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(54) APPARATUS HAVING A STRIP-FEEDING DEVICE FOR UNWINDING A COIL OF STRIP FROM A REEL

(71) We, KARL VOCKENHUBER, of 118 Potzleindorferstrasse, Vienna 18, and RAIMUND HAUSER, of 2, Goldegg-Gasse, Vienna 4, both Austrian, both citizens of Austria, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to apparatus having a mounting space for a reel of coiled strip, and is particularly well suited, although not exclusively, for use with a projector for accepting a film cartridge having a supply reel and an opening in the cartridge wall, into which opening a friction roller, arranged on a movable support member is inserted to thread the film. The device of the invention is also usable with tape recording equipment.

Film projectors have already been suggested having film feeding devices for guiding the leading or free end of the film out of the cartridge so that it can be threaded through the projector. These devices comprise a stripper disposed on the apparatus and which is inserted into the cartridge so as to abut the film coil. A rotatably driven friction roller is then pressed against the film coil in the run-off direction of the film and immediately in front of the stripper, and drives the film coil to feed the free end of the film through an opening in the cartridge.

An object of this invention is the provision of an improved way of extracting the free end of a strip from a reel when in an unaccessible position such as within a cartridge.

In accordance with the present invention there is provided apparatus having a mounting space for a reel of coiled strip which is to be unwound, means defining a fixed axis of rotation for the reel, a friction roller driven by way of an endless tensioned belt and moun-

ted on a displaceable support member the roller being movable thereby between a first position at which it is held away from the reel and a strip-end extraction second position at which the roller is advanced towards the position of the reel axis, the belt travelling around the friction roller and also around two other rollers whose axes together with the axis of the friction roller lie at respective corners of an imaginary triangle, the arrangement of the apparatus being such that when the friction roller is in the second position an arcuate portion of the belt passing around it is nearer the reel axis than any other part of the belt to form a driving nip, and when extraction of the strip-end is taking place the unsupported run of the belt loop travelling towards the friction roller makes an acute angle with the adjacent portion of the tangent to the arcuate belt portion at the point on its surface through which passes a line joining the rotational axes of the friction roller and the

The apparatus of the invention may utilise a strip or film cartridge in which the opening for the insertion of the friction roller is at the same time the outlet opening for the strip or film. The invention may also be utilised in apparatus employing cartridges where an outlet separate from the opening for the friction roller is provided. The invention is also usable with film coils not arranged in cartridges but mounted in relatively inaccessible positions.

If desired, the three rollers of the device may be mounted on a single member bodily movable towards the coil axis. One of the rollers may then be suitably driven by a motor mounted on the member and displaceable therewith.

In the preferred arrangement of the invention, one of said two rollers is an axially fixed driven roller, and the other roller comprises

a tensioning roller resiliently mounted for maintaining the belt in tension during displacement of the friction roller.

The belt tensioning roller may then be mounted on a pivoted and displaceable tension lever linked to the member. In such an arrangement the axially fixed driven roller may comprise the main drive motor of the apparatus on which the device is mounted so that a separate drive motor for the belt is unnecessary.

Conveniently the guide apparatus has a stripper for guiding the free end of the strip along a predetermined path. The stripper may define one side of a channel through which the free end of the strip is fed during extraction, the other side of the channel being formed by a second run of the belt travelling away from the friction roller. Conveniently a mechanism used to shift the member towards the coil also moves the stripper into its operative position. Preferably the movements of the stripper and the second run of the belt are guided to follow predetermined curves which maintain the width of the channel substantially constant irrespective of the diameter of the strip winding on the reel.

The invention will now be described in more detail, by way of example, with reference to the accompanying drawings, in which:—

FIGURE 1 shows part of a projector with a film feed device;

FIGURE 2 is a cross-section through part of Figure 1;

FIGURE 3 shows part of a projector with a second form of film feed device;

FIGURE 4 is an enlarged and more detailed plan view of part of Figure 3 showing components in a rest position;

FIGURE 5 shows the component of Figure 4 in their operating positions;

FIGURE 6 is a side elevation of Figure 5 as viewed in the direction of the arrow VI; and,

FIGURE 7 is a section along the line and in the direction indicated by the arrows VII—VII of Figure 5.

Figures 1 and 2 show a cartridge housing 101 containing a rotatably arranged film supply reel having a coil of film 104 wound on a reel core 103. In using the cartridge in conjunction with a projector 125 it is necessary to push the leading end 105 of the film which may occupy any position around the film coil out of the cartridge through an outlet 106. For that purpose a front portion of a support member 108 is inserted into the cartridge through an opening 107 in the cartridge wall, the front portion carrying a friction roller 709. The friction roller 109 fits between the flanges of the reel 102 and presses a portion of a belt 115 against the film coil 104. The belt is preferably made of rubber and passes around a drive roller 116

driven by a motor 117. When roller 109 rotates counterclockwise, the free end portion of the film is moved around an arcuate path in a clockwise direction towards the outlet 106 of the cartridge, the film's movement being guided by an inner cylindrical wall 110 of the cartridge.

The support member 108 together with the motor 117 is displaceable lengthwise of the member and is guided by bolts 118 contained in slots 119 in the member 108. Figure 2 shows one of the bolts 118 only, together with its slot 119.

The front portion of the support member 108 is provided with an oblique guide surface 120. Upon inserting the support member into the cartridge, the guiding surface 120 engages a leaf spring 122, which is fastened to the inner cylindrical cartridge wall 110 by rivets and abuts the inner cylindrical cartridge wall in its rest position. The leaf spring 122 acts as a guide rail and is flexed inwardly from a position between the flanges of the reel 102, when the support member is inserted so that it provides an outwardly spiralling guide surface for the free end of the film devoid of corners which might buckle the film as it advanced.

The cartridge is also provided with a stripper lever 124 pivoted at 123 and pressed towards the circumference of the coil 104 by a spring 125. The front portion of the stripper lever 124 is so disposed that it bears only on the perforated margins of the film so that possible damage of the picture frames of the film by the spring is avoided.

The support member 108 has a lateral extension 135 carrying a guide roller 136 around which runs the belt 115. The outer face of the portion of the belt 115 travelling from the guide roller 136 to the roller 109 makes an obtuse angle with the inside surface of the adjacent flat portion of the cartridge wall as it is advanced towards the coil through the wall of the cartridge. Thus when extraction is taking place the unsupported run of the belt loop travelling towards the friction roller makes an acute angle with the adjacent portion of the tangent to the arcuate belt portion at the point on its surface through which passes a line joining the rotational axes of the friction roller 109 and the reel 102. In this way the free end of the film is deflected by the belt towards the roller 109, so that the film end 105 is trapped in the driving nip formed between the roller 109 and the film coil 104, the nip then driving the film end towards the outlet opening of the cartridge. A friction wheel 112 is rotatably arranged in the cartridge 101, which shows a central pin 113 upon which the film reel 102 is slipped. For rewinding the film into the cartridge, a roller 126 is suitably provided in the projector 125 and is driven through a belt drive 127 by a motor 128 and engages

the friction wheel 112 to rotate it in the film winding direction.

In the modification shown in Figures 3 and 7, there is no need to provide a motor 117 which moves bodily with the support member 108, such an arrangement having the advantage that the roller 116 can be driven directly from the main driving motor of the projector which has a stationary axis of rotation. In this modification the roller 116 corresponds to a driving roller 14 and the guiding roller 136 to a tensioning roller 28.

As illustrated in Figure 3, film cartridges of different sizes 2, 2a may be fitted to the projector. After having fitted the cartridge, a device 3 is inserted into the cartridge in order to extract the free end of the film from the coil. The device 3 may also be used if the film coil is not arranged in a cartridge but is otherwise mounted in an inaccessible position.

For operating the device 3 an operating bar 4 shown in detail in Figures 4 and 5 is used. A lever 5 is pivoted to the end of the bar 4 to turn around an axis of rotation 6. On its other end the lever 5 carries a roller 7. A support member 8 is mounted so that it may be swung around the axis of rotation of the roller 7 and carries at its free or front end a friction roller 9. The support member is integrally formed with a parallel arm 10, which is guided along a control curve by a pin 11 guided in a slot 12. If the lever 5 is turned the support member 8 is displaced towards the cartridge 2 and the coil disposed therein and follows a path determined by the shape of the slot 12. A belt 13 is driven around the idling rollers 7, 9 and a roller 28, by a stationary driving roller 14. The portion 13a of the belt 13 running from the friction roller 9 to the driving roller 14 forms a channel with a stripper 15 in the operating position of the device 3. The film being wound off the coil is guided through the channel which always has a constant width irrespective of the diameter of the coil. In order to achieve this, the stripper 15 is guided in its movement by control curves 16, 17 defined by slots along which move respective pins 24, 25 mounted on the stripper. The drive for moving the stripper 15 is obtained from the operating bar 4 which is formed with an elongated hole 19 containing a pin 18 of a lever 21 turning around an axis 20. Upon lengthwise displacement of the operating bar 4, the lever 21 is rotated to move the stripper 15 which is linked to the lever by a pin 22 located in a slot 23 in the lever 21. The lever 21 resiliently biases the device 3 towards its operating position under the action of a spring 26. In the same manner also the movement of the lever 5 is helped by a spring 27.

Movement of the support member 8 produces a change in the belt path and therefore the guiding roller 28 is designed as a

tension roller and is carried by a tension lever 29 of T-shape. The tension lever 29 is provided in its head with a longitudinal slot 30. A pin 31 engages in this longitudinal slot and determines the centre of rotation of the tension lever 29. The tension lever 29 however is always urged away from the coil by a spring 32.

The arm 10 of the support member 8 is provided with a guiding pin 33 which extends into a slot 34 formed in the stem 35 of the tension lever 29 and is arranged substantially perpendicularly to the slot 30.

When the device 3 is used, the belt portion 13 running around the friction roller 9 intersects the path of movement which one normally expects for the free end of the film at an obtuse angle, so that the free end of the film engaging the belt 13, is urged thereby reliably towards the driving nip formed under the friction roller 9. This stems from the fact that when extraction of the strip end is taking place the unsupported run of the belt loop travelling towards the friction roller makes an acute angle with the adjacent portion of the tangent to the arcuate belt portion at the point on its surface through which passes a line joining the rotational axes of the friction roller and reel. By comparing Figures 4 and 5, it is apparent that in using the additional roller 7, and arranging for tension roller 28 to be displaceable lengthwise of the slot 30, the tension roller 28 swivels only a little amount. As a consequence, the device occupies relatively little space on the projector.

In the views shown in Figures 6 and 7, numeral 36 indicates a plate of the projector 1 in which the slots defining the control curves 12, and 16, 17 are formed. The numeral 37 denotes the projector wall.

The invention may be put into effect in numerous ways. For instance it is advantageous to design the belt 13 as a toothed belt. It will also be appreciated that the invention is applicable to film cameras and tape recorders, as well as to their refill cartridges.

In the following Claims the term "strip" is used to denote a film or tape or like flexible member requiring its free end to be extracted when mounted on a spool.

WHAT WE CLAIM IS:—

1. Apparatus having a mounting space for a reel of coiled strip which is to be unwound, means defining a fixed axis of rotation for the reel, a friction roller driven by way of an endless tensioned belt and mounted on a displaceable support member and roller being movable thereby between a first position at which it is held away from the reel and a strip-end extraction second position at which the roller is advanced towards the position of the reel axis, the belt travelling around the friction roller and also around two other



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- rollers whose axes together with the axis of the friction roller lie at respective corners of an imaginary triangle, the arrangement of the apparatus being such that when the friction roller is in the second position an arcuate portion of the belt passing around it is nearer the reel axis than any other part of the belt to form a driving nip, and when extraction of the strip-end is taking place the unsupported run of the belt loop travelling towards the friction roller makes an acute angle with the adjacent portion of the tangent to the arcuate belt portion at the point on its surface through which passes a line joining the rotational axes of the friction roller and the reel.
2. Apparatus as claimed in Claim 1, in which the three rollers are mounted on the support member and one of said two rollers is driven.
3. Apparatus as claimed in Claim 2, in which the driven roller has a driving motor mounted on the member and displaceable therewith.
4. Apparatus as claimed in Claim 1, in which one of said two rollers is an axially fixed driven roller, and the other roller comprises a tensioning roller resiliently for maintaining the belt in tension during displacement of the friction roller.
5. Apparatus as claimed in Claim 4, in which the belt tensioning roller is mounted on a displaceable pivoted tension lever linked to the member.
6. Apparatus as claimed in Claim 1, Claim 4 or Claim 5, in which opposite ends of the member carry rollers engaging the belt and one of which provides the friction roller and the other of which provides a fourth roller.
7. Apparatus as claimed in Claim 4, Claim 5, or Claim 6, mounted on apparatus adjacent a stripper which defines one side of a channel through which the free end of the strip is extracted, the other side of the channel being formed by a second run of the belt travelling away from the friction roller.
8. Apparatus as claimed in Claim 7, in which a mechanism used to shift the member towards the reel axis also moves the stripper into its operative position.
9. Apparatus as claimed in Claim 7 or Claim 8, in which the movements of the stripper and the second run of the belt are guided to follow predetermined curves which maintain the width of the channel substantially constant irrespective of the diameter of the strip coil.
10. Apparatus as claimed in any one of the preceding Claims, in which the mounting space is adapted to receive a cartridge containing the reel of coiled strip.
11. Apparatus as claimed in Claim 10, in which the apparatus is a film projector.
12. Apparatus having an arrangement for extracting the free end-portion of a reel-mounted coil of strip material, the arrangement being adapted to operate substantially as described with reference to the accompanying drawings.

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