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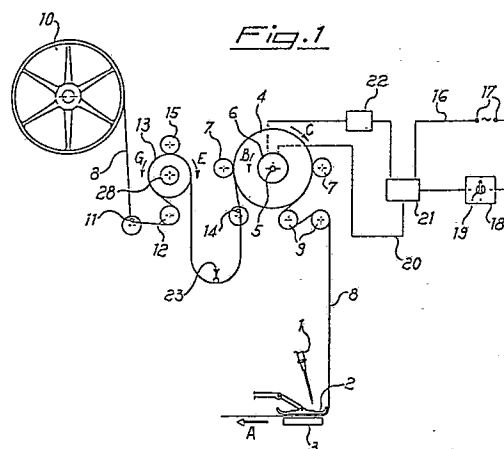
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54 **An improved device for controlling the feeding of an elastic tape in sewing machines.**

57 This invention concerns an improved device for controlling the feeding of an elastic tape in sewing machines.

It includes a tensioning roller and a first pressing means having inserted therebetween a tape pulled by the sewing machine forwarding means, said roller being connected to the shaft of an electric motor which is rotated according to the tension which is desired to be provided in the tape; a slackening roller mounted between the tensioning roller and the source of supply of the elastic tape; a second means adapted to press the tape against the slackening roller; and a sensor adapted to detect the tape position within the span between the tensioning roller and the slackening roller, and being connected to a motor which rotates the slackening roller in either direction respectively withdrawing tape from said source of supply or paying it out thereto in order to constantly maintain a slack tape loop within said span, whereby the tape is supplied tension-free to the tensioning roller.



Description

AN IMPROVED DEVICE FOR CONTROLLING THE FEEDING OF AN ELASTIC TAPE IN SEWING MACHINES

The subject of this invention is a device for controlling the feeding of an elastic tape. Said device is applied in sewing machines.

In the manufacture of garments it is often required to crimp certain areas thereof, particularly at their hems. Said crimped areas are usually provided by tensioning the elastic tape while the same is being sewn on the garment, whereby once the sewing is over and tensioning of the elastic tape is dropped, the garment, at the tape area, gets formed with a crimp which is proportional to the tension applied to the elastic tape during the sewing operations. Usually, it is the operator of the sewing machine who applies said tension by hand. However, said operation requires an operator skill, whereby a difference usually shows in the crimped areas of the same garments at different times of manufacturing.

There is already known U.S. Patent No. 3 856 224, filed on July 31st, 1972, concerning an apparatus adapted to control the feeding of an elastic tape in a sewing machine, said apparatus including an arm actuated by the elastic tape pulled by the sewing machine forwarding means, feed rollers for said elastic tape located upstream from said arm and a control unit for supplying power to an electric motor whose speed varies as a function of the position taken by said arm, whereby the rollers who are mechanically connected to said motor can feed the tape at a controllable rate.

Italian Patent Application No. 40074 A/81, filed on July the 10th, 1981, is also known, concerning an apparatus for controlling the feeding of an elastic tape, including motor means connected to tape feed rollers, an electromechanical transducer adapted to sense the elastic tape stretching, whereby deformations generated on the mechanical part of the transducer are transformed into electrical signals which, after having been compared with predetermined reference signals, provide actuating signals for said motor means, whereby said rollers are rotated in a certain direction, or in the opposite direction, in order to provide the tape with predetermined tension levels.

While said apparatus already known are conceptually of value, as far as their background principle is concerned, their cost cannot be disregarded, in particular when comparing it to the service they provide: in fact in most cases said apparatus are used to provide limited tape tensions and therefore they cannot be cost-effective compared to the job done. They may be useful in some particular cases when either high tension levels, or variable tension levels are required, which make their use justifiable.

Also known is an Italian Utility Model Application N. 22640 B/86, filed on July 24, 1986, in the name of the same inventor of this invention Patent Application, concerning a device for controlling the feeding of an elastic tape in sewing machines. Said device includes a roller and a pressing means having the tape located therebetween, said tape being pulled in a first direction by the sewing machine forwarding

means while said roller is connected to the shaft of a motor rotating in a direction opposite to that of a roller rotated by the pull of said tape under the action of the sewing machine forwarding means. The above device fits in particular those applications where high levels of the elastic tape tension are not required. On the other hand said applications are the most frequently used.

However, the three devices mentioned above, in case of an elastic tape abnormal unwinding from the source thereof, comprising a reel or a container, which problem arises from the tape getting twisted or entangled or from a reduction of the tape winding diameter on the reel as unwinding proceeds, disadvantageously cause the elastic tape tension to vary while said tape enters the feeding or tensioning roller.

In such a way, the tension generated by an abnormal unwinding of the tape from the source of supply thereof would get summed up to the tension generated by the elastic tape tensioning roller.

It is an object of this invention to correct the drawback mentioned above by providing a device having the following advantageous features:

the tensioning roller gets from the source of supply a tension-free elastic tape, whereby there is no alteration to the tensioning thereof and therefore to the garment crimping;

the device can be mounted on the bed of the sewing machine without the vibrations thereof having any negative influence on the device operation;

the tensioning roller stops when all the tape has been used up; and

the device is simple, cost effective and easy to be assembled on the sewing machine, convenient in use and highly reliable.

The above and further objects are obtained with the subject device, comprising a tensioning roller and a first pressing means having the tape located therebetween, said tape being fed by the sewing machine forwarding means, said roller being connected to the shaft of a first motor whose rotation is a function of the tensioning to be given to the tape, with the feature that said device includes a slackening roller mounted between the tensioning roller and the elastic tape source of supply; a second pressing means provided to press the tape against said slackening roller, and a sensor adapted to detect the tape position in the span lying between the tensioning roller and the slackening roller, and connected to a second motor which rotates the slackening roller in either direction to draw tape from the source of supply, or to return it thereto respectively, in order to continuously keep a tape slack loop in said span, whereby the tape is supplied tension-free to said tensioning roller.

Further features and advantages of this invention will become apparent from the following detailed description of a preferred but non exclusive embodiment of the subject device, shown for purely exemplary and non limiting purposes in the attached

drawing, wherein:

Figure 1 is a schematic outline of the subject device; and,

Figure 2 is a schematic representation of a detail of Figure 1.

As shown in Figure 1, out of the sewing machine there is shown schematically only the needle bar 1, the pressure shoe 2, having the forwarding means 3 and the "crochets", not shown in the Figure, mounted thereat. The above mentioned members, by their motions, cause the sewing to take place, as generated by the known interlacing of the yarn threaded through the eye of the needle mounted on needle bar 1 with the threads carried by the "crochets" mentioned above.

As it is apparent from Figure 1, the subject device is provided with a tensioning roller 4, mounted on shaft 5 of first motor 6. Pressure means comprising a pair of small rollers 7 are mounted on the sides of tensioning roller 4. Elastic tape 8 is pressed between roller 4 and small rollers 7 which keep it tight against substantially half of the circumference of roller 4. Said tape, winding around small idle rollers 9 passes underneath pressure shoe 2, together with the garment, not shown in the Figure, to which elastic tape 8 is sewn while being tensioned by said forwarding means 3 in the direction of arrow A.

Tape 8 is drawn from a source of supply which, in the case shown in Figure 1, comprises a reel 10 wherefrom the tape unwinds, passes along stationary guide 11, winds around a small idle roller 12, around a slackening roller 13, passes through a stationary guide 14 winding then around tensioning roller 4, as described above. Tape 8 is pressed against slackening roller 13 by a small roller 15.

As it is still shown in Figure 1, electrical circuit 16 is supplied with electric power at terminals 17 and, by means of a voltage divider 18, through a knob 19, circuit 20 receives by means of a feeder 21 an electric current having different constant values depending upon corresponding positions of knob 19. Said constant electric currents supply electric motor 6 in such a way that shaft 5 thereof is made to rotate in the direction of arrow B, which is opposite to the direction of rotation C of roller 4 being rotated by elastic tape 8 which is pulled, in a direction opposite to direction B of rotation of electric motor 6, by the motion of forwarding means 3 in the direction of arrow A. It should be understood that a reduction gear may be provided between motor 6 and roller 4.

In that way, tensioning roller 4 cooperating with small pressure rollers 7, subjects tape 8 to a steady force, opposite to the pulling force of the sewing machine forwarding means, and said steady force will be controlled by voltage divider 18, according to the tension to be generated in the tape and therefore to the crimping to be provided in the garment. Therefore, the elastic tape is kept under tension, while it is gradually drawn by the forwarding means according to the motion thereof, whereby once the sewing is over the required crimping takes place when the tension formerly applied to the elastic tape is released.

A threshold controller 22 is further provided in

electric circuit 20, in order to prevent further rotation of electric motor 6 when there is no more tape present between tensioning roller 4 and small pressure rollers 7.

In fact, if the tape is missing, or in case the tape is cut as required by the sewing operations, a rotation of motor 6 would draw the tape unthreading it out of the device. In order to prevent that from happening, controller device 22 stops motor 6 when the latter is relieved of the tape load due to the pull of forwarding means 3 of the sewing machine.

From what has been described herein above, it should be noticed that electric motor 6 acts as a brake on tape 8, in order to keep it tensioned. To prevent overheating and failure of the electric motor in such operating conditions, the armature thereof has been provided with windings in free copper wire, i.e. without an iron support. By means of the subject device a continuous and steady tape feeding may be provided, while the electric motor is supplied with a constant current, at low to average voltages. Said device may also be very conveniently applied to sewing machines provided with a differential forwarding means which, being suitably controlled, provides garment crimping while the elastic tape, subjected to a limited tensioning generated by the subject device, is steadily fed and therefore it gets sewn in a smooth pattern on the garment while the latter is being crimped.

As it is shown in Figures 1 and 2, according to the subject of this invention, there is provided a sensor 23 for detecting the position of elastic tape 8 within the span between tensioning roller 4 and slackening roller 13. Said sensor comprises for instance a rod 24 pivoted at 25 and carrying, at one end thereof, a member 26, so that when tape 8 winding around the opposite end of rod 24 is pulled in the direction of arrow D, member 26 touches a contact 27 of a photoelectric cell or microswitch device. The latter closes an electric circuit (not shown in the Figures) for supplying power to a second motor 28 which rotates slackening roller 13 in the direction of arrow E. In that way, due to the pull on tape 8, rotation of roller 13 according to the direction of arrow E causes a certain length of tape to be withdrawn from reel 10.

When tape 8 gets loose relative to rod 24, the latter is forced to rotate by return means comprising for instance a spring 29, in the direction of arrow F. In this case member 26 touches contact 30 and the same photoelectric cell or microswitch device closes the second circuit of motor 28 which in this case rotates roller 13 in the direction of arrow G, thereby paying out tape to reel 10.

Spring 29 may be replaced with a counterweight positioned at the end opposite to the one carrying member 26.

From what has been described herein above it should be apparent that a tape loop is steadily maintained within said span between roller 4 and roller 13, whereby the tape is supplied tension-free to roller 4. This is a necessary condition in order not to alter the elastic tape tensioning, as it is generated by first motor 6 by rotation thereof in the direction of arrow B, as being transmitted to roller 4 in opposition to the pull exerted on elastic tape 8 by

sewing machine forwarding means 3, in the direction of arrow A.

Stiff rod 24 may be replaced with a resilient rod, clamped at the end, in such a way that distortions thereof caused by tape 8 are transformed into electric signals for controlling electric supply to motor 28, in the way described herein above.

Similarly, the arrangement of sensor 23-motor 28-roller 13 may be inserted in the span between the tape source of supply and the variable speed tape feeding roller as disclosed in U.S. Patent No. 3 856 224, or tape feeding roller rotated in either direction as disclosed in the Italian Patent Application No. 40074 A/81.

In fact, regardless how the feed or tensioning roller providing the elastic tape to the sewing machine pressure shoe is made to rotate, the problem still exists of feeding tension-free tape to said roller, i.e. forming a slack loop within said span, in order not to cause an altered and therefore undesirable tensioning in said tape.

In these cases as well, the electric circuit supplying the motor connected to the tensioning roller is provided with a threshold controller having the features mentioned above and able to stop the motor when there is no more tape.

The device making the subject of this invention may be mounted on the bed of the sewing machine without any possibility that vibrations thereof may cause undesirable elastic tape tension variations, while feeding the latter.

Construction variations and modifications may be made to the subject device without exceeding the scope of protection of this invention, as defined in the attached Claims.

Claims

1. An improved device for controlling the feeding of an elastic tape in sewing machines, including a tensioning roller (4) and a first pressing means (7) having a tape (8) inserted therebetween, said tape being fed to the sewing machine forwarding means (3), said roller (4) being connected to shaft (5) of a first electric motor (6) which is rotated according to the tension that is desired to be provided to the tape, characterized in that it includes: a slacking roller (13) inserted between roller (4) and source of supply (10) where said elastic tape (8) is drawn from; a second pressing means (15) adapted to press tape (8) against said roller (13); and a sensor (23) adapted to detect the position of tape (8) within the span between roller (4) and roller (13), and being connected to a second electric motor (28) in such a way that the latter rotates roller (13) in either direction (E or G), respectively withdrawing tape from source (10) or paying it out thereto, in order to constantly maintain a slack loop of tape (8) within said span, thereby providing tension-free tape to said roller (4).

2. The device of Claim 1, characterized in that sensor (23) comprises a rod (24) which is made

to rotate in a direction (D) by the pull of tape (8), or in an opposite direction (F) by return means (29), whereby a device (27, 30) closes either one of the circuits supplying power to motor (28) in such a way as to rotate roller (13) in a direction (E) to withdraw tape from source (10) following the pull of tape (8), or in the direction (G) in order to pay out tape to source (10) when said rod (24) is rotated by said return means (29).

3. The device of Claim 1, characterized in that first pressing means (7) comprises a pair of small rollers pressing tape (8) in order to keep it in contact with substantially half the circumference of tensioning roller (4).

4. The device of Claim 1, characterized in that the electric circuit supplying power to first motor (6) is provided with a threshold controller (22) adapted to stop said motor (6) when the latter is not subjected to the load of tape (8) generated by the pull of forwarding means (3).

Fig. 1

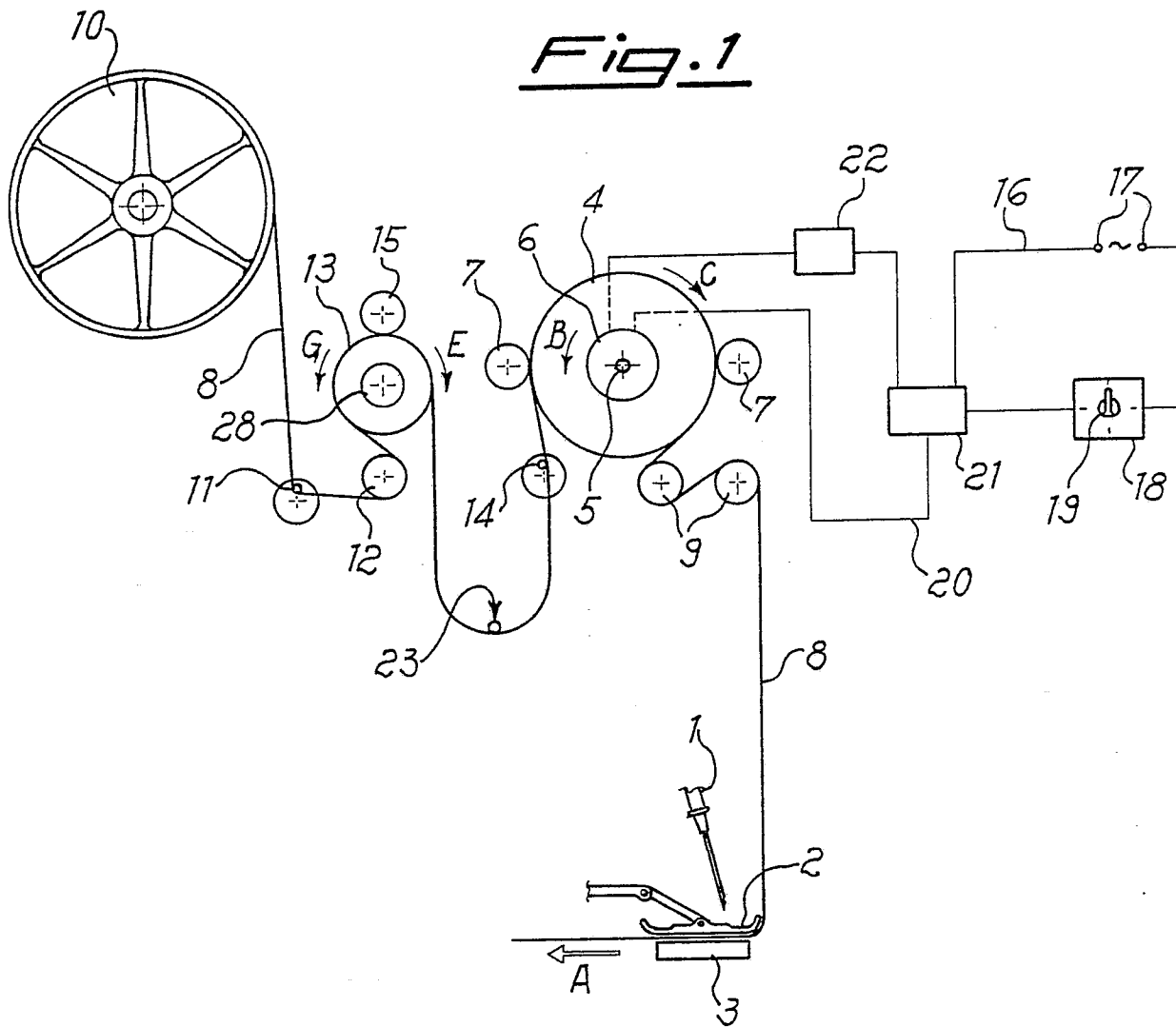


Fig. 2

