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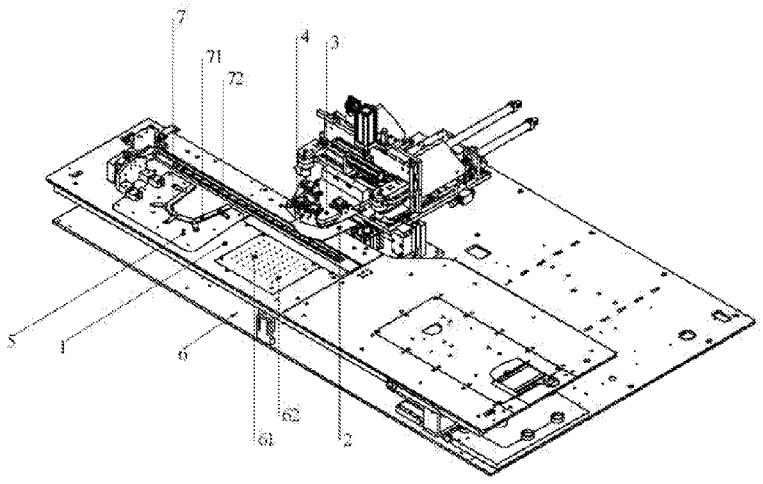
(54) Title: FOLDING DEVICE AND FOLDING PROCEDURE FOR AUTOMATIC SEWING MACHINE

[Fig. 1]



(57) Abstract: A folding device for an automatic sewing machine, for sewing a piece of fabric (P) on a portion of the surface of a sheet (F), comprises: a support plate (1); a shaped bracket (2); an outer folding frame (3) on a frame support to press the piece of fabric (P) against the shaped bracket (2); folding members (4) on the outer folding frame (3) to engage the portions of the edge of the piece of fabric (PB); a presser plate for fabric (5) on a movable support. At least one, between first compensation means (6) and second compensation means (7), is configured and operatively positioned to recover the separation and/or improving the contact between the piece of fabric (P), (PB) and the portion of the surface of a sheet (F). Moreover, a folding procedure for an automatic sewing machine is described.

[Continued on next page]

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Description

Title of Invention: FOLDING DEVICE AND FOLDING PROCEDURE FOR AUTOMATIC SEWING MACHINE

Technical Field

[0001] The present invention relates to a folding device and a procedure for folding for an automatic sewing machine.

[0002] In general, the present invention relates to sewing machines with devices for the automatic control of the movement of the product with respect to the mechanism of formation of working points in order to obtain a particular configuration of the stitch, for example, control program collars for attaching the sewing pockets, etc.

[0003] In particular, the present invention relates to supports of the workpiece, pneumatic or hydraulic devices, suction devices or blowing machines or devices for folding the edges of pockets, collars cuffs or the like during production, devices incorporated in sewing machines for the supply or the removal of the product feed elements, working devices not otherwise provided to facilitate clamping; Elements to rotate and/or folding the edge.

Background Art

[0004] The state of the art is given in US patent 5,809,920 A.

[0005] It is also known the state of the art given in US patent 5,188,044 A concerning a folding device for a sewing machine automatic to sew a second piece of material on a first piece of material, the folding device comprising a support plate for receiving the first piece; a blade mounted on a blade holder for receiving the second piece; an outer frame arranged on a support for outer frame; folding means on the outer frame to engage edge portions of the second part and then fold the edge portions of the second piece around the blade, and then disengage edge portions; the blade being movably mounted by means of its support of blade between a lower working position on the support plate and an upper operating position above the support plate and the outer frame being mounted in a movable way from the support of the outer frame in a lower working position on the support plate and a position near the upper working position of the blade; retaining means on the support plate to hold the first and the second part on the support plate in such a way as to prevent the edge portions being open when the folding means are disengaged from edge portions; the containment means comprising a holding element which extends along the folded edges of the second workpieces; and the element retaining projecting upwards from the support plate and fixing of the first and the second part against the blade.

[0006] Furthermore, the state of the art is represented by US patent 5,454,336 A concerning

a device for holding a job sheet on a support plate, the support plate having opposed major surfaces, the job sheet being arranged on one of the two main surfaces of the support plate, the apparatus comprising a table that is placed adjacent to the other major surface of the support plate, an excess of the job sheet that extends from the major surface of the support plate being folded and retained between the other major surface of the support plate and the board; the support plate having at least one opening for the passage of the air at the main surface; and a suction device that sucks air through said at least one passage of air of the support plate so as to retain an inner portion of the sheet of work on the principal surface.

[0007] Furthermore, the state of the art is given in US patent 5,915,318 A concerning a folding of sheets of working apparatus comprising a table having a hole; a support plate which is provided on top of the table and on which is positioned the job sheet; a first folding element that cooperates with the supporting plate for folding an outer peripheral portion of the sheet in a first direction perpendicular to the support plate; a first mobile device that moves the first folding element in the first direction; second folding elements which cooperate with the support plate for folding the outer peripheral portion of the sheet in a second direction parallel to the support plate; second mobile devices that moving the second folding elements in the second direction; a support element which surrounds an outer peripheral portion of the support plate and which supports the second folding elements; a compression device that presses on the plate the support plate and the support element; a mobile element that is provided in the hole of the table so that the movable member is movable upwards and downwards; and a supporting device which supports the movable element in such a way that an upper surface of the movable element is at the level of an upper surface of the table and that allows the movable member to be moved downwards by the pressure from the peripheral portion of the sheet folded outer working when the support plate is pressed on the table from the press device.

[0008] The above-described state of the art offers the starting to solve the problem of recovering the detachment and/or improve the contact between a piece, the edge portions of the piece and the portion of a surface of a sheet of a material such as, for example, a tissue, as the movable means for supporting the piece disengage from the piece and from edge portions of the piece.

[0009] In order to recover the detachment and/or improve the contact between the piece, the edge portions of the piece and the portion of the surface of a sheet serve actuating devices of high speed. The known devices for displacing the means for folding the edge of the piece, hardly can contribute to reduce the empty spaces which are created during the step of being drawn backwards and extraction of the folding means. The folding means as not bulky, being formed from sheets and moving blades, during their

withdrawn to go out of the piece and the folded edges of the patch leave empty spaces which can cause irregular shapes of the bent edges of the patch, both in thickness and in the plane of the sheet surface. A solution to the problem of the bent edges irregular of one piece, for example, those of a pocket sewing on a portion of a sheet of fabric, consists in increasing the width of the edge in order to increase the adhesion of the edge on the sheet of fabric avoiding the unraveling of the bent and the weakening of the folded edge. However, a wide band edge folded along the contour of a piece decreases the quality of the product in respect to a bent edge regular and with thin band.

Summary of Invention

[0010] The object of the present invention is solving the above prior art problems by providing a folding device and a procedure for folding for automatic sewing machine so as to recover the automatic detachment and/or improve the contact between the piece the edge portions of the piece and the portion of the surface of a sheet.

[0011] A further object is to provide a folding device and a procedure for folding for an automatic sewing machine to obtain quality products and value, of precise dimensions and finishes treated in detail.

[0012] A further object is to provide a folding device for a sewing machine provided with automatic actuation means with a snap so as to recover the empty spaces left in the product during the main steps of folding of the edges and extraction of the knives.

[0013] A further object is to provide a folding device and a procedure for folding for an automatic sewing machine to optimize the step of preparing the piece by plotting a geometric contour of reduced dimensions.

[0014] The above and other objects and advantages of the invention, as will appear from the following description are achieved with a device and a procedure for folding for an automatic sewing machine, as described in the claims.

[0015] Preferred embodiments and non- trivial variations of the present invention are claimed in the dependent claims. It is to be understood that all the claims form an integral part of the present description. It will be immediately obvious to the skilled people in the art that could be performed to what has been described numerous variations and modifications (for example related to shape, sizes, arrangements and parts with equivalent functionality) without departing from the scope of protection of the invention as appears from the enclosed claims.

Brief Description of Drawings

[0016] The present invention will be better described by some preferred embodiments thereof, given as a non-limiting example, with reference to the enclosed drawings.

[0017] [Fig.1] [Fig. 2] show a perspective view and a plan view of an embodiment of a

folding device for the automatic sewing machine according to the present invention.

[0018] [Fig.3] [Fig. 4] show a first and a second perspective view of an embodiment of a subassembly of a folding device for the automatic sewing machine according to the present invention.

[0019] [Fig.5] shows a plan view of the subassembly of the previous figure.

[0020] [Fig.6] shows a sectional view according to a line VI-VI of the previous figure.

[0021] [Fig.7] shows an enlarged view of a portion VII of the preceding figure.

[0022] [Fig.8] [Fig. 10] [Fig. 12] [Fig. 14] [Fig. 16] [Fig. 18] [Fig. 20] [Fig. 22] show a diagram of a step of an embodiment of the folding procedure for the automatic sewing machine, according to the present invention.

[0023] [Fig.9] [Fig. 11] [Fig. 13] [Fig. 15] [Fig. 17] [Fig. 19] [Fig. 21] [Fig. 23] show an enlarged view of a portion IX, XI, XIII, XV, XVII, XIX, XXI, XXIII of [Fig. 8] [Fig. 10] [Fig. 12] [Fig. 14] [Fig. 16] [Fig. 18] [Fig. 20] [Fig. 22].

Description of Embodiments

[0024] With reference to the figures, it is possible to note that a folding device for an automatic sewing machine, for sewing a piece of fabric P on a portion of the surface of a sheet F comprises:

[0025] a support plate 1 for receiving the portion of the surface of a sheet F;

[0026] a shaped bracket 2 placed on a bracket support to support the piece of fabric P;

[0027] an outer folding frame 3 on a frame support to press the piece of fabric P against the shaped bracket 2;

[0028] folding members 4 on the outer folding frame 3 to engage the portions of the edge of the piece of fabric PB and then fold the portions of the edge of the piece of fabric PB around the shaped bracket 2 and then disengage from the portions of edge of the piece of fabric PB;

[0029] a presser plate for fabric 5 on a movable support, to press over the piece of fabric P and over the portion of the surface of a sheet F so as to prevent the portions of the edge of the piece of fabric PB from opening in the absence of the shaped bracket 2, of the outer folding frame 3 and of the folding members 4.

[0030] The shaped bracket 2 is movable by means of its bracket support, in a working position resting over the portion of the surface of a sheet F and in a working position without the support plate 1.

[0031] The outer folding frame 3 is movable on the frame support, in working positions resting over the piece of fabric P.

[0032] Advantageously, at least one compensation means, between first compensation means 6 and second compensation means 7, is configured and operatively positioned to recover the separation and/or improving the contact between the piece of fabric P,

the portions of the edge of the piece of fabric PB and the portion of the surface of a sheet F.

[0033] In particular, the first compensation means 6 comprise a movable plate 61 in a direction perpendicular to the support plate 1.

[0034] With reference to [Fig. 12], [Fig. 13], in a first configuration, the movable plate 61 of the first compensation means 6 is adapted to press the portion of the surface of a sheet F against the folding members 4, to engage the portions of the edge of the piece of fabric PB folded around the shaped bracket 2.

[0035] With reference to [Fig. 14], [Fig. 15], in a second configuration, the movable plate 61 of the first compensation means 6 is adapted to press the portion of the surface of the sheet F against the portions of the edge of the piece of fabric PB, the folding members 4 being disengaged from the portions of the edge of the piece of fabric PB.

[0036] According to a preferred embodiment of the invention, the mobile plate 61 is driven by pneumatic means.

[0037] The movable plate 61 has a plurality of first holes 62 formed through the thickness of the movable plate 61. The first holes 62 are opposite the shaped bracket 2. An air chamber provided below of the support plate 1 is in communication with the air in the shaped bracket 2 through the first holes 62, the air chamber communicating with a vacuum pump by means of piping, not shown.

[0038] In particular, the second compensation means 7 comprise a movable frame 71 approximately open in a direction perpendicular to the support plate 1. The movable and open frame 71 is elastically connected with the presser plate 5 by means of a plurality of flexible foils 72.

[0039] With reference to [Fig. 18], [Fig. 19], in a third configuration, the movable and open frame 71 of the second compensation means 7 is adapted to press the piece of fabric P against the shaped bracket 2 by means of the plurality of flexible foils 72 to engage the portions of the edge of the piece of fabric PB folded around the shaped bracket 2, while the pressure plate 5 presses on the portion of the surface of a sheet F.

[0040] Referring to [Fig. 20], [Fig. 21], in a fourth configuration, the movable and open frame 71 is adapted to press the piece of fabric P against the portions of the edge of the piece of fabric PB folden by means of the plurality of flexible foils 72, the shaped bracket 2 being disengaged from the piece of fabric P and from the portions of the edge of the piece of fabric PB and the presser plate 5 pressed on the portion of the surface of a sheet F.

[0041] According to a preferred embodiment, an elastically deformable edge 73 is fixed with the presser plate 5 to allow the presser plate 5 to press uniformly on the surface portion of the sheet F through the elastically deformable edge 73.

[0042] The folding device for an automatic sewing machine for the piece of fabric P on a

portion of the surface of a sheet F consists of a pocket with its edges folded over a portion of a surface of a sheet of fabric.

[0043] A folding procedure for an automatic sewing machine comprises the following steps.

[0044] [Fig.8], [Fig. 9]. A piece of fabric P on a shaped bracket 2 placed on a bracket support, an outer folding frame 3 on a frame support to press the piece of fabric P against the shaped bracket 2, portions of the edge of the piece of fabric PB emerging from the boundary of the surface of the shaped bracket 2 and folded downwards by the outer folding frame 3.

[0045] [Fig.10], [Fig. 11]. The portions of the edge of the piece of fabric PB folded around the shaped bracket 2 thanks to folding members 4.

[0046] [Fig.12], [Fig. 13]. The shaped bracket 2, the outer folding frame 3 and the folding members 4 moved in a single block to make the folding members 4 press against the portion of the surface of a sheet F, first compensation means 6 pushed against the portion of the surface of a sheet F.

[0047] [Fig.14], [Fig. 15]. Disengagement of the folding members 4 from the portions of the edge of the piece of fabric PB and at the same time the first compensation means 6 pushed against the portion of the surface of a sheet F to press the portion of the surface of a sheet F against the portions of the edge of the piece of fabric PB.

[0048] [Fig.16], [Fig. 17]. The outer folding frame 3 and the folding members 4 moved away in a single block to disengage the piece of fabric P and the portion of the surface of a sheet F.

[0049] [Fig.18], [Fig. 19]. Second compensation means 7 connected to a presser plate 5 pushed against the piece of fabric P against the portion of the surface of a sheet F.

[0050] [Fig.20], [Fig. 21]. Disengagement of the shaped bracket 2 from the piece of fabric P and from the portions of the edge of the piece of fabric PB. At the same time, the first compensation means 6 pushed against the portion of the surface of a sheet F to press portion of the surface of a sheet F against the portions of the edge of the piece of fabric PB.

[0051] [Fig.22], [Fig. 23]. The first compensation means 6 and the second compensation means 7 moved in a single block to smooth the portion of the surface of a sheet F.

[0052] Not shown. Transverse movement in a single block, along the support plate 1, the presser plate 5 and of the piece of fabric P pressed on the portion of the surface of a sheet F, the portions of the edge of the piece of fabric PB folded on the portion of the surface of a sheet F, to reach the station where the sewing takes place of the piece P on the surface portion of a sheet F, on its peripheral edge folded, by a device for the formation of points.

Examples

[0053] The folding device for an automatic sewing machine allows to recover the automatic detachment and/or improve the contact between the piece of fabric, the edge portions of the piece of fabric and th e portion of the surface of a sheet.

[0054] It is achieved the object to obtain products of quality and value, of precise dimensions and finishes treated in detail.

[0055] The first and second compensation means are light to ensure the response required in order to recover the empty spaces left in the product during the main steps of folding of the edges and extraction of the knives.

[0056] In this way, the steps of the process ensure for the preparation of the piece, by plotting a contour of small geometric dimensions.

Claims

[Claim 1] Folding device for an automatic sewing machine, for sewing a piece of fabric (P) on a portion of the surface of a sheet (F), comprising:
- a support plate (1) for receiving the portion of the surface of a sheet (F);
- a shaped bracket (2) placed on a bracket support to support the piece of fabric (P);
- an outer folding frame (3) on a frame support to press the piece of fabric (P) against the shaped bracket (2);
- folding members (4) on the outer folding frame (3) to engage the portions of the edge of the piece of fabric (PB) and then fold the portions of the edge of the piece of fabric (PB) around the shaped bracket (2) and then disengage from the portions of edge of the piece of fabric (PB);
- a presser plate for fabric (5) on a movable support, to press over the piece of fabric (P) and over the portion of the surface of a sheet (F) so as to prevent the portions of the edge of the piece of fabric (PB) from opening in the absence of the shaped bracket (2), of the outer folding frame (3) and of the folding members (4);
the shaped bracket (2) movable by means of its bracket support, in a working position resting over the portion of the surface of a sheet (F) and in a working position without the support plate (1), the outer folding frame (3) movable on the frame support, in working positions resting over the piece of fabric (P);
- at least one, between first compensation means (6) and second compensation means (7), said first and said second compensation means (6), (7) configured and operatively positioned to recover the separation and/or improving the contact between the piece of fabric (P), the portions of the edge of the piece of fabric (PB) and the portion of the surface of a sheet (F);
- said first compensation means (6) comprising a movable plate (61) in orthogonal direction to the support plate (1);
said movable plate (61) adapted to press a portion of the surface of a sheet (F) against the folding members (4), to engage the portions of the edge of the piece of fabric (PB) folded around the shaped bracket (2) or to press the portion of the surface of a sheet (F) against the portions of the edge of the piece of fabric (PB), the folding members (4)

disengaged from the portions of the edge of the piece of fabric (PB); said folding device characterized in that the movable plate (61) has a plurality of first holes (62) drilled through the thickness of the movable plate (61), said first holes (62) in front of the shaped bracket (2), an air chamber provided under the support plate (1), in air communication with the shaped bracket (2) thanks to the first holes (62), the air chamber also communicating with a vacuum pump by means of piping, and in that said second compensation means (7) comprise a open movable frame (71) approximately in a orthogonal direction to the support plate (1), said open movable frame (71) elastically connected to said presser plate (5) by means of a plurality of flexible foils (72).

[Claim 2] Folding device for an automatic sewing machine according to the previous claim, characterized in that said open movable frame (71) is adapted to press the piece of fabric (P) against the shaped bracket (2) thanks to said plurality of flexible foils (72), to engage the portions of the edge of the piece of fabric (PB) folded around the shaped bracket (2), while the presser plate (5) presses over the portion of the surface of a sheet (F).

[Claim 3] Folding device for an automatic sewing machine according to claim 1, characterized in that said open movable frame (71) is adapted to press the piece of fabric (P) against the portions of the edge of the piece of fabric (PB) folded through said plurality of flexible foils (72), the shaped bracket (2) disengaged from the piece of fabric (P) and from the portions of the edge of the piece of fabric (PB) and the presser plate (5) pressed over the portion of the surface of a sheet (F).

[Claim 4] Folding device for an automatic sewing machine according to one of the preceding claims, characterized in that it comprises an elastically deformable edge (73) fixed to said presser plate (5) to allow said presser plate (5) to press uniformly over the portion of the surface of a sheet (F) by means of said elastically deformable edge (73).

[Claim 5] Folding procedure for an automatic sewing machine of the type according to claim 1, characterized in that it comprises the following steps:

a) a piece of fabric (P) on a shaped bracket (2) placed on a bracket support, an outer folding frame (3) on a frame support to press the piece of fabric (P) against the shaped bracket (2), portions of the edge of the piece of fabric (PB) emerging from the boundary of the surface of the shaped bracket (2) and folded downwards by the outer folding

frame (3);

b) the portions of the edge of the piece of fabric (PB) folded around the shaped bracket (2) thanks to folding members (4);

c) the shaped bracket (2), the outer folding frame (3) and the folding members (4) moved in a single block to make the folding members (4) press against the portion of the surface of a sheet (F), first compensation means (6) pushed against the portion of the surface of a sheet (F);

d) disengagement of the folding members (4) from the portions of the edge of the piece of fabric (PB) and at the same time the first compensation means (6) pushed against the portion of the surface of a sheet (F) to press the portion of the surface of a sheet (F) against the portions of the edge of the piece of fabric (PB);

e) the outer folding frame (3) and the folding members (4) moved away in a single block to disengage the piece of fabric (P) and the portion of the surface of a sheet (F);

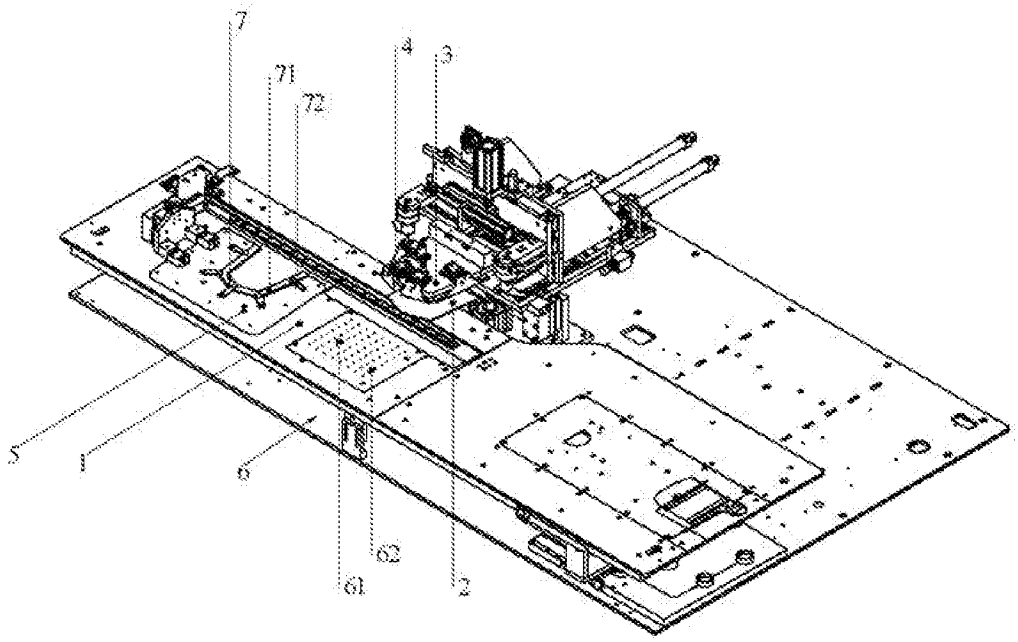
f) second compensating means (7) connected to a presser plate (5) pushed against the piece of fabric (P) and against the portion of the surface of a sheet (F);

g) disengagement of the shaped bracket (2) from the piece of fabric (P) and from the portions of the edge of the piece of fabric (PB) and at the same time the first compensation means (6) pushed against the portion of the surface of a sheet (F) to press portion of the surface of a sheet (F) against the portions of the edge of the piece of fabric (PB);

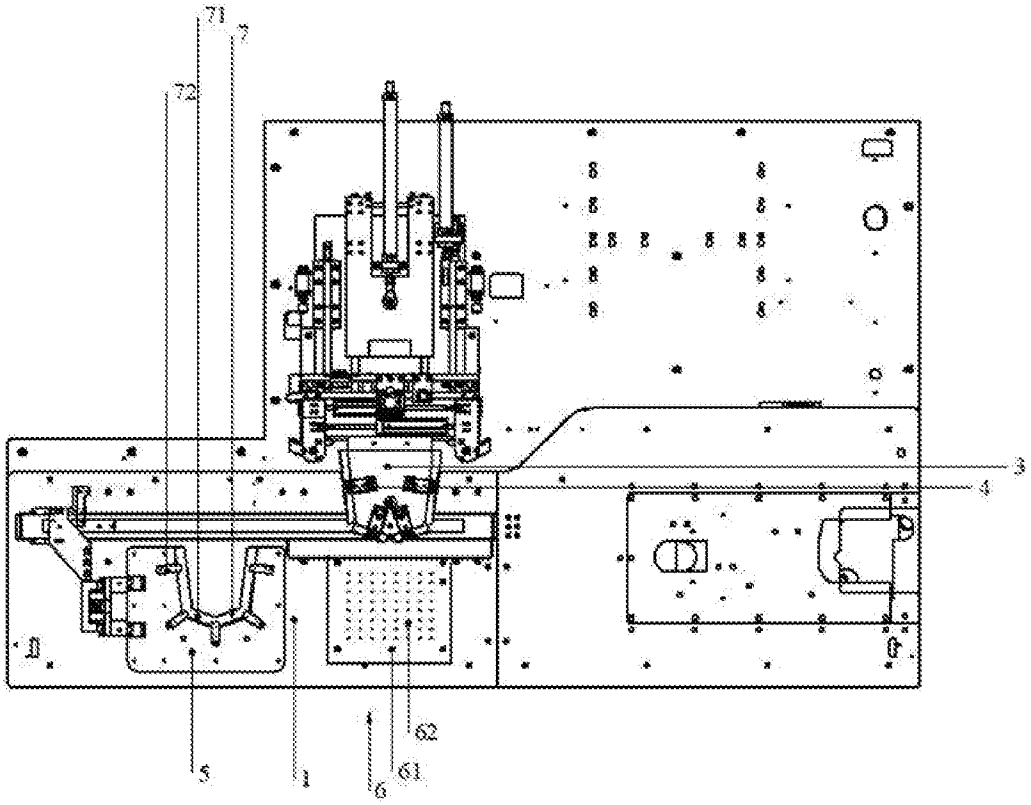
h) the first compensation means (6) and the second compensation means (7) moved in a single block to flatten the portion of the surface of a sheet (F);

i) transverse displacement in a single block, along the support plate (1), of the presser plate (5) and of the piece of fabric (P) pressed over the portion of the surface of a sheet (F), the portions of the edge of the piece of fabric (PB) folded over the portion of the surface of a sheet (F), to reach the location where the piece of fabric (P) is sewn over the portion of the surface of a sheet (F), along its folded peripheral edge, by means of a points forming device.

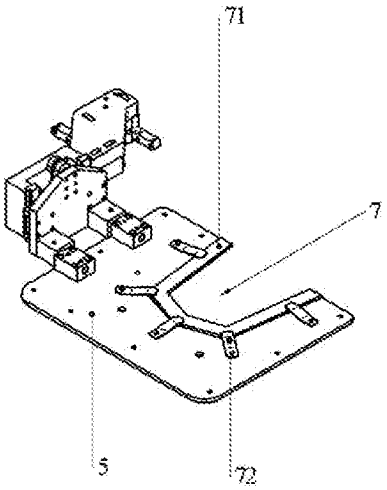
[Fig. 1]



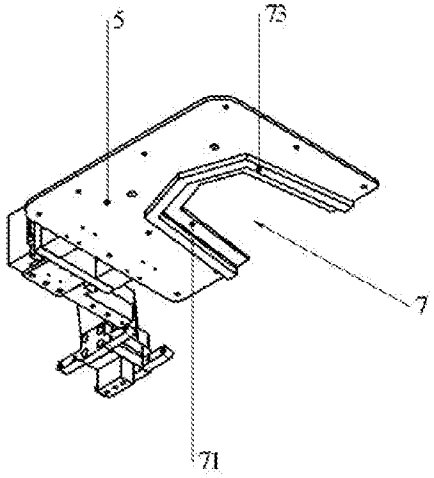
[Fig. 2]



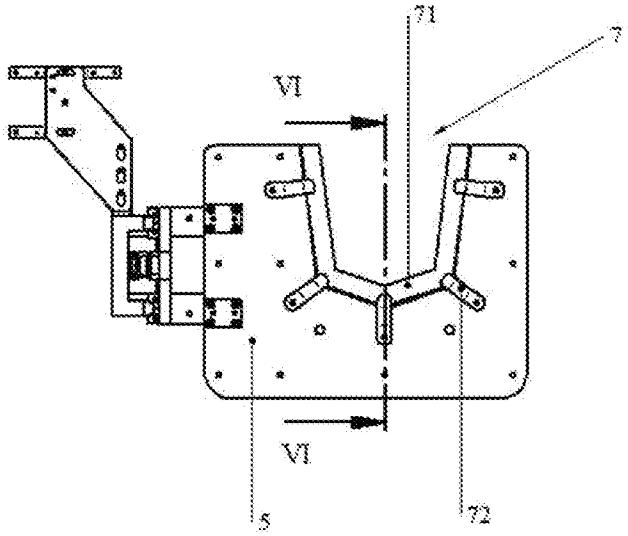
[Fig. 3]



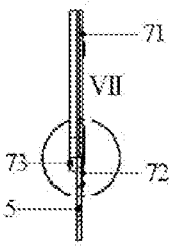
[Fig. 4]



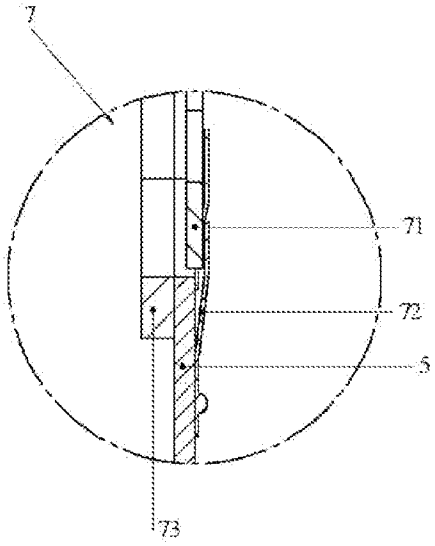
[Fig. 5]



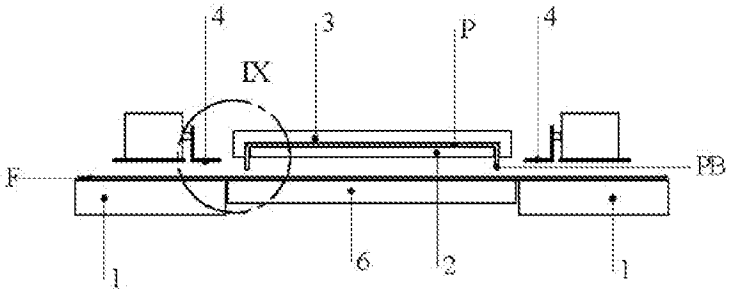
[Fig. 6]



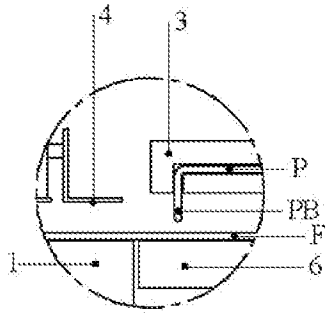
[Fig. 7]



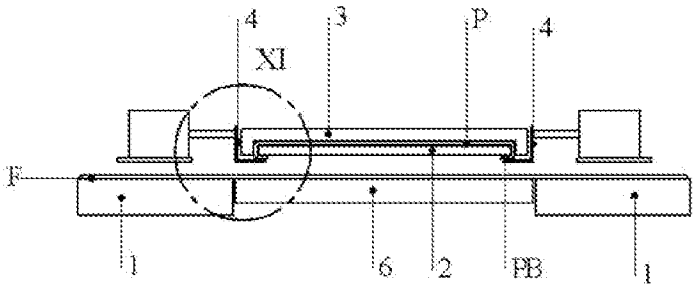
[Fig. 8]



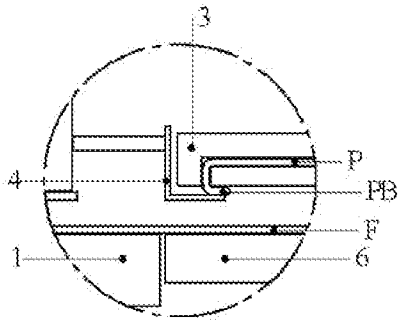
[Fig. 9]



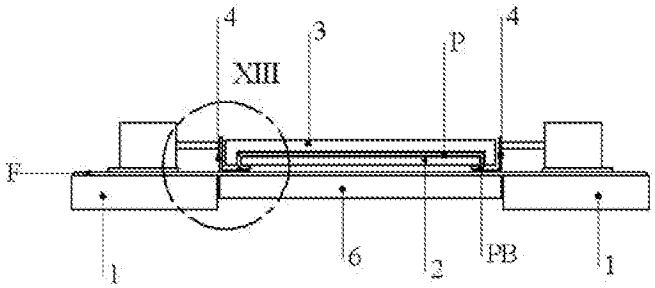
[Fig. 10]



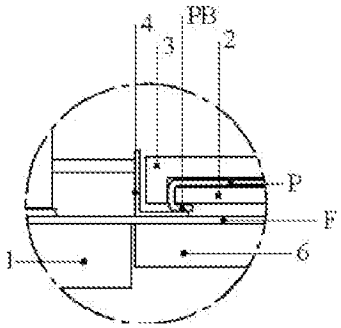
[Fig. 11]



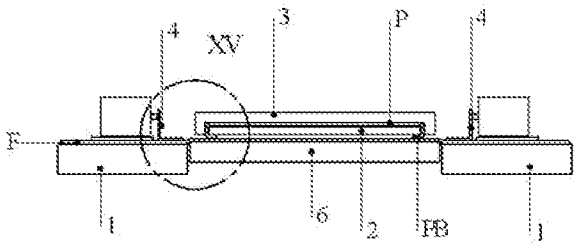
[Fig. 12]



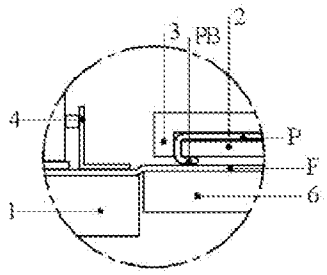
[Fig. 13]



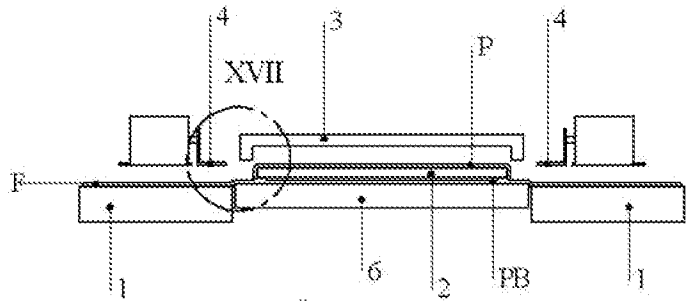
[Fig. 14]



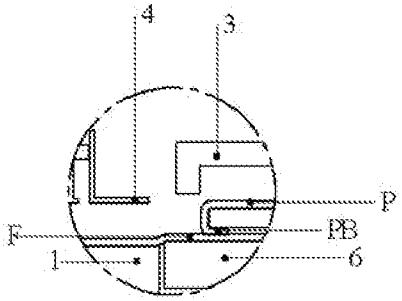
[Fig. 15]



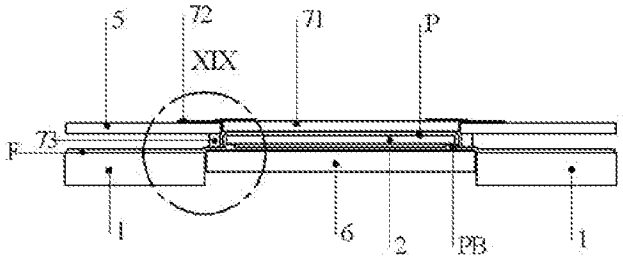
[Fig. 16]



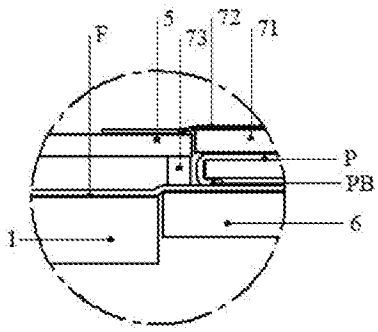
[Fig. 17]



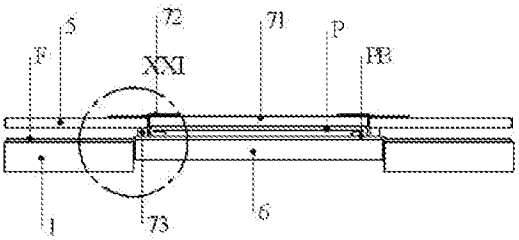
[Fig. 18]



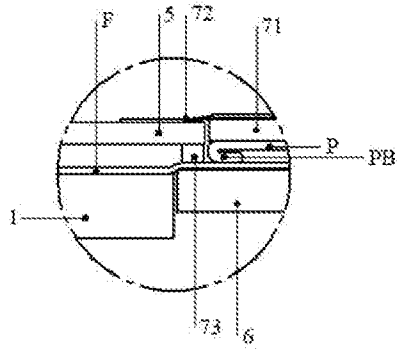
[Fig. 19]



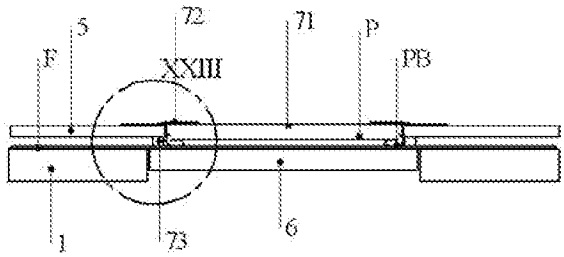
[Fig. 20]



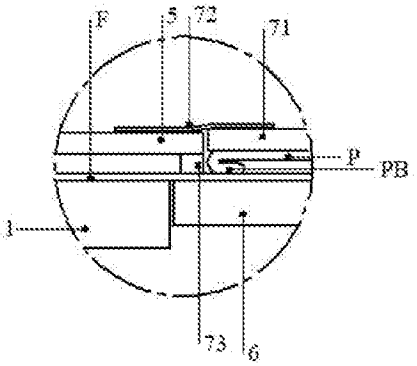
[Fig. 21]



[Fig. 22]



[Fig. 23]



INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2019/050099

A. CLASSIFICATION OF SUBJECT MATTER
INV. D05B35/04
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
D05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 809 920 A (ZANTOPP JUERGEN [DE] ET AL) 22 September 1998 (1998-09-22) column 3, line 42 - column 5, line 49; figures 1-5	1-5
A	US 4 445 631 A (DEL CASTILLO-OLIVARES FERNANDO) 1 May 1984 (1984-05-01) column 3, line 29 - column 7, line 68; figures 1-19	1-5
A	US 5 553 564 A (PUTNEY LAWRENCE B [US]) 10 September 1996 (1996-09-10) column 5, line 16 - column 15, line 25; figures 1-14	1-5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
19 July 2019	30/07/2019

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IT2019/050099

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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