

## PATENT SPECIFICATION

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## DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO THE  
 EXTRACTION OF COILED STRIPS FROM CARTRIDGES

(71) We, KARL VOCKENHUBER, of 118 Potzleinsdorferstrasse, Vienna 18, and RAIMUND HAUSER, of 2, Goldegg-Gasse, Vienna 4, both Austria, 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:—

This invention relates to apparatus having a device for carrying out the extraction from a cartridge of a free end-portion of a strip coiled on a reel inside the cartridge, such extraction being carried out by means of a roller which is moved through an opening in the cartridge so that it frictionally engages the exterior surface of the outside convolution of the coiled strip. The friction roller provides with the strip a nip through which the free end-portion of the strip passes when the coil is driven in the unwinding direction. The nip defines the beginning of a guide path inside the cartridge along which the free end-portion of the strip passes towards an outlet opening formed in the cartridge. The roller in contact with the coiled strip may act as an idler so that it is driven by the rotating coil, or it may itself be driven to rotate the coil which is normally held on a reel inside the cartridge.

The invention is particularly useful in connection with cinematograph projectors using a film strip held in a cartridge. The invention is also usable, however, with other forms of apparatus which utilise a cartridge containing a reel on which a strip is coiled, such apparatus may for example comprise a tape-recorder or certain types of camera.

Where a length of strip or film is coiled on a reel inside a cartridge, difficulties may be encountered in guiding the free end-portion of the strip out of the cartridge, particularly if the free end-portion is cracked or broken. In this case there is a tendency

for the free end-portion to throw loops inside the cartridge which quickly accumulate to block the path leading to the cartridge outlet. Unless the drive applied to the coil is removed immediately, the strip may be permanently damaged or broken.

An object of this invention is the provision of a device for lessening the likelihood of damage to a strip in the event of its free end not emerging safely from a cartridge containing a reel on which the strip is coiled.

In accordance with the present invention apparatus having a mounting position for a cartridge containing a length of strip coiled on a reel inside the cartridge, also has a device for extracting the free end-portion of the strip from the cartridge such device comprising: a support member advanceable towards the strip coil through an opening in the cartridge from an inoperative first position at which a roller, carried by the member, is spaced from the coil to a second position lying in a range of operating positions at which further advance of the member is opposed by circumferential contact with the coil; a spring which, when stressed, moves the member from the first position to the second position and maintains a thrust on the roller so that it rotates with the coil; an actuator movable from a first station towards which it is resiliently biased, to a latched second station to stress the spring, a drive operable to rotate the reel in a direction which unwinds the coil so that the free end of the strip follows a path inside the cartridge leading towards an outlet opening; an element separate from the strip and which moves by an amount determined by the rotation of the roller and thus provides a measure of the displacement of the free end of the strip as the coil is rotated by the drive; and a mechanism which unlatches the actuator and disengages the drive from the reel in response

to the movement of the element attaining a pre-arranged value corresponding to the displacement of the free end-portion of the strip being such that, irrespective of the initial angular position of the free end of the strip with respect to the axis of rotation of the coil, it should have emerged from the cartridge.

The invention ensures that in the event of the free end-portion of the strip not being guided correctly along the path in the cartridge, the drive rotating the coil is removed before permanent damage to the strip can take place.

The roller may be arranged to drive the coil and in this case it is conveniently belt driven so that the movement of the belt provides a measure of the rotational movement of the roller. Alternatively, the reel may be directly driven from a motor, for example by means of a suitable rim drive, and the roller in this case acts as an idler which is driven from the coiled strip on the reel and its rotational movement once again provides a measure of the angular displacement of the free end-portion of the strip during the application of the drive.

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

FIGURE 1 shows parts of a projector having a device for pushing the free end-portion of a film strip out of a cartridge containing a reel on which the film strip is coiled;

FIGURE 2 is a section through the cartridge to illustrate how parts of the device co-operate directly with the cartridge; and,

FIGURE 3 shows a displaceable support member carrying a friction roller and its associated operating mechanism.

Referring to Figures 1 and 2, a film projector has a body partially shown at 25 and to which is fitted a cartridge 1 containing a rotatable reel 2 on which is wound a coil of film 4.

When first using the cartridge it is necessary to extrat the free end-portion 5 of the film strip from the cartridge by way of an opening 6 formed in the cartridge wall. The amount the reel must be rotated to enable the free end-portion of the strip to emerge from the opening depends on the position occupied by the free end of the film when the cartridge is first fitted to the projector.

To eject the free end of the film from the cartridge, a support member 8 is inserted through an opening 7 in the cartridge wall. The inserted front portion of the member 8 carries a friction roller 9 which passes between the flanges of the reel 2 and presses a driven belt 15, which passes around the roller 9, against the outside surface of the outermost convolution of the coiled film. The belt is preferably made of rubber and provides a

driving nip for rotating the coil 4. The belt is driven in a direction which rotates the roller 9 in a counterclockwise direction as shown in the drawing, so that the free end-portion of the film is moved along a predetermined curved path inside the cartridge in a clockwise direction and towards an inner cylindrical wall 10 of the cartridge. The free end-portion then slides along the wall 10 until it is deflected by a stripper 24 towards the outlet opening 6. The support member 8 is guided during its longitudinal displacement by bolts 18 which pass through slots in the support member and one of which is shown in Figure 1.

The front portion of the support member 8 is L-shaped to provide an upwardly and rearwardly extending guiding surface 20. Upon inserting the support member 8 into the cartridge 1, the guiding surface 20 presses against a leaf spring 22 which is fastened to the inside surface of the cylindrical wall 10 of the cartridge by means of rivets 21 and which rests against the inside cylindrical wall before the member 8 is inserted. The insertion of the member 8 causes the free end of the leaf spring 22 to be deflected between the flanges of the reel 2 to the position shown in Figure 2 at which it provides a curved, outwardly spiralling guiding surface devoid of sharp corners and capable of guiding the free end-portion of the film leaving the nip without risk of buckling. The stripper 24 in the cartridge is constructed as a lever which engages the coil 4 tangentially at one end which is so shaped that it contacts the marginal perforated edges of the film only so that damage to the frames of the picture is avoided.

A friction wheel 12 coaxially arranged beneath the reel 3 is also disposed in the cartridge 1 and has a central pin 13 upon which the film reel 3 is fitted. For rewinding the film into the cartridge, a roller 26, shown in Figure 1, is provided on the projector body 25 and is driven by a belt 27 by a motor, not illustrated, to rotate the friction wheel 12.

Immediately outside of the cartridge opening 6, are provided a pair of transport rollers 30, 31. The roller 30 is driven in a clockwise direction while the roller 31 is driven in a counterclockwise direction. The two transport rollers provide between them a nip which seizes the free end-portion of the film as it emerges from the opening 6 in the cartridge and feeds it forwards to a film transporting device not illustrated but forming a part of the projector.

The belt 15 and thus the roller 9 are driven by a motor 17 shown in Figure 3. The motor shaft carries a pinch-roller 32 which resiliently presses the belt 15 against the rim of a rotatable disc 33 mounted in stationary bearings. The disc 33 has a centre pinion 34 which mates with a gear wheel 35 to provide a gear reduction system. The gear wheel 35 has an

element formed by an eccentric pin 36 projecting parallel to its axis from one face as shown in Figure 3.

5 The support member 8 is displaced by a mechanism comprising an actuator formed by a slider 37 which can be moved parallel to the support member 8 and is guided during its movement by pin and slot arrangements as shown. The member 8 is connected to the slider 37 by a resilient bias element formed by a tension spring 38, and also to a stationary fixture provided on the body of the projector by a spring 39 which acts against the spring 38. A further spring 40 urges the slider 37 towards its rest position which is located towards the left of the drawing. The slider 37 is held in its operated position by a latch 42 having a biasing spring 41 which urges it into engagement with a complementary latching recess provided in the slider 37. A push rod 43 is used to press the slider to the right of the drawing in order to push the front of the member 8 carrying the friction roller 9 through the opening 7 in the cartridge 1.

25 The device operates in the following manner. After the carriage 1 has been fitted to the body of the film projector, the slider 37 is displaced by means of the push rod 43 from its left-hand or rest position to its operating position shown in the Figure where it is held by the latch 42. The spring 38 extends during this movement to draw the support member 8 to the right so that the roller 9 passes through the opening 7 in the cartridge 1 and presses resiliently against the outside surface of the outermost convolution of the film coil. If the driving motor 17 is now switched on, the roller 9 is belt driven in a counterclockwise direction to rotate the film coil 5 and thus its free end in a clockwise direction inside the cartridge so that the free end of the film is guided towards the outlet opening 6 of the cartridge 1.

45 The free end of the film has to rotate through the maximum angular distance inside the cartridge before it can emerge, when, upon bringing the roller 9 against the film the free end of the film is positioned directly beneath the end of the stripper lever 24 as shown in Figure 2. As the end of the film rotates from this position, it may first be directed towards the nip formed beneath the belt 15 by the movement of the belt as is explained in more detail in our copending Application No. 23411/68 (now Serial No. 1233708). After passing through the nip the free end is guided with further rotation of the coil along a predetermined path defined by the leaf spring 22, the inside wall 10 of the cartridge 1, and the lever 24 which directs the free end through the opening 6 where it can be seized by the rollers 30 and 31.

65 As is clearly shown in Figure 3, the drive belt 15 which drives the roll of film also

drives the disc 33 and, by way of the gear reduction system formed by the pinion 34 and the gear wheel 35, the pin 36 is rotated also.

The displacement of the belt 15 corresponds to the distance travelled by the leading or free end of the film around the inside of the cartridge. The pin 36 therefore provides an element whose angular displacement in a measure of the movement of the free end-portion of the film strip. Eventually the pin 36 reaches the position shown and engages the latch 42 and releases it from the latching recess of the slider 37 which thereupon returns with the support member 8 to their left-hand or rest positions under the action of their respective return springs 39 and 40. The angular movement carried out by the gear wheel 33 before the element or pin 36 causes disengagement of the latching mechanism, is preset to correspond to the maximum distance the free end-portion of the strip can travel before it emerges from the cartridge 1.

If the film throws a loop inside the cartridge as a consequence of having a cracked or broken free end-portion, it will not travel around the pre-arranged path in the cartridge. Subsequent damage to the film caused by further loops accumulating and pressing upon one another and perhaps subsequent breakage, are prevented with the device described as the angular movement of the film coil in the cartridge is automatically limited by the preset angular movement allowed to the pin 36 before the latching mechanism disengages the drive from the film coil 4.

In a modification of the above described device the drive motor is de-energised simultaneously with return of the support member 8 to its left-hand or rest position.

The invention may be used in conjunction with an undriven friction roller 9. In this case the reel 2 is turned in a clockwise direction by the friction wheels 26 and 12, instead of by the friction roller 9. Here the friction roller 26 is stopped in an analogous manner to that described in the above embodiment after a certain number of revolutions of the friction roller 9.

The device of the invention is not restricted to cinematograph projectors but may also be applied with the same advantages to certain constructions of film camera and sound tape instruments.

#### WHAT WE CLAIM IS:—

1. Apparatus having a mounting position for a cartridge containing a length of strip coiled on a reel inside the cartridge, and a device for extracting the free end-portion of the strip from the cartridge, such device comprising: a support member advanceable towards the strip coil through an opening in the cartridge from an inoperative first position at which a roller, carried by the member,



\* C L M S \*

element formed by an eccentric pin 36 projecting parallel to its axis from one face as shown in Figure 3.

The support member 8 is displaced by a mechanism comprising an actuator formed by a slider 37 which can be moved parallel to the support member 8 and is guided during its movement by pin and slot arrangements as shown. The member 8 is connected to the slider 37 by a resilient bias element formed by a tension spring 38, and also to a stationary fixture provided on the body of the projector by a spring 39 which acts against the spring 38. A further spring 40 urges the slider 37 towards its rest position which is located towards the left of the drawing. The slider 37 is held in its operated position by a latch 42 having a biasing spring 41 which urges it into engagement with a complementary latching recess provided in the slider 37. A push rod 43 is used to press the slider to the right of the drawing in order to push the front of the member 8 carrying the friction roller 9 through the opening 7 in the cartridge 1.

The device operates in the following manner. After the carriage 1 has been fitted to the body of the film projector, the slider 37 is displaced by means of the push rod 43 from its left-hand or rest position to its operating position shown in the Figure where it is held by the latch 42. The spring 38 extends during this movement to draw the support member 8 to the right so that the roller 9 passes through the opening 7 in the cartridge 1 and presses resiliently against the outside surface of the outermost convolution of the film coil. If the driving motor 17 is now switched on, the roller 9 is belt driven in a counterclockwise direction to rotate the film coil 5 and thus its free end in a clockwise direction inside the cartridge so that the free end of the film is guided towards the outlet opening 6 of the cartridge 1.

The free end of the film has to rotate through the maximum angular distance inside the cartridge before it can emerge, when, upon bringing the roller 9 against the film the free end of the film is positioned directly beneath the end of the stripper lever 24 as shown in Figure 2. As the end of the film rotates from this position, it may first be directed towards the nip formed beneath the belt 15 by the movement of the belt as is explained in more detail in our copending Application No. 23411/68 (now Serial No. 1233708). After passing through the nip the free end is guided with further rotation of the coil along a predetermined path defined by the leaf spring 22, the inside wall 10 of the cartridge 1, and the lever 24 which directs the free end through the opening 6 where it can be seized by the rollers 30 and 31.

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If the film throws a loop inside the cartridge as a consequence of having a cracked or broken free end-portion, it will not travel around the pre-arranged path in the cartridge. Subsequent damage to the film caused by further loops accumulating and pressing upon one another and perhaps subsequent breakage, are prevented with the device described as the angular movement of the film coil in the cartridge is automatically limited by the preset angular movement allowed to the pin 36 before the latching mechanism disengages the drive from the film coil 4.

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The invention may be used in conjunction with an undriven friction roller 9. In this case the reel 2 is turned in a clockwise direction by the friction wheels 26 and 12, instead of by the friction roller 9. Here the friction roller 26 is stopped in an analogous manner to that described in the above embodiment after a certain number of revolutions of the friction roller 9.

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is spaced from the coil to a second position lying in a range of operating position at which further advance of the member is opposed by circumferential contact with the coil; a spring which, when stressed, moves the member from the first position to the second position and maintains a thrust on the roller so that it rotates with the coil; an actuator movable from a first station towards which it is resiliently biased, to a latched second station to stress the spring; a drive operable to rotate the reel in a direction which unwinds the coil so that the free end of the strip follows a path inside the cartridge leading towards an outlet opening; an element separate from the strip and which moves by an amount determined by the rotation of the roller and thus provides a measure of the displacement of the free end of the strip as the coil is rotated by the drive; and a mechanism which unlatches the actuator and disengages the drive from the reel in response to the movement of the element attaining a pre-arranged value corresponding to the displacement of the free end-portion of the strip being such that, irrespective of the initial angular position of the free end of the strip with respect to the axis of rotation of the coil, it should have emerged from the cartridge.

2. Apparatus as claimed in Claim 1, in which a belt passes around the roller, and the element is connected to respond to the movement of the belt.

3. Apparatus as claimed in Claim 2, in which the belt is driven directly by a motor providing said drive.

4. Apparatus as claimed in Claim 2, in

which the belt is driven indirectly by a motor providing said drive which is transmitted from the roller to the belt.

5. Apparatus as claimed in Claim 3, in which the output of the element is derived from a mechanical connection extending to the belt and including a gear reduction system.

6. Apparatus as claimed in Claim 5, in which the belt passes through a nip formed between a pinch-wheel mounted on a shaft of a motor, and the rim of a rotary disc against which the pin-wheel is resiliently biased and whose rotational movement is transmitted through the gear reduction system to the element.

7. Apparatus as claimed in any one of the preceding Claims, including a second spring holding the support member in the inoperative first position when the actuator is at the first station.

8. Apparatus as claimed in any one of the preceding Claims, in which the actuator and the support member comprise sliders which are movable parallel to one another and are interconnected by said spring.

9. Apparatus for extracting a free end-portion of a strip from a reel mounted inside a cartridge, arranged and adapted to operate substantially as described with reference to the accompanying drawings.

10. Apparatus as claimed in any one of the preceding Claims and constructed as a film projector.

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