United States Patent

Tanigami

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[54] **TAPE FEED APPARATUS FOR USE IN ELECTRO-MOTIVE TAPE CUTTER**

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[73] Assignee: **Elm Industry Co., Ltd.,** Tokyo, Japan

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[30] **Foreign Application Priority Data**

July 25, 1970 Japan 45/64735

[52] **U.S. Cl.** **226/136,** 83/204, 83/242, 225/11

[51] **Int. Cl.** **B65h 17/26**

[58] **Field of Search**.....226/188, 134, 135, 136; 83/204, 242; 225/11

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Attorney—Woodhams, Blanchard & Flynn

[57] **ABSTRACT**

A tape feed apparatus for use in electro-motive tape cutter which is characterized by such construction that; in the dent provided lengthwise on the upper part of a rectangular casing of the apparatus, there are provided a reel for adhesive tape supported by pivoting on the confronting walls of one end of said dent and a feed roll as well as a stripping roll disposed in a row and supported by pivoting on the confronting walls of the other end of said dent so as to make these rolls rotate simultaneously by means of a motor equipped within the casing; a tape adjusting roll is disposed above said stripping roll so as to make it move vertically; and, a pressing segment which functions to switch on or off the motor in concert with the vertical motion of the stripping roll is mounted on the wall of the casing so as to be vertically movable.

6 Claims, 9 Drawing Figures

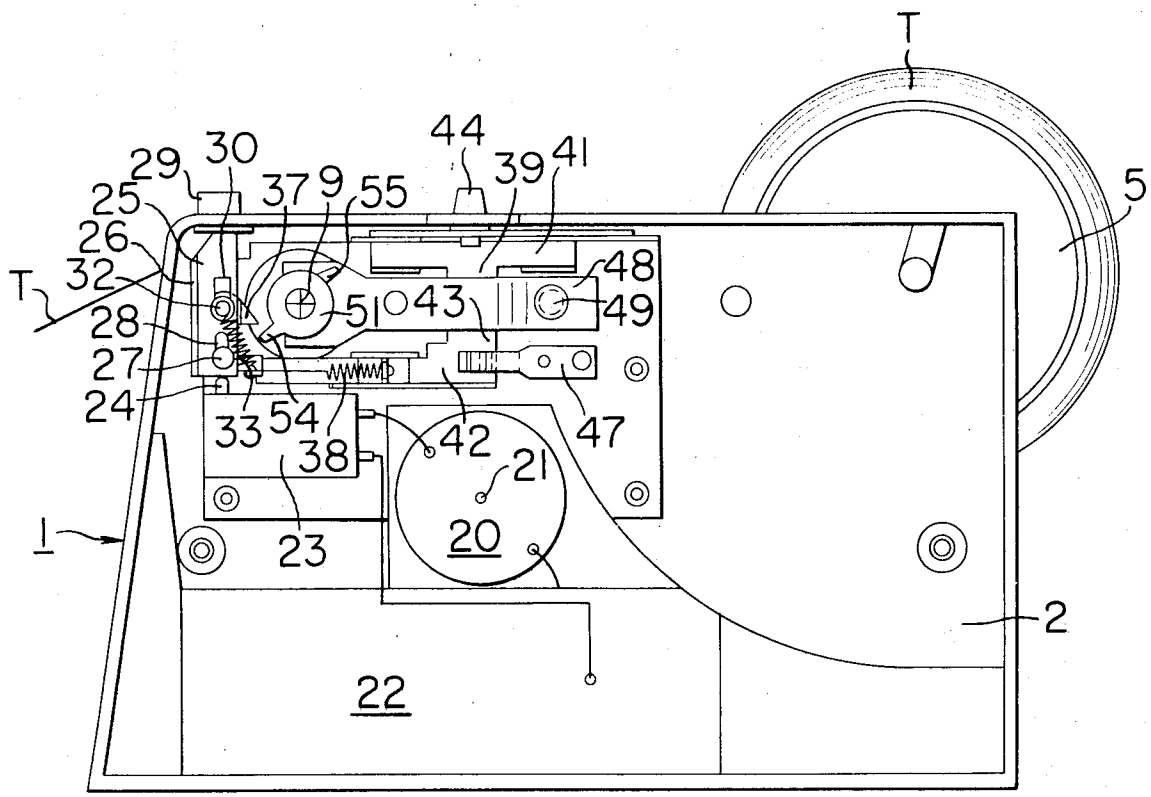

FIG. 1

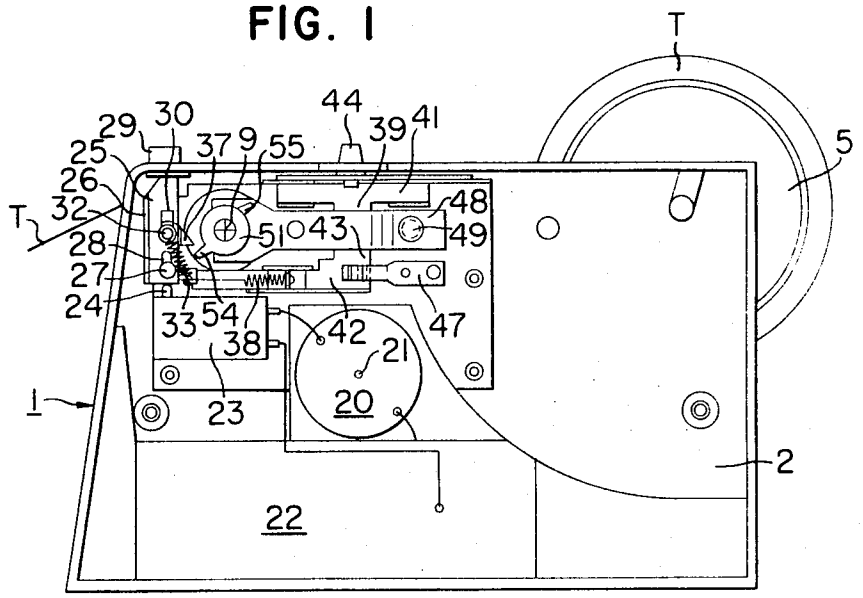

FIG. 2

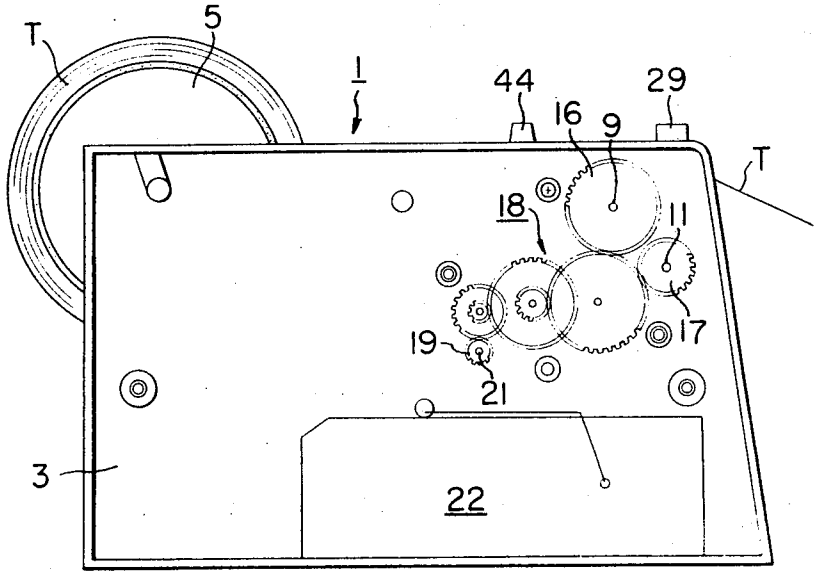

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FIG. 3

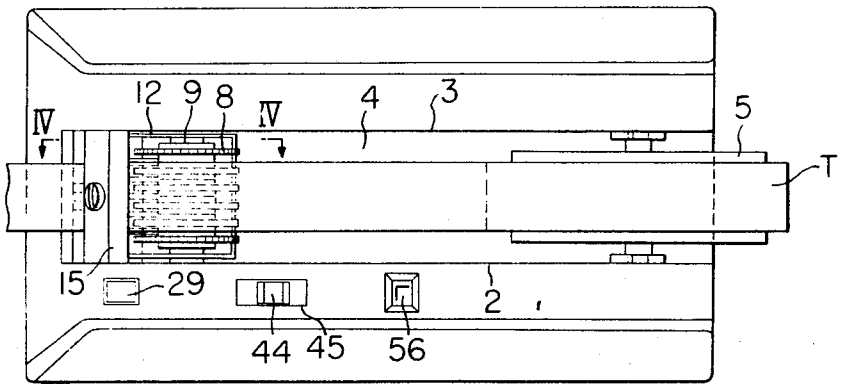

FIG. 4

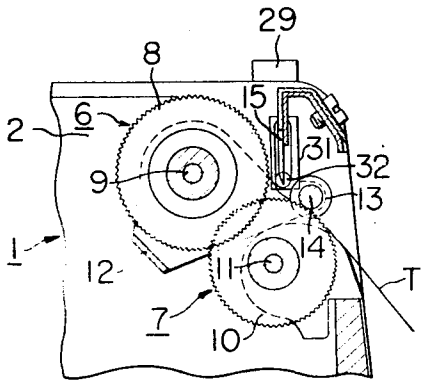

FIG. 5

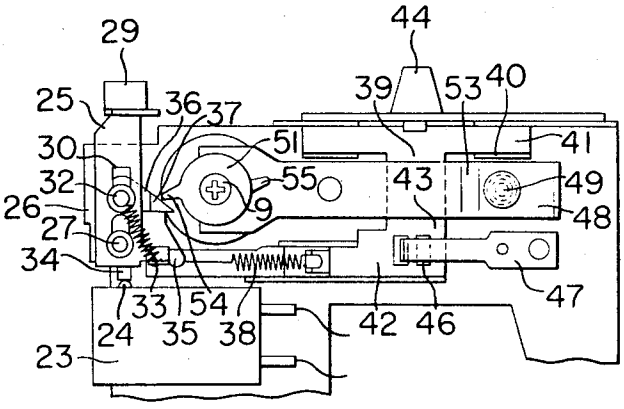

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FIG. 6

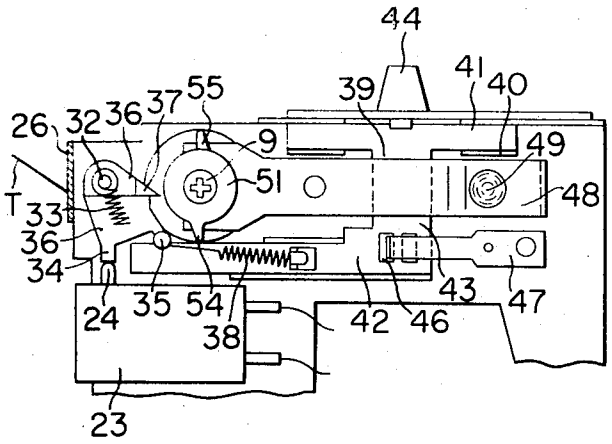


FIG. 7

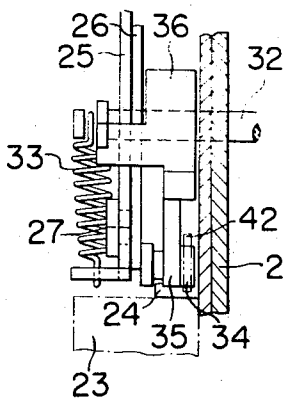


FIG. 8

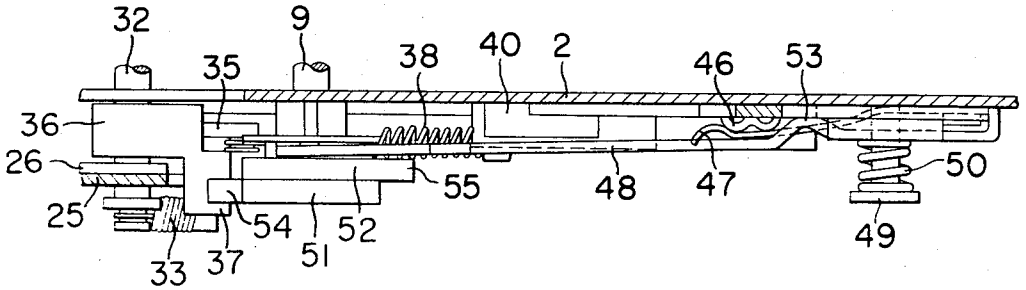
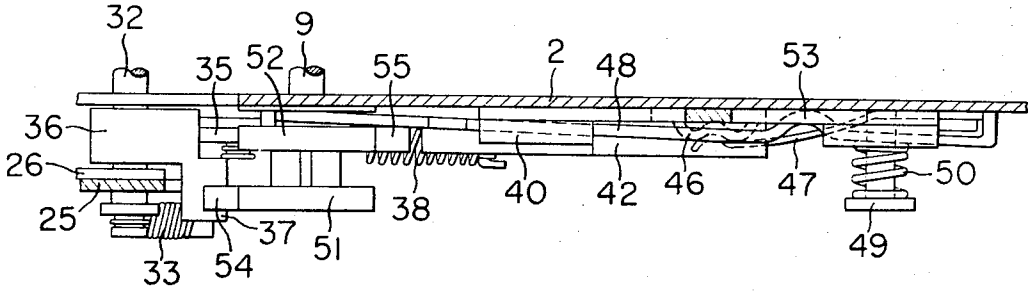


FIG. 9



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TAPE FEED APPARATUS FOR USE IN ELECTRO-MOTIVE TAPE CUTTER

BACKGROUND OF THE INVENTION

1. Field Of The Invention

The present invention relates to an electro-motive tape cutter which is capable of automatically feeding by optional length of an adhesive tape for use in sealing that is provided with the adhesive coated on one side thereof and coiled round an annular spool make of cardboard.

2. Description Of The Prior Art

There has already been proposed such a model of electro-motive tape cutter that wherein: a roll of an adhesive tape prepared by applying the adhesive on one side thereof and coiled round an annular spool made of cardboard is mounted on an electro-motive tape cutter; the adhesive tape is unreeled by a desired length by means of a motor; the thus unreeled tape is cut; and, by virtue of the cutting operation, the tape is automatically unreeled by the same length as that of the previous one.

However, the electro-motive tape cutter in the prior art as above has been defective in that: it tends to make the tape being unreeled thereby warp upwards gradually to become annular; and, because of its complicated mechanism comprising plural switches as well as numerous levers, it is not only hard to manufacture, resulting in a high price, but also apt to go out of order while being used.

SUMMARY OF THE INVENTION

Principal object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, which is so devised as to make up for the above mentioned shortcomings of the conventional apparatuses and prevent the unreeled adhesive tape from warping upwards.

Another object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, which is relatively simple in construction, is easy to manufacture, and can be offered at moderate prices.

A further object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, which is so devised that a tape adjusting roll to function to prevent the unreeled tape from warping upwards moves vertically, and a pressing segment capable of moving vertically in concert with the vertical motion of said tape adjusting roll functions to switch on or off the motor.

A still further object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, wherein: a pressing segment, which is fixed onto and is always pulled downwards by a rotary shaft capable of moving vertically in concert with the vertical motion of a tape adjusting roll, functions to rotate the motor by switching thereon when it descends and switches off the motor when it is disengaged from the switch by the pressure of the pawl of a pawl discfixed on the shaft of the feed roll connected to the motor.

Still another object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, which features provision of a feed roll and a stripping roll, each roll consisting of plural discs having knurled periphery and fixed onto a rotary shaft at prescribed intervals, of which the stripping roll is

devised to have peripheral speed higher than that of the feed roll so as to prevent the adhesive tape from sticking to the periphery of both rolls and also separate the tape smoothly from the stripping roll.

An additional object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, wherein a tape adjusting roll is installed by so energizing as to make its periphery eat into the loop groove of a stripping roll at the time of feeding the tape in order to prevent it from warping upwards.

Yet another object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, wherein the second pawl disc is fit onto the shaft of a feed roll in axially slidable fashion, in addition to the first pawl disc fixed on said shaft, in order to make the pawl of the second pawl disc engage with or disengage from the pressing segment by virtue of the movement of a travelling lever, which supports the second pawl disc rotatably, along the shaft of the feed roll to thereby change the feed length of the tape optionally.

Still an additional object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, wherein a changeover lever for the purpose of shifting the foregoing travelling lever is installed in slidable fashion on the wall of the casing, so that, when this change-over lever is moved, its tip comes to contact with the pressing segment to displace it so as not to strike the switch and, by virtue of such displacement, the pressing segment will not turn the switch on even when it descends.

A particular object of the present invention is to provide a tape feed apparatus for use in electro-motive tape cutter, wherein a supporting plate for the purpose of supporting said pressing segment in vertically movable fashion is installed on the wall of the casing so as to be capable of vertical motion with a bias for ever ascending and is so devised as to be capable of switching on when it is pushed down even if the pressing segment is disconnected from the switch.

BRIEF DESCRIPTION OF THE DRAWING

Of the accompanying drawings,

FIG. 1 is a front view of an apparatus which may be utilized in practicing one embodiment of the present invention, wherein the state of the pressing segment disengaged from the switch and held in abeyance is shown by removing the cover of one side of the apparatus.

FIG. 2 is a rear view of the same apparatus as in FIG. 1 with its cover taken off partially to show the interior thereof.

FIG. 3 is a plane figure of the same apparatus with both sides thereof covered up.

FIG. 4 is an enlarged sectional view taken along the direction of the arrow upon cutting the apparatus in FIG. 3 along the line N—N.

FIG. 5 is an enlarged front view of the switch system of the apparatus in FIG. 1, showing the state of the switch being on to operate the apparatus.

FIG. 6 is an enlarged sectional view of the same apparatus as in FIG. 1, wherein the state of the switch being off due to ascent of the pressing segment is shown by removing the supporting plate.

FIG. 7 is an enlarged sectional view taken of the right side of the pressing segment and the supporting plate of the apparatus in FIG. 1, showing their interrelation.

FIG. 8 is a partial plane figure, on an enlarged scale, of the apparatus in FIG. 1, showing the state of the second pawl disc prior to displacement.

FIG. 9 is a partial plane figure, on an enlarged scale, of the apparatus in FIG. 1, showing the state of the second pawl disc after displacement.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIGS. 1–4 above, 1 denotes the main body of the apparatus, which is provided with: the dent 4 sandwitched between the confronting walls 2 and 3; the reel 5 pivoted on one side of both walls 2 and 3 by the upper part thereof for the purpose of coiling thereon the tape T; the feed roll 6 pivoted on the other side of both walls 2 and 3 by the upper part thereof and the stripping roll 7 pivoted on the same side below said feed roll 6 slantwise.

The feed roll 6 consists of plural discs 8 having knurled periphery and fixed onto the rotary shaft 9 at prescribed intervals. The stripping roll 7 consists of plural discs 10 having knurled periphery and fixed onto the rotary shaft 11 at prescribed intervals, and said interval is devised to be slightly wider than the thickness of each of said discs 8 while the thickness of each of the discs 10 is slightly less than the interval of the discs 8 so as to insert the discs 8 and 10 into the opposite openings of the discs 10 and 8.

The supporting shaft 14 of the adjusting roll 13 is supported by the arms, which extend above the stripping roll 7, of the bracket 12 pivoted on the rotary shaft 9 of said feed roll 6, and this adjusting roll 13 eats into the openings of the discs 10 of the stripping roll 7. The cutter 15, which is located between the tape adjusting roll 13 and the feed roll 6 and disposed above the stripping roll 7, is fixed on the walls 2 and 3.

Referring to FIG. 2, on the ends of the rotary shafts 9 and 11 of the feed roll 6 and the stripping roll 7 penetrating the wall 3, there are fixed the toothed wheels 16 and 17, of which the former is larger than the latter in diameter. Said toothed wheels 16 and 17 are engaged with the driving toothed wheel 19 by means of the gear train 18 attached to the wall 3.

In FIG. 1, 20 denotes the motor, and, on the opposite end of the rotary shaft 21 thereof, there is fixed said driving toothed wheel 19. This motor 20 is rotated by a battery (not shown) placed in a housing 22 and controlled by the switch 23.

As shown in FIGS. 5–7, opposite to the tip of the contact 24 of the switch 23, there is provided the supporting plate 25 which is engaged, by the oblong hole 28 thereof, with the stop pin 27 screwed into the bracket 26 fixed on the wall 2, and, on the upper end of this supporting plate 25, there is fixed the push button 29 projecting over the top of the wall 2. On the upper part of the supporting plate 25, there is provided the oblong hole 30, and, the wall 2 is provided with the oblong hole 31 bored therein at a position opposite to the oblong hole 30 and having a length almost the same as said hole 30. Each end of the shaft 32 is put into the oblong holes 30 and 31, and one end of said shaft 32 protruding into the inner side of the wall 2 is supported by the top side of the bracket 12, while, between the other end of said shaft protruding outside and the lower end of the supporting plate 25, there is installed the spring 33 so as to make the shaft 32 contact with the lower ends of the oblong holes 30 and 31 and to make the lower end of the oblong hole 28 of the supporting plate 25 contact with the stop pin 27, respectively. In the middle of this shaft 32, the head of the pressing segment 36 having forked legs 34 and 35 appended to the lower end thereof is fixed to said shaft, and the projecting pawl 37 is provided on the upper right side of the pressing segment 36. Between the leg 35 of said forked legs 34 and 35 and the wall 2, there is installed the spring 38 which always gives a pull so as to confront the other leg 34 with the top side of the contact 24 when the pressing segment 36 ascends.

In FIGS. 5–7, there is also shown the change-over lever 39. This lever is so devised as to be supported by the guide plate 40 projecting from the wall 2 and shiftable along said wall, and consists of a couple of horizontal plates 41 and 42 and the vertical plate 43. Above the upper horizontal plate 41, there is provided the button 44 which protrudes upwards through the slit 45 provided on the top of the wall 2, and the change-over lever 39 moves in concert with this button 44 moving within the slit 45. One end of the lower horizontal plate 42 of the change-over lever 39 is confronted with the leg 34 of the pressing segment 36 above the contact 24 of the switch 23, and a couple of contact stop projections 46 are provided at the junction of the lower horizontal plate 42 and the vertical plate 43. These contact stop projections 46 are connected with the tip of the leaf spring 47 whose base section is fixed on the wall 2.

In FIGS. 5–7, 48 denotes the travelling lever, and its portion adjacent to one end thereof is slidably supported by the pin 49 installed on the wall 2. This lever is always pressed against the wall 2 in its entirety by the spring 50 coiled round the pin 49, and the other end of this lever supports, in rotatable fashion, the second pawl disc 52 which not only rotates together with the rotary shaft 9 of the feed roll 6 but also fits therein in axially slidable fashion. On the outside of the rotary shaft 9, there is fixed the first pawl disc 51. The travelling lever 48 is provided with the projection 53 on its inside so as to make the vertical plate 43 of said change-over lever 39 strike it when said lever travels rightwards as illustrated. The pawls 54 and 55 provided on the first and second pawl discs 51 and 52 are disposed symmetrically centering around the rotary shaft 9. 54 denotes the telltale hole, trough which the signals L, S. OFF, etc. indicated on the top of the upper plate 41 of the change-over lever 39 can be read.

OPERATION

FIGS. 1–4 show a phase of the operation being in abeyance upon stripping the end of a roll of the tape T coiled round the reel 5 and feeding it to the left side as in FIG. 1 by way of the feed roll 6, the stripping roll 7 and the adjusting roll 13.

On this occasion, by pulling up the protruding end of the tape T with his fingers, the user can get the tape T cut by means of the cutter 15 and stick the thus cut tape on a desired place.

When the tape T is pulled up as above, the adjusting roll 13, the shaft 14 supporting said roll 13 and the bracket 12 oscillate upwards centering around the rotary shaft 9, whereby the shaft 32 supported by the top side of the bracket 12 is raised along the oblong hole 31 of the wall 2 and the oblong hole 30 of the supporting

plate 25. On this occasion, the pressing segment 36 located as shown in FIG. 1 ascends in defiance of the tensile force of the spring 33, and, with this ascent, the leg 34, one of the legs of the pressing segment 36, connecting with the side of the contact 24 of the switch 23 by its side gets disconnected from said contact 24, so that the other leg 35 is pulled by the spring 38 and oscillates rightwards centering around the shaft 32, thereby displacing the pressing segment 36 to make the leg 34 practically vertical and confront its tip with the top of the contact 24 as shown in FIG. 6.

At this juncture, the tape T is cut and the upward force imposed on the adjusting roll 13 disappears, so that the pressing segment 36 descends by virtue of the spring 33 to push down the contact 24 by the tip of the leg 34 as shown in FIG. 7, whereby the switch 23 is turned on to operate the motor 20, rotate the driving toothed wheel 19 mounted on the rotary shaft 21, rotate the toothed wheels 16 and 17 through the gear train 18, and bring about simultaneous rotation of the feed roll 6 and the stripping roll 7 by means of the rotary shafts 9 and 11 to feed the tape T.

With the rotation of the rotary shaft 9 of the feed roll 6, the first pawl disc 51 fixed on the opposite side of the rotary shaft 9 rotates and the pawl 54 provided on the periphery of said disc strikes the pawl 37 of the pressing segment 36 to oscillate the pressing segment 36 leftwards centering around the shaft 32. By this oscillation, the tip of the leg 34 gets disconnected from the top of the contact 24 to descend while keeping in touch with the side of the contact 24 as it is pulled by the spring 33, and the contact 24 projects to turn the switch 23 off, thereby stopping the motor 20 to discontinue the feeding of the tape T.

At the time of operation as above, the tape T is fed by the length equivalent to one rotation of the first pawl disc 51.

Next, how to operate the present apparatus to feed the tape T by the length half the above size will be explained in the following.

In this case, the button 44 is slidden a little to the right from the position shown in FIG. 1. By so doing, the change-over lever 39 located as in FIG. 8 shifts rightwards as shown in FIG. 9, and the right side of the vertical plate 43 comes in contact with the projection 53 disposed inside the travelling lever 48, whereby the travelling lever 48 shifts from the position shown in FIG. 8 to the position shown in FIG. 9. In other words, the travelling lever 48 shifts along the pin 49 in defiance of the pressure of the spring 50. At this juncture, the second pawl disc 52 pivoted on one end of said lever 48 also shifts simultaneously, thereby moving the pawl 55, which is disposed not to engage with the pawl 37 of the pressing segment 36 prior to said shift of the lever 48, to come to engage with said pawl 37. The pawl 55 of the second pawl disc 52 and the pawl 54 of the first pawl disc 51 are disposed symmetrically centering around the rotary shaft 9 and the pawls 54 and 55 work to turn the switch 23 off the pressing segment 36 twice per one rotation of the rotary shaft 9, so that the feed length of the tape T becomes half that of the previous operation.

Next, how to operate the present apparatus to discontinue the automatic feed of the tape T will be explained in the following.

In this case, the button 44 is slidden to the utmost left of the slit shown in FIG. 1. At this, the change-over lever 39 moves leftwards and the tip of its lower horizontal plate 42 passes the back of the contact 24 of the switch 23 to come in contact with the side of the leg 34 of the pressing segment 36 and push it leftwards to disconnect it from the contact 24. As a result, the pressing segment 36 cannot move rightwards despite the pull of the spring 38 and the lower end of the leg 34 does not connect with the top of the contact 24 when the pressing segment 36 descends in the wake of its ascent at the time of cutting the tape T, whereby the switch 23 remains off and the motor 20 does not work.

Next, how to operate the present apparatus to feed the tape T continuously will be explained in the following.

In this case, the position of the button 44 does not matter. When the push button 29 is pressed down, the supporting plate 25 descends and its lower end presses the top of the contact 24 of the switch 23 to turn it on and rotate the motor 20, while the push button 29 is released, by virtue of the spring installed between its lower part and the shaft 32, the supporting plate 25 descends and gets disconnected from the contact 24 to turn the switch 23 off and stop the rotation of the motor 20. Accordingly, the tape T can be fed by required length through operation of the push button 29.

In the foregoing embodiments, the periphery of both the feed roll 6 and the stripping roll 7 is confronted with the adhesive coated side of the tape T, so that it is necessary to prevent the tape T from sticking to the periphery of these rolls at the time of feeding it. Therefore, these rolles 6 and 7 consist of plural discs 8 and 10, each having knurled periphery and being fixed on the rotary shafts 9 and 11, respectively, at prescribed intervals. By this means, not only the tape T is prevented from sticking to the periphery of the both rolls 6 and 7, but also it can be smoothly stripped off the periphery of the feed roll 7 inasmuch as these rolls are so devised that the driving toothed wheel 17 for the stripping roll 7 is provided with diameter smaller than that of the driving toothed wheel 16 for the feed roll 6 and consequently the peripheral speed of the stripping roll 7 is higher than that of the feed roll 6 to thereby bias the tape T slightly upwards as it is released from the stripping roll 7.

However, the sheer employment of the foregoing rolls would result in an excessive upward bias of the tape T being fed, causing it to warp upwards. Therefore, for the purpose of checking such excessive bias and effecting a practically straight feed of the tape T, there is provided the adjusting roll 13. The edge of this adjusting roll 13 functions to push the tape T in the opening between the discs 10 of the stripping roll 7, whereby the tape T comes to be provided with continuous stria grooved lengthwise thereon and the upward swarping bias of the tape T is checked by these stria.

Although particular preferred embodiments of the present invention have been disclosed hereinabove for the purpose of illustration, it will be understood that variations or modifications thereof which lie within the scope of the present invention as defined by the appended claims are fully contemplated.

What is claimed is:

1. A tape feed apparatus for use in electro-motive tape cutter which is characterized by that: in one section of the dent provided on the upper part of the casing of the apparatus, a reel for the adhesive tape is pivoted in rotatable fashion; a feed roll and a stripping roll are pivoted in a row in the other section of said dent; said feed roll and stripping roll are connected with a motor equipped inside the casing through an interlocking device; an adjusting roll is pivoted above the stripping roll in the dent in vertically movable fashion; a pressing segment capable of vertical motion in concert with said adjusting roll is installed on the wall of the casing in slidable fashion; and the lower end of said pressing segment is made to face the contact of a change-over switch of said motor.

2. A tape feed apparatus for use in electro-motive tape cutter as defined in claim 1, wherein: said feed roll and stripping roll each consists of plural discs having knurled periphery and fixed on a roll shaft at prescribed intervals forming loop grooves; the periphery of the feed roll is smaller than that of the stripping roll; and the periphery of the adjusting roll is made to eat into the loop groove of said stripping roll.

3. A tape feed apparatus for use in electro-motive tape cutter as defined in claim 1, wherein: said pressing segment, which is fixed on a rotary shaft capable of vertical motion in concert with the vertical motion of said adjusting roll and is always pulled downwards, is so devised that its upper part is provided with a pawl projecting from one side thereof and its lower part is provided with a forked leg, said pawl being confronted with the pawl of a pawl disc installed on one end of the feed roll and said forked leg consisting of two legs of which one leg faces the top of the contact of the switch by its lower end while the other leg is always pulled in transverse direction so as to bias the pressing segment toward the switch.

4. A tape feed apparatus for use in electro-motive tape cutter as defined in claim 1, wherein a change-over lever equipped with a transverse plate whose tip faces the side of the leg of said pressing segment facing the contact of the switch is installed along the wall of the casing in horizontally slidable fashion, so that, by shifting this change-over lever toward the pressing segment, the pressing segment can be moved to such a position as will not bring it into contact with the change-over switch for the motor even when the pressing segment moves vertically.

5. A tape feed apparatus for use electro-motive tape cutter as defined in claim 1, wherein a supporting plate to support said pressing segment in vertically movable fashion is installed in the casing in vertically movable fashion, and the lower end of this supporting plate is made to face the contact of said change-over switch for the motor upon disposing it in parallel with the lower end of said pressing segment.

6. A tape feed apparatus for use in electro-motive tape cutter as defined in claim 3, wherein: said pawl disc consists of the first pawl disc which is fixed on the feed roll shaft and has its pawl so disposed as to be always confronted with the pawl of said pressing segment and the second pawl disc which not only rotates together with the feed roll shaft but also can slide along said shaft; the second pawl disc is rotatably supported by a lever which travels axially along the feed roll shaft in concert with the transverse movement of said change-over lever; and, when the second pawl disc shifts its position toward the first pawl disc in concert with the movement of this travelling lever, its pawl comes in line with the pawl of the first pawl disc to face the pawl of said pressing segment.

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