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(54) **Apparatus for feeding a quilting machine with a cloth to be quilted**

(57) An apparatus for feeding a quilting machine with a cloth (P) to be quilted, composed of superimposed sheets (T1, T2, T3) which are unwound from respective rolls (C1, C2, C3) in an advancement direction (B), and comprising longitudinal gripper elements (19, 20, 21, 22) which can move between a closer position for gripping the lateral edges of said cloth (P) which are parallel to said advancement direction (B) and a spaced position for widening the cloth (P), transverse grip means which are arranged downstream of said longitudinal gripper elements (19, 20, 21, 22) and are associated with elements (11, 12) for conveying the cloth (P) and means (10) for the transverse locking of the cloth (P) which are arranged upstream of the longitudinal gripper means (19, 20, 21, 22), auxiliary means (29) being arranged upstream of the transverse locking means (10) and being suitable to act on the upper sheet (T2) and produce an elongation thereof with respect to the underlying sheets (T1, T3).

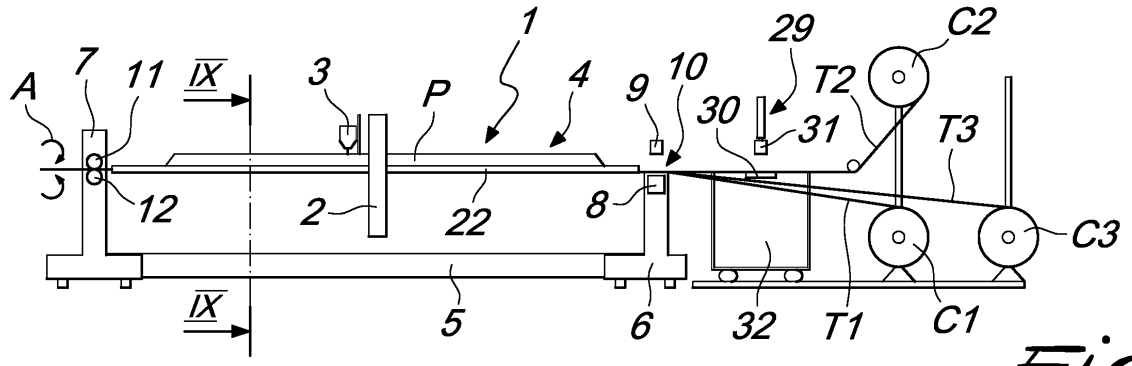

Fig. 1

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Description

[0001] The present invention relates to an apparatus for feeding a quilting machine with a cloth to be quilted.

[0002] For the sake of clarity in terminology, in the continuation of the description and in the claims, the term "cloth" is used to reference any single- or multilayer article composed of one or more superimposed sheets of woven or nonwoven fabric, on which quilting is performed.

[0003] For the production of articles known as quilts, duvets and the like, quilting machines are known which comprise an apparatus which allows first of all to unroll individual sheets from the respective rolls on which they are rolled up and then mutually superimpose them so as to form a cloth which is made to advance on a frame which is equipped with means which, after gripping it on its sides, tension it in order to allow perfect quilting by means of sewing machines which are actuated on it in order to produce the quilting lines according to the intended pattern.

[0004] An apparatus of this type is known for example from Italian patent No. 1290697 in the name of this same Applicant. In this apparatus, the frame is provided with two longitudinal grip elements and with two transverse grip elements, which are suitable to grip the cloth to be quilted at its four sides. The transverse grip elements are arranged upstream and respectively downstream of the longitudinal elements with respect to the cloth advancement direction. In particular, the downstream grip element is constituted by two contrarotating rollers, which are designed to actuate the advancement of the cloth by an extent which corresponds to the intended length and, in cooperation with the upstream grip element and the other two longitudinal grip elements, to keep it taut in order to allow quilting.

[0005] However, with the apparatus described above it is problematic to perform quilting when the cloth comprises sheets which have different characteristics of elasticity or in any case are extensible to mutually different extents because they are made of fabrics subjected to embossing processes, i.e., to the formation of reliefs and hollows which facilitate their elongation, and are also known as "stretch fabric" or simply "stretch". With these fabrics, especially if used as outer sheets of the cloth, the quilted article in fact has considerable manufacturing irregularities, such as wrinkles or creases or excessively taut regions which make the product unsightly and unacceptable for marketing.

[0006] The aim of the present invention is to improve current apparatuses so as to obviate the above cited drawbacks which arise from the different material characteristics with which the sheets that compose the cloth are made.

[0007] Within this aim, an object of the present invention is to provide an apparatus which is capable of offering a better performance without thereby requiring such a technical expenditure as to compromise its competitiveness.

[0008] This aim and this and other objects that will become better apparent hereinafter are achieved with an apparatus for feeding a quilting machine with a cloth to be quilted, composed of superimposed sheets which are unwound from respective rolls in an advancement direction, and comprising longitudinal gripper means which can move between a closer position for gripping the lateral edges of said cloth which are parallel to said advancement direction and a spaced position for widening the cloth, transverse grip means which are arranged downstream of said longitudinal gripper means and are associated with means for conveying said cloth and means for the transverse locking of said cloth which are arranged upstream of said longitudinal gripper means, characterized in that auxiliary means are arranged upstream of said transverse locking means and are suitable to act on the upper sheet and produce an elongation thereof with respect to the underlying sheets.

[0009] In an advantageous embodiment of the invention, the conveyance means are actuated so as to produce a stepwise advancement of the cloth to be quilted with a step which is equal to the length of the cloth, and said auxiliary means are constituted by grip means which are suitable to grip the upper sheet and pull it in the opposite direction with respect to the advancement direction of the cloth at the end of each advancement step.

[0010] Preferably, the apparatus further associates with the longitudinal gripper means additional grip means which are suitable to grip the upper sheet and produce a widening thereof transversely to the advancement direction of the cloth at the end of each advancement step.

[0011] Further characteristics and advantages of the invention will become better apparent from the following detailed description of an embodiment thereof, shown in the accompanying drawings, wherein:

Figure 1 is a schematic side elevation view of the apparatus according to the invention in a first step of operation;
Figure 2 is a plan view of the apparatus of Figure 1;
Figure 3 is a schematic side elevation view of the apparatus in a second step of operation;
Figure 4 is a plan view of the apparatus of Figure 3;
Figure 5 is a schematic side elevation view of the apparatus in a third step of operation;
Figure 6 is a plan view of the apparatus of Figure 5;
Figure 7 is a schematic side elevation view of the apparatus in a fourth step of operation;
Figure 8 is a plan view of the apparatus of Figure 7;
Figures 9, 10, 11 are three sectional views, taken on the lines IX-IX of Figure 1, X-X of Figure 3, and XI-XI of Figure 4.

[0012] With reference to Figures 1, 2 and 9, the reference numeral 1 designates a generic quilting machine, which is not shown in detail since it is substantially traditional. Of this machine, a beam 2 and an apparatus 4 are shown schematically: the beam supports a sewing

machine 3 and the apparatus 4 positions and feeds a multilayer cloth P to be quilted (Figure 9), which is composed by way of example of a lower sheet T1, an upper sheet T2 and an intermediate sheet T3 which is thicker and is constituted by a soft material. It is further assumed that the upper sheet T2 is more elastic than the sheets T1, T3 because it is constituted by an embossed fabric. The number and quality of the sheets may of course be any, without altering the higher elasticity of the upper sheet.

[0013] The beam 2 can slide on rails in the direction X, while the sewing machine 3 can slide along the beam 2 in the direction Y, at right angles to the direction X. The feeding and advancement direction of the cloth P to be quilted is designated by the arrow B. The actuation motors of the beam 2 and of the sewing machine 3 are controlled by control elements so as to trace on the cloth P the quilting lines provided by a preset program.

[0014] The apparatus according to the invention, which allows the cloth P to be fed and positioned below the sewing machine 3, comprises a frame from a footing 5 of which uprights 6, 7 rise. The uprights 6 are connected at the top by a beam 8 and support a bar 9 which, by way of suitable linear actuators, for example of the pneumatic type, not shown in the figures, can be raised and lowered with respect to the beam 8. In this way, the bar 9 and the beam 8 constitute a stationary transverse locking element, generally designated by the reference numeral 10, which allows to retain or release the cloth P driven between them.

[0015] The uprights 7 support at the top two rollers 11, 12, which are actuated so as to rotate in opposite directions with the orientation A by an appropriate motor drive, which is not shown. The rollers 11, 12 act together tangentially so as to clamp on the cloth P guided between them and thus act, in the stopped condition, as a cloth grip element and, in the actuation condition, as an element for conveying the cloth in the direction B.

[0016] Two mutually parallel longitudinal members 13, 14 lie between the uprights 6 and 7 and are supported by the frame so that they can move mutually closer and further apart with respect to the central plane C of the apparatus. The approach and spacing movement is actuated by linear actuators of any kind, for example pneumatic cylinders, or by means of gear drives actuated by electric motors.

[0017] The upper faces of the longitudinal members 13, 14 are flat and act as a support for the lateral edges of the cloth, more specifically of the two sheets T1, T3. Further, two profiled elements 17, 18 are pivoted on the longitudinal members about axes 15, 16 which are parallel to the direction X, and have an L-shaped cross-section in which the free edge is folded downward, so as to provide, together with the longitudinal members 13, 14, two gripper elements 19, 20, which are suitable to grip and release the sheets T1, T3. For this purpose, the profiled elements 17, 18 are actuated by actuators (not shown) so that they can be raised and lowered onto the longitudinal members 13, 14 in order to clamp on the longitudinal members the edges of the sheets T1, T3 and therefore, by means of the spacing of the longitudinal members, produce the tensioning of the sheets T1, T3 in the transverse direction Y.

[0018] Likewise, two respective mutually opposite longitudinal gripper elements, generally designated by the reference numerals 21, 22, are supported on the profiled elements 17, 18; each gripper element is composed of a flat element 23, 24 and a profiled element 25, 26 which has an L-shaped cross-section and an edge which is folded toward the flat element 23, 24. The flat elements 23, 24 and the profiled elements 25, 26 are mutually pivoted about axes 27, 28 which are parallel to the axes 15, 16 of the underlying gripper elements 19, 20.

[0019] The gripper elements 21, 22 are actuated, by way of actuators which are not shown, between an open position, to allow the positioning of the lateral edges of the upper sheet T2 between the flat elements 17, 18 and the respective profiled elements 25, 26, and a closed position, in order to grip said edges. Further, the gripper elements 21, 22 are actuated, by way of further actuators which are not shown, between a mutually close position, in which they grip the lateral edges of the upper sheet T2, and a spaced position in order to allow the tensioning of the upper sheet T2 in the transverse direction Y. In particular, it is noted that the lower gripper elements 19, 20 perform a mutual spacing stroke which is shorter than the stroke of the upper gripper elements 21, 22, so that the upper sheet T2 undergoes an elongation in a transverse direction Y which is greater than the elongation of the sheets T1, T3 which allows to equalize the transverse tension of all three sheets T1, T2, T3.

[0020] In order to equalize the tension of the three sheets also in the longitudinal direction X, according to the invention there is an additional transverse grip element 29 for the upper sheet T2 which is arranged upstream of the locking element 10 and, differently from the latter, can move in the direction X.

[0021] The element 29 is composed of a beam 30 and a bar 31 which is arranged parallel to the beam 30 and above it. The beam 30 and the bar 31 are mounted on a carriage which is shown schematically in the figures, is designated by the reference numeral 32 and can move back and forth in the direction X by means of an actuator which is not shown. The bar 31 is constituted by two elements which can slide telescopically within each other and can be raised and lowered with respect to the beam 30 by way of respective actuators, which are not shown. The lifting and lowering of the bar 31 is designed to grip or release the upper sheet T2 which is guided between the bar and the beam 30, while the elongation of the bar is intended to tension the sheet T2 when it is locked by the element 10.

[0022] The operation of the described apparatus, although intuitive from the provided description, is as follows.

[0023] Assume that the apparatus is in the operating

condition shown in Figures 1, 2, in which sheets T1, T2, T3, after being unwound from the respective rolls C1, C2, C3 and conveyed through the grip element 29, the locking element 10 and the gripper elements 19, 20 and 21, 22, are gripped with the front end between the contrarotating rollers 11, 12.

[0024] It is noted in particular that the sheets T1, T3, after being guided below the beam 30 of the grip element 29, are guided between the beam 8 and the bar 9 of the locking element 10 and have lateral edges which are arranged between the longitudinal members 13, 14 and the respective profiled elements 17, 18 of the gripper elements 20.

[0025] At the same time, the upper sheet T2 is guided between the beam 30 and the telescopic bar 31 of the clamp element 29, which is assumed to be in the open condition, then between the beam 8 and the bar 9 of the locking element 10, and finally between the flat elements 23, 24 and the profiled elements 25, 26 of the gripper elements 21, 22.

[0026] In a second step, shown in Figures 2 and 6, the locking element 10 is activated and initially, by means of an elongation of the bar 31, produces a widening of the upper sheet T2 and then, by way of a movement of the carriage 32 in the opposite direction with respect to the direction B, elongates the sheet T2 by a preset extent which is set according to the elastic characteristics of the material of which the sheet is made.

[0027] At this point, a third step, shown in Figures 3, 7 and 10, 11, is started and spaces the gripper elements 19, 21 from the opposite gripper elements 20, 22, allowing to tension transversely the two lower sheets T1, T3 and the upper sheet T2 until the latter (due to the longer stroke of the upper grip elements 21, 22 with respect to the stroke of the lower grip elements 19, 20) has reached the same widening as the portion upstream of the locking element 10.

[0028] In a subsequent fourth step, shown in Figures 4, 8, a rectangular cloth P is formed which is kept tensioned in the transverse direction Y between the gripper elements 19-22 and in a longitudinal direction X between the locking element 10 and the rollers 11 and 12, ready to perform quilting, during which the gripper element 29 is returned to the starting point adjacent to the locking element 10.

[0029] Once quilting has ended, the gripper elements 19-22 and the locking elements 10 are opened in order to allow the rollers 11, 12 to push out of the quilted cloth and feed into the apparatus a new portion of sheets to be tensioned before the quilting of a subsequent cloth.

[0030] The steps of operation follow each other in the described manner.

[0031] As can be seen, the described apparatus perfectly achieves the intended aim and object. In particular, the apparatus allows to equalize the transverse tension with respect to the longitudinal tension by adjusting the stroke of the gripper elements 19-22 with respect to the stroke of the element 29, so as to compensate for any differences in elasticity of the fabric in the weft direction with respect to the warp.

[0032] Numerous modifications and variations are possible in the practical embodiment of the invention, and all are within the scope of the appended claims. For example, instead of providing two gripper elements on each side of the cloth, it is possible to provide a single element which grips the edges of all the sheets and comprises an upper jaw provided with friction means which, during the transverse widening step, by acting on the most elastic sheet, allow to move it laterally, by making it slide on the underlying sheets and thus elongating it transversely with respect to them.

[0033] In another embodiment, conceived for machines which perform the quilting of a continuously unwound cloth, the lateral gripper elements are equipped with divergent means which are suitable to produce a widening of the upper sheet during the advancement of the cloth, while the elongation of the cloth is determined by providing braking means which act on the upper cloth so as to produce a longitudinal elongation thereof.

[0034] The disclosures in Italian Patent Application No. BO2005A000737 from which this application claims priority are incorporated herein by reference.

[0035] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An apparatus for feeding a quilting machine with a cloth (P) to be quilted, composed of superimposed sheets (T1, T2, T3) which are unwound from respective rolls (C1, C2, C3) in an advancement direction (B), and comprising longitudinal gripper elements (19, 20, 21, 22) which can move between a closer position for gripping the lateral edges of said cloth (P) which are parallel to said advancement direction (B) and a spaced position for widening the cloth (P), transverse grip means which are arranged downstream of said longitudinal gripper elements (19, 20, 21, 22) and are associated with elements (11, 12) for conveying said cloth (P) and means (10) for the transverse locking of said cloth (P) which are arranged upstream of said longitudinal gripper means (19, 20, 21, 22), **characterized in that** auxiliary means (29) are arranged upstream of said transverse locking means (10) and are suitable to act on the upper sheet (T2) and produce an elongation thereof with respect to the underlying sheets (T1, T3).

2. The apparatus according to claim 1, **characterized**

in that said auxiliary means (29) are constituted by a transverse gripper element which can move in a direction (X) which is parallel to the advancement direction (B) of said cloth (P) between an advanced position, in which said element (29) grips the upper sheet (T2) of said cloth (P), and a retracted position, in which said element (29) produces a longitudinal elongation of said sheet (T2) with respect to the lower sheets (T1, T3).

3. The apparatus according to claim 1 or 2, **characterized in that** said longitudinal gripper elements (19, 20, 21, 22) comprise a first pair of lower gripper elements (19, 20), which are suitable to grip the edges of the lower sheets (T1, T3) of said cloth (P), and a second pair of upper gripper elements (21, 22), which are suitable to grip the edges of the upper sheet (T2), the gripper elements of said second pair (21, 22) being movable mutually further apart than the gripper element of said first pair (19, 20).

4. The apparatus according to one of claims 2 and 3, **characterized in that** said transverse gripper element (29) is constituted by a beam (30) which is arranged transversely to the advancement direction (B) of the sheets (T1, T2, T3) and by a telescopically extensible bar (31) which is associated in a parallel arrangement with said beam (30), first actuation means being provided in order to move said bar (31) into a position for clamping said upper sheet (T2) guided between said bar (31) and said beam (30) when said beam is positioned proximate to said locking element (10), second actuation means being provided to extend said bar (31) when said upper sheet (T2) has been clamped between said bar (31) and said beam (30) so as to produce a widening of said sheet (T2) transversely to its advancement direction (B).

5. The apparatus according to one of claims 3 and 4, **characterized in that** each lower gripper element (19, 20) of said first pair is constituted by a longitudinal member (13, 14), which lies between said grip and conveyance means (11, 12) and said locking element (10) and has a flat supporting surface for the lateral edges of the lower sheets (T1, T3) of the cloth (P), and by a profiled element (17, 18), which is pivoted to said longitudinal member (13, 14) and is actuated between a raised position, in order to allow the sliding of the edges of the lower sheets (T1, T3), and a lowered position on said longitudinal member (13, 14) in order to grip the edges of the lower sheets (T1, T3) and allow their transverse tensioning, and **in that** each upper gripper element (21, 22) of said second pair is constituted by a flat element (23, 24), which is supported on said lower gripper element (19, 20), and by a profiled element (25, 26), which is pivoted to said flat element (23, 24) and is actuated between a raised position, in order to allow the sliding of the edges of the upper sheet (T2), and a lowered position on said flat element (23, 24), in order to grip the edges of the upper sheet (T2) and allow its transverse tensioning, said upper gripper elements (21, 22) being actuated in a transverse direction (Y) so as to produce a transverse widening of said upper sheet (T2) which is greater than that of the lower sheets (T1, T3).

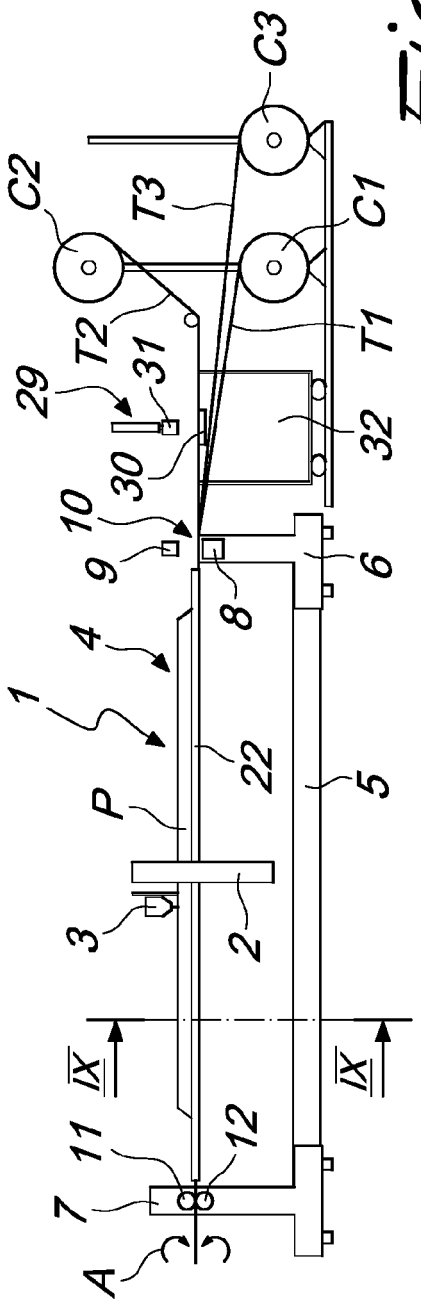

C3
C2
T3
C1
T2
T1
29
31
32
30
10
9
8
6
4
1
P
22
5
3
2
IX
IX
11
12
7
A

Fig. 1

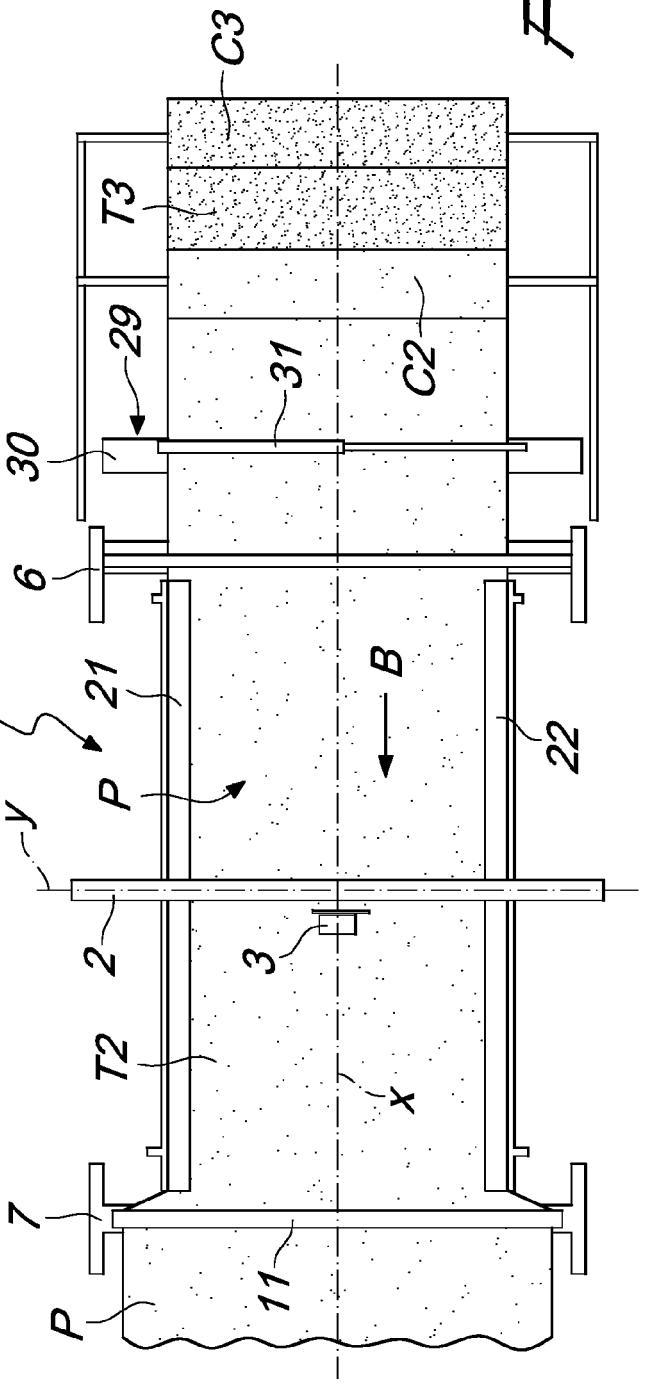

C3
T3
29
31
C2
30
6
1
21
B
22
P
y
2
3
T2
x
7
11
P

Fig. 5

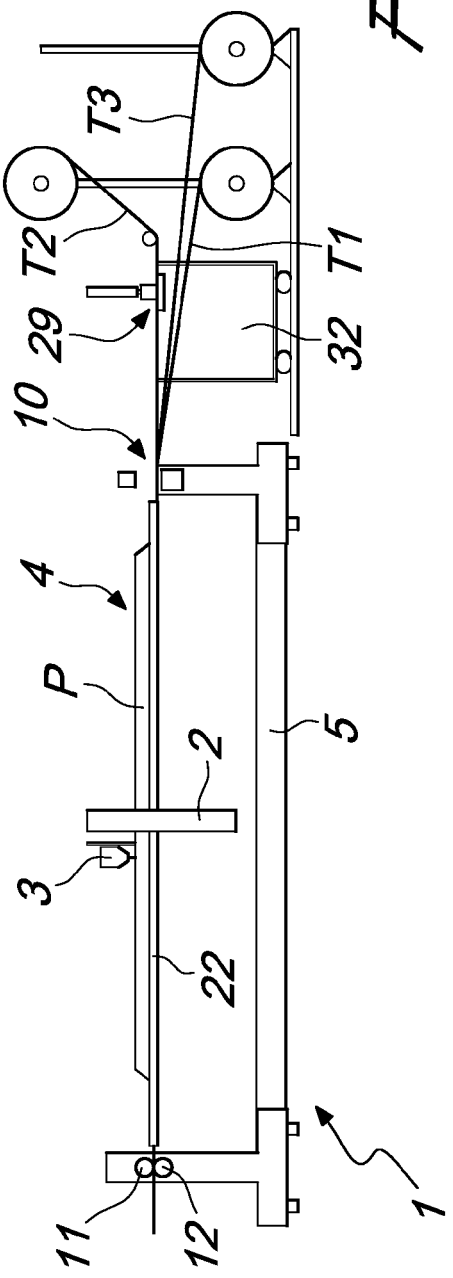


Fig. 2

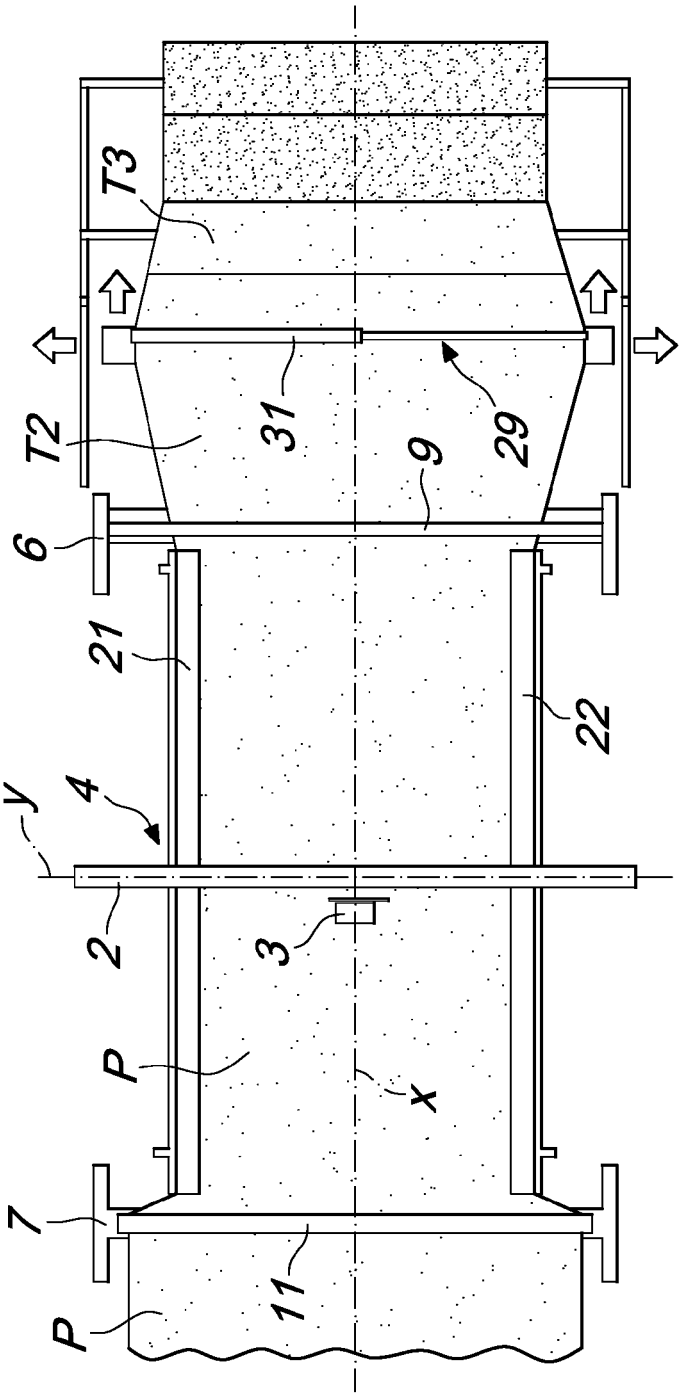


Fig. 6

Fig. 3

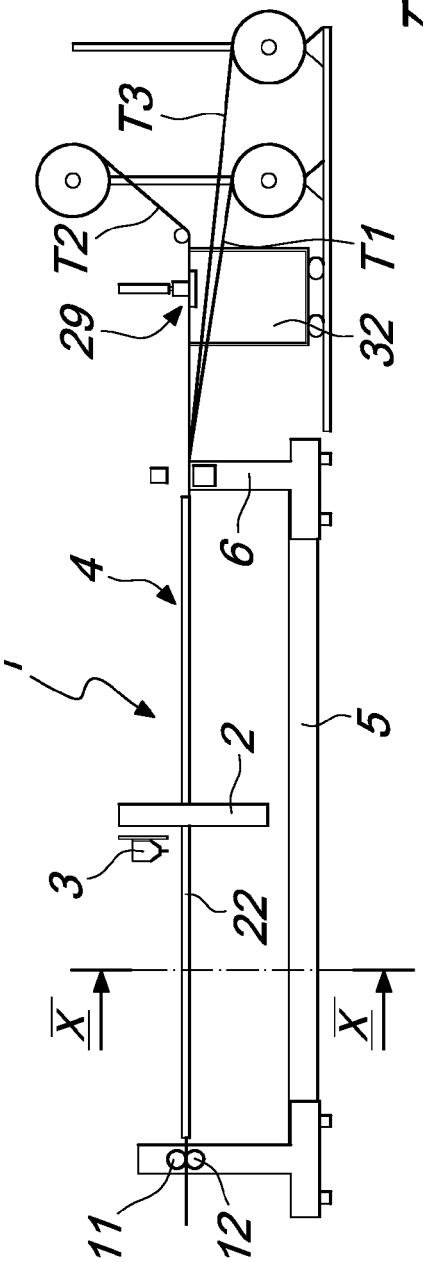

T3
T2
T1
29
32
6
4
1'
2
5
3
22
X
X
11
12

Fig. 7

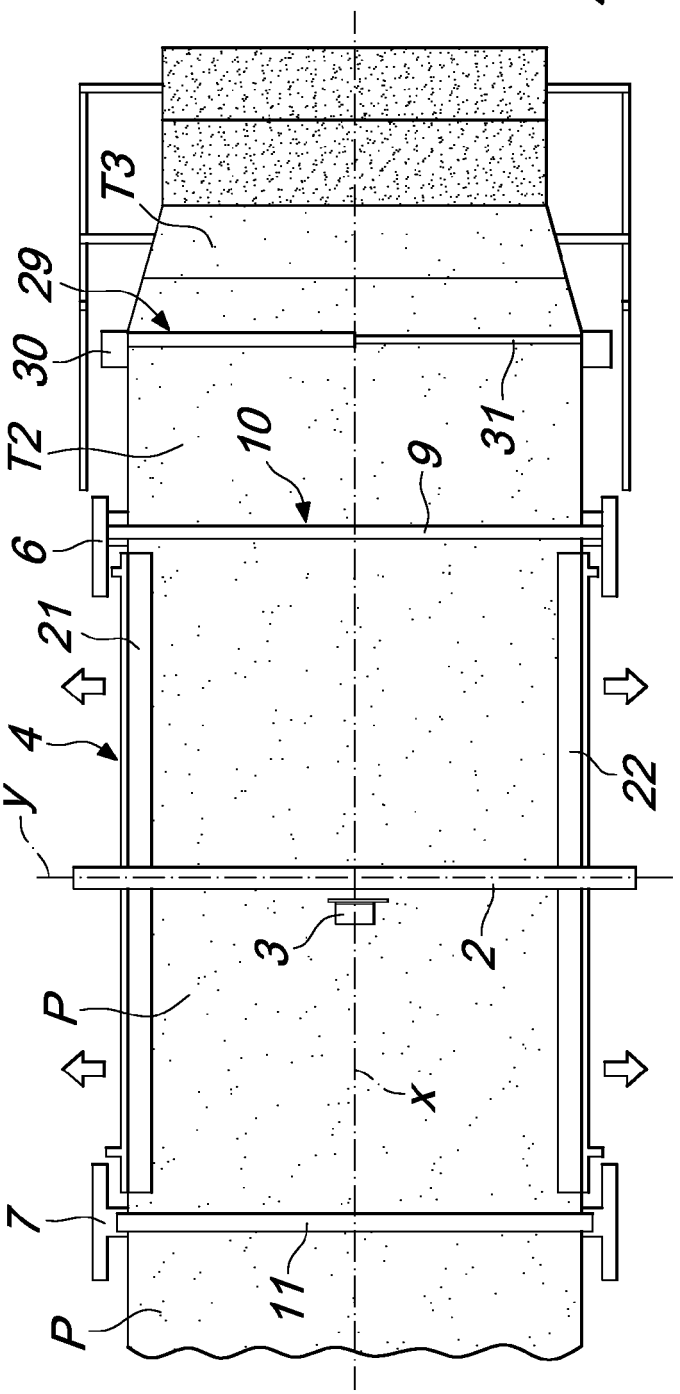

T3
29
30
T2
10
9
31
6
21
4
22
y
3
2
P
x
7
11
P

Fig. 4

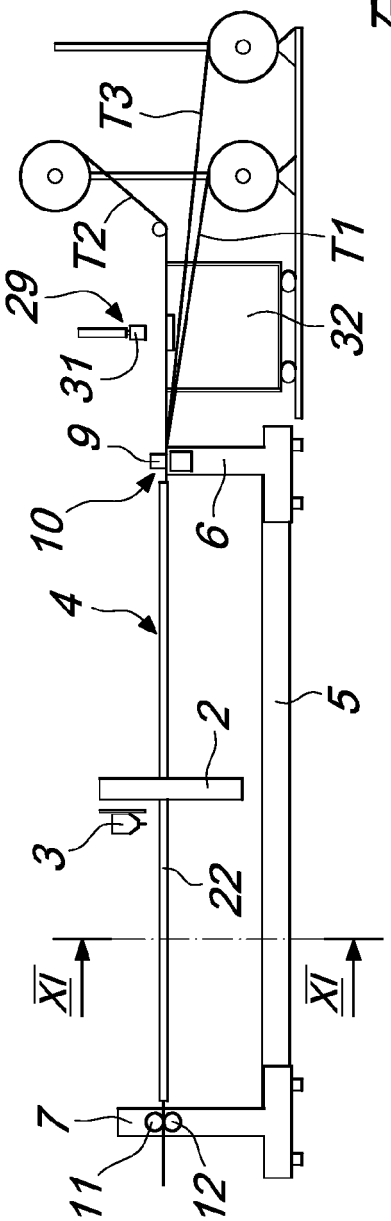
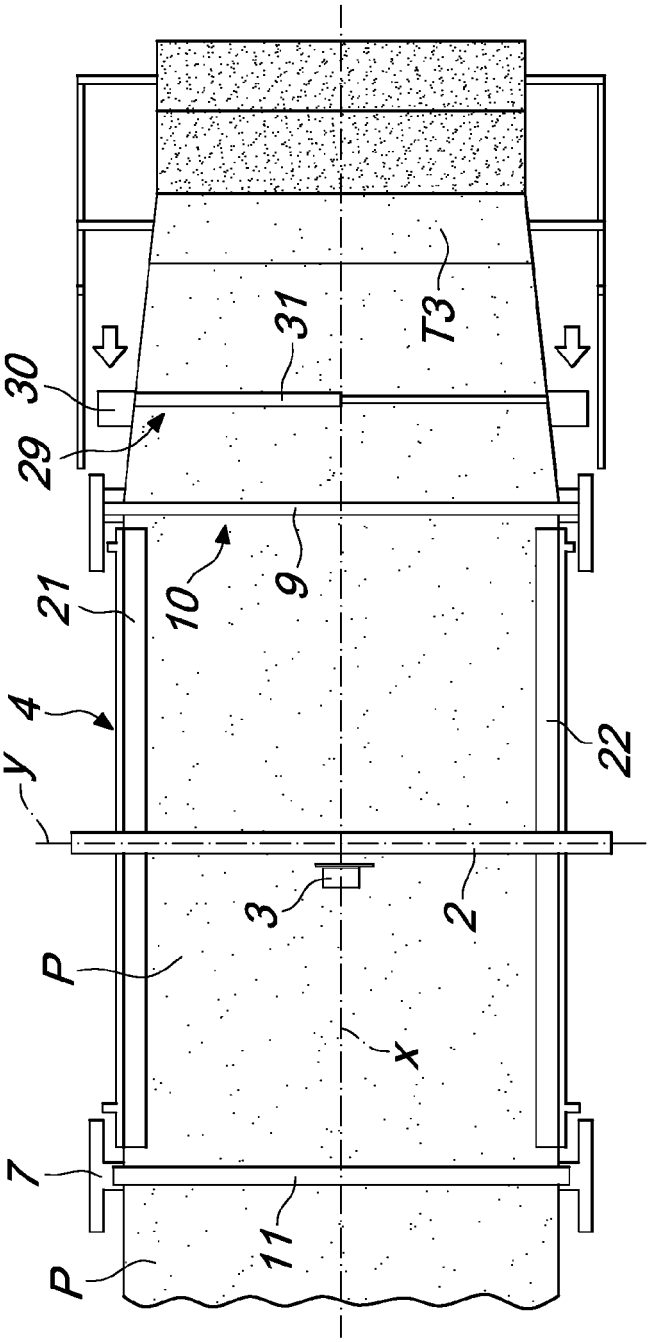

T3
T2
T1
29
31
32
9
10
6
4
5
2
3
22
XI
XI
7
11
12

Fig. 8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x
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11
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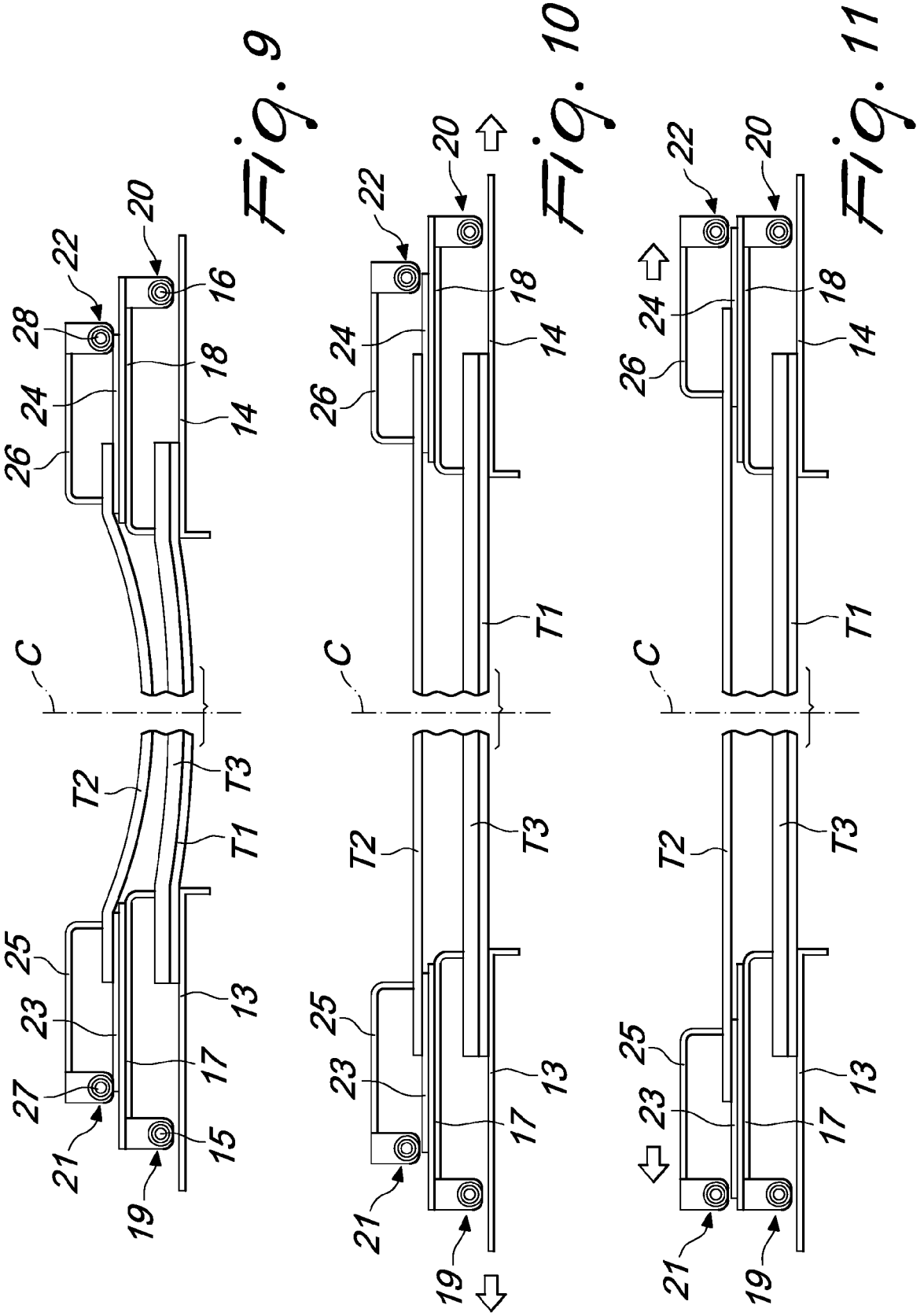
Fig. 9
Fig. 10
Fig. 11
C
T1
T2
T3
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- IT 1290697 **[0004]**
- IT BO20050737 A **[0034]**