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(54) **Device for the automatic application of seam-protecting tapes on moving fabrics**

(57) A device for the automatic application of seam-protecting tapes on moving fabrics comprises means for sensing the seams (22) between moving associated sheets (9,31) of fabric or the like, relieving, constraint, release means (5,7,15,13,20), cutting means (6,14) of the protective tapes (2,18,36), support, approaching

and pressing means (10,11,33) of the protective tapes, and means for moving away the specular structures from the zones of said seams, and means of alignment synchronization of the protective tapes (2,18,36) with seams (22) depending on the advancement movement of sheets (9,31).

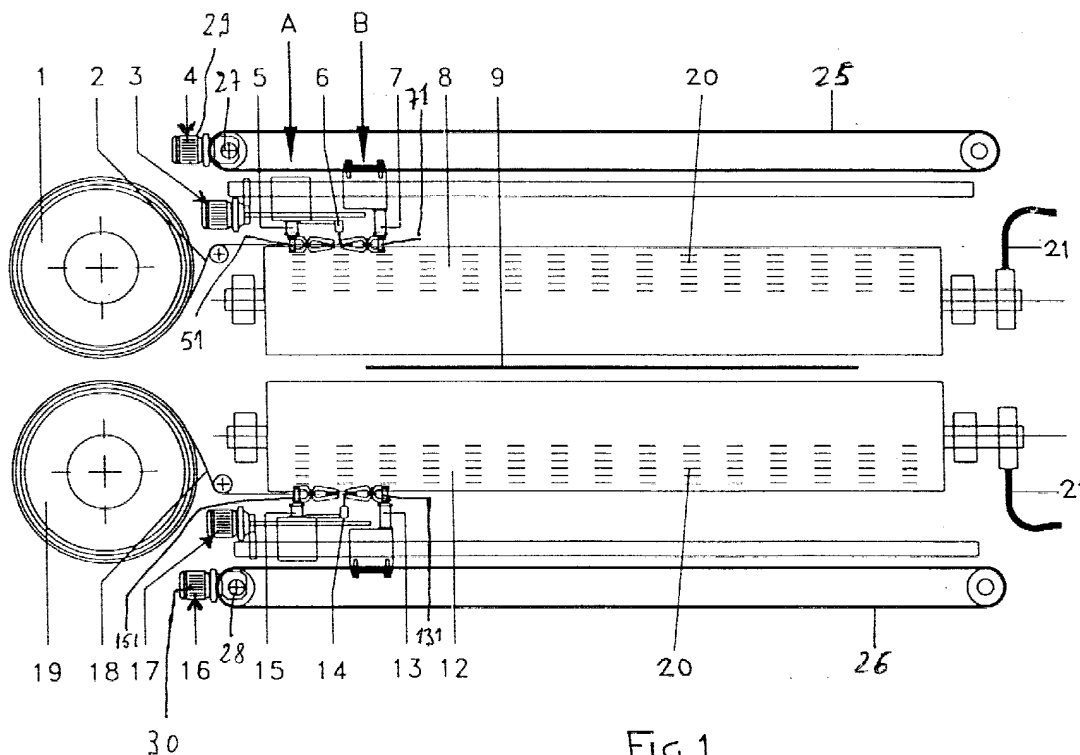


FIG. 1

Description

[0001] The present invention relates to a device for the automatic application of seam-protecting tapes for use on moving fabrics and/or the like.

[0002] More particularly, the present invention relates to a device for the automatic application of seam-protecting tapes on moving fabrics and/or the like associated to each other for the sequential workings on weaving machines, such as for instance finishing and treating machines by raising, fluffing an possible cuttings.

[0003] As is known, the seams that connect fabric sheets or the like, intended for raising and/or fluffing with possible cuttings on trains of sequential weaving machines are carefully protected in order to prevent them from quickly wearing and lacerating during the passages on raising and fluffing rollers, with ensuing detachment of the sheets and the immediate necessity of interrupting the working cycle.

[0004] This drawback involves high time losses and the engagement of supplementary labor in order to restore the operating conditions, requires the interruption of the whole production cycle and causes high fabric wastes with evident and marked economic losses.

[0005] In order to solve the problem of the wear and rapid laceration of sheet seams, a device has been proposed that provides for the application on each weaving machine of motor-driven tiles which, depending on position controls, interpose between said sheets and the raising and fluffing rollers, aligned along the circumference of the bearing structures, known by the name of "barrel". Said tiles raise the seams and keep them raised during the partial circumferential path that develops about the barrels, preventing the contact of the seams with said operating rollers. Each tile is substantially mounted on end arms that periodically rotate about the external circumference of the barrels, as function of the presence of each seam. On the arrival of each seam, the tiles activate, keeping said zone raised during the partial circumferential path of the sheet on the drum, leaving the raised zone at the end of the path during which the operating rollers are active and position again in the starting station, awaiting a subsequent seam.

[0006] However, the results obtained with the aforesaid solution are not entirely satisfactory. The main reason lays in that the device must be applied on each of the weaving machines that are present on the working lines, with ensuing higher purchase costs. Another drawback lies in that it can be mounted only on new weaving machines and not on the existing ones.

[0007] Besides, the structure of this device, especially in the part concerning the transfer of the tiles from the point of release of the seamed sheets to the starting point for a subsequent intervention, is rather complex, of difficult realization and delicate setting up and maintenance and, as a consequence, of high cost and certainly non remunerative with respect to the productivity that may be obtained.

[0008] To this, the fact adds that the thickness and the shape of the tiles and their positioning distance with respect to the circumferential operative line of the raising and/or fluffing rollers, causing not only the desired raising of the seams, but also the partial and/or progressive raising of the front and rear adjoining zones, with the evident result of a greater fabric strip before, in correspondence of and after a seam, wherein there is no working at all or the working is partial and irregular and therefore discarded.

[0009] A solution that is certainly more elementary but more effective is that of covering the seam, above and under, with strips of resistant adhesive tapes than can support without lacerating the passages and the sliding due to the contact with the raising and/or fluffing rollers. At present, this operation is carried out by hand by specifically qualified operators who, upon the arrival of each seam, partially unroll the sheets, so as to obtain a sufficient abundance of fabric allowing to operate without stopping the machines, and apply rapidly the adhesive tape on both sides, in a manner as correct and aligned as possible, to minimize wastes.

[0010] However, also this solution, while being more effective than the first one, is not free from drawbacks. In fact, it requires the presence of at least two operators with the related shift changes, and a good sensitivity and precision by said operators, both on individuating the arriving seams and the rapidity and dexterity necessary for the application of the adhesive tapes.

[0011] Object of the present invention is to solve the above drawbacks.

[0012] More particularly, object of the present invention is to provide a device such as to allow the automatic application of seam-protecting tapes on moving fabrics.

[0013] According to the present invention, these and other objects, that will be apparent thanks to the following description are obtained by means of a device comprising two specular structures comprising pressure-elements, aligned on each other, astride and orthogonal to the passing and sliding of the fabric sheets being worked. The specular structures are provided with means for sensing the seams present between the associated and moving means for the sheets of fabric and the like, of means for unfolding, restraint, cutting and release of the seam-protective tapes, supporting, approaching, pressing means of the protective tapes, and means for moving away the specular structures of the seam zones, as well as means for the alignment synchronization of the protective tapes with the seams, according to the advancing movement of said sheets.

[0014] The advantages obtained with the device for the automatic application of seam-protecting tapes on moving fabrics and/or the like of the present invention are many. The device is applied only downstream of the operating machine or before the set of sequential operating machines in case of a complete working cycle.

[0015] Its working is entirely automatic or only half-automatic for the part that concerns the cycle start ac-

tion, if no seam-sensors are present.

[0016] It may be applied not only in association with new machines of any known type, but also in association with already employed operating machines, without any need of interventions and/or modifications of the existing parts.

[0017] Besides, it allows the automatic application of protecting tapes not only on the seams but also on damaged parts of fabrics or the like, such as holes, cuttings, tears, lacerations or of any part or detail to be protected, without interrupting the continuous working cycle.

[0018] The utilizable protecting tapes may be pressure-sensitive adhesive films, films to be glued by heat-smelting, layers of heat smeltable or self-setting materials directly deposited on the seam, layers of polymerizing or heat- or cold-smeltable directly sprayed on the seams, layers of heat-drying materials directly spread on the seams.

[0019] Other advantages lie in that, according to the characteristics of the products to be treated and the treatments to be carried out, the protecting tapes may be applied on one side only of the sheets or on both sides, in the same way and with a substantially equal execution time.

[0020] The device of the present invention, though being particularly suitable for the protection of seams of fabrics to be fluffed and/or raised, is advantageously utilizable also when the protection of one or more fabric parts or the like is required, or when the seams, while being not directly abraded during the workings, are all the same traction-stressed and subject to breaks.

[0021] The consistence and resistance of the protective tapes is such as to bear without problems the passages on the raising and fluffing rollers and to ensure the stability of the seams during the passage on all the operating rollers of all the barrels. The size of the protective rollers and their correct and regular positioning allow to minimize the production wastes; the whole with evident and marked economic advantages, both from the point of view of investments in machines and the productive one.

[0022] The constructive and functional characteristics of the device for the automatic application of seam-protecting device on moving fabrics of the present invention will be better understood thanks to the following description wherein reference is made to the attached drawings that represent some embodiments solely reported by way of non limiting example and illustration, and wherein:

Figure 1 shows a schematic front view of a first embodiment of the device for the application of the seam-protecting tapes on moving fabrics of the present invention comprising two specular structures provided with rollers;

Figure 2 shows a schematic lateral view of the device of Figure 1;

Figures 3a, 3b, 3c, 3d and 3e show the schematic

front views of the upper roller of the device of figure 1 in the sequential operating steps of automatic application of the seam-protecting tapes;

Figure 4 shows the schematic plan view of an example of protective tape applied on the seam between two fabric sheets; and

Figure 5 shows the schematic lateral view of a second embodiment of the device of the present invention comprising two specular structure linearly sliding, with pressure or spray means.

[0023] With reference to Figures 1-3, the device for the automatic application of the seam-protective tapes on moving fabrics of the present invention comprises two specular parts or structures, one of which for the application of a protective tape 2 on one side and the other one for the application of a protective tape 18 on the other side of the fabric or like material 9.

[0024] The protective tape 2, 18 may be applied on both sides or surfaces of fabric 9 to be protected or on one only side of the same, causing the intervention of one only of the two specular structures.

[0025] The protective tape 2, 18 may be an adhesive tape applied by compression by means of two nip rollers 8, 12. The protective tapes 2, 18, that adhere on the side opposite to rollers 8, 12, are maintained on said rollers by means of a suction obtained by vacuum pumps. To this aim, a circumferential portion of rollers 8, 12 is provided with a set of holes or slits 20 through which the sucking effect of an internal depression, due to the action of vacuum pumps (not shown) connected through connectors 21, takes place. Alternatively, the protective tapes 2, 18 may be maintained on rollers 8, 12 also electrostatically, by magnetizing said protective rollers by means of a high voltage device, or with other anchoring systems.

[0026] During the step of deposition and compression of the adhesive protective tapes 2, 18 on seams 22 present between fabric sheets or the like 9, the vacuum is taken off to allow a perfect adhesion on the fabric. If the adhesive protecting tapes have been electrostatically magnetized, it is not necessary to de-magnetize them at the time of the gluing on the fabric.

[0027] The two adhesive protection tapes 2, 18, adhered on each upper and lower side of seams 22, project for some centimeters along both sides of fabric 9 and the two protruding edges 24 glue with each other so as to increase the adhesion effect and eliminate possible undesired detachments.

[0028] The two protruding edges 24 on both sides act also as visual signal of the presence of seams 22. On said protruding edges 24 it is possible to apply, by hand or automatically, the identification codes of the batches of the treated fabric or the like.

[0029] The protective tapes 2, 18 awaiting to be applied are not necessarily positioned on the lower and upper sides of the fabric sheet 9, but may be positioned on the sides or directly near the seamed fabric sheets 9.

[0030] Rollers 8, 12 of deposition of the protective tapes 2, 18 on seams 22, normally rotate automatically because of the dragging effect produced by said fabrics 9, or the like, that slide according to arrow 23. In any case, it is possible to motorize both rollers 8, 12 causing their rotation in perfect synchronism with the velocity of fabrics 9, or the like, being treated.

[0031] The approaching of rollers 8, 12 takes place through the action of piston 10, 11 of a pneumatic cylinder. The approaching control takes place preferably automatically in synchronism with the presence of seam 22. The individuation of the seam may be carried out by means of any known means, such as for instance a seam sensor (not shown) with or without physical contact with fabric 9.

[0032] For already existing plants, the approaching control of rollers 8, 12 may also be made by hand, with a visual individuation of seams.

[0033] The protective adhesive tapes 2, 18, wound on bobbins 1, 19, are automatically unwound and laid on deposition rollers 8, 12, by means of couples of gripping pliers 5, 7 and 15, 13.

[0034] A cutting device 6, 14 is positioned on the end of rollers 8, 12, in correspondence of the entry zone of the protective tape 2, 18.

[0035] Said cutting device 6, 14 is activated by solenoid valves managed by a PLC or microprocessor, according to known technologies.

[0036] The gripping pliers 5, 7 and 15, 13 of the protection tapes 2, 18 are of the pneumatic type and are activated by pistons 51, 71, 131, 151 of a cylinder-piston pneumatic system assisted by solenoid valves which, in their turn, are managed by the PLC or microprocessor.

[0037] In order to ensure the perfect detachment of pliers 5, 7, 15, 13 by the adhesive part of the protection tapes 2, 18, pliers are made from anti-adhesive material and may be provided in their central part, with a compressed air ejector. A jet of compressed air let directly in the pliers' middle at the time of the detachment ensures and facilitates such action.

[0038] Each pliers 5, 7, 13, 15 is connected to a translator 3, 4, 16, 17 and does along fabric 9, as specified in the following.

[0039] Each translator 3, 4, 16, 17 comprises a positive drive belt 25, 26, supported by a serrated pulley 27, 28, activated by a motor 29, 30 that may be a stepping motor or a DC motor or other motors.

[0040] Motors 29, 30 are controlled, with regard to their velocity and intervention times, by dedicated cards, assisted in their turn by a PLC or microprocessor.

[0041] The working logic of the whole machine is performed by PLC or microprocessor.

[0042] The cutting measure of both protruding lateral edges 24, corresponding to each protected seam, is automatically calculated with the width of fabric 9, plus some centimeters, depending on the calibration of the cutting devices 6 and 14.

[0043] The reader of the position and height of fabric

9 may be a photocell or other known optical or mechanical sensing means.

[0044] The height of fabric 9 being worked is sensed at the time of the reading of seam 22, and is stored until the end of the operations of deposition, adhesion and cutting of the protective tapes 2, 18.

[0045] The positioning of pliers 5, 7, 13, 15 according to the position of fabric 9 is controlled by a reader of the position and height of the fabric, which transfers data to the PLC which, in its turn, governs the motor cards.

[0046] The detailed working of the device of the present invention will be described hereafter with reference only to its upper structure; the lower structure, being identical and specular, operates in the same way.

[0047] The operating machine or the first operating machine of several machines intended for working fabrics 9 constituted of sequential sheets associated to each other by seams 22, is associated to the present device, located downstream.

[0048] Awaiting to sense a seam, pliers 5 and 7 are in the initial positions A and B (Fig. 1). Fabric 9 advances according to the direction of arrow 23, and a sensor of a known type, not shown, located at a certain distance from the device, senses the passage of every seam 22.

[0049] The more external pliers 5 remains open, while the more internal pliers 7 closes grasping the end of the protective adhesive tape 2; roller 8 remain at atmospheric pressure (Fig. 3a).

[0050] Translator 4 of the more internal pliers 7 draws pliers 7 and the protective film 2, engaged in it, towards the right end of fabric 9, plus some centimeters (according to the view of Fig. 3b), up to the sensed height of fabric 9, plus some centimeters.

[0051] After some seconds from the start of pliers 7, translator 3 of the more internal pliers 5, positions the same at the opposite end (left end, according to the view of Fig. 3c) of fabric 9 up to the sensed measure of the fabric, minus some centimeters.

[0052] Now pliers 5 closes, a vacuum pump connected to roller 8 through connection 21 creates a depression in the inside of said roller and the cutting device 6 cuts to the right measure film 2.

[0053] Afterwards, the more internal pliers 7 opens and the film deposits on roller 8, maintained by the suction effect caused by the vacuum created in the inside of said roller 8 and felt through the set of holes or slits 20, made on a portion of its circumferential surface (Fig. 3d).

[0054] When a seam 22 to be protected is near rollers 8, 12, an electronic synchronism device of a known type activates pistons 10, 11, putting said rollers 8, 12 in touch with fabric 9. The fabric which is undergoing a translation movement according to the direction indicated by arrow 23 and pressed between nip rollers 8, 12, causes their rotation, until the protective adhesive tape 2 has reached seam 22 (Fig. 3e). The protective tapes 2, besides adhering to the fabric, glue to each other for a length of some centimeters, in correspondence of the

two edges 24, located at the sides.

[0055] In a calculated position, at the contact time of the adhesive films with the fabrics, the vacuum of rollers 8 and 12 ends, while pistons 10, 11 go on with their action until said rollers, rotating, return to their starting position; at this time, pistons reopen and rollers are sent away.

[0056] The more internal pliers 7, still open, is brought again to the B position by means of translator 4, after which pliers 7 is closed by means of piston 71, locking the new end of film 2; once finished the closing operation, the more external pliers 5 opens and the device is ready for a new operation on a subsequent seam.

[0057] Bobbins 1 and 19 whereon the adhesive films 2 are wound are so submitted to friction as to keep them adequately in traction. Translator 3 acts by shifting pliers 5, to the right or to the left, depending on the length of the fabric, but its action is always subsequent to the shifting of pliers 7.

[0058] All the operations described for the upper pliers 5 and 7 and those of the cutting tool 6 are equal and simultaneous with the corresponding lower pliers 13 and 15 and cutting tool 14, as are equal the pressing and moving away 10 and 11 and of activation/deactivation of vacuum in rollers 8 and 12. The exhaustion of material on bobbins 1 and 19 is sensed and signaled by inductive or mechanical sensor of a known type.

[0059] The working logic of the whole device is performed by a PLC or microprocessor.

[0060] According to an embodiment, the devise of the present invention, instead of adopting the nip rollers 8, 12 system, utilizes a linear compression system, comprising (Fig. 5) a supporting structure 37 on which there are located translation guides 35, parallel to the moving direction 23 of fabric 31 to be treated. On each of guides 35 and on each of devices on the two sides of fabric 31, there slide flat translator carriages 34 orthogonal to fabric 31, provided with piston 33 and a possible heat-smelting ovens 32.

[0061] The linear compression device allows to carry out the deposition of the protective tape 36 in different ways with adhesive and/or thermoplastic, self-agglomerating, hot welded materials or any other material capable of constituting a protection for the concerned parts. The application of the protection material may be carried out by gluing, pressing, coatings, spraying or any other suitable application system. In particular, it is possible to perform the deposition of the protective tape by means of: compression-gluing of an adhesive film, heat-smelting gluing or direct deposition on the fabric of a layer of heat-smelting material, or direct deposition of a layer of self-setting material directly on the fabric; or spraying of layer of heat- or cold polymerizing layer directly on the fabric; or spraying a heat- or cold smelting; or spraying a layer of head-drying material directly on the fabric.

[0062] The possible positioning pliers of the protective tape, the cutting means and the seam sensing systems

are similar to those described with reference to the first embodiment of the device.

[0063] The constraint means of the protective film supports 31 and the like may also be constituted by holes or slits, distributed throughout their surface, connected in their inside to depression-suction means, such as vacuum pumps or means of high pressure electrostatic magnetizing means or the like.

[0064] In the spraying system, the approaching/going away pistons 33 are not present; the deposition takes place through spray-guns mounted on transversal translator, of the type already described in the first solution, and the possible ovens 32 are located after the spraying-guns.

[0065] In any case, the flat translating carriages 34 are caused to slide along guide 35 with synchronized tracking movement of the fabric, by means of motors or pneumatic pistons.

[0066] Although the invention has been described in conjunction with specific embodiments, offered for illustrative purpose only, it is evident that many alternatives and variations in the components; the control, the movement and the measuring means will be apparent to those skilled in the art, in the light of the foregoing description.

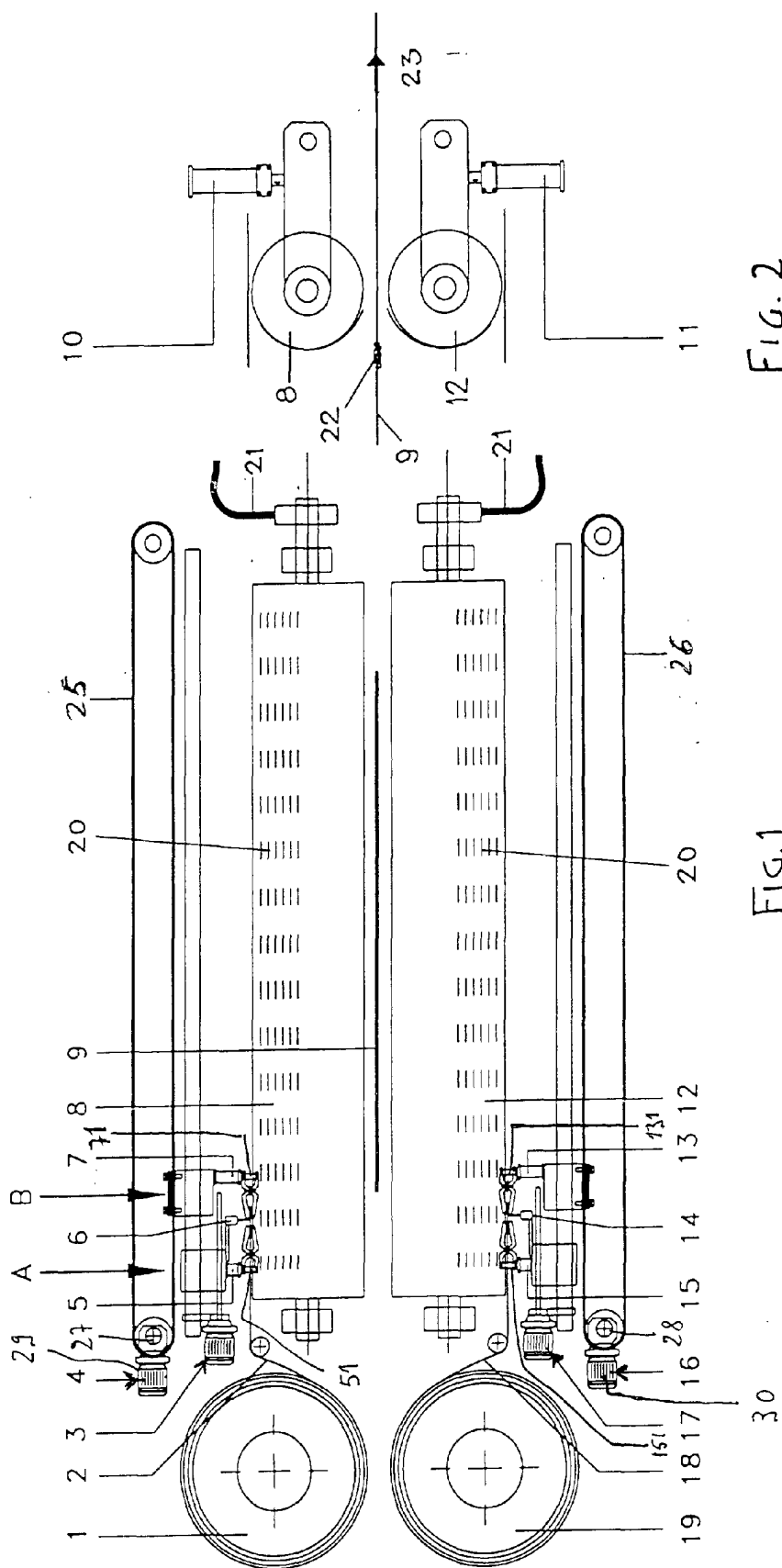
[0067] Accordingly, the invention is intended to embrace all of the alternatives and variations that fall within the spirit and scope of the appended claims.

Claims

1. A device for the automatic application of seam-protecting tapes on moving fabrics and/or the like, **characterized in that** it comprises specular structures comprising pressing element (8-12, 34) aligned to each other astride and orthogonal to the passing and sliding (23) of the sheets (9, 31) of the fabric sheets (9) and the like being worked; said specular structures being provided with means for sensing seams (22) located between associated and moving fabric sheets (9, 31) or the like; relieving, constraint, release means (5, 7, 15, 13, 20) and cutting means (6, 14) of the protective tapes (2, 18, 36) for seams (22); means (10, 11, 33) of support, approach, pressing of the protective tapes (2, 36); means for moving away the specular structures from the zones of said seams; and synchronized means for the alignment of the protective tapes (2, 18, 36) with seams (22), according to the advancing motion of the sheets.
2. The device according to claim 1, **characterized in that** the pressing elements are hollow rollers (8, 12) that comprise restraint means for protective tapes (2) constituted by holes or slits (20) distributed throughout a circumferential portion thereof, which connect their inside with depression-suction means

such as vacuum pumps.

3. The device according to claim 1, **characterized in that** the pressing elements are hollow rollers (8, 12) associated to restraint means for protective tapes (2) of the type of high voltage electrostatic magnetization type. 5
4. The device according to claim 1, **characterized in that** the pressing elements are flat translating carriage (34) comprising restraint means for protective supports (31) constituted by holes or slits (20) distributed throughout their surface, connecting in their inside depression-suction means such as vacuum pumps; said carriages being slidably moved along guide (35) with a synchronized tracking movement of the fabric, by means of motors or pistons. 10
5. The device according to claim 1, **characterized in that** the pressing elements are flat translating carriages (34) comprising restraint means for protective supports (31) of the high voltage electrostatic magnetization (35) with synchronized tracking movement of the fabric, by means of motors or pistons. 20 25
6. The device according to any of the preceding claims, **characterized in that** the pressing means (8, 12, 34) are provided with automatic approaching/moving away gears (10, 11, 33) with a synchronized control of the presence of seam (22) on moving fabrics and the like (9, 31); said synchronism depending on the sensing of the seams by means of a sensor. 30 35
7. The device according to any of the preceding claims, **characterized in that** the film-like protective tapes (2, 18, 36) are caused to adhere to the upper and lower side of seams (22), with side projections of some centimeters; the resulting protruding edges (24) being glued to each other and acting as a visual signal of the presence of seams (22) and as support for possible identification codes of the treated fabric batches, or the like. 40 45
8. The device according to any of the preceding claims, **characterized in that** the relieving, constraint, release means and the cutting means associated to the pressing means (8, 12, 34) comprise couples of pliers (5, 15, 7, 13) and cutting means (6, 14); said pliers (5, 15, 7, 13) being fixed to translators (3,4,16,17) for the gripping and adjustment of the position of each edge of the fabrics, with the addition of a width of a lateral edge (24); the total measure of the extension of the protective tapes (2, 18, 36) being automatically calculated as concerns the width of the fabric plus some centimeters, depending on the calibration of the cutting devices (6, 14); the sensing of the width of the fabric being performed by means of photocells or other optical or mechanical sensing devices at the time of the reading of the seam (22), and being kept stored until the end of the deposition, adhesion and cutting of the protective tapes (2, 18, 36). 50
9. The device according to any of the preceding claims, **characterized in that** the protective tapes (2, 18, 36) may be applied on both sides of the fabric or the like (9) or one only side of the material to be protected, with the intervention of either of its specular structures. 55
10. The device according to any of the preceding claims, **characterized in that** it comprises heat-smelting ovens (32).



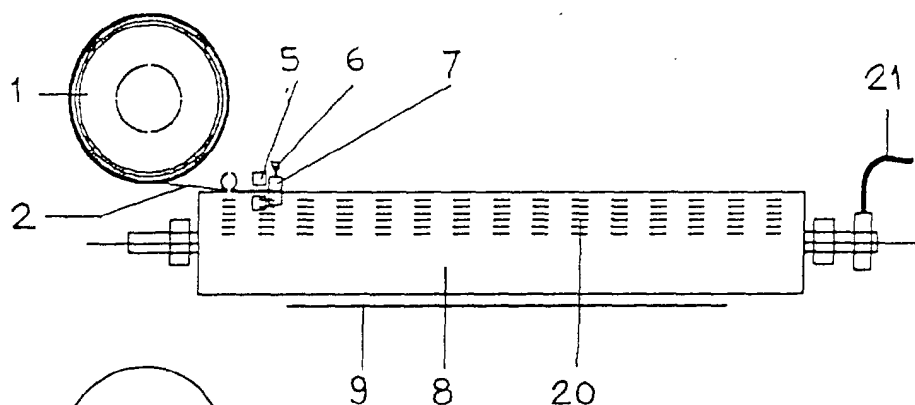


Fig. 3a

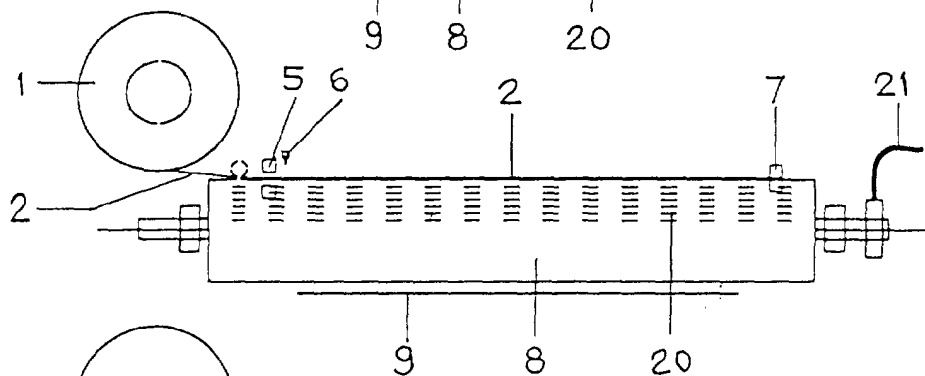


Fig. 3 b

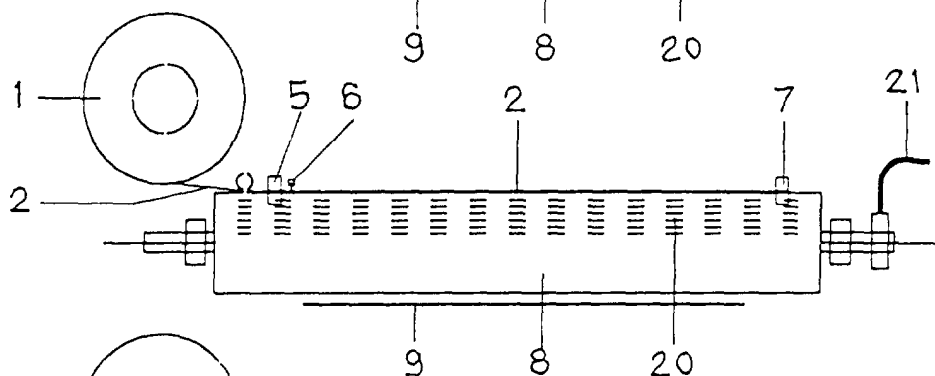


Fig. 3c

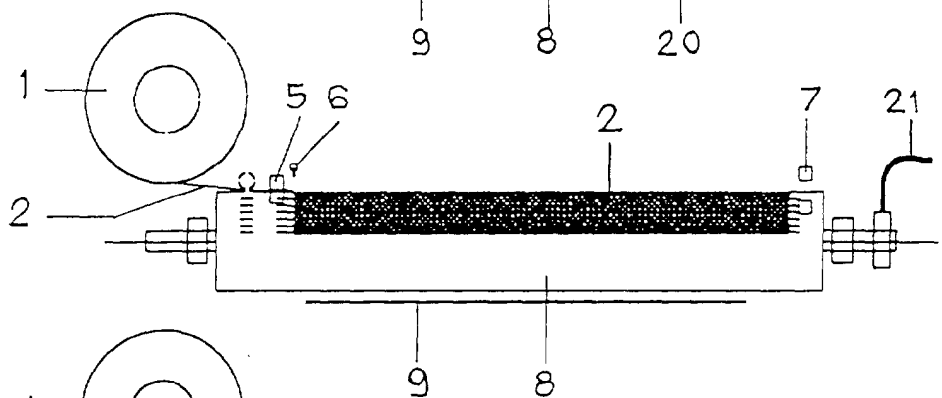


Fig. 3d

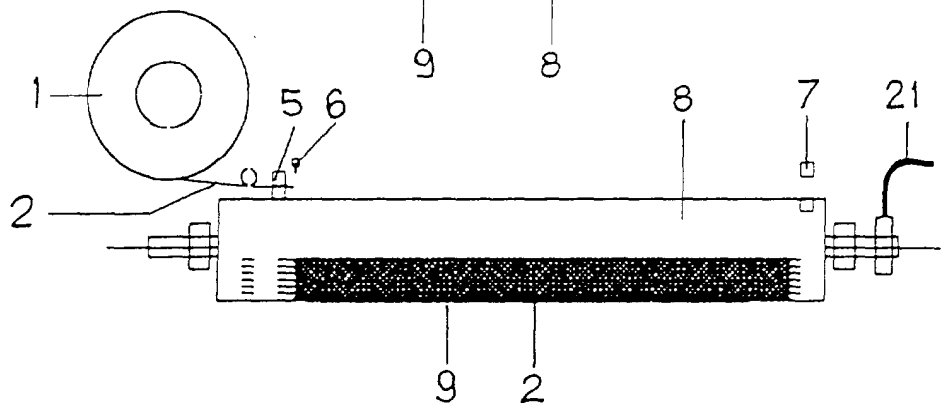


Fig. 3 e

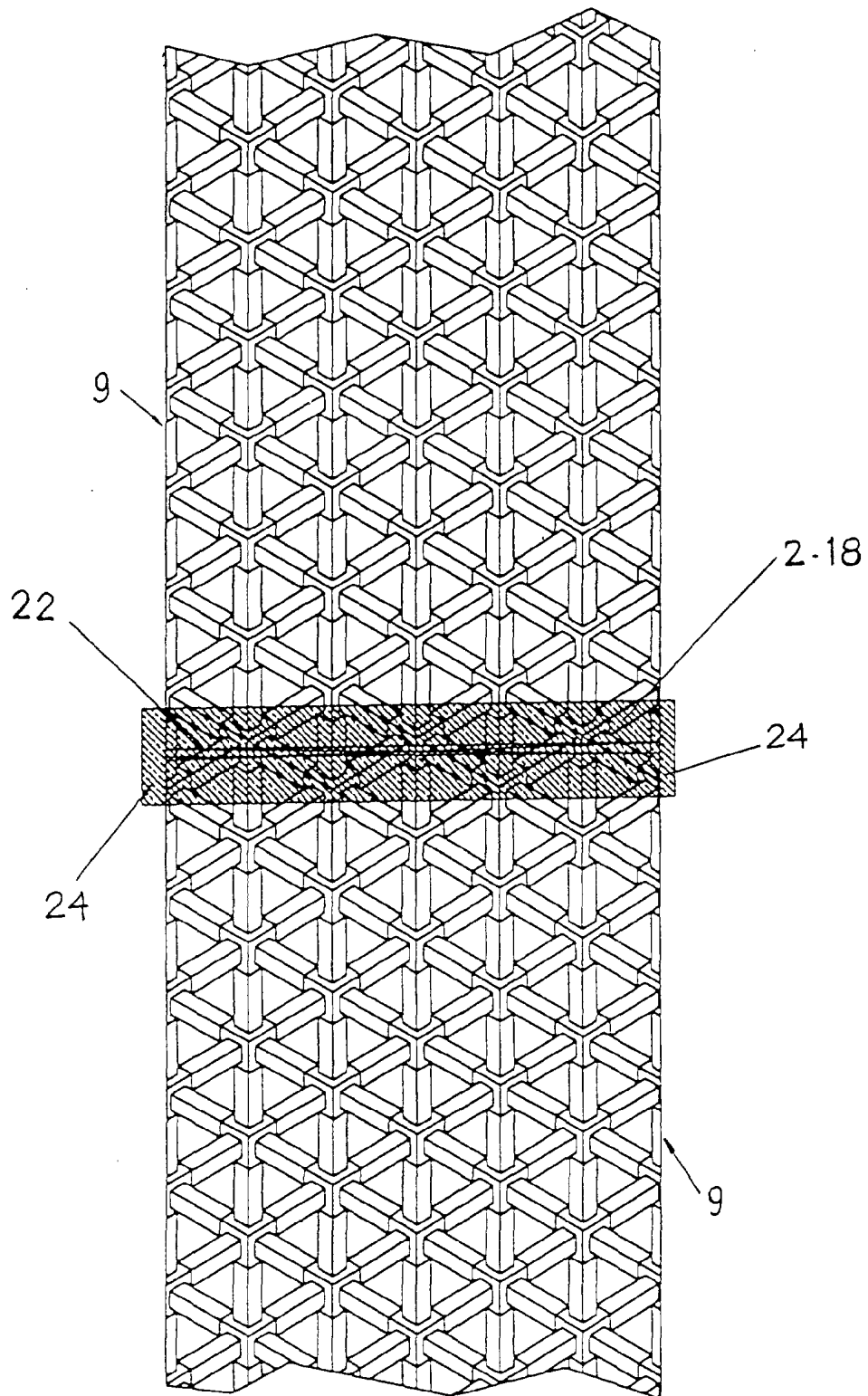


FIG. 4

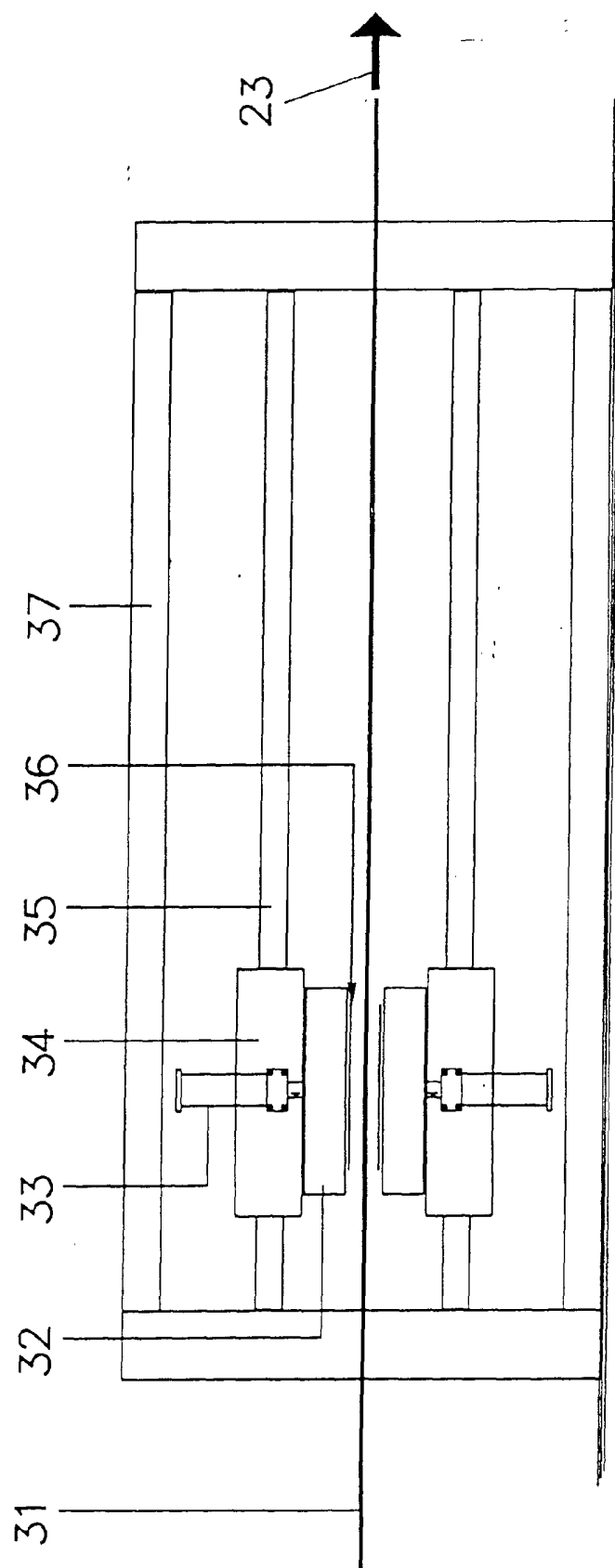


FIG. 5