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[54] **DEVICE FOR TAKING UP THE END OF A WOUND TAPE**

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[51] **Int. Cl.** **G03b 1/56**

[58] **Field of Search** 242/192, 195, 197, 198, 242/210; 352/157, 158

[56] **References Cited**

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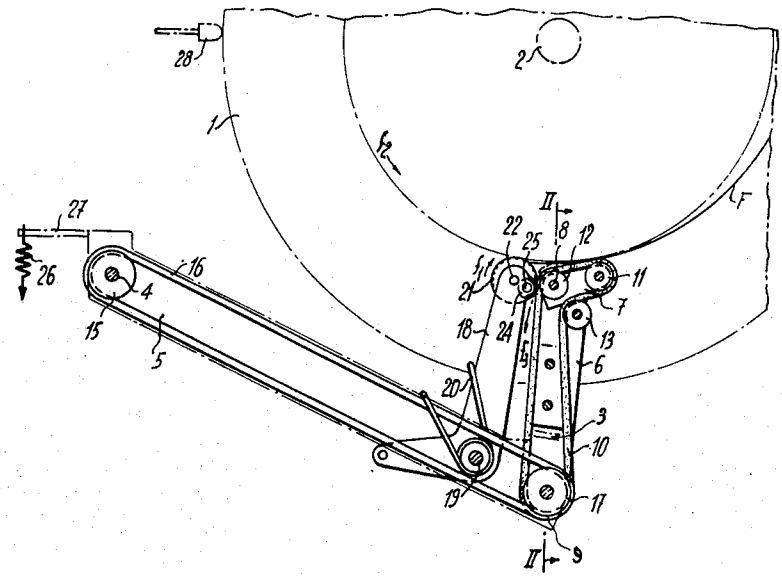
[57] **ABSTRACT**

First and second rotary members are independently mounted on a support arm and can be brought into contact with the outer periphery of a tape wound on a spool. The first member is rotatably driven and the second member elastically applied against the first member, so that it is driven in the opposite direction, the parts of the members adjacent the wound tape tending move in direction towards one another. The second member is applied against the wound tape by a substantially different force than is the first member, for example a greater force, so that the second member drives the wound tape and brake means intermittently acting on the tape spool ensures that the outer spiral of tape is loosened. When the free end of the loosened tape leaves the second member it is driven in the opposite direction by the first member and is taken up by a grooved surface on the second member which guides it between the first and second members, the tape then actuating means to disengage the second member from driving contact with the first member, so that when the tape end is extracted, the tape is driven solely by the first member and the second member is idly driven by the wound tape.

6 Claims, 3 Drawing Figures



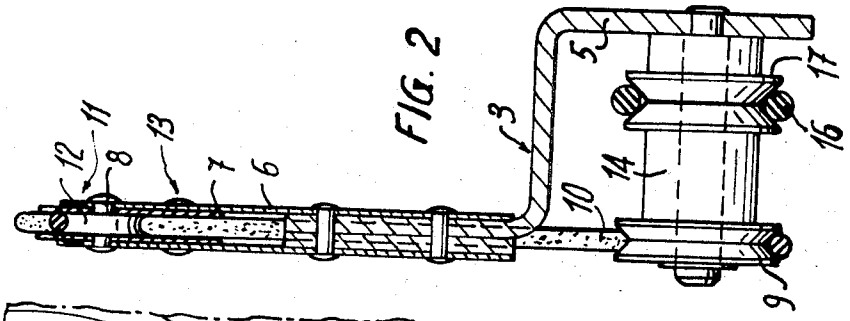


FIG. 2

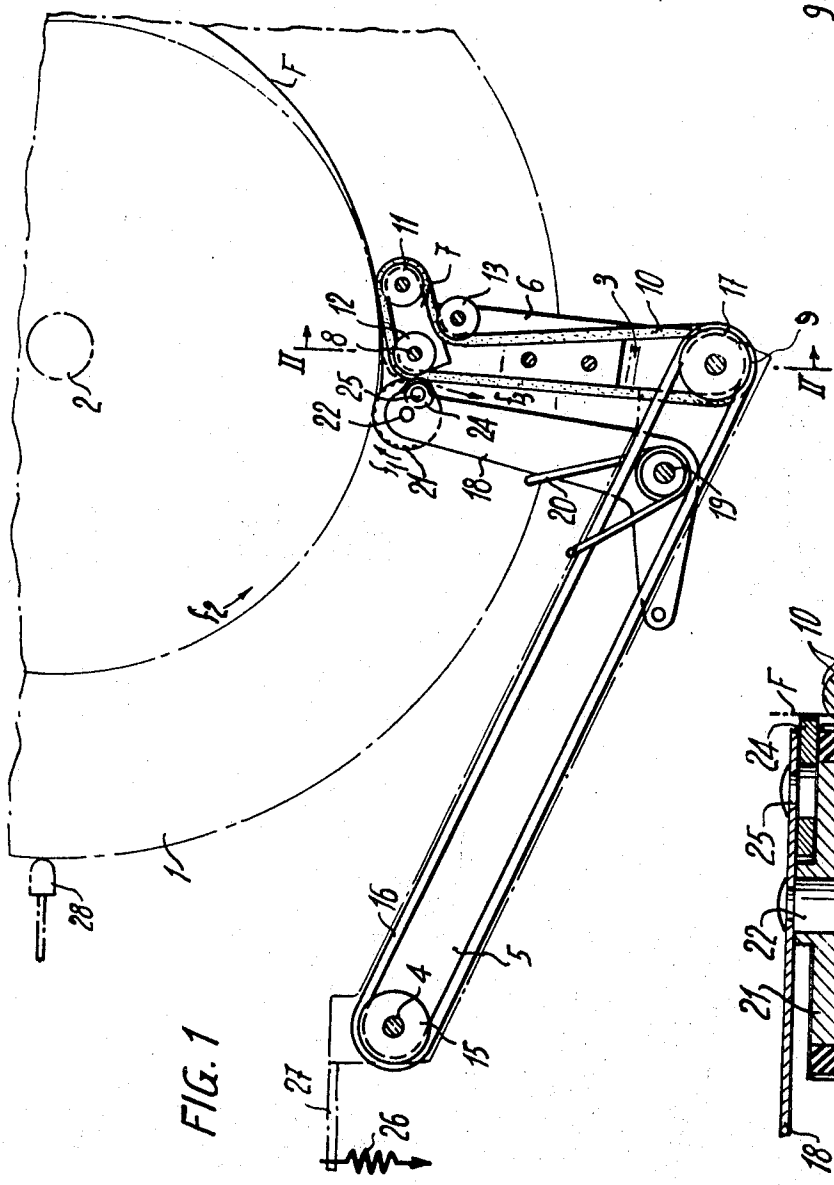


FIG. 1

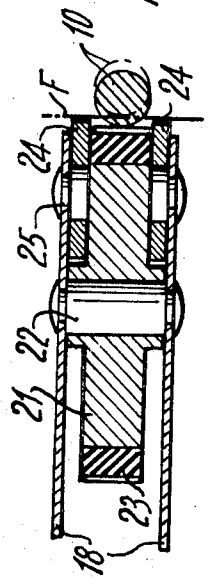


FIG. 3

DEVICE FOR TAKING UP THE END OF A WOUND TAPE

This invention relates to devices for taking up the end of a wound tape, for example a movie film or a magnetic tape wound on a spool, and guiding the tape through a passageway. For the sake of convenience, whenever the term tape is used in the description, it is meant to embrace all types of flexible elongate tapes, films, bands, strips and the like having a certain width and which may be wound onto spools.

Known such devices comprise first and second members rotating in opposite directions and adapted to come into contact with the outer spiral of the wound tape to lead the free end of the tape into an outlet passageway between these two members, the first member being more particularly for driving the tape and the second member being a deflecting member and for this purpose having at its periphery a surface adapted to take up the end of the wound tape and direct it between the first and second members.

In certain applications, the braking effect exerted on the wound tape by the deflecting member unduly reduces the extraction force applied on the end of the tape as soon as it has moved out between the two members, which can result in an insufficient extraction force on the tape.

It is an object of the invention to eliminate the above disadvantage.

In the device according to the invention, the first member is carried by a movable support and is movable into or out of contact with the periphery of the wound tape, means being provided for applying the first member against the periphery of the wound tape with a certain bearing force. The second member is carried by an element movable relative to the said support, and means are provided for elastically acting on said element to urge the second member towards the periphery of the wound tape with a force substantially independent of said certain bearing force.

In the accompanying drawings, which schematically show, by way of example, an embodiment of the invention:

FIG. 1 is a front elevational view of said embodiment of device;

FIG. 2 is a partial side elevation, partially in cross-section along line II—II of FIG. 1; and

FIG. 3 is an enlarged scale cross-sectional view of a detail of FIG. 1.

The device shown is designed to automatically take up the end of the outer spiral of a movie film F wound on a spool 1 rotatably mounted about a shaft 2, the spool being disposed such that upon unwinding the film by pulling the free end, the spool tends to turn in the clockwise direction, looking at FIG. 1. This spool, for example, forms part of a movie film projector.

The device comprises an arm 3 with two branches 5 and 6 of non-equal length in substantially V-configuration. This arm is pivotally mounted at the end of its longer branch 5 about a shaft 4 forming a driving shaft for the device. The shorter branch 6 has at its end an articulated lever 7 pivotally mounted about a pin 8. The arm 3 has an elbow-like cross-sectional shape, as shown in FIG. 2, to house a drive transmission member comprising a pulley 9 angularly fixed to a pulley 17. A drive belt 10 passes about the pulley 9 and a contact pulley 11 for bearing against the wound film, via an intermediate pulley 12 mounted on the pin 8, and about a return pulley 13.

The lever 7 is articulated about the pin 8 which simultaneously serves as shaft for the pulley 12.

The pulleys 9 and 17 are coaxially mounted on a hollow shaft 14 at the summit of the angle of the arm 3. Pulley 17 is driven by a control pulley 15 mounted on the driving shaft 4, by means of a drive belt 16.

When the belt 10 is driven in the counterclockwise direction (FIG. 1) by rotation of the pulley 9, tension in the belt and the friction produced generates a torque on the lever 7 carrying the contact pulley 11, ensuring that the belt 10, urged by the pulley 11, bears against the wound film.

A lever 18 is pivotally mounted about a shaft 19 fixed on the longer branch 5 of the arm 3, close to the summit of the V. The lever 18 is elastically urged in the clockwise direction (FIG. 1) by a spring 20 passing about the shaft 19, the ends of this spring being respectively fixed on the lever 18 and on branch 5. The lever 18 carries at its end the deflector member formed by a roller 21 freely rotatably mounted about a shaft 22. As shown in FIG. 3, this roller 21 is provided at its periphery with a laterally toothed or ribbed layer 23 of rubber. It can be seen that the spring 20 by urging the lever 18 applies the roller 21 against the drive belt 10, at the location where the belt 10 bears against pulley 12.

Moreover, a spring 26 fixed to an arm 27 protruding from the end of the branch 5 tends to apply the lever 18 and consequently the roller 21 against the wound film. The roller 21 is thus in elastic contact with the wound film, and is urged thereagainst with a force greater than the bearing force of the belt 10 provided by the contact pulley 11.

The lever 18 also carries on one of its edges, laterally spaced apart from the roller 21, two small rotary discs 24, a part of the periphery of each of which radially protrudes from the outer surface of the toothed or ribbed layer 23. These discs 24, located facing the pulley 12, freely turn about pins 25.

The discs 24 are disposed so as to only enter into contact with the film F when the latter is engaged in the pinching zone between the pulley 12 and roller 21; the film then causes breakage of the contact between the toothed roller 21 and the drive belt 10.

The device also comprises a brake block 28, controlled by a mechanism, not shown, of the projector to intermittently act against the periphery of the flanges of the film spool 1.

The described device operates as follows:

The arm 3 is introduced between the flanges of the spool 1 by a mechanism, not shown, so that the toothed roller 21 bears against the wound film F on the spool 1 and we will consider an initial position in which the brake block 28 is out of contact with the periphery of the flanges of the spool 1. While at rest, the belt 10 is out of contact with or only slightly brushes against the wound film.

Starting up of the drive pulley 9 causes a disequilibrium in the tensions between the strands of the belt 10 passing on the pulley 9. This disequilibrium causes pivoting of the articulated lever 7 carrying the contact pulley 11, so that the belt 10 bears against the wound film, while adapting to the radius of curvature of the wound film.

Simultaneously, the toothed roller **21** is rotatably driven by the belt **10** in the clockwise direction, as indicated by arrow f_1. Because its pressure on the wound film is greater than that of the contact pulley **11** and belt **10**, the roller **21** drives the spool **1** and the wound film in the counterclockwise direction, as indicated by arrow f_2.

At the moment when the brake block **28** comes into action, the spool **1** and wound tape stop during a short period. During this period, the exterior spiral of the wound tape is still in contact with the toothed roller **21**. The coefficient of friction between the toothed roller **21** and the exterior spiral being considerably greater than the coefficient of friction between this spiral and the subjacent spiral, the exterior spiral slides relative to the inner spirals of the wound film and loosens until the action of the brake block **28** ceases. At this instant, the wound tape and the spool once more move until the next braking action. When the end of the loose outer spiral passes under the toothed roller **21**, this end of the outer spiral is only acted upon by the contact pulley **11** and belt **10**. The coefficient of friction between the belt **10** of the contact pulley **11** and the spiral being greater than that between the outer spiral and the subjacent spiral of wound film, the loose outer spiral is driven in the opposite direction (i.e., clockwise, FIG. **1**) to the rest of the wound film. This end comes to abut against one of the channels in the toothed rubber layer **23** of roller **21** which acts as a deflector and transports the end of the film into the pinching "funnel" formed between the layers **23** and the belt **10** passing over the pulley **12**.

As can be seen in FIG. **3**, the end of the film thus engages between the rotary discs **24** and the belt **10** and takes the position indicated in broken lines. In this position, the film displaces the belt **10** to the position indicated in broken lines in FIG. **3**, and the toothed roller **21** is thus no longer in contact with the drive belt **10**.

Subsequently, therefore, the wound film is only driven by means of the contact pulley **11** and by the traction exerted on the end of the film by the drive belt **10**, with the aid of the discs **24** against which the film is supported to disengage the drive of the roller **21**. Under the effect of this traction drive, the direction of rotation of the spool **1** reverses and the film F is directed, as indicated by arrow f_3, into the loading device of the apparatus. The roller **21** acts as an idler roller solely driven by the wound tape, and thus freely turns in the opposite direction to arrow f_1.

After introduction of the film in the passageway of the projector, the device is switched off by a mechanism, not shown.

The described device, as shown, only has a single drive belt **10**, which on the one hand simplifies both manufacture and adjustment upon fitting the device and, on the other hand, enables elimination of thrust reactions due to the contact of two belts, as is the case in known devices. It should be noted that the spring **20** only gives to the toothed roller **21** a single pressure sufficient to take up the end of the film.

Moreover, the extraction force on the film in the introduction passageway is high, due to the presence of the rotary discs **24** and to the improved pinching effect of the film between the roller **12** and the said rotary discs **24** and, also, due to the fact that the toothed roller **21**, after engagement of the film, is freed from the action of the primary driving means. In this manner, any braking effect of the toothed roller **21** is eliminated as soon as the film engages in the introduction passageway.

The described device can both extract films from free spools and from magazine-loaded spools.

To extract a film in the case when the spool is housed in a magazine, the described device, without departing from the scope of the invention, could be modified as follows:

The deflecting member could be formed by a roller **21** comprising a toothed surface with a relatively low coefficient of friction with the film. The pressure of contact given by the spring **26** could be reduced sufficiently to render the declutching discs **24** superfluous, and the brake block **28** could be eliminated. In this modification, rotation of the spool could no longer undergo reversal. During all of the phases of the extraction operation, the effect of the belt **10** would be predominant and the roller **21** would only function as a deflecting member for the end of the film and as a pinching member.

We claim:

1. A device for taking up the free end of a wound tape and guiding it through a passageway comprising, a movable support, at least one pulley mounted on said support, a belt for driving said wound tape, said belt passing over said at least one pulley and movable into and out of contact with the periphery of the wound tape, means for driving said belt around said pulley, means for applying the belt against the periphery of the wound tape with a certain bearing force, guide means on said support and on which said at least one pulley is mounted for guiding a part of said belt along a path along which the belt may contact the wound tape, a lever pivotally mounted on said support, first spring means urging said support towards the periphery of said tape with a force substantially independent of said certain bearing force, a member rotatably mounted at one end of said lever, second spring means acting on said lever to urge said rotatable member against said belt whereby said rotatable member is friction driven in a direction opposite to said belt, means on a peripheral surface of said rotatable member for taking up the free end of said tape and directing it between said belt and said rotatable member, and means on said lever for preventing the tape from contacting the rotatable member and thereby causing the belt and the rotatable member to be separated from driving contact with each other.

2. A device according to claim **1**, in which said certain bearing force is such that the rotatable member exerts a greater tractive force on the wound tape than does the belt.

3. A device according to claim **1**, in which said certain bearing force is such that the belt exerts a greater tractive force on the wound tape than does the rotatable member, and including means for intermittently braking a spool carrying the wound tape.

4. A device according to claim **1**, in which the rotatable member is a roller freely mounted on said lever, and said means on said lever for preventing the tape from contacting said rotatable member comprise a pair of discs freely rotatably mounted on said lever, said discs protruding beyond the periphery of said roller in the direction of said belt, the end of the tape being guided between said discs and said belt.

5 A device according to claim 3, in which the means on the support for guiding the belt comprises said at least one pulley mounted about a shaft movably mounted on the support and a second pulley mounted about a shaft fixed to said support, said means for driving the belt about said pulleys forming the means for applying a traction to the belt to move said movably mounted pulley towards the support and apply said part of the belt between the first and second pulleys against the periphery of the wound tape with said certain bearing force.

6. A device for taking up a free end of a wound tape and guiding it along a selected path, comprising first and second rotary members, means for driving the first member in a first direction, a movable support on which said members are independently mounted, said support being movable to bring the members into an

operative position at the periphery of the wound tape, means for urging the members towards one another and into driving contact with one another whereby the first member drives the second member in a second direction opposite the first direction, means for differentially urging the first and second members towards the periphery of the wound tape, whereby in the operative position one of the first and second members drives the wound tape in a selected direction, means on the peripheral surface of the second member for taking up the free end of the wound tape and directing said free end between the first and second members, and means on said support adjacent said second member for preventing the tape from contacting the rotatable member and thereby causing the belt and the rotatable member to be separated from driving contact with each other.

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