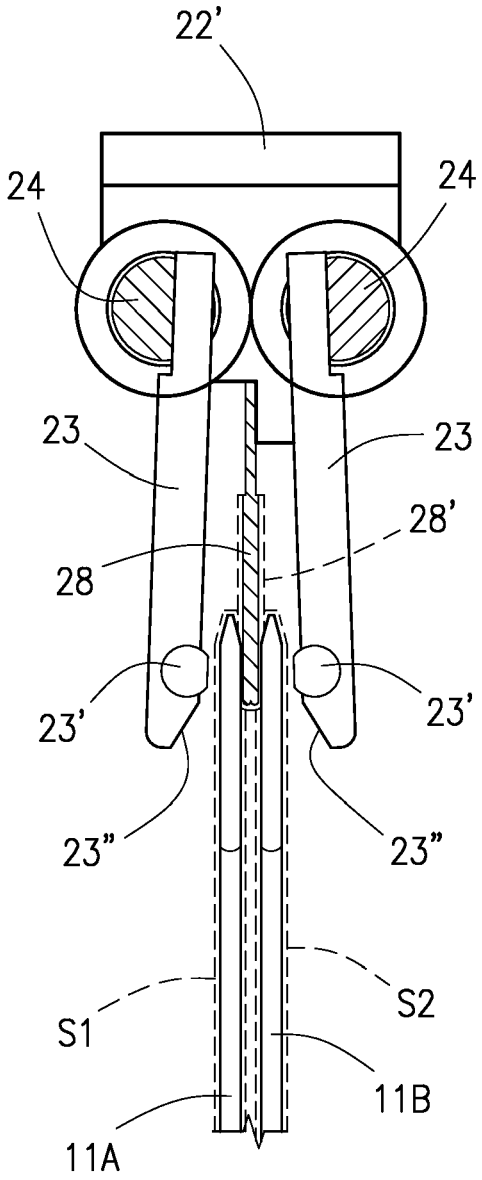

22'
24
24
23
23
28'
28
23'
23'
23"
23"
S1
S2
11B
11A

Fig. 8

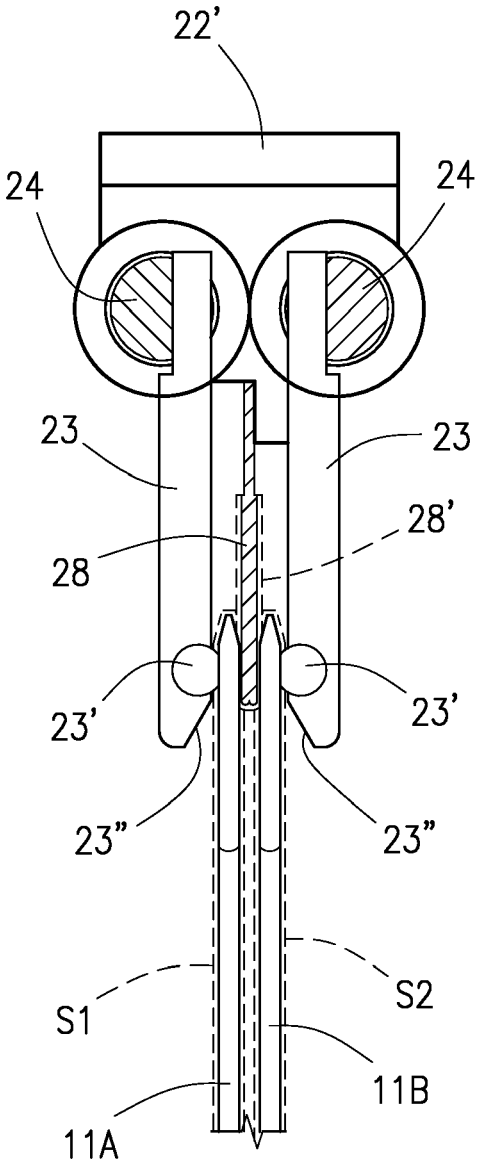

22'
24
24
23
23
28'
28
23'
23'
23"
23"
S1
S2
11B
11A

Fig. 9

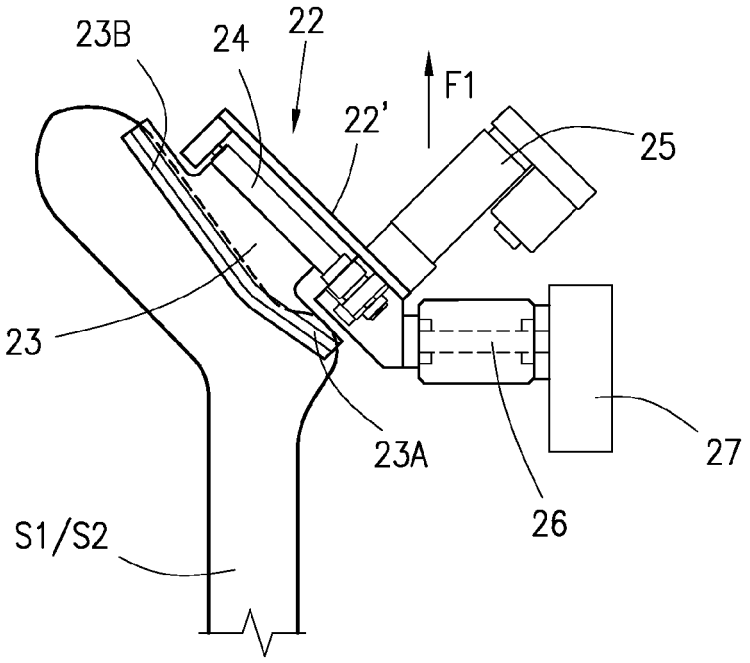


Fig. 10

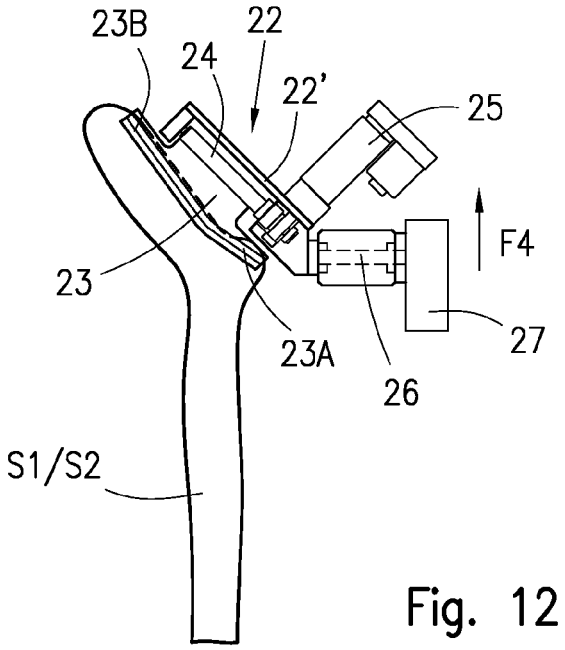
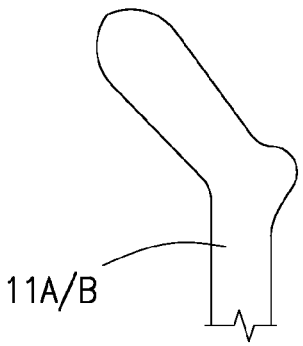


Fig. 12



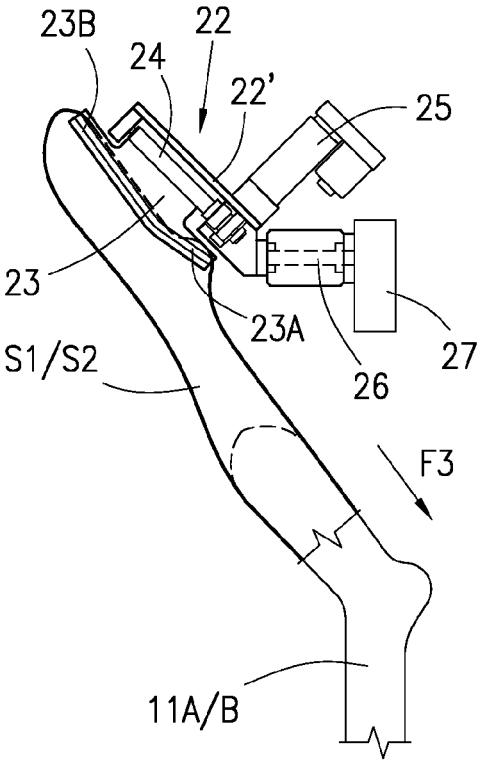


Fig. 11

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 8444

DOCUMENTS CONSIDERED TO BE RELEVANT

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A,D	US 3 481 516 A (HORBERG CHARLES JR) 2 December 1969 (1969-12-02) * the whole document *	1-10	INV. D06H3/16 D06C5/00
A	WO 03/069040 A1 (VOURIOT MICHEL [FR]) 21 August 2003 (2003-08-21) * claim 1; figures 1-14 *	1-10	
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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	16 May 2014	Iamandi, Daniela

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