FIG. 5

FIG. 6

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APPARATUS FOR ROLLING TAPES
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5 Claims

ABSTRACT OF THE DISCLOSURE
An apparatus for rolling tapes which comprises a rotatable tape container consisting of a wall to support outer tape windings and a plate on which said supporting wall is set upright, a pinch roller accessibly facing the inner surface of said supporting wall and having an axis parallel to that of said tape container, a means to transmit a rotating force to either said tape container or pinch roller so as to cause tight rotation therewith. The tape is fed through the space between the circumferential surface of said pinch roller and the inner surface of said supporting wall. A guide means is provided to conduct a tape to where it comes in contact with said pinch roller.

BACKGROUND OF THE INVENTION
The present invention relates to an apparatus for reeling magnetic or perforated or other types of tape, more particularly for taking up tapes progressively from the outside toward the inside of the windings.

In general, where the aforementioned types of tape are taken up on a reel for use as the regenerated tape of a tape recorder or a projector film, the starting end of the tape is fitted to the taking up axle provided in the central part of the reel and wound progressively from the inside toward the outside of the windings. In this case, the commonly used taking up device for tapes comprises a spool type reel and a drive mechanism to rotate it.

This device has the drawbacks that since the starting end of the tape is first taken up on the inside of the windings and the finishing end is placed on the outside thereof, said tape is gradually used from the last part thereof if it is reused. Consequently before the tape is put to use again, it is necessary to rewind it on a separate reel so that its starting end is positioned on the outermost side of the windings. Hence there are difficulties in the continuous repeated use of the tape and also extra time and work have to be expended in rewinding it.

SUMMARY OF THE INVENTION
The tape rolling apparatus of the present invention comprises a tape container having a circumferential wall, a pinch roller in contact with the inner surface of said wall with a tape intervening between them and a guide means to conduct the tape through the space between said wall and roller, thereby making it possible to take up the tape from the outside toward the inside of the windings along said circumferential wall. Therefore the present invention has eliminated the troublesome rewinding of a tape in practical use as required with the commonly used tape reeling apparatus which took it up progressively from the inside toward the outside of the windings.

BRIEF DESCRIPTION OF THE DRAWINGS
FIG. 1 is an elevation of one embodiment of the tape rolling apparatus according to the present invention;
FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;
FIG. 3 is an elevation of one modification of the embodiment of the present invention illustrated in FIGS. 1 and 2;
FIG. 4 is a side view of the apparatus shown in FIG. 3;
FIG. 5 is a front elevation of another embodiment of the tape rolling apparatus according to the present invention;
FIG. 6 is a sectional view taken along line 4—4 of FIG. 5;
FIG. 7 is an elevation showing one modification of the main part of the embodiment shown in FIGS. 5 and 6;
FIG. 8 is an elevation of still another embodiment of the present invention;
and FIG. 9 is a perspective of one modification of the tape container used in the tape rolling apparatus according to the present invention.

One embodiment of the present invention will now be described with reference to FIGS. 1 and 2. A support plate 10 is fitted at the bottom end to a fixing plate 12 by means of a pivotal axle 11 in a manner freely to rotate in the direction indicated by an arrow a. Provided in the lengthwise direction of said support plate 10 is a slit of slide way 13 in which a slidable main shaft 14 is placed. Fitted to the rear end of said main shaft 14 is a circular stop means 15 so as to prevent said main shaft 14 from falling off in the forward direction. Attached around said stop means 15 is a cylindrical ball bearing device 16. Stretched between said ball bearing device 16 and said fixing plate 12 is a coil spring 17, which pulls main shaft 14 downward at all times. On the other hand, fitted at the fore end of said main shaft 14 having an engaging projection 14a is a cylindrical tape container 20 open at the top and made, for example, of acrylic resin by fixing the central part of the bottom plate 21 thereof to said main shaft 14, said container having a circumferential wall 19 carrying a slit 18 to take hold of the starting end of a tape. Thus said tape container 20 rotates with said main shaft 14 and is always pulled downward by said spring 17.

A pinch roller 22 is inserted from the open side of said tape container 20 into that part which faces the inner surface of the circumferential wall 19 of said tape container 20. The bottom face of said pinch roller 22 is placed in the proximity to the aforesaid bottom 21 of said tape container 20. Said pinch roller 22 is connected through a rotary shaft 24 to a means of a drive mechanism 23 such as a motor. Further, a sheet-shaped guide 25 is extended upward from the neighborhood of the part where said pinch roller 22 faces said circumferential wall 19 to the upper opening of said tape container 20 in a semicircularly twisted form, serving to react to conduct tape 26 from outer port through the space between said pinch roller 22 and circumferential wall 19. Said guide 25 can be transferred to the prescribed position by support arm 27.

Further, where it is desired to move tape container 20 in the direction of an arrow β, it will be sufficient only to set support plate 10 upright as illustrated in FIGS. 3 and 4. In this case, the force required to work in the direction β will be supplied by the self weight of said tape container 20.

Also where a relatively thick and elastic tape such as an ordinary projector film is used, a sheet-shaped guide will not be required, and instead, as shown in FIGS. 3 and 4, installation of only a pair of guide rollers 30 or the like will be sufficient to conduct tape through the space between pinch roller 22 and the circumferential wall 19 of tape container 20.

Description will now be given of the functional operation of the tape rolling apparatus under the present invention. First, tape 26 to be taken up is held between said circumferential wall 19 of tape container 20 and pinch roller 22 by being conducted through guide 25, and the...
starting end of said tape 26 is fixed into the slit 18 on said circumferential wall 19. At this time, tape container 20 is pulled in the direction of an arrow $\beta$ due to the tension of a coil spring 17 and presses tape 26 between it and the endless rubber belt 22. Next when pinch roller 22 is made to rotate in the direction of an arrow $\gamma_1$ by drive mechanism 23, tape container 20 concurrently rotates along with tape 26 in the direction of an arrow $\gamma_2$, allowing said tape 26 to be taken up progressively from the outside toward the inside of the windings in said tape container 20.

Since the starting end of tape 26 thus taken up is located at the outermost side of the resultant windings and the finishing end lies in the innermost part thereof, the use of such tape for practical purposes can be made with great ease without rewinding, namely, simply by drawing it out from the outside of the windings in a usual manner.

Another embodiment of the present invention will now be described with reference to FIGS. 5 and 6. Located in the substantially central part of horizontally rotatable support plate 40 is main shaft 42, one end of which is supported by a stop means 41. Fitted at the other end of said main shaft 42 is a tape container 45 open at the top and formed, for example, from an aluminum plate by fixing the central part of the bottom plate thereof to said shaft 42, said container having a circumferential wall 44 cast in a sheet-shaped wall 44. A pinch roller 47 is inserted from the open side of said tape container 45 into that part which faces the inner surface of the circumferential wall 44 of said tape container 45. The bottom face of said pinch roller 47 is placed in the proximity to the aforesaid bottom plate 46 of said tape container 45. Fitted to said pinch roller 47 is one end of rotary shaft 48, and mounted on the other end of said rotary shaft 48 is one end of rotatable arm 49. The other end of said rotatable arm is fitted to the center of a spiral spring 50 so as to pull said pinch roller 47 in the direction of $\beta$ at all times. There is also stretched an endless belt 53 between a pulley 51 placed on said rotary shaft 48 and another pulley 52 provided in a protruding manner on the side of spiral spring 50 of rotatable arm 49. Said pinch roller 47 is driven through the belt 53 by a drive mechanism 54 connected to said pulley 52.

Further, another pinch roller 71 having the circumferential surface made of hard rubber is placed in the upper part of the approximately central part of horizontally rotatable support plate 70. Fitted below this pinch roller 71 is another pinch roller 72. The latter roller is contacted by rotatable arm 49 and driven by endless rubber belt 53 in the same manner as in the aforementioned embodiment of FIGS. 5 and 6. The clearance between said upper pinch roller 71 and said lower pinch roller 72 is adjustable according as the wound tape increases in thickness. The contact between these two rollers through the intervening tape and their respective rotation may, of course, be carried out by the means shown in FIG. 7 or by connecting upper pinch roller 71 to a drive mechanism (not shown) or by pressing said roller downward by a separate device.

A sheet-shaped guide 73 of the same type as in the aforementioned embodiments is connected to said rotatable arm 49 by means of support arm 74 so as to move along with said rotatable arm 49. The outlet of said guide 73 is located near the upper part of said lower pinch roller 72 so as to conduct a tape constantly through the space between both pinch rollers 71 and 72. While this guide 73 may be fitted to said support plate 70, the above-mentioned method of attaching said guide has the advantage that the feeding of a tape is performed smoothly and that the amount of the tape to be taken up can be increased without being restricted by the position of said guide.

The functional operation of the modification illustrated in FIG. 8 will now be described. First, tape 75 is conducted through sheet-shaped guide 73 to the space between pinch rollers 71 and 72. Tape 75 is further drawn out to form a circular ring. The starting end of the tape is fixed by an adhesive to that point of the succeeding length of the tape at which a container 55 is fitted by said starting end of the tape while it is being drawn out. This ring constitutes the outermost side of the windings formed from tape 75 taken up. Next in the same manner as in the foregoing embodiments, lower pinch roller is allowed to rotate in the direction of $\gamma_1$ and tape 75 pressed between upper end of lower pinch rollers 71 and 72 is made to rotate in the direction of $\gamma_2$ so as to be taken up progressively. If, in this case, upper pinch roller 71 is allowed to rotate in the direction of $\gamma_1$ it will facilitate the rotation of tape 75.

The apparatus illustrated in FIG. 8 eliminates a tape container, so that a tape can be taken up to any desired diameter of the resultant windings. This embodiment also has the effect of saving the time required in removing the finished windings from a tape container.

Furthermore, the present invention permits a wound tape to be used as enclosed in a tape container after removal therefrom. In the former case, it will be sufficient only to engage the tape container having an engaging slit with a main shaft having an engaging project as illustrated, for example, in FIG. 1. In the latter case, the rotation of a support plate will easily release the windings from the tape container, though it is engaged with the rotary shaft. The tape container used in the aforesaid cases may consist of one which has a circumferential wall formed around the circular bottom plate as shown in each of the related embodiments or one which has a circumferential wall formed, as illustrated in FIG. 9, from a plurality of wall segments 81 arranged at proper spaces on the circumference of a circular bottom plate 80.

What is claimed is:

1. An apparatus for rolling a tape comprising in combination, (a) a cylindrical tape container with an inner circular wall and a cylindrical side wall, said container being at least partially open at the opposite circular end, said inner wall and said side wall defining a tape storage zone wherein tape can be wound up against said inner wall; (b) a rotating shaft, said container being mounted on said shaft to rotate generally in the vertical plane; (c) supporting means to hold said container, base
means, means pivotally attaching said supporting means to said base means to allow said container to at least partially pivot about a horizontal axis so that said rotating shaft is disposed at an angle to the horizontal;

(d) a driven rotatable pinch roller in said container parallel to said shaft and resilient means to urge said side wall toward said pinch roller so that tape taken up in said container is sandwiched and pressed between said side wall and pinch roller;

(e) driving means to rotate said pinch roller;

(f) guide means attached to said supporting means at least partially spiral to spirally guide tape between said pinch roller and said side wall.

2. The apparatus according to claim 1 wherein said side wall has a slit to take hold of the starting end of the tape.

3. The apparatus according to claim 1 wherein said side wall has a plurality of openings through which the fingers can be inserted to take up the wound tape.

4. The apparatus according to claim 1 wherein said urging means consists of a coil spring whose ends are connected to said tape container and said base means.

5. The apparatus according to claim 1 wherein said guide means consists of a twisted sheath-shaped guide having a tape inlet near said opposite circular end and a tape outlet within said container in the vicinity of said pinch roller.

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