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(54) **Method for sewing hems in patches of fabric or the like and apparatuses for manufacturing said items**

(57) Method and apparatus for sewing hems in patches (10) of fabric or the like, in particular for providing lateral hems in napkins. The system provides for longitudinally advancing said patches (10) at a pre-set velocity (V1), and to fasten, by sewing, a first and a second lateral edge (13, 14) in a folded condition to the central segment (16) of each patch. The system uses, for the lateral sewing of said first and second lateral edges (12, 14) of the patch (10), a first pair of sewing machines (18, 18) and a second pair of sewing machines (20, 20) lon-

gitudinally distanced from said first pair of sewing machines. Said first (18, 18) and second (20, 20) pairs of sewing machines provide seams with knotted stitches and are activated, in mutually alternative fashion, to provide said lateral seams (17, 17) on respective patches (10). According to a further aspect, it is provided for said first pair of sewing machines to be such as to sew a chain stitch and for said second pair of sewing machines to be such as to provide knotted stitch seams able to define fastening seams in correspondence with the extremities of said lateral seams.

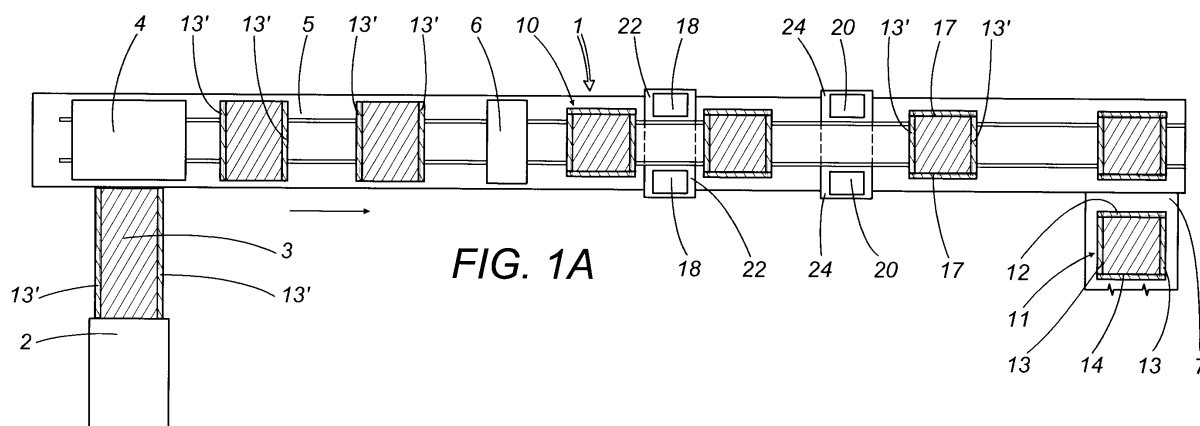


FIG. 1A

Description

[0001] The present invention relates in general to methods for manufacturing hems in patches of fabric or the like, and in particular for manufacturing seams of lateral hems in napkins or the like.

[0002] The present methods being preferably usable in apparatuses for manufacturing said hemmed items, in particular napkins or the like, which also constitute the subject of the present invention.

[0003] Currently, apparatuses or plants for the automatic manufacture of said napkins provide, for the manufacture of said hem, for folding the lateral edges of the individual bi-dimensional patch to bring them in contact and fasten them, by sewing, to the central portion of the napkin.

[0004] In such known apparatuses or plants, sewing machines are used, to effect said lateral hemming seams, which employ a stitch named and known in the sector as "double chain stitch", which is advantageous relative to other sewing systems, thanks to the fact that it can be executed with spools for feeding the sewing threads that present large sizes, being able to be positioned in appropriate seats overlying the sewing machine, and whose replacement by the assigned personnel can be performed at considerable time intervals, overcoming the need for specific and continual attention on the personnel's part.

[0005] This kind of seam with "double chain" stitch, although it does allow to operate in automatic, at considerable speed, on a large number of napkins, nonetheless still presents the drawback of providing a seam that is not sufficiently robust and resistant to unravelling, so that, after the repeated washings where to said napkins are subjected, the seams themselves become worn, with their consequent breakage and disassembly, which propagates, generally starting from the extreme parts of the seams, shortly reaching the complete unravelling of the entire hem seams.

[0006] A further type of seam used for the execution of said hems of napkins and the like is the so-called "knotted stitch" seam, which is used in relation to sewing machines commanded manually by the personnel according to a wholly traditional operating mode, preceding the advent of the aforesaid automatic machines.

[0007] Advantageously, such a destruction of the hem generally does not take place in case of seams executed with "knotted stitch", wherein even the breakage of the seam itself, resulting from wear and repeated washings, in correspondence with some stitches, does not also cause the further unravelling of the whole seam and the destruction of the whole hem, as occurs for the chained stitch seam.

[0008] This notwithstanding, the "knotted stitch" seam is still inconvenient and not advantageous in view of its use in automatic apparatuses, since the machines that effect such seams require the periodic substitution of the traditional spool situated in a position underlying the

sewing plane of the apparatus and which, because it must be contained inside the movable shuttle for gripping and forming the loop, which is inserted through the fabric by the needle of the sewing machine, presents a limited capacity for loading the sewing thread. Such a characteristic would therefore force the assigned personnel to conduct continual spool-changing operations, which, in addition to being annoying and inconvenient, would excessively slow the operating rate of the apparatus. Use of this kind of "knotted stitch" seam in automatic machines for manufacturing napkins or the like destined to considerable production efficiencies does not seem to be deemed practicable in the industry.

[0009] It should further be stressed that, in order to provide better guarantees against the risks that the seam may unravel, the execution of the hand-made "knotted" stitch allows, unlike the "double chained" stitch seam, to perform the so-called "stamping" of the edges, i.e. the execution in correspondence with said edges of a substantially "S" shaped segment, which comprises a partial backward return segment of the seam path, which better allows to fasten the corresponding corner of the napkin. Although it is possible to effect bi-directional seams with the "double chained" stitch, it is not possible to return backwards with the seam to effect the so-called stamping.

[0010] An aim of the present invention therefore is to obtain in a convenient manner hemmed items having hems that are particularly resistant to wear and disassembly.

[0011] In accordance with claim 1, a method is provided for manufacturing hems in patches of fabric or the like, in particular for providing lateral hems in napkins, the method providing, after at least a first and a second opposite lateral edges of each patch have been folded back to bring them in contact with the central portion of the patch itself, for said patches to be advanced longitudinally at a pre-set velocity and for said first and second edge to be fastened by sewing in a condition folded back onto the central portion of the patch.

[0012] Advantageously, the present method provides for using, for the lateral sewing of said first and second lateral edges of the patch, at least a first pair of sewing machines and a second pair of sewing machines longitudinally distanced from the first pair of sewing machines, wherein said first and second pair of sewing machines are such as to provide knotted stitch seams and are activated in mutually alternative fashion, to provide said lateral seams on respective patches.

[0013] It is thus possible, when the knotted-stitch sewing machine of one of said first and second pairs is in the operative condition for sewing the related hem, easily to access and replace the empty thread spools of the non-operative sewing machines. The capability is obtained of operating automatically exploiting, in a wholly different manner from what took place previously, the knotted-stitch seam. Hemmed items having strong and durable hems are obtained.

[0014] According to a further advantageous aspect, a method is also provided, in accordance with claim 3, for manufacturing hems in patches of fabric or the like, in particular for providing lateral hems in napkins, wherein at least a first pair of sewing machines is used for the lateral sewing of said first and second lateral edges of the patch, and a second pair of machines is used, longitudinally distanced from the first pair of sewing machines, wherein said first pair of sewing machines is such as to sew a chained stitch and the second pair of sewing machines is such as to provide seams with knotted stitches able to define fastening seams in correspondence with the extremities of said lateral seams.

[0015] With the aforementioned method it is possible to effect the lateral seams for fastening the lateral edges of fabric with chained stitch, which gives no substantial problems from the point of view of the ability to feed the thread, and to effect knotted stitch seams only to provide said extreme fastening stampings, which allow to obtain hems that are extremely resistant against disassembly. The problems related to the replacement of the thread spool in correspondence with the related movable shuttle in such knotted-stitch sewing machines, which would limit the capacity and working rate of the plant, are therefore overcome thanks to the fact that, such knotted stitch seam being provided only for a few stamping stitches, said spool is exhausted only at long time intervals. Moreover, the present method also provides for the easy replacement of the same spool during the sewing of the lateral hem by the first pair of machines.

[0016] An apparatus according to claim 9 and an apparatus according to claim 11 are also provided.

[0017] The secondary claims refer to further particular and advantageous aspects of the invention.

[0018] The technical features and the advantages of the present invention shall become more readily apparent in the detailed description that follows, made with reference to the accompanying drawings, which show embodiments provided purely by way of non-limiting examples, in which:

- Figure 1A shows a general schematic view of a first preferred embodiment of apparatus for manufacturing napkins;
- Figure 1B shows a schematic perspective view of a napkin obtainable with the present first preferred embodiment of apparatus;
- Figures 2A, 3A, 4A, 5A, 6A, 7A show a lateral view of a specific area of said first preferred embodiment of apparatus, with particular illustration of one of said knotted-stitch sewing machines in different longitudinal working positions;
- Figures 3B, 4B, 5B, 6B, 7B schematically show a lateral portion of a napkin in the various setting up phases of the lateral and fastening seams by said first preferred embodiment of apparatus;
- Figures 3C, 4C, 5C, 6C, 7C schematically show a lateral portion of a napkin in the various setting up

phases of the lateral and fastening seams by a second preferred embodiment of apparatus;

- Figure 8A shows a general schematic view of a second preferred embodiment of apparatus for manufacturing napkins;
- Figure 8B shows a schematic perspective view of a napkin obtainable with the present second preferred embodiment of apparatus;
- Figures 9 and 10 show schematic views of a third embodiment of the present invention.

[0019] A first preferred embodiment 1 of apparatus or plant for manufacturing bi-dimensional items 11 made of fabric or the like, in particular for manufacturing napkins, starting from corresponding patches 10, is shown in Figure 1A.

[0020] The present first embodiment 1 of apparatus is suitable for the manufacture of napkins 11, or of other bi-dimensional items, of the kind exemplified in the subsequent Figure 1B, in which a first and a second opposite lateral edges 12, 14 of a patch are folded back onto the central portion 16 of the patch itself and are fastened thereto by means of lateral seams 17.

[0021] Optionally, the napkins are completed with hems perpendicular to the aforementioned lateral hems obtained by means of said seams 17. In particular, according to a first mode, it is possible (as shown in Figure 1B) to fold back and fasten, by means of respective transverse seams 15, also the lateral edges 13 of the patch, or otherwise said transverse hems could be obtained (as shown in Figure 1A) in another manner, without folding back the corresponding transverse edges of the patch, therein providing pre-constituted hems 13' obtained in any suitable fashion, known to the person versed in the art.

[0022] According to the present first embodiment of apparatus, to be illustrated more clearly in the remainder of the description, said seams 17 are made with knotted stitch and it is also possible for them to be provided in correspondence with the extremities of said lateral seams 17, of the fastening or stamping seams 19, also executed with knotted stitch, as shall be better described hereafter.

[0023] The present first preferred embodiment 1 of the apparatus comprises, in a substantially known manner, a section for feeding a ribbon or band of fabric 3 towards the main part, with longitudinal extension, of the apparatus, which main part presents a section 4 that receives said ribbon and cuts it into patches 10, which are sent along the apparatus through suitable longitudinal advance means comprising, in the example shown, a conveyor belt 5 which advances said patches 10 in a longitudinal direction at a pre-set velocity V1. The fabric ribbon or band 3, is expressly shown in this Figure 1A to be provided with pre-constituted longitudinal hems, which are indicated by way of example with the reference number 13' in Figure 1A and which will constitute a pair of opposite lateral hems 13' of the napkin.

[0024] To obtain the hemming of the remaining lateral flanks of the patch 10, the present first preferred embodiment 1 of apparatus comprises, as schematically shown in Figure 1A, appropriate means 6 able to fold back a first and a second opposite lateral edges 12, 14 of each patch 10 in longitudinal advancement to bring them in contact with the central segment 16 of the patch itself. Said lateral fold back means can be of any kind known to the person versed in the art and are not therefore described in detail herein.

[0025] Downstream from said lateral fold-back means 6, advantageously, in accordance with the present first preferred embodiment, to fasten the respective and transversally opposite first and second lateral edges 12, 14 in folded back condition to the central segment 16 of the patch, a first pair of sewing machines 18 and a second pair of sewing machines 20 are provided which, as shown, are positioned longitudinally distanced from the first sewing machines 18.

[0026] Said first and second pairs of sewing machines 18 and 20 are thus such as to provide knotted stitch seams and, with appropriate suitable means (not shown in the figures), are activated, in mutually alternative fashion, to provide said lateral hem seams 17 onto respective patches 10. In practice it will be possible to initiate sewing, on corresponding patches 10, at first by the first pair of machines 18 and, when said first pair has exhausted the thread of the spool internal to the shuttle described above, to initiate the sewing of other patches 10 by the second pair of machines 20. With the present first embodiment it is therefore possible to execute in automated fashion the aforesaid lateral hems of the napkin using a knotted stitch sewing machine. While a pair of sewing machines, for instance the pair 20, is operating on corresponding patches 10, assigned personnel have sufficient time available to provide for the replacement of the spool, with its thread supply exhausted, of the other machines 18, with a new spool loaded with thread. The time available to personnel is, with the present first embodiment of apparatus, wholly sufficient and ample to perform such a spool replacement operation and it is therefore not necessary to interrupt or slow the operation of the present apparatus. Durable napkins are obtained, whose edges are particularly resistant against disassembly; also obtained are high production efficiencies by the apparatus.

[0027] Once the lateral edge seams have been provided, the finished products, indicated with the numeric reference 11, are extracted from the apparatus with the aid of a transverse conveyor belt 7.

[0028] According to a further advantageous aspect of the present first preferred embodiment, said first and second pair 18 and 20 of sewing machines are mounted on corresponding carriages 22 and 24 movable longitudinally to provide, in correspondence with the extremities of said lateral seams 17, fastening or stamping seams 19 which allow to fasten in a particularly secure manner the extremities of the lateral seams themselves,

which constitute the most delicate portion of the edge seam, and whose safeguard guarantees the good durability of the edges of the aforementioned napkins.

[0029] It should in any case be stressed that, if the provision of said extreme fastening seams 19 is not desired, it will be possible to avoid the use of said movable cursors, maintaining said sewing machines in a fixed position in the longitudinal direction.

[0030] The use is therefore provided of appropriate means for the actuation in the longitudinal direction of said cursor and hence of the sewing machines supported thereby. Figures 2A, 3A, 4A, 5A, 6A and 7A show a preferred embodiment of said means for longitudinally actuating the cursor 24 for the pair of sewing machines 20 supported thereby. Similar means are obviously provided for actuating also the cursor 22 for the pair of machines 18.

[0031] With reference in particular to Figure 2A, one can observe that said conveyor belt 5 for the longitudinal advance of the patches 10 of the apparatus makes uses, in order to keep said patches 10 in contact with the upper surface of the belt itself along the route, a plurality of upper pressure rollers 8 longitudinally distributed along the route itself.

[0032] From Figure 2A, one can thus observe that, in order to actuate the longitudinal motion of said cursor 24 supporting the sewing machines 20 which is made to slide on appropriate longitudinal guides (not expressly shown in this figure and in the subsequent ones), means are preferably used in the form of a continuous belt 26 closed in a loop and tensioned on respective pulleys 28 whereof one is destined to provide for driving, which belt 26 is held permanently in motion at a pre-set rotating speed V1 which is equal to the velocity V1 of advance of the patches 10 by said advancement means 5.

[0033] Said driving belt 26 is selectively coupled and uncoupled with driving means of the cursor 24, whereof said cursor is connected in integral fashion, which means 30 are in the form of a respective belt closed in a loop 32 tensioned on respective pulleys 34. Said belts 26 and 30 and the related support and rotation pulleys extend as shown in a plane underlying the plane defined by the belt 5 for the advancement of the patches 10.

[0034] In particular according to the embodiment shown, the rotatory actuation of said belt 26 is derived from the same motor M which actuates the belt 5 for the advancement of the patches.

[0035] To provide for said selective coupling between said means 26 able permanently to move at velocity V1 and said means 30 for driving the cursor 24, latching and unlatching means are provided which comprise a first and a second fastening portion 38, 40, which are integrally connected in longitudinal direction to the corresponding cursor 24 and between which extends said driving belt 30 and slides said belt 26 able permanently to move at velocity V1.

[0036] Said first and second portion 38, 40 are actu-

ated, by suitable preferably pneumatic actuator means which are not expressly shown in the figures, in a first operative condition of mutual approach, which provides for the fastening of said driving means 30 and of said means 26 able continuously to move at velocity V1 and provides for the mutual coupling of the driving means 30 and means 26 able continuously to move at velocity V1, and a second condition of mutual detachment, such as to provide for the mutual release of said driving means 30 and of said means 26 able to move at velocity V1.

[0037] Said means for the longitudinal actuation of the cursor 24 are completed by appropriate means for braking the same movable cursor 24, which are able to be activated to brake when said driving means 30 and said means 26 movable at speed V1 are in unlatched condition and are able to be de-activated from the braking condition when said driving means 30 and said means 26 movable at velocity V1 are in the latched condition.

[0038] In particular, the aforementioned braking means comprise a first and a second portions 42, 44 integral with the corresponding cursor 24 and an elongated element 46 fixed to the frame of the apparatus positioned between said first and second braking portions 42, 44.

[0039] Suitable actuator means, preferably pneumatic, which are not expressly shown in the figures, are provided for activating said first and second braking portions 42, 44 to secure said elongated element 46 fixed to the frame of the apparatus, to block the longitudinal displacement of the corresponding cursor 24, and in mutual detachment to release said fixed elongated element 46 to allow the longitudinal motion of the corresponding cursor 24.

[0040] According to the present embodiment, in order to perform backward movements of said cursor 24 and of the machines 20 supported thereon, the employment is provided of a linear actuator 48 comprising a pneumatic cylinder 50, fixed with an extremity to the frame of the apparatus, wherefrom extends a movable stem 52 which presents its front extremity that is fixed, in 53, to said cursor 24 and which extends longitudinally and parallel to a level underlying said plane of advance 5 for said patches 10.

[0041] In an advantageous manner which shall become more readily apparent hereafter, said portions 38, 40 for the latching and unlatching of the cursor 24, said braking portions 42, 44 and the attachment point 53 for the pneumatic return cylinder 48 are positioned on a portion 24' which is connected to said cursor 24 by means of a second pneumatic cylinder or linear actuator 55 that allows an additional forward and backward longitudinal motion of the cursor 24 relative to said block 24' and that allows, among other things, to obtain, when it moves the cursor 24 forward, a velocity V2 of advance of the cursor 24 exceeding the velocity V1 of advance of the patch 10 undergoing work. Said actuator 55 for advancing the cursor at a greater speed comprises a cylinder 59 which

is integral with said cursor 24 and a stem 57 movable in the axial direction, which extends horizontally and which is integral with said block 24'.

[0042] This configuration allows, as shall become more readily apparent hereafter, when it is necessary to bring the sewing machine forward relative to the patch 10 being advanced, to obtain an advancement of the cursor 24, and of the sewing machines supported thereby, at a velocity V2 exceeding the velocity of advance V1 of the patch along the line 5, as well as to provide a pre-determined return, depending on the current operative condition, by said cursor 24.

[0043] The aforementioned Figure 2A shows an operative condition in which the patch 10 has already been subjected to the folding of the lateral edges and is reaching the corresponding pair of machines 20 in view of the lateral sewing of said folded-back edges. In this condition the sewing machines 20 are operatively deactivated and the means for coupling the cursor with the driving means are inactive and the brake of the cursor is activated.

[0044] In the following figures, purely in order to allow a clear and understandable description of the operation of the present apparatus, the longitudinal strokes of the cursor and the actual lengths and positions of the seams on the patches have been indicated purely by way of schematic example, having been, among other things, conveniently increased in length with respect to actual dimensions.

[0045] The better to comprehend the operation of the present preferred embodiment, reference should first be made to the subsequent Figure 3A, which refers to a phase of the work operations performed on the patch 10 which is subsequent to the realisation, on the same patch 10, of the aforementioned fastening or stamping seams 19, in correspondence with the front edge of the patch, and of the lateral seams 17 of the folded edges of the patch itself. Said realisations of the front stamping seams 19 and of the lateral seams 17 for retaining the folded edges of the patch shall be described better hereafter with reference to the subsequent figures.

[0046] As Figure 3A shows, after providing the patch with said stampings and lateral seams for the folded edges of the patch, the sewing machines 20 and the cursor 24 that supports them are stopped in a first initial or rear reference position, which is indicated with the reference P0 in Figure 3A.

[0047] In accordance with the subsequent Figure 4A, it can be observed that starting from said initial reference position P0 of Figure 3A, said means for longitudinally activating said cursor 24 for supporting the sewing machines 20 are such that, in order to provide in said patch 10 said blocking seams 19 in correspondence with the rear advancement edge of the patch 10, said cursor 24 and the corresponding sewing machines 20, when said advancing patch 10 arrives with its rear edge substantially in correspondence with the sewing needle A of the same apparatus, are made to move in the direction of

advance of the patch 10 at a velocity V2 exceeding the velocity V1 of advance of the patch 10 to provide a fourth seam segment of a pre-determined length L4 (shown in the subsequent Figure 4B). As previously stated, in order to execute this advancement of the cursor 24, the braking portions 42, 44 are mutually detached and the braking action is de-activated, whilst the engagement portions 38, 40 are approached to retain between them said belt able permanently to move at velocity V1 and the driving belt 30 providing for said driving of the cursor 24 at velocity V1. Simultaneously, said second linear actuator 55 is activated, which moves the cursor 24 forward with respect to the block 24', and brings said braking means and the latching and unlatching means, allowing the cursor 24 itself to attain a velocity V2 exceeding the velocity V1 of advance of the patch.

[0048] At the end of this advancing motion, whose extent is equal to the length of said fourth seam segment L4 with the addition of a quantity corresponding to the segment travelled in the meantime by said patch 10, the cursor 24 and the sewing machines 20, as shown in the subsequent Figure 5A, are stopped in the first advanced position P1 and kept active sewing the patch 10 as it advances providing a fifth segment of seam with pre-determined length L5 (as shown in Figure 5B). In this phase the engagement portions 38, 40 are removed to release the mutual engagement between them and said belt able permanently to move at velocity V1 and the driving belt 30 and the braking portions 42, 44 are approached providing a braking action on the braking bar 46.

[0049] After completing said seam segment L5, the machines stop sewing and, taking advantage of the space present between the patch just worked and the subsequent advancing patch, a partial zeroing of the position of the cursor 24 is effected, with the cursor 24, thanks to the return movement of the cylinder 55, being brought backwards again in a second reference position indicated with reference P0' in the subsequent Figure 6A. Given the less than considerable distance between the rear edge of a patch and the front patch of the following one, a total return of said cursor to the initial position P0 of said cursor cannot be obtained.

[0050] Considering initially Figure 6A, one can observe that in this subsequent working phase starting from this second reference position P0' the sewing machines 20 work on the front part of the subsequent patch 10. In this phase, the sewing machines 20 are activated to sew and said cursor 24 and the sewing machines 20 carried thereby, in order to provide the first portion L1 of the blocking seams 19 in correspondence with the front edge of the advancing patch 10, are kept motionless in said second rearward reference position P0'. In this way, as Figure 6B shows, it is possible to obtain, due to the advancing motion of the belt 5, a seam for a first segment of pre-determined length L1 on said advancing patch 10. In this condition the braking portions 42, 44 are activated to brake and the coupling or engaging por-

tions are removed from each other, letting said belt 26 slide freely.

[0051] As the subsequent Figure 7A shows, when said seam segment L1 has been completed, said cursor 24 and, therewith, the related sewing machines 20, is made to move, in the direction of advance of the patch 10, at a velocity V2 exceeding the velocity V1 of advance of the patch 10 to provide (as Figure 7B shows) a second seam segment of predetermined length L2. The advance of the cursor 24 is in this phase equal to the length of the segment L2 with the addition of a quantity corresponding to the segment travelled in the meantime by said patch 10 on said advancement belt 5. In this phase the braking portions 42, 44 are detached and the braking action is deactivated, whilst the engagement portions 38, 40 are approached to retain between them said belt able permanently to move at velocity V1 and the driving belt 30, driving the cursor 24 at speed V1. In a manner similar to the one described above, simultaneously with the activation of the cursor at velocity V1, said cylinder 55 is activated, which cylinder moves the cursor 24 forward relative to the block 24', which bears said braking means and latching and unlatching means, allowing the cursor 24 itself to attain a velocity V2 exceeding the velocity V1 of advance of the patch.

[0052] As the aforementioned Figure 7A shows, this advancement at velocity V2 brings the cursor 24 in a second advanced position P2, downstream of the first advanced position P1, where the cursor 24 is stopped and starts to move back towards the first rear reference position P0 (shown in Figure 3A). This return being obtained by activating backwards said first linear return actuator 48 and the second intermediate linear actuator 55. During this return phase the machines supported by the cursor 24 are maintained in sewing operation to provide the seam segment that corresponds to the lateral seams 17 and that, in Figure 3B, is indicated with the reference L3. In this phase, obviously, the braking portions 42, 44 are removed and the braking action is thus deactivated; moreover, said engagement portions 38, 40 are also removed and the driving action is interrupted.

[0053] Once the cursor 24 has reached the position P0 of Figure 3, the operative cycle is repeated, as illustrated previously, to allow the provision of said stamping seams in correspondence with the rear edge of the patch 10.

[0054] The subsequent Figure 8A shows a second preferred embodiment 101 of apparatus or plant for manufacturing bi-dimensional items made of fabric or the like, in particular for manufacturing napkins, starting from corresponding patches 10.

[0055] The present second embodiment 101 of apparatus is suitable for manufacturing napkins 111 or other similar bi-dimensional items, of the type exemplified in the subsequent Figure 8B, i.e. of the type in which a first and a second opposite lateral edge 112, 114 of a patch are folded back onto the central portion 116 of the patch

itself and fastened thereto by means of lateral seams 117.

[0056] The napkins are, optionally, also completed with perpendicular hems to the aforementioned lateral hems obtained by means of said seams 117. In particular, according to a first mode (as shown in Figure 8B) it is possible to fold back and fasten, by respective transverse seams 115, also the lateral edges 113 of the patch, or, otherwise, said transverse hems could be obtained in another way (as shown in Figure 8A), without folding back the corresponding transverse edges of the patch, providing pre-constituted hems 113' obtained in any suitable manner known to the person versed in the art.

[0057] According to the present second preferred embodiment 101 of apparatus, as shall become more readily apparent hereafter, said seams 117 are made with chained stitch and blocking or stamping seams 119, executed with knotted stitch, are also provided in correspondence with the extremities of said lateral seams 117.

[0058] The present second preferred embodiment of the apparatus or plant comprises a series of components similar to those of the first preferred embodiment. Said similar components maintain, in Figure 8A, the same numeric reference that has been used in relation to the first embodiment and, in order not to overburden the present description, are not described in detail again.

[0059] This second preferred embodiment 101 differs from the first one in that it presents, downstream of said lateral folding-back means 6, a first pair of sewing machines 118 able to sew with chained stitch and fixed to the frame of the apparatus and a second pair of sewing machines 120, which are positioned longitudinally distanced from the first pair 118 of sewing machines and which are such as to provide knotted stitch seams to form only the extreme stamping seams 119.

[0060] In practice in the present second embodiment, on each patch 10 the lateral seam is provided with chained stitch by means of the machines 118, whereupon said patch 10 is advanced by the belt 5 to the pair of sewing machines 120 which provide the stamping 119 with knotted stitch seam.

[0061] To provide said stamping 119, the pair of sewing machines 120 is mounted on a respective cursor 124 wholly similar to the cursor 24 of the first preferred embodiment, which is therefore not described in detail again.

[0062] With the present second embodiment it is therefore possible to execute the aforesaid lateral hems 117 of the napkins using a chained stitch seam, which gives no problems from the point of view of replacing thread spools, and to obtain durable edges thanks to the provision of a knotted-stitch stamping 119 of the extremities of the seam 117. When the respective spool housed within the shuttle of the machines 120 sewing with knotted stitch exhausts the thread, it is possible to exploit the time interval elapsing between a stamping 119 and

the next one to complete with relative ease the replacement of said exhausted spool with a new spool filled with thread. It should also be noted that this necessary replacement of the spool must, with the present second embodiment of the invention, advantageously be performed at time intervals that are not too close, since the consumption of thread to execute the aforesaid stampings is rather modest.

[0063] The present second embodiment of apparatus presents some aspects of operation which are substantially similar to those provided by the first preferred embodiment. The various phases of execution of said lateral seams are summarised in Figures 3C, 4C, 5C, 6C, 7C which expressly refer to the stamping phases executed by the machines 120 borne by the respective cursor 124.

[0064] From the aforementioned figures one can deduce that the patch 10 reaches said longitudinally movable machines 120 with said chained-stitch seams L0 provided by the preceding machines 118 already present on the lateral edges.

[0065] The execution of the stampings therefore takes place in a manner substantially similar to the one provided for the first embodiment.

[0066] The stamping method is, as was done for the first embodiment and for a better comprehension thereof, described starting from a condition wherein, in addition to the aforementioned lateral seam L0, a seam segment L3" has already been provided in correspondence with the rear edge of the patch and the entire stamping in correspondence with the front edge of the patch 10 itself (as shown in Figure 3C). The rear stamping thus provides for the machines 120, starting from the first rear position P0, are advanced at velocity V2 exceeding the velocity V1 of advance of the patch to provide the segment L4', as shown in Figure 4C, and then stopped in advanced position P1, with the belt 5 that advances, and maintained in sewing operation to provide the final segment L5' shown in Figure 5C.

[0067] Once this final segment L5' is completed, the machines 120 stop sewing and the cursor 124 with the related machines 120 is moved back again in a rear reference position P0' intermediate between said initial position P0 and the rear position P1.

[0068] With the cursor 24 stopped in this position P0', the machines 120, once the front edge of the subsequent patch meets the sewing needle A, start sewing providing a segment L1' (as Figure 6C shows), followed by a segment L2' (as Figure 7C shows), which is obtained with the machines 120 that are accelerated forward at a pre-set velocity V2 exceeding the velocity V1 of advance of the belt 5 for the longitudinal conveyance of the patches 10 arriving in the second advanced position P2 longitudinally downstream from the first position P1.

[0069] Subsequently, with the machines 120 idle, a seam segment L3' is provided in correspondence with the front edge of the patch 10, to interrupt the sewing of

these machines 120 for a certain longitudinal segment, during which the cursor 120 is returned to the initial position P0 whilst the belt 5 continues to make said patches 10 advance, and to resume sewing, in the vicinity of the rear edge of the patch, to provide a seam segment L3" (as Figure 3C shows).

[0070] According to a third embodiment of the present invention, the stamping seams can be effected exploiting the known motion, clockwise and counterclockwise, of the traditional organ for driving the fabric situated in a position below said fabric being sown, which, in a wholly known manner, is able to move to drive the fabric forward and, respectively, backward, thanks to the execution of a closed trajectory, which presents an active upper branch able to contact and drive the patch 10 respectively forward and backward, depending on whether a forward seam or a rearward seam is to be executed on the fabric itself.

[0071] As subsequent Figures 9 and 10 show, with the third embodiment of the present invention, which for the sake of descriptive clarity is described starting from the stamping in correspondence with the rear edge of the patch, the stamping seams can be executed in correspondence with said rear edge, after the same patch has already been provided with the stamping on the front edge and the longitudinal seam, starting from a first rear position P0 of the cursor wholly similar to that of the previous embodiments and which therefore is not shown again. For this purpose when the sewing needle A has nearly arrived in correspondence with the rear edge of the patch 10, starting from said rear position P0 of the cursor 24, the cursor 24 itself is coupled to means able to move at a velocity V1 equal to the velocity of advance of the patch 10, in a manner wholly similar to the one described for the first embodiment and hence not described in detail again.

[0072] This coupling operation allows to bring said sewing machines 20 borne by the cursor 24 at exactly the same speed V1 as the patch 10, as arrow V1 shows in said Figures 9 and 10. At this point said transport organ, indicated with reference T in the figures, is activated according to such a trajectory that its active upper branch, which contacts the patch 10, drags the latter forward (as shown in Figure 9), so that some stitches are provided in said patch 10 in an inward direction relative to the patch 10 itself and, immediately thereafter, to the transport organ T is imparted such a trajectory that its upper active branch which contacts the patch 10 drive the latter backwards to provide a seam constituted by some backward stitches. Such forward and backward seams provide the same blocking or stamping seam in correspondence with the rear edge. In the meantime the movable cursor 24 that bears the machine has moved from the position P0 to an advanced position P1, in the space that lies between the patch and the subsequent one the cursor 24 is brought back to a rear position which can be the position P0 again or, if space is insufficient to complete this return, in an intermediate position

P0' between the position P0 and the advanced position P1.

[0073] Although it is not shown expressly in the figures, in order to effect the stamping seams in correspondence with the front edge of the patch 10 the procedure is substantially similar. In practice, when the sewing needle A has arrived nearly in correspondence with the front edge of the patch 10, starting from the position P0, or from the position P0', the longitudinally movable cursor that bears the sewing machine is activated again, at a velocity V1 equal to the velocity of advance of the patch, in such a way that the sewing machine presents the same velocity as the fabric. Thereupon, to the conveying organ T is imparted such a trajectory that its upper active branch that contacts the patch drives the latter backwards, in such a way that some stitches are provided in said patch in a direction towards its interior and, immediately afterwards, to the conveying organ T is imparted such a trajectory that is upper active branch that contacts the patch drives the latter forward, providing a seam constituted by some forward stitches. Such forward and backward seams provide said blocking or stamping seam in correspondence with the front edge of the patch. In the meantime the movable cursor bearing the machine has moved from the position P0, or P0', to a second advanced position P2 which may coincide with the position P1, if the starting position had been the position P0, or a little farther forward, if the starting position had been the position P0'. Starting from the second position P2, the sewing machine - with the patch that continues to advance at velocity V1 - effecting the seam along the lateral edge of the patch, the sole return linear actuator, corresponding to the cylinder 46 of the first embodiment, is activated, thereby returning the cursor to the starting position P0, exploiting the space constituted by the length of the patch.

[0074] With the present invention, the feeding of the patches is never interrupted while said hemming and stamping seams are effected. All embodiments preferably provide for the use of centralised means for processing and controlling the various parts of the present apparatus that act starting from signals coming from preferably optical sensors appropriately positioned on said apparatus.

[0075] The invention thus conceived can be subject to numerous modifications and variations, without thereby departing from the scope of the inventive concept. Moreover, all details can be replaced by technically equivalent elements.

Claims

1. A method for sewing hems in patches (10) of fabric or the like, in particular for providing lateral hems in napkins, the method providing, after at least a first and a second opposite lateral edges (12, 14) of

- each patch (10) have been folded back to bring them in correspondence with the central portion (16) of the patch itself, for longitudinally advancing said patch (10) at a pre-set velocity (V1), and to fasten, by sewing, said first and second edge (12, 14) in a condition in which they are folded back onto the central portion (16) of the patch, the method being characterised in that it uses, for the lateral sewing (17, 17) of said first and second lateral edges (12, 14) of the patch (10), at least a first pair of sewing machines (18, 18) and a second pair of sewing machines (20, 20) longitudinally distanced from the first pair (18, 18) of sewing machines, in which said first (18, 18) and second (20, 20) pair of sewing machines are such as to provide knotted stitch seams and are activated, in mutually alternative fashion, to provide said lateral seams (17, 17) onto respective patches (10).
2. A method according to claim 1, characterised in that said first (18, 18) and said second (20, 20) pair of sewing machines are such as to provide blocking seams (19, 19) on the corresponding patch (10), in correspondence with the extremities of said lateral seams (17, 17).
 3. A method for sewing hems in patches (10) of fabric or the like, in particular for providing lateral hems in napkins, the method providing, after at least a first and a second opposite lateral edges (112, 114) of each patch (10) have been folded back to bring them in correspondence with the central portion (116) of the patch itself, for longitudinally advancing said patch (10) at a pre-set velocity (V1), and to fasten, by sewing, said first and second edge (112, 114) in a condition in which they are folded back onto the central portion (116) of the patch, the method being characterised in that it uses at least a first pair of sewing machines (118, 118) for the lateral sewing (117, 117) of said first and second lateral edges (112, 114) of the patch (10), and a second pair of sewing machines (120, 120) longitudinally distanced from the first pair (118, 118) of sewing machines, in which said first pair of sewing machines (118, 118) is such as to sew with chained stitch and said second pair of sewing machines (120, 120) is such as to provide knotted stitch seams able to define blocking seams (119, 119) in correspondence with the extremities of said lateral seams (117, 117).
 4. A method according to either of the previous claims 2 or 3, characterised in that, in order to provide on said patch (10) said blocking seams (19, 19; 119, 119) in correspondence with the extremities of said lateral seams (117, 117), said first (18, 18) and/or said second (20, 20; 120, 120) pair of sewing machines are actuated relative to the patch (10).
 5. A method according to claim 4, characterised in that, in order to provide on said patch (10) said blocking seams (19, 19; 119, 119), in correspondence with the rear edge of the patch (10), said sewing machines (18, 18, 20, 20; 120, 120), stopped in the first rear reference position (P0), when said advancing patch is with its own rear edge substantially in correspondence with the sewing needle (A) of the corresponding machines (18, 18, 20, 20; 120, 120), said sewing machines (18, 18, 20, 20; 120, 120) are made to move, in the direction of advance of the patch (10), to provide a fourth seam segment of predetermined length (L4, L4'), at a velocity (V2) exceeding the velocity (V1) of advance of the patch (10), said sewing machines (18, 18, 20, 20; 120, 120) after executing said fourth lateral seam segment (L4, L4') are stopped in a first advanced position (P1) and kept sewing the advancing patch (10), providing a fifth seam segment of predetermined length (L5, L5').
 6. A method according to claim 5, characterised in that, after executing the fifth seam segment of predetermined length (L5, L5'), said sewing machines (18, 18, 20, 20; 120, 120) are brought back to a second rear position (P0') between the first rear position (P0) and the first advanced position (P1).
 7. A method according to claim 6, characterised in that in order to provide on said patch (10) said blocking seams (19, 19; 119, 119) in correspondence with the forward advancing edge of the patch (10), said sewing machines (18, 18, 20, 20; 120, 120), stopped in said second rear reference position (P0'), provide a seam for a first segment of predetermined length (L1, L1') onto said advancing patch (10), after executing which said sewing machines (18, 18, 20, 20; 120, 120) are made to move, in the direction of advance of the patch (10), at a velocity (V2) exceeding the velocity (V1) of advance of the patch (10) to provide a second seam segment of predetermined length (L2, L2') and are stopped in a second advanced position (P2), after executing said second lateral seam segment (L2, L2'), said sewing machine (18, 18, 20, 20; 120, 120), sewing the advancing patch (10), are moved back to the first initial reference position (P0) providing a return seam segment (L3) corresponding to the lateral seam, or to a portion (L3') of the blocking seam in correspondence with the front edge of the patch (10) and a portion (L3'') of the blocking seam in correspondence with the rear edge of the patch (10) itself.
 8. A method according to either of the previous claims 2 or 3, characterised in that, in order to effect the stamping seams, said first (18, 18) and/or said second (20, 20; 120, 120) pair of sewing machines are

moved at a velocity (V1) equal to the velocity of advance of the patch (10) and the movement is exploited of an organ (T) for driving the fabric provided on each sewing machine, which drives the patch (10) forward and, respectively, backwards, providing corresponding seam segments able to realise said blocking seams.

9. An apparatus (1) for manufacturing bi-dimensional items made of fabric or the like, in particular for manufacturing napkins starting from corresponding patches (10); said apparatus (1) comprising means (5) for longitudinally advancing said patches (10) at a pre-set velocity (V1); means (6) for folding back a first and a second opposite lateral edges (12, 14) of each patch (10) to bring them in correspondence with the central portion (16) of the patch itself; and means for fastening, by sewing (17, 17), said first and second edge (12, 14) in a condition where they are folded back onto the central portion (16) of the patch; the apparatus being characterised in that said means for laterally sewing said first and second lateral edges (12, 14) of the patch (10) comprise a first pair of sewing machines (18, 18) and a second pair of sewing machines (20, 20) longitudinally distanced from the first pair (18, 18) of sewing machines, wherein said first (18, 18) and second (20, 20) pair of sewing machines are such as to provide knotted stitch seams and are activated, in mutually alternative fashion, to provide said lateral seams (17, 17) onto respective patches (10).
10. An apparatus according to claim 9, characterised in that said first (18, 18) and said second (20, 20) pair of sewing machines are activated in such a way as to provide blocking seams (19, 19) on the corresponding patch (10), in correspondence with the extremities of said lateral seams (17, 17).
11. An apparatus (101) for manufacturing bi-dimensional items made of fabric or the like, in particular for manufacturing napkins starting from corresponding patches (10); said apparatus (101) comprising means (5) for longitudinally advancing said patches (10) at a pre-set velocity (V1); means (6) for folding back a first and a second opposite lateral edges (112, 114) of each patch (10) to bring them in correspondence with the central portion (116) of the patch itself; and means for fastening, by sewing (117, 117), said first and second edge (112, 114) in a condition where they are folded back onto the central portion (116) of the patch; the apparatus being characterised in that said means (117, 117) for laterally sewing said first and second lateral edges (112, 114) of the patch (10) comprise a first pair of sewing machines (118, 118), and in that a second pair of sewing machines (120, 120) is provided, longitudinally distanced from the first pair (118, 118) of

sewing machines, in which said first pair of sewing machines (118, 118) is able to sew with chained stitch and said second pair of sewing machines (120, 120) is such as to provide knotted stitch seams able to define blocking seams (119, 119) in correspondence with the extremities of said lateral seams (117, 117).

12. An apparatus according to either of the previous claims 10 or 11, characterised in that, in order to provide on said patch (10) said blocking seams (19, 19; 119, 119), in correspondence with the extremities of said lateral seams (17, 17; 117, 117), said first (18, 18) and/or said second (20, 20; 120, 120) pair of sewing machines are supported by corresponding cursor means (22, 24; 124) movable with respect to the advancing patches (10).
13. An apparatus according to claim 12, characterised in that said means for longitudinally actuating said cursor means (22, 24; 124) for supporting the sewing machines (18, 18; 20, 20; 120, 120) are such that, in order to provide on said patch (10) said blocking seams (19, 19; 119, 119) in correspondence with the rear edge of the patch (10), with said cursor means (22, 24; 124) stopped in the first rear reference position (P0), when said advancing patch (10) is with its own rear edge substantially in correspondence with the sewing needle (A) of the corresponding machines (18, 18, 20, 20; 120, 120), said cursor means (22, 24; 124) are made to move, in the direction of advance of the patch (10), to provide a fourth seam segment of predetermined length (L4, L4') at a velocity (V2) exceeding the velocity (V1) of advance of the patch (10); after said sewing machines (18, 18, 20, 20; 120, 120) have executed said fourth lateral seam segment (L4, L4'), said cursor means (22, 24; 124) are stopped in a first advanced position (P1) and said sewing machines (18, 18, 20, 20; 120, 120) are maintained active sewing the advancing patch (10), providing a fifth seam segment of predetermined length (L5, L5').
14. An apparatus according to claim 13, characterised in that means are provided for longitudinally actuating said cursor means (22, 24; 124) for supporting the sewing machines (18, 18, 20, 20; 120, 120) in such a way that, after executing the fifth seam segment of predetermined length (L5, L5'), said sewing machines (18, 18, 20, 20; 120, 120) are brought back to a second rear position (P0') between the first rear position (P0) and the first advanced position (P1).
15. An apparatus according to claim 14, characterised in that means are provided to actuate longitudinally said cursor means (22, 24; 124) supporting the sewing machines (18, 18, 20, 20; 120, 120) in such a

way that in order to provide on said patch (10) said blocking seams (19, 19; 119, 119) in correspondence with the forward advancing edge of the patch (10), with said cursor means (22, 24; 124), stopped in said second rear reference position (P0'), the sewing machines (18, 18, 20, 20; 120, 120) provide a seam for a first segment of predetermined length (L1, L1') onto said advancing patch (10), after executing which said cursor means (22, 24; 124) are made to move, in the direction of advance of the patch (10), at a velocity (V2) exceeding the velocity (V1) of advance of the patch (10) to provide a second seam segment of predetermined length (L2, L2') and are stopped in a second advanced position (P2), after executing said second lateral seam segment (L2, L2'), with said sewing machines (18, 18, 20, 20; 120, 120), sewing the advancing patch (10), said cursor means (22, 24; 124) are moved back to the first initial reference position (P0) providing a return seam segment (L3) corresponding to the lateral seam, or to a portion (L3') of the blocking seam in correspondence with the front edge of the patch (10) and a portion (L3'') of the blocking seam in correspondence with the rear edge of the patch (10) itself.

16. An apparatus according to any of the previous claims from 13 to 15, characterised in that said means for actuating longitudinally said cursor means (22, 24; 124) for supporting the sewing machines (18, 18; 20, 20; 120, 120) comprise means (26) able permanently to move at a pre-set velocity (V1) equal to the pre-set velocity (V1) of advance of the patches (10) by said advancement means (5), driving means (30) connected in an integral manner with corresponding cursor means (22, 24; 124) for the sewing machines, and means (28) for selectively coupling and uncoupling said driving means integral with the cursor means (22, 24; 124) to said means (26) able permanently to move at a pre-set velocity (V1).

17. An apparatus according to claim 16, characterised in that said selective coupling and uncoupling means comprise a first and a second fastening portion (38, 40) connected to the corresponding cursor means (22, 24; 124), between which are situated said driving means (30) and between which slide said means (26) able permanently to move at pre-set velocity (V1), means being provided for activating said first and second coupling portion (38, 40) to fasten said driving means (30) and said continuous means (26) able permanently to move at pre-set velocity (V1) to provide for driving the corresponding cursor means (22, 24; 124), and to activate said first and second coupling portion (38, 40) to release the coupling of said driving means (30) with said means (26) able permanently to move a

pre-set velocity (V1) to provide for the uncoupling of the corresponding cursor means (22, 24; 124).

18. An apparatus according to any of the previous claims from 14 to 17, characterised in that said longitudinal actuation means comprise means for braking said cursor means (22, 24; 124) having a first and a second portion (42, 44) integral with the corresponding cursor means (22, 24; 124) and an elongated element (46) fixed to the frame of the apparatus positioned between said first and second braking portions (42, 44), means being provided for activating said first and second braking portion (42, 44) to grip said elongated element (46) fixed to the frame, in such a way as to block the longitudinal displacement of the corresponding cursor means (22, 24; 124) and to release said elongated fixed element (46), to allow the free longitudinal motion of the corresponding cursor means (22, 24; 124).

19. An apparatus according to any of the previous claims from 16 to 18, characterised in that said means for driving the cursor means (22, 24; 124) are in the form of a continuous element closed in a loop (30) extending with an active branch, for coupling and uncoupling to said means (26) able permanently to move at a pre-set velocity (V1), which extends longitudinally and parallel to the direction of advance, lying in a plane underlying the plane of advance (5) of the patches (10).

20. An apparatus according to either of the previous claims 18 or 19, characterised in that means are provided, between said cursor means (22, 24; 124) and a block (24') which bears the coupling and uncoupling portions and the braking portions, to obtain an advance of the cursor means (22, 24; 124) at a velocity (V2) exceeding the velocity (V1) of advance of the patch along the line (5).

21. An apparatus according to any of the previous claims from 14 to 20, characterised in that said means for causing said cursor means (22, 24; 124) to be brought back to the initial reference position (P0), comprise a linear actuator (48) extending longitudinally and parallel to the direction of advance.

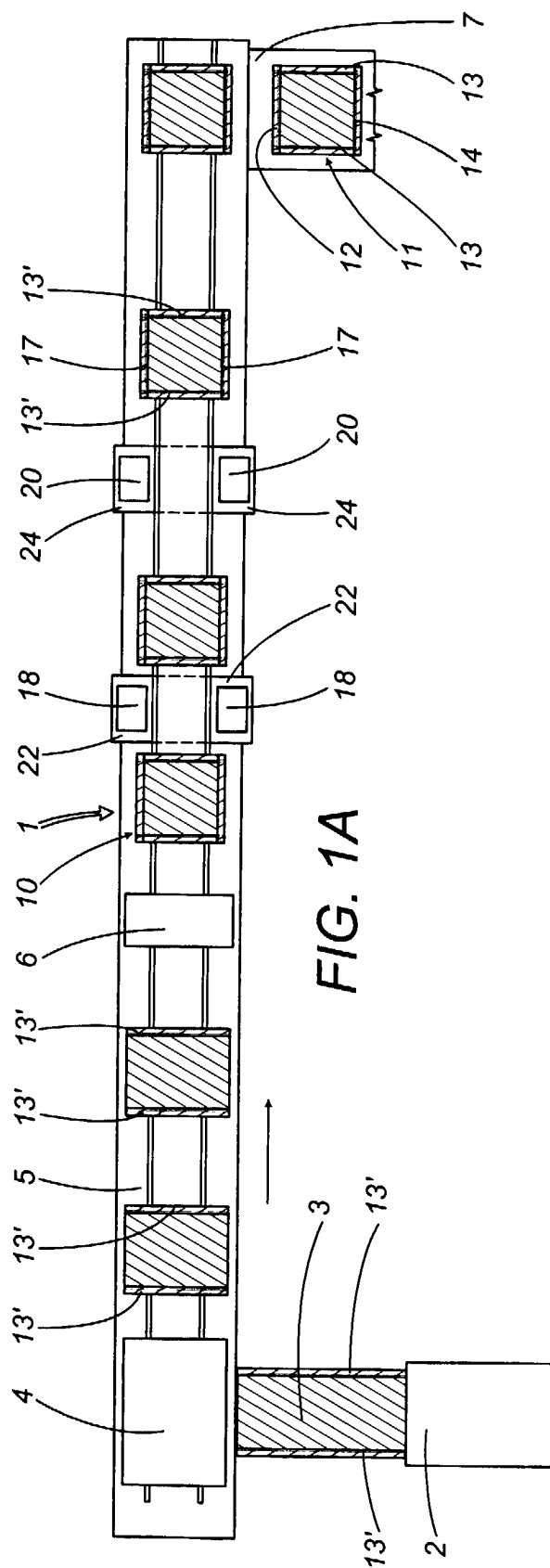


FIG. 1A

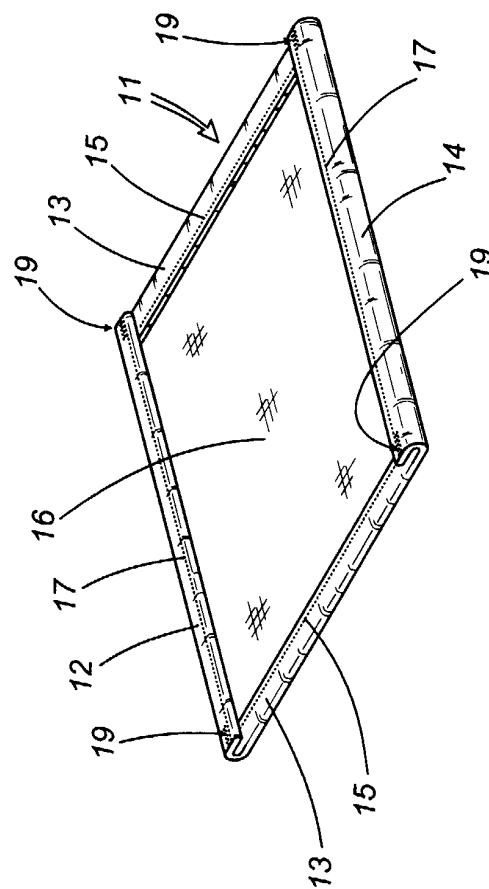


FIG. 1B

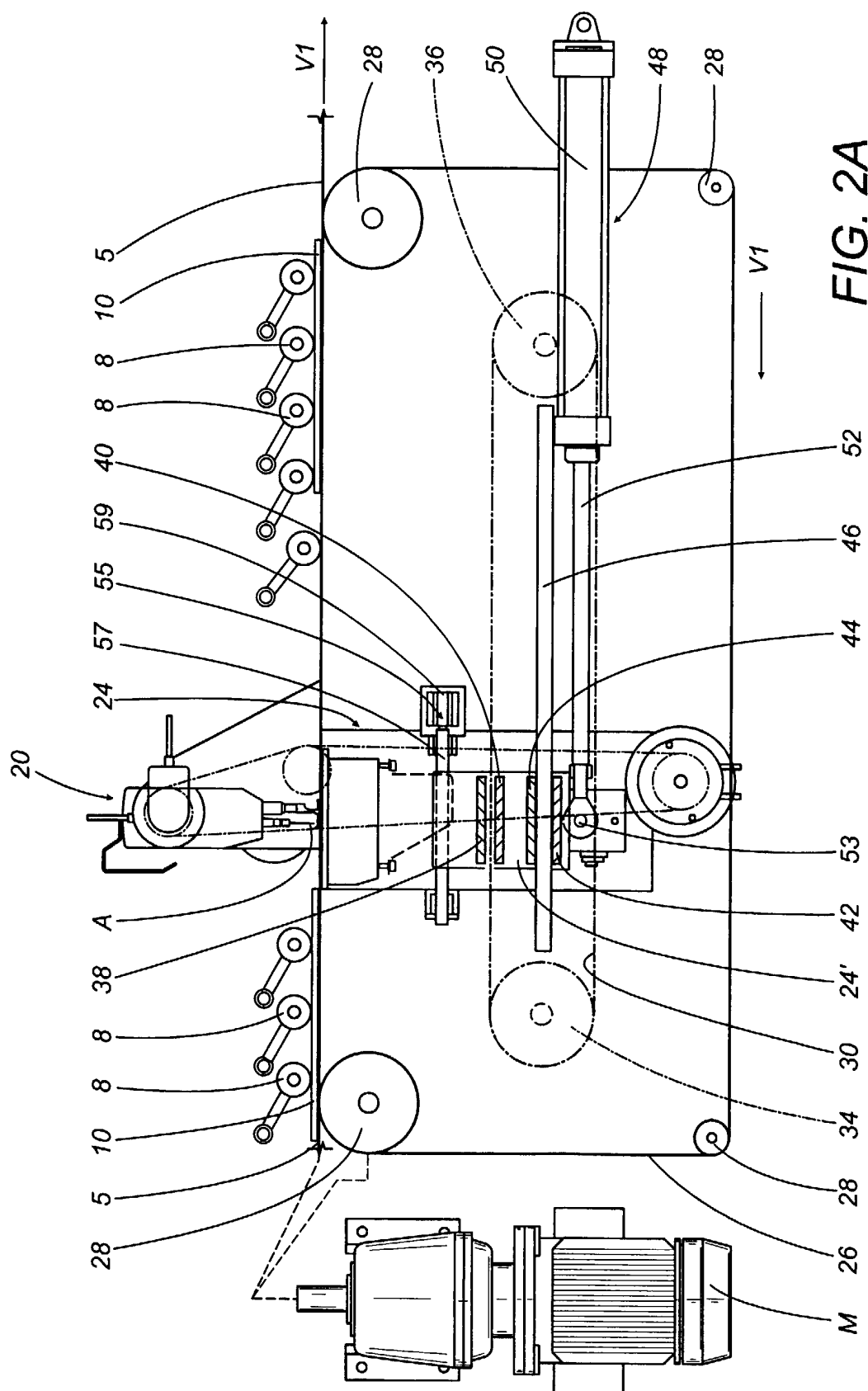
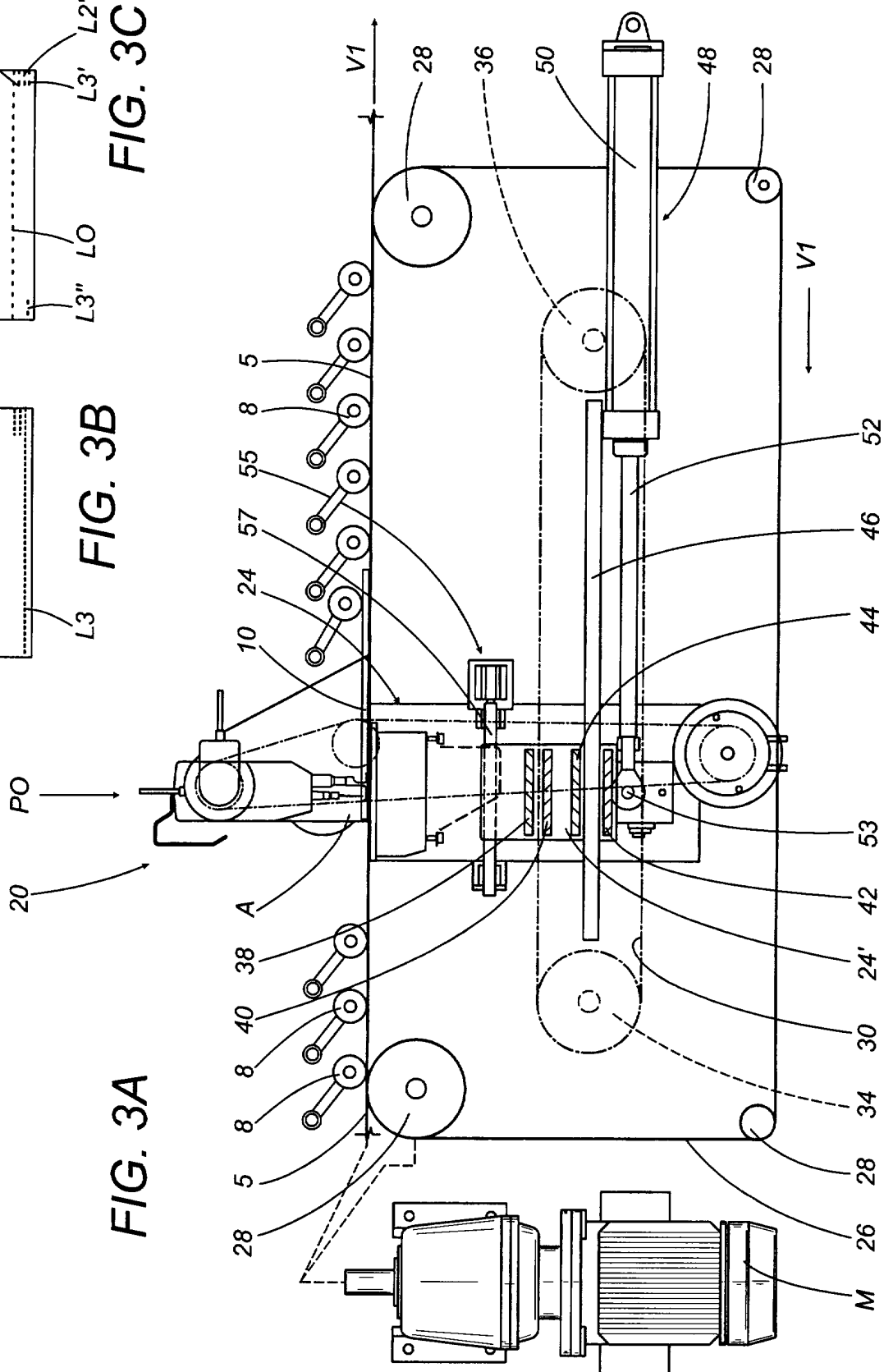
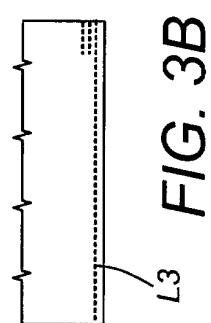
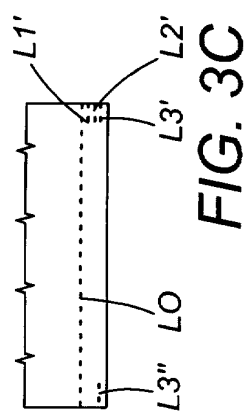
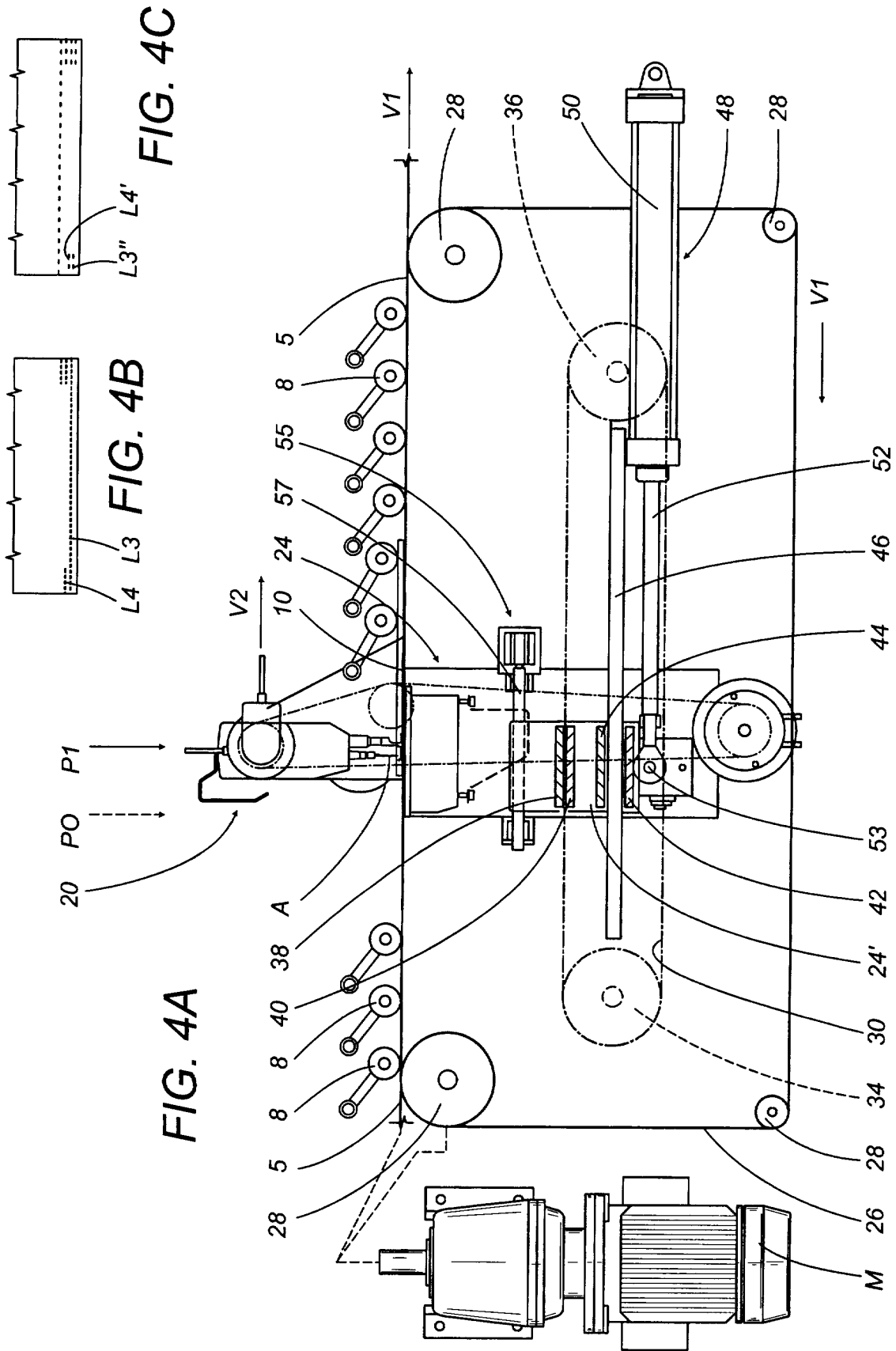
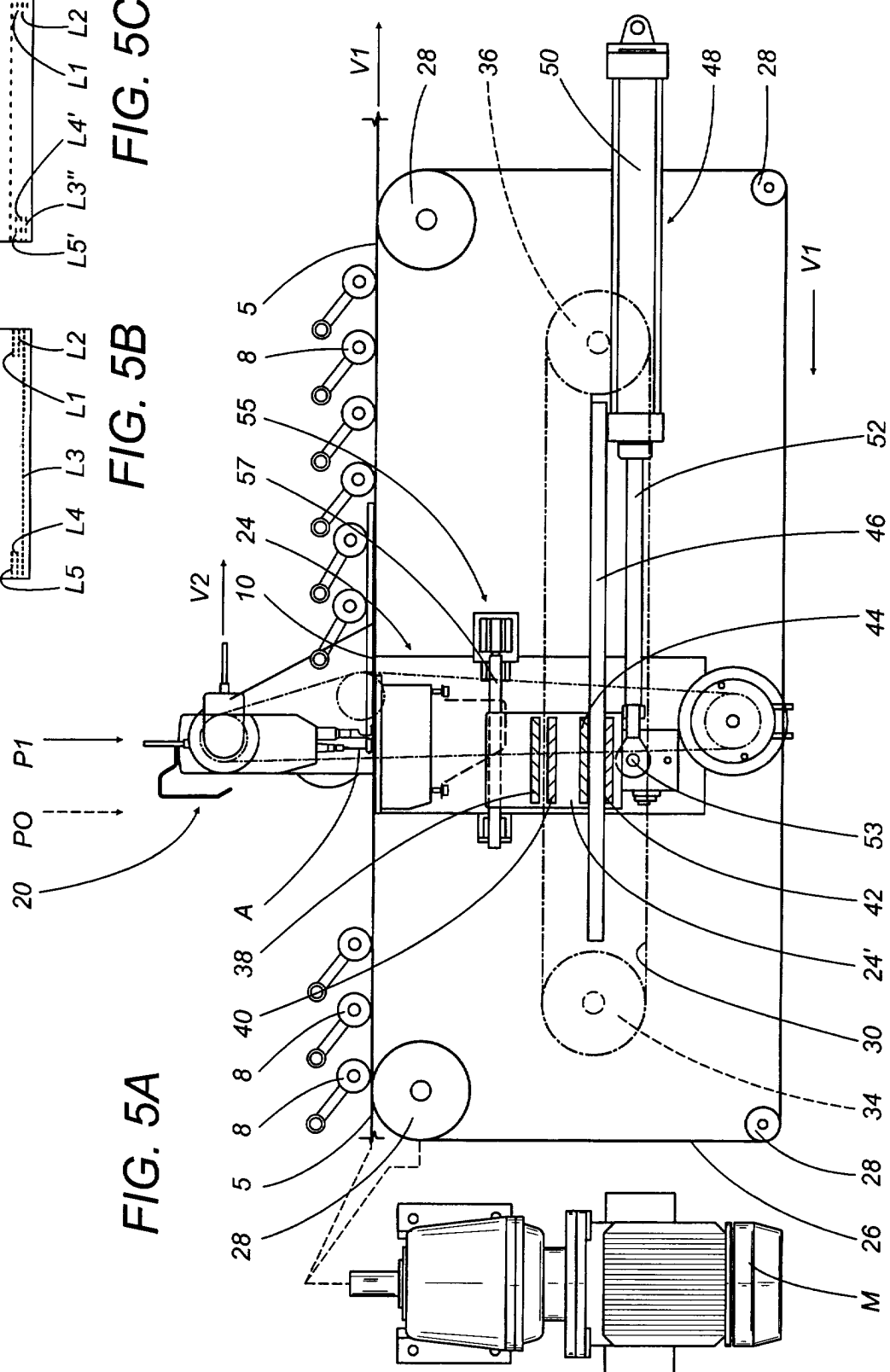
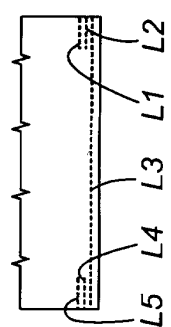
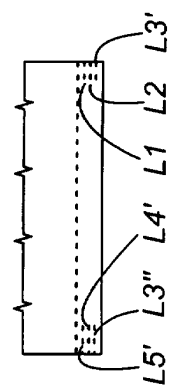


FIG. 2A







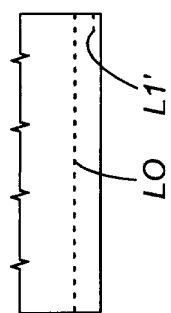


FIG. 6C

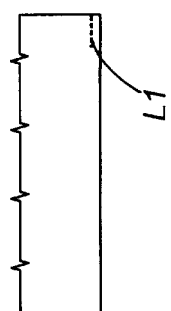


FIG. 6B

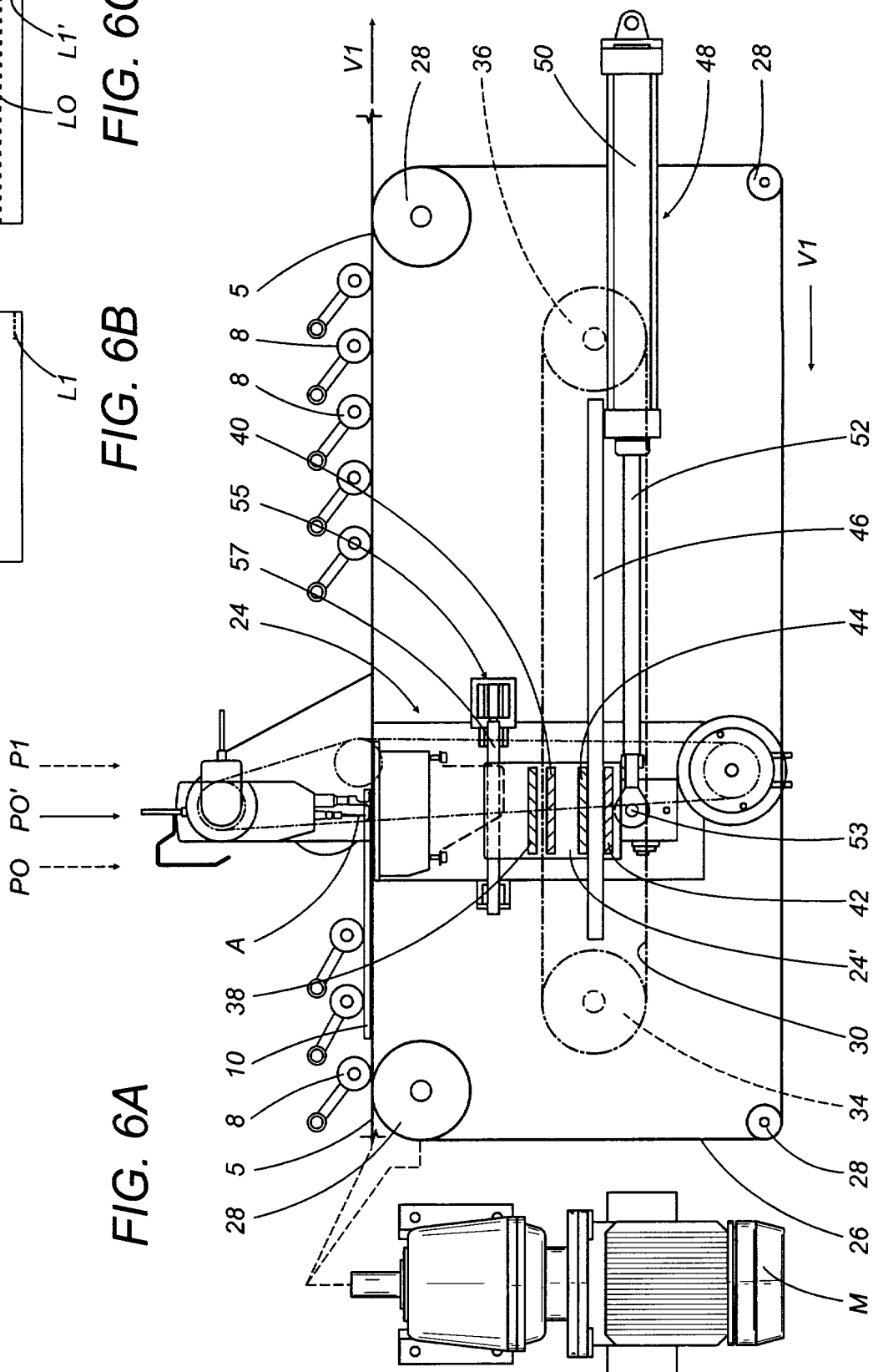


FIG. 6A

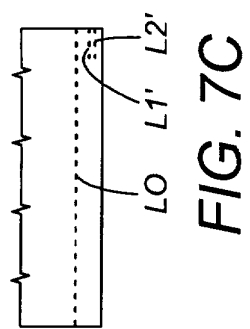


FIG. 7C

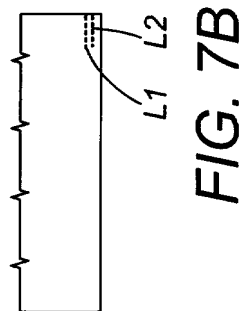
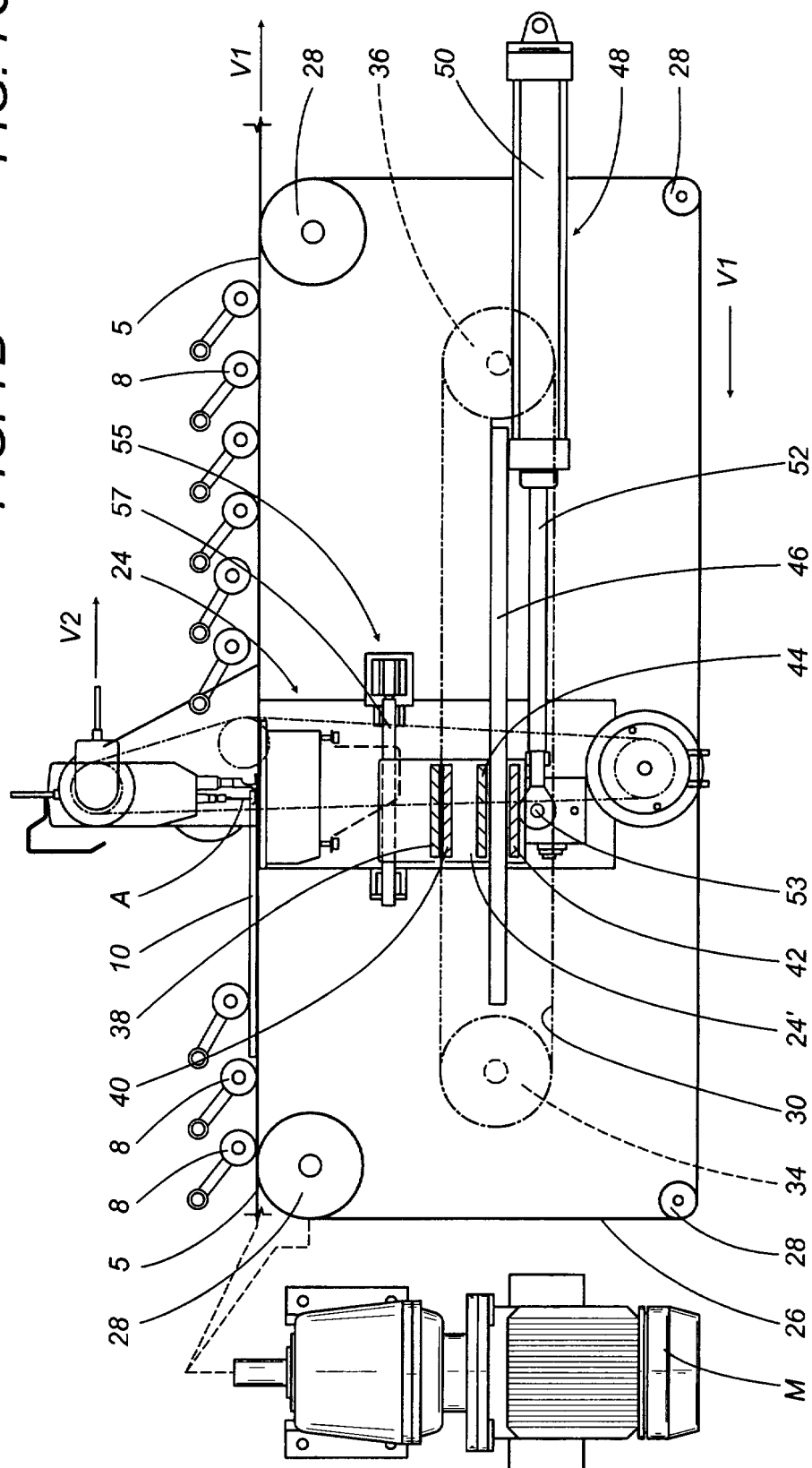
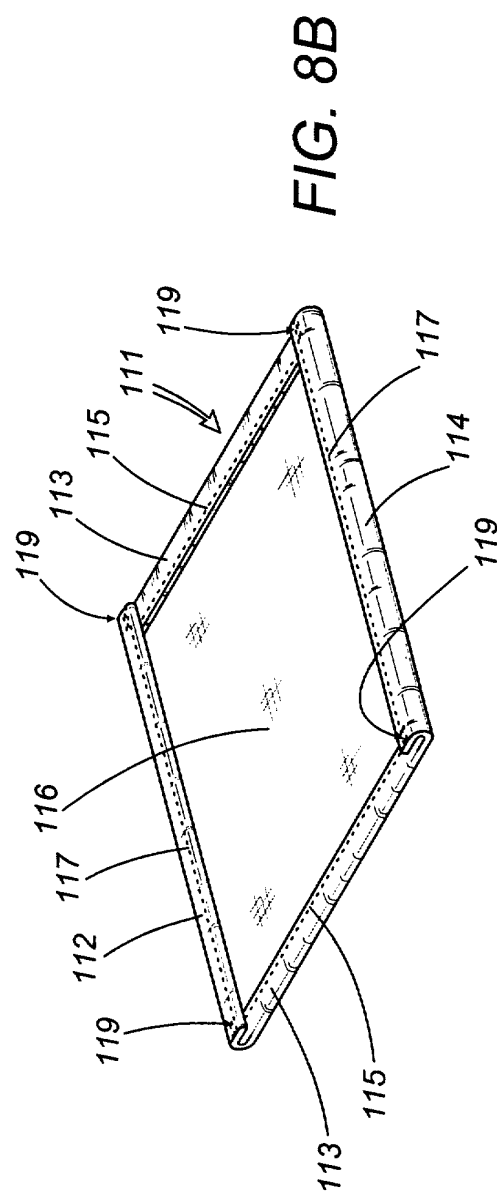
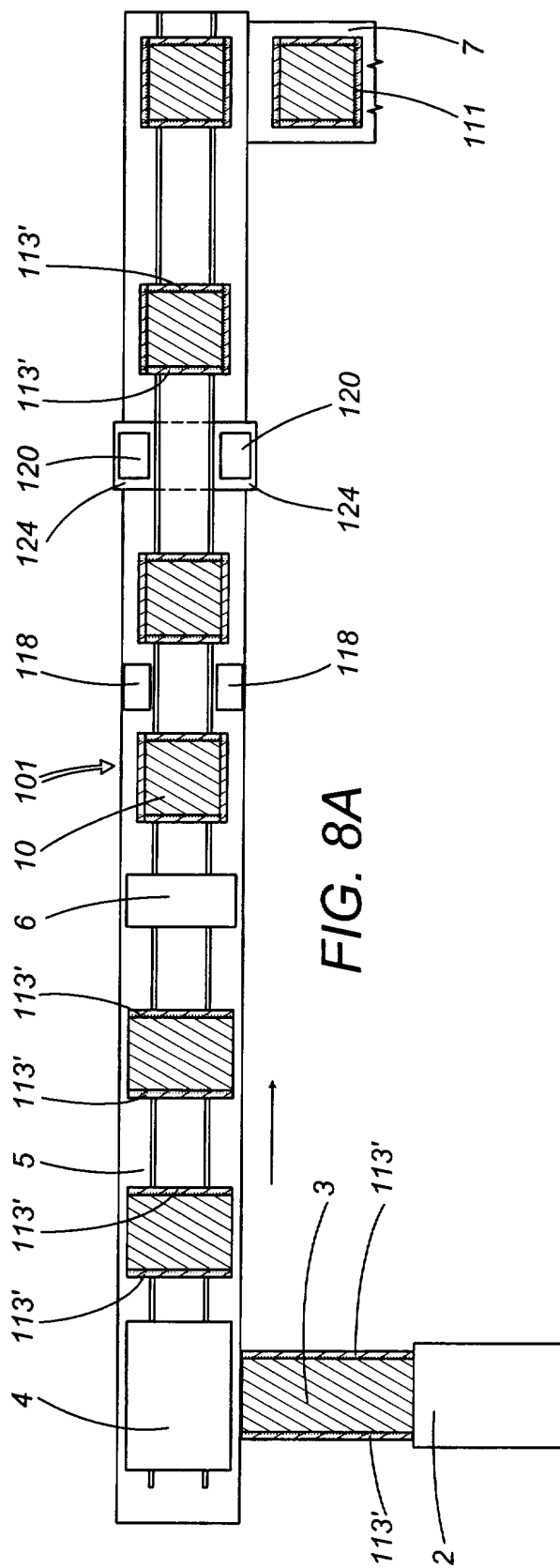


FIG. 7B

PO PO' P1 P2

FIG. 7A





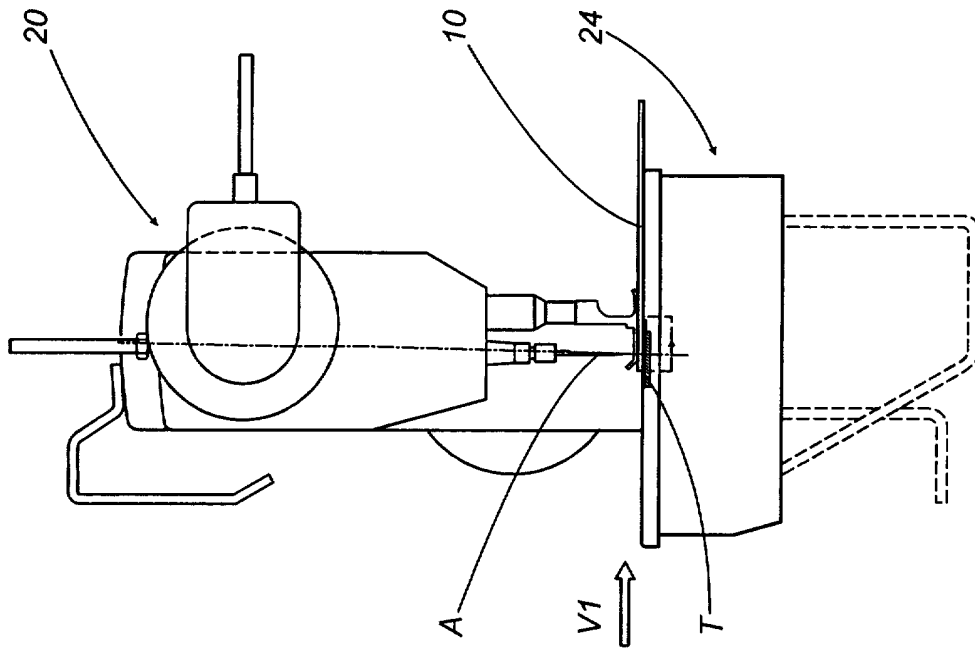


FIG. 10

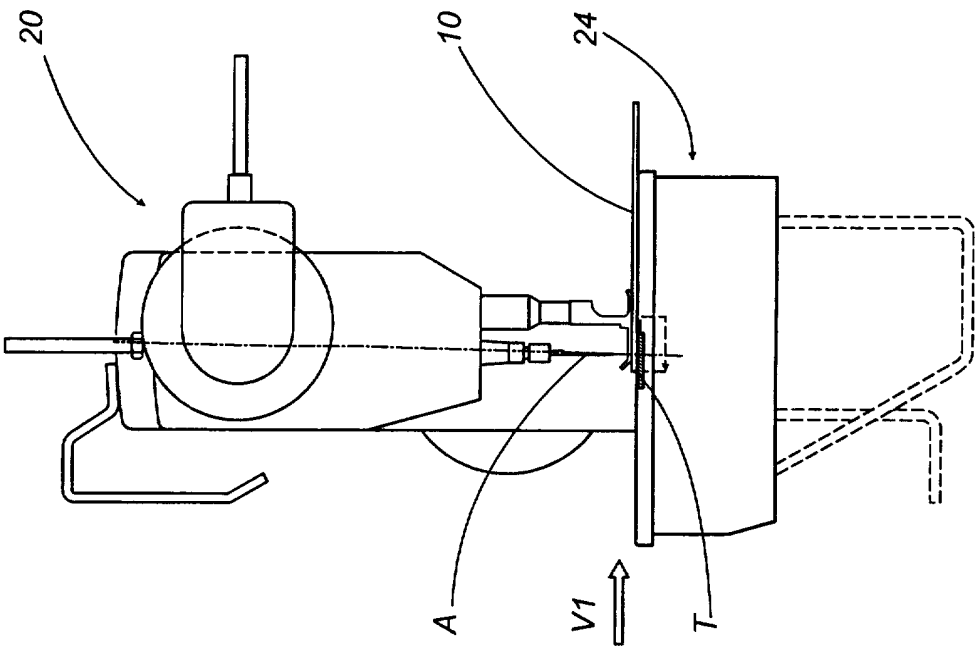


FIG. 9



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 83 0794

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|---|---|----------------------------------|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
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| | | | D05B |
| The present search report has been drawn up for all claims | | | |
| Place of search | | Date of completion of the search | Examiner |
| THE HAGUE | | 12 April 2000 | Debard, M |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p> <p>& : member of the same patent family, corresponding document</p> | | | |

EPO FORM 1503 03/82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 83 0794

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-04-2000

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