

[72] Inventors **Isao Hirano**
Tokorozawa-shi;
Nofuhito Nakajima, Tokyo, Japan

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[73] Assignee **Nichiban Co. Ltd., Chiyoda-ku, Tokyo**
by Nofuhito Nakajima

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[56] **References Cited**

UNITED STATES PATENTS			
2,113,239	1938	Petskeyes.....	83/424
2,326,915	1943	Anderson.....	83/358X
2,748,861	1956	Von Stoeser.....	83/203
FOREIGN PATENTS			
850,939	1960	Great Britain.....	83/168

Primary Examiner—Andrew R. Juhasz
Assistant Examiner—James F. Coan
Attorney—Waters, Roditi, Schwartz & Nissen

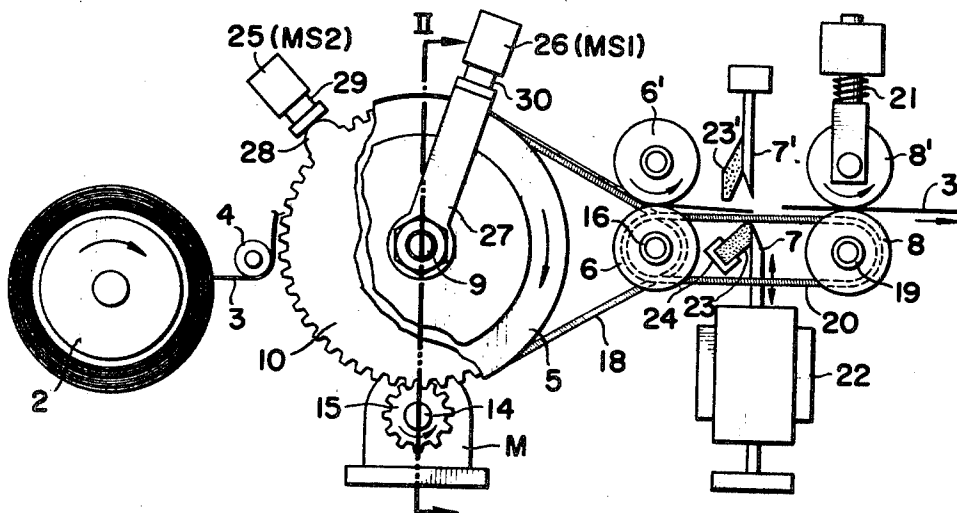
[54] **AUTOMATIC ADHESIVE TAPE DISPENSER**
9 Claims, 4 Drawing Figs.

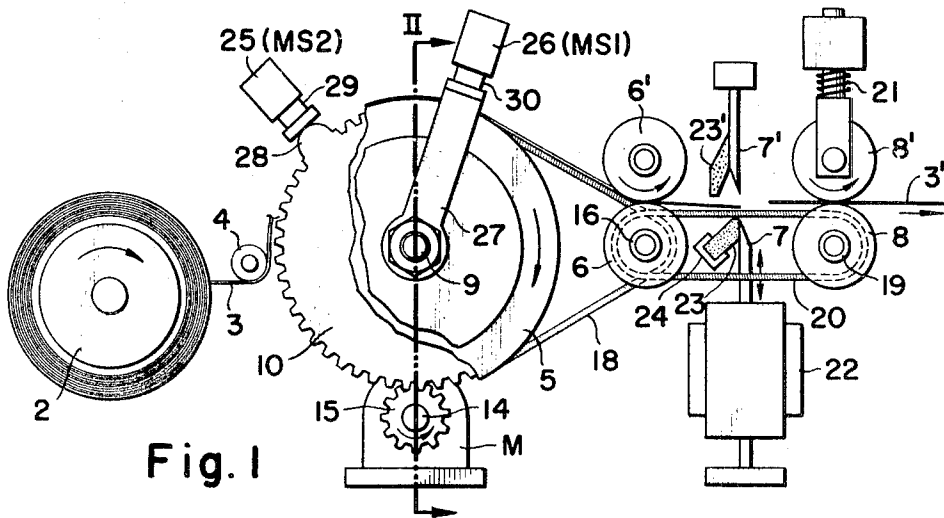
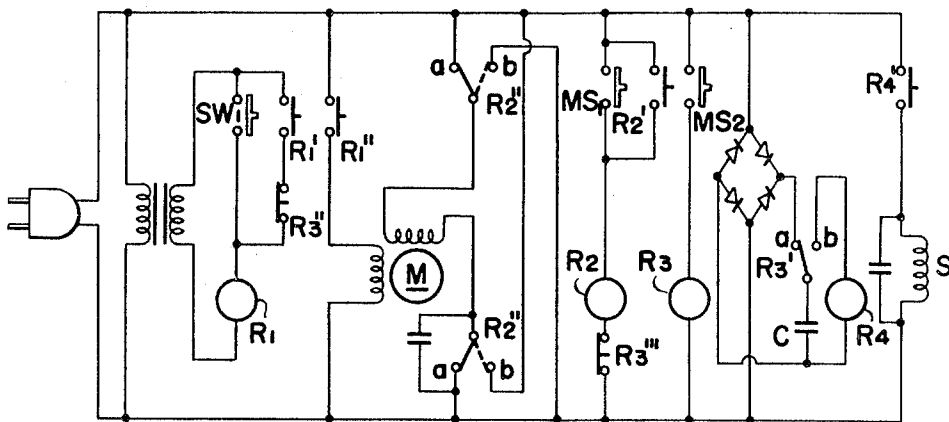
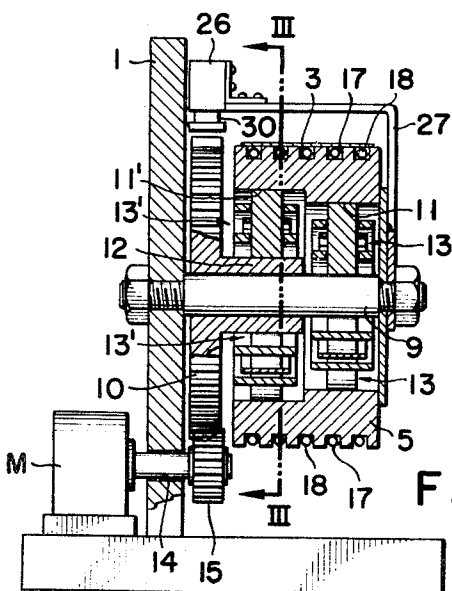
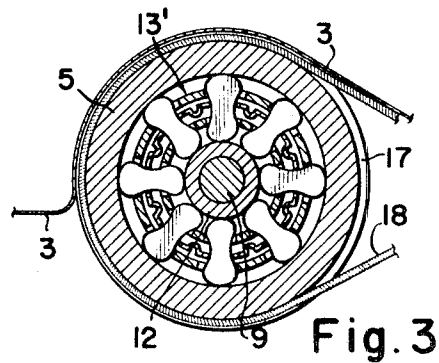
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ABSTRACT: A piece of tape which is cut to length is positioned between a pair of dispensing rollers and when the piece of tape is removed, the rollers come into contact and serve as a closed switch to operate a motor to feed tape from a roll thereof over a feed drum and through a pair of guide rollers to the dispensing rollers. The motor is halted after a dispensing length of tape projects from the dispensing rollers. The dispensing rollers tension the tape as it is fed thereto and a knife device severs the tape as it is held taut between the pairs of rollers.





AUTOMATIC ADHESIVE TAPE DISPENSER

BACKGROUND OF THE INVENTION

This invention relates to an automatic adhesive tape dispenser, and more particularly to an electrically operated device for continuous dispensing of tape strips of constant desired length.

Hitherto, various types of such devices have been proposed, however most of them are not satisfactory due to their complicated structure and frequent malfunctioning. Even the simplest of these devices is inconvenient in handling. In the device disclosed in U.S. Pat. No. 2,326,916, for instance, the severing and drawing out of the tape are simultaneously effected by the roll-drive drawing of the tape. The operator must hold one or both the ends of the severed tape piece attached to a wheel in order to remove this piece, and in order to adjust the length of the tape piece to be severed, the diameter of the wheel must be changed each time. Moreover, the operator is exposed to the danger of cuts when removing the tape piece from the wheel, because the end or ends of the tape are in the vicinity of the severing edges.

A tape-feeding means with several combined gears has also been proposed. With this means, however, friction is great and thus a motor with large output is required.

The dispenser of this type has a low efficiency due to severing failures which are caused by adhesive which remains at the severing edges.

SUMMARY OF THE INVENTION

The device in accordance with this invention is an improvement over the prior-art devices as mentioned above, and comprises a rotatable roll of insulating adhesive tape to be severed; a tape-feeding drum combined with a motor for driving said tape through gears and unidirectional clutches, one of said gears having projections for controlling a pair of switches to reverse the rotation of the motor; a pair of switching rollers made of electrically conductive material for controlling the motor, the pair of switching rollers being insulated from each other by the tape moving between them, whereas the switching rollers electrically contact each other when the tape leaves the rollers; and severing knives placed between said tape-feeding drum and said switching rollers with at least one of these knives being movable.

One of the features of the present invention is that the pair of switching rollers are used as a switching means for driving the motor of the tape-feeding drum.

Another feature is that the severing knives are electromagnetically actuated by utilizing the discharge of a capacitor.

Still another feature is that the tape is severed when in a taut condition.

A further feature is that the length of the tape to be severed is adjustable.

Still a further feature is that the severing knives are cleaned every time a strip of tape is severed.

Since the pair of rollers which serve to feed the strips of the severed tape are used as a switching means for driving the motor, and the function of the switching means is controlled by the insulating property of the tape, not only is the switching means simplified but also the entire device is simplified and a simple operation is made possible.

As the severing knives are actuated electromagnetically, the structure of the device is simple in comparison with the conventional device, and a reliable and fast operation is provided.

As the tape is severed in a taut condition, a clean and sharp severing is attained and thus the severed tapes have no tendency to stick to each other due to overlap.

The length of a severed strip can be adjusted by simply varying the distance between the pair of switches provided along the periphery of the gear which has the projections.

The provision of cleaning members keeps the severing knives clean and permits a smooth severing of the insulating adhesive tape. By the foregoing advantages, an improvement in operating efficiency is achieved.

The above and other features and objects of this invention will become fully understood from the following description to be given with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side view of one embodiment of the dispenser according to the invention;

FIG. 2 is a sectional view taken on line II-II of FIG. 1;

FIG. 3 is a sectional view taken on line III-III of FIG. 2; and
FIG. 4 is an electrical circuit diagram of the dispenser according to this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now is carried on the tape holder the drawing, there is shown in FIG. 1 an embodiment of an automatic adhesive tape dispenser. In this device, a tape holder drum 2 is rotatably supported by an axle bolt on a frame 1 and a supply roll of adhesive tape 3 is carried on the tape holder drum 2. The free end of the tape 3 is led from the supply roll, passes along an idler roll 4 and a tape-feeding drum 5, and further passes between a pair of guide rolls 6, 6' and a pair of severing knives 7, 7' into a pair of switching rolls 8, 8'. The tape 3 is moved by the tape-feeding drum 5 in the direction as indicated by the arrow in FIG. 1 of the drawing. The switching rolls 8, 8' serve as a switch to control a motor M which drives the tape-feeding drum 5 in the manner described hereinafter, and the switching rolls are constructed to make electrical connection when contacting each other and to break the current flowing through them when the insulating tape 3 is inserted between the rolls. When the tape 3, passing between the pair of severing knives 7, 7' and being fed to the switching rolls 8, 8', advances the desired distance, the tape-feeding drum 5 stops in order to sever the tape 3 by means of the knives 7, 7'. By drawing out this severed tape 3' from between the rolls 8, 8', the latter make electrical contact therebetween in order to start the motor M, thus driving the tape-feeding drum 5 to feed the tape 3 to be severed, again.

The tape-feeding drum 5 is disposed concentrically on a shaft 9 which is journaled in and extends from the frame 1, and the drum 5 is supported on this shaft by means of two unidirectional clutches 13 and 13', clutch 13 being positioned between the inner surface 11 of drum 5 and shaft 9 and clutch 13' being positioned between inner surface 11' of drum 5 and boss portion 12 of gear 10 which is carried on the shaft 9 for rotation therewith. (See FIGS. 2 and 3). The gear 10 engages a pinion 15 directly connected with the motor M through shaft 14. With the motor M rotating in either direction, the pinion 15 and the gear 10 can rotate in either direction according to the rotation direction of the motor M. The rotation of the motor M in either one of the directions, however, is not transmitted to the drum 5 due to the function of the unidirectional clutches 13 and 13'. Namely, when the motor M rotates in one direction only, the tape-feeding drum 5 rotates in the direction to feed the tape 3 as indicated by the arrow in FIG. 1, whereas, when the motor rotates in the opposite direction, the drum 5 does not rotate at all due to disengagement of the clutches. The function of clutches of this type is well known in the art, and therefore an explanation thereof will not be given herein. It is to be understood that ratchet gearing may be used instead of clutches in this invention.

The lower guide roll 6 is mounted on a shaft 16 which is secured to the frame 1. Attached between roll 6 and the tape-feeding drum 5 are several endless belts in the form of coil springs 18, each being disposed in respective grooves 17 provided on the outer periphery of the roll 6 and the drum 5, the belts serving to transmit the rotation of the drum 5 to the roll 6. The upper guide roll 6' is mounted on the frame in order to be slightly displaceable upwardly or downwardly and to bear on the lower roll 6 in its downward position. Roll 6' rotates due to its contact with the lower roll 6 to feed the tape 3 in the forward direction.

The switching rolls 8, 8' may be made of a conductive material such as copper alloy or light alloy, and the lower roll 8 is rotatably mounted on a shaft 19 journaled in the frame 1. A coiled endless belt 20 similar to the belt 18 stretches between the lower guide roll 6 and the lower switching roll 8, the belt being disposed in grooves provided on the surfaces of respective pulleys secured laterally on the rolls 6 and 8. The switching roll 8 is thus rotated by the guide roll 6. The peripheral speed of the switching rolls 8, 8' is made faster than that of the guide rolls 6, 6' to give the tape a tension force for convenient severing. This is achieved by adjusting the diameter of the pulleys or the rolls. The upper switching roll 8' is mounted on the frame 1 so as to be pressed downwardly against the lower switching roll 8 by spring 21 which is also mounted on the frame 1.

The severing knives 7, 7' are positioned between the guide rolls 6, 6' and the switching rolls 8, 8', and the upper severing knife 7' is fixed on the frame 1, while the lower severing knife 7 is constructed so as to be lifted by a force produced by an electromagnet 22 and to fall, due to its own weight. These knives 7 and 7' cooperate with each other to sever the tape when the lower knife 7 moves upward. In order to avoid the tape and the adhesive from sticking to the knives, there are provided cleaning members 23 and 23', the former being placed at a position enabling the edge of the knife 7 to be rubbed thereagainst during its up and down motion, and the latter being placed adjacent to the knife 7' at the side of the guide roll 6' so that the lower end of the member 23' may extend slightly beyond the edge of the knife 7'. When the tape is severed, these cleaning members prevent the severed tape from bending upward and sticking to the knives. The lower cleaning member 23 is replaceably fitted in a supporting body 24 which is secured to the frame 1 and has a channel shape section. The cleaning members are usually made of a soft material such as felt or sponge containing an antisticking agent such as silicone resin liquid or silicone oil. A microswitch 25 is mounted fixedly on the frame 1 and a microswitch 26 is mounted on an arm 27 one end of which is rotatably mounted on the shaft 9 of the tape-feeding drum 5. By moving arm 27, the distance between the microswitches 25 and 26 may be changed in order to vary the length of the tape to be fed, and hence to regulate the tape length to be severed.

On the outer periphery of the gear 10 is a projection 28 which is adapted to actuate the microswitches 25 and 26.

As is apparent from the foregoing description, the guide rolls 6, 6' serve to feed the tape and the switching rolls 8, 8' serve to discharge the severed tape which has been cut to length. The peripheral speeds of these rolls are different from each other. It should be noted, however, that the guide rolls may be omitted and in this case the tape-feeding drum 5 would serve as a tape-feeding roll, in which case the peripheral speed of the tape-feeding drum would be different from that of the switching rolls. It is also understood by those skilled in the art, that the switching rolls may be of any kind of ordinary rolls, and additional microswitches or nonarcing switches using a photoelectric cell may be utilized. The drum may of course be driven manually and in connection with this drive the severing knives would be actuated.

According to the arrangement of the present invention as explained before, the tape is severed while in a taut condition and thus the cut piece never sticks to the following tape because the cut ends of the tape separate and never overlap.

After manual removal of the severed tape 3' from between the switching rolls 8, 8', the upper roll 8' is pressed against the lower roll 8 by the spring 21 to make electrical contact between these rolls.

The switch whose opening and closing is controlled by the presence of the insulating adhesive tape between the switching rolls 8, 8', is illustrated in FIG. 4 as SW1. Referring now to FIG. 4, when the switch SW1 is closed by pulling out the adhesive tape from between the switching rolls as mentioned above, a relay R1 is energized to close its contact R1', thereby self-holding the relay R1, and at the same time closing the

contact R1' with the result that the motor M is energized and its drive is transmitted, through pinion 15 and gear 10 and unidirectional clutches 13, 13' to the tape-feeding drum 5, in order to rotate the latter in the direction as shown in FIG. 1. As the drum 5 rotates, the guide roll 6 is rotated by means of the endless belts 20 and thereby the upper guide roll 6' contacting the lower guide roll 6 is also rotated. Upon rotation of the guide rolls 6, 6', the switching roll 8 is rotated through the endless belt 20, subsequently feeding the tape.

The projection 28, which is provided on the outer periphery of the gear 10, contacts the pushbutton 29 of the microswitch 25 (MS2) during the stoppage of the gear in order to make an electrical connection through the microswitch. When the motor M has begun to start, however, the gear 10 connected to the motor rotates, so that the projection 28 on the gear becomes disengaged from the pushbutton 29, and thus the microswitch 25 (MS2) is opened with the result that a relay R3 is deenergized to switch its contact R3' into the position *a* and to charge the condenser C. When the gear 10 rotates further and the projection 28 thereon contacts pushbutton 30 of the microswitch 26 (MS1), the latter makes an electrical contact. As a result, a relay R2 is energized to close its contact R2', self-holding the relay R2, and to switch the contact R2'' into the position *b* as illustrated by the dotted line. Then the motor M begins to rotate in the opposite direction. As the motor M thus rotates, the pinion 15 and the gear 10 both connected to the shaft 14 of the motor M also rotate in reverse direction, however, no driving force is exerted on the tape-feeding drum 5 by reason of the unidirectional clutches 13, 13', the structure of which is illustrated in detail in FIG. 3, with the result that the drum will be stopped and hence the feeding of the tape stops. When the gear 10 rotates in reverse until the projection 28 contacts the pushbutton 29 of the microswitch 25 (MS2), the microswitch 25 makes electrical contact and thus the relay R2 is energized to open its contact R3''. As a result of this, the relay R1 is deenergized to open its contacts R1' and R1'' and thus stop the motor M. At the same time, as the contact R3''' is opened, the relay R2 is deenergized to open its contact R2' and to switch the contact R2'' into the position *a*. In this way, the motor M is ready to rotate again in the forward direction. At the same time as the relay R3 is energized, the contact R3' is switched from position *a* to *b*, a relay R4 is energized by the electrical charge stored in the condenser C to the extent depending upon the amount of the charge, and thus the contact R4' of the relay R4 is closed accordingly. Upon closure of the contact R4', a current begins to flow through a solenoid S from the power source, and the electromagnetic force produced by the solenoid moves the movable severing knife 7 upward to cooperate with the fixed severing knife 7' in order to cut the tape 3. As the peripheral speed of the switching roll 8 is faster than the guide roll 6 as mentioned before, the tape is severed while taut and the end of the severed tape piece moves away from the severing knives, so that there is no risk that the end of the severed tape will contact and stick to the remaining tape. When the relay R4 is deenergized, the contact R4' opens and the electromagnetic force being produced by the solenoid S is terminated. As a result, the movable severing knife 7 descends due to its own weight. At that instance, when the operator draws out the severed tape 3' between the switching rolls 8, 8', these switching rolls contact each other for an electrical contact, and the same operation as explained before will be repeated.

In the embodiment explained before, the upper severing knife is fixed and the lower severing knife is movable. It is to be noted, however, that the upper severing knife may be made movable and the lower severing knife may be fixed, or that both severing knives may be movable or that only one movable severing knife may be provided. In the embodiment of this invention, the severing knife moves vertically, however, the knife or knives may also move horizontally or obliquely.

It is of course possible in this invention to use mechanical means such as links or cams instead of the electromagnetic force of the solenoid to drive the severing knives.

It is also to be understood that the tape-feeding drum may be driven manually instead of electrically in which case the severing knives are to be actuated in synchronization with the feeding of the tape.

It is obvious to those skilled in the art that the present invention is not limited to the foregoing description of the exemplified embodiment and that various changes and modifications can be made without departing from the spirit and scope of the invention.

We claim:

1. An adhesive tape dispenser comprising a rotatable roll of tape, first means engaging and feeding said tape, second means receiving the tape from the first means to feed the tape while holding the tape taut between the first and second means, drive means for said first and second means, knife means for severing the tape between the first and second means while the tape is taut to leave a piece of tape in the second means in readied position for being dispensed, said second means constituting switch means which is open when engaged with the tape and closed when the tape is removed therefrom, said switch means being coupled to said drive means to control energization thereof, electromagnetic means operatively coupled to the knife means for activating the same when the tape is held taut between the first and second means, and electrical circuit means containing said electromagnetic means and said drive means, said circuit means including a condenser which is charged as the drive means is energized and which releases its charge to the electromagnetic means to operate the same after the drive means is deenergized.

2. A dispenser as claimed in claim 1 wherein said first means comprises a feed drum receiving tape from said roll, a pair of guide rollers for feeding the tape from the drum, and an endless resilient belt interconnecting said feed drum with one roller of said pair of guide rollers.

3. A dispenser as claimed in claim 1 wherein said first and second means each include a roller in contact with said tape,

the roller of the second means having greater peripheral speed than the roller of the first means to produce tension in the tape to maintain the same taut.

4. A dispenser as claimed in claim 1 wherein said first means comprises a feed drum receiving tape from said roll, and a pair of guide rollers for feeding the tape from the drum, said second means comprising a pair of rollers receiving the tape from the guide rollers, said drive means being coupled to both said pairs of rollers to drive the same such that the peripheral speed of the rollers of the second means is greater than that of the guide rollers.

5. A dispenser as claimed in claim 4 wherein said drive means comprises a reversible motor, and a one-way clutch coupling said motor and feed drum, said rollers of said second means constituting said switch means, and further switch means for reversing the motor when a predetermined quantity of tape has been drawn from said roll.

6. A dispenser as claimed in claim 5 wherein said drive means further comprises a drive gear driven by said motor, said clutch coupling said drive gear and feed drum, said further switch means cooperating with said drive gear which is driven forwardly and in reverse by said motor whereas the feed drum is only driven in one direction due to the presence of the one-way clutch.

7. A dispenser as claimed in claim 6 wherein said further switch means comprises first and second switches spaced along the periphery of said drive gear, the latter including a projection to activate said switches to control reversal and halting of the motor and thereby the amount of tape fed.

8. A dispenser as claimed in claim 7 comprising means for adjusting the position of one of said switches to regulate the length of tape fed.

9. A dispenser as claimed in claim 1 comprising cleaning means adjacent said knife means to clean the same during each operation thereof.

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