

PATENT SPECIFICATION

(11) 1 262 188

DRAWINGS ATTACHED

1 262 188

- (21) Application No. 26252/69 (22) Filed 22 May 1969
(31) Convention Application No. 731 377 (32) Filed 23 May 1968 in
(33) United States of America (US)
(45) Complete Specification published 2 Feb. 1972
(51) International Classification G 03 b 1/58
(52) Index at acceptance
G2E A14
(72) Inventor ALLAN MILLARD PALMER



(54) STRIPPING MECHANISM FOR FILM ROLLS

(71) We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343 State Street, Rochester, New York 14650, United States of America, 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 a film stripping mechanism for separating and guiding a leading end of a strip of material from a rotatably supported roll of the strip material. Such a mechanism may be mounted on a motion picture projector or the like and be adapted to strip film from a film roll carried by a reel disposed within a cartridge supported on the projector.

Film stripping mechanisms for use with a film roll contained in a cartridge have been described in Patent Specification No. 1,234,812, and in Patent Application No. 55365/68 (Serial No. 1,254,705). In these mechanisms a rotatable means in the form of a belt is movable into a cartridge to engage the outer convolution of a film roll therein and to drive the film roll in a film unwinding direction. A stripper finger is also movable into the cartridge to separate the leading end of the film from the film roll during rotation of the film roll and to guide this leading end into a narrow channel formed between the stripper finger and one reach of the belt. The present invention is concerned with a film stripping mechanism of this general type which is usable with rolls of film of different outside diameters.

In accordance with the present invention there is provided a film stripping mechanism for separating and guiding a leading end of a strip of material, such as film, from a rotatably supported roll of the strip material, the stripping mechanism comprising a stripper member mounted on a carrier and movable to an operative position in which it can separate the leading end of the strip material from the rotating roll, and drive

means for engaging and rotating the roll, the stripper member being mounted for movement about a plurality of axes whereby the stripper member can maintain a predetermined relationship relative to the said drive means for a plurality of roll diameters.

The stripping device of the invention is preferably incorporated in a motion picture projector, and two embodiments of film stripping device suitable for this purpose will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a view illustrating the first embodiment of film stripping mechanism in its inoperative position with respect to a roll of motion picture film;

Figs. 2 and 3 are fragmentary views similar to Fig. 1 showing the mechanism in two other positions.

Fig. 4 is a view illustrating the second embodiment of the invention.

Figs. 5—7 are views similar to Fig. 4 but drawn to a smaller scale and showing the second embodiment in other positions.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to Figs. 1—3, the film stripping mechanism comprises a film stripping finger or member generally designated 1 supported by a lever 3. The lever is pivoted at 5 to a wall 6 of an apparatus such as a motion picture projector for movement between the position illustrated in Fig. 1, wherein it engages a stop 7, and the position illustrated in Figs. 2 and 3, wherein it bears against a stop 9. The lever is moved from the Figure 1 position by means diagrammatically illustrated at 11, and is returned to the Figure 1 position by suitable means diagrammatically illustrated at 13. This movement of lever 3 controls movement of the stripper finger into and out of an opening in a cartridge 15 and into and out of engagement with the outer convolution of a roll of film 17 positioned within the cartridge. The film may be wound onto the hub

of a reel which is rotatable about an axis 19 of a spindle forming part of the projector.

An endless belt 21 is trained about a drive pulley 23 and two idler pulleys 25 and 27. The belt is driven in the direction indicated by the arrows, and the unit comprising the belt and pulleys can be swung about the axis of pulley 23 from its normal or inoperative position shown in Fig. 1 through an opening in cartridge 15 and into its operative position (seen in Figs. 2 and 3) wherein it is in engagement with the outer convolution of film roll 17 to drive the film roll in an unwinding (clockwise) direction. Means for driving the belt and for swinging it to its operative position are disclosed in more detail in the beforementioned copending patent applications.

When the belt and finger are in their operative positions within the cartridge as illustrated in Figs. 2 and 3, film is removed from the roll 17 by using the belt to drive the film roll in an unwinding direction, and using the finger 1 to lift the leading end of the film from the roll. The film is fed through a substantially closed channel 28 formed by one reach 29 of the belt and the adjacent elongate side edge 31 of the stripper. As the film leaves channel 28 it is threaded the usual film drive mechanism of the projector, and this threading operation is preferably accomplished by directing the film from channel 28 into automatic film threading means forming part of the projector. The film stripping mechanism of the invention is preferably constructed so that reach 29 and edge 31 are substantially parallel to each other whenever they are in contact with a film roll. Thus channel 28 is substantially the same width throughout its length. The spacing between reach 29 and edge 31 is designated 35, and the mechanisms of this invention permit use of the film stripping mechanism with rolls of film having different outside dimensions without changing the dimension 35.

Film stripping finger 1 has an arcuate edge 37 which meets the edge 31 at a rounded end portion 39. End 39 is the only portion of the stripping finger which normally engages the film roll and, in operation, it tends to separate the leading end of the film from the film roll and direct the film through channel 28.

There are times when a film roll tends to clockspring resulting in the outer convolution of film being separated from the main body of the film roll although still retained in the cartridge 15. When this occurs the leading end of the film strip engages a second reach 33 of the belt and is driven along this reach towards the film roll and then between pulley 25 and the film roll.

The film stripping finger is coupled to the lever 3 for limited and controlled move-

ment with respect to the lever by means of three pins or posts 41, 43 and 45 which are secured to lever 3 and which project through corresponding guide slots or grooves 47, 49 and 51, respectively, in the finger. Slot 47 has two arcuate end portions 47a and 47b which are substantially perpendicular to each other. Similarly, slot 49 has arcuate end portions 49a and 49b extending at substantially right angles with respect to each other. Slot 51 has arcuate end portions 51a and 51b inclined at an obtuse angle.

The centres of curvature for slot portions 47a and 49a are located at the closed end of slot portion 51a. The centres of curvature for slot portions 47b and 51a are located at the intersection of slot portions 49a and 49b. The centres of curvature for slot portions 49b and 51b are located at the closed end of slot portion 47b. This relation between the various portions of the guide slots permits the desired limited and controlled pivotal movement of the finger 1 on lever 3 as described more fully hereinafter.

A tension spring 53 is connected at 55 and 57 to the stripper finger and to the lever 3 to bias the stripper finger in a counterclockwise direction into its normal or rest position (Fig. 1) wherein pivot 41 is located at the closed end of the slot portion 47a, pivot 43 is at the closed end of slot portion 49a, and pin 45 is at the closed end of slot 51a.

When lever 3 moves away from stop 7 into engagement with stop 9 the stripping finger 1 swings about the axis of pivot 5 into the cartridge 15. During initial movement of the lever away from stop 7, and before the lever engages stop 9, the tip end 39 of the stripping finger engages the outer convolution of the roll of film 17. During subsequent movement of lever 3 into engagement with stop 9, the reaction between the end 39 of the finger and the roll causes the stripping finger to rotate clockwise against the bias of spring 53 about pins 41, 43 and/or 45 to adjust the position of the stripping finger relative to lever 3. The extent of rotation of finger 1 relative to the lever and the axis of its rotation depends upon the outside diameter of the roll of film. This rotational movement will now be described in detail.

After tip end 39 of the finger first contacts the roll of film, the stripping finger initially swings about the axis of pin 45 toward the position illustrated in Fig. 2 wherein pins 41 and 43 are located at the intersection of the inclined end portions of the respective slots 47 and 49. Thus for rolls of film with comparatively small outside diameters the stripper finger can assume any of the various positions throughout a range of positions between the positions illustrated in Figs. 1 and 2.

When film rolls having substantially larger

outside diameters are positioned within the cartridge, then the stripper finger needs to rotate clockwise to a greater extent with respect to lever 3 in order to maintain the desired relation between belt reach 29 and edge 31 of the stripper finger. Therefore, when large diameter film rolls are encountered, the stripper finger first moves about pin 45 from the Fig. 1 position to the Fig. 2 position as previously described. Further rotation about pin 45 is prevented due to the engagement between pins 41 and 43 and the left side edges of their respective slots. However, the continuing reaction between the film roll and the finger end 39 now produces rotational movement about pin 43 in a clockwise direction until the pin 41 is seated in the closed end of slot portion 47b and pin 45 is located at the intersection between slot portions 51a and 51b as shown in Fig. 3. Further clockwise rotation about pin 43 is prevented by engagement between pin 41 and the closed end of slot portion 41b. Movement of the finger within this second range of positions (i.e., from the Fig. 2 to the Fig. 3 position) is sufficient to strip film from film rolls having outside diameters of the intermediate size, e.g. 100—200 foot film rolls. Where even larger rolls of film are encountered, e.g. 400 foot rolls of film, the stripper finger can rotate clockwise about pin 41 from its Fig. 3 position until pin 43 or pin 45 reaches the closed end of its respective slot portion 49b or 51b. The position within this third range of positions that the finger actually assumes is determined by the outside diameter of the film roll. When lever 3 is moved away from stop 9 and into contact with stop 7, spring 53 returns the stripper finger through the positions shown in Figs. 2 and 3 to the Fig. 1 position.

As will be apparent from the foregoing description and from an examination of the drawings, the unique manner in which the stripper member is mounted on and moved with respect to lever 3 permits it to be used for stripping film from rolls having widely varying outside diameters without significantly changing the important relation between edge 31 of the stripper finger and reach 29 of the belt.

Figs. 4—7 illustrate an embodiment of the invention which is particularly useful in connection with belt drive means generally designated 65 which, for example, may be of the type described in Patent Application No. 55365/68 (Serial No. 1,254,705). Drive means 65 is similar to the belt structure illustrated in Figs. 1—3, however, reach 67 is inclined at a substantially greater angle with respect to reach 69. Due to the different construction and operation of drive 65, the stripping finger can travel in a somewhat different path while maintaining

the desired dimension 35 between stripping finger and reach 69 of the belt. The mechanism illustrated in Figs. 4—7 is similar to the mechanism shown in Figs. 1—3 and, accordingly, similar parts have been designated by the same reference characters used in Figs. 1—3.

A stripping finger 1¹ is connected to lever 3 by means of two pins or posts 71 and 73 which project through curved guide slots 75 and 77, respectively. These slots curve towards an imaginary point located between the pins and the tip end 39 of the stripper member, and the centre of curvature of each slot lies within the other guide slot. A spring 79 attached at 81 and 83 to the stripper member and to the lever 3, respectively, biases the stripper finger into its normal or inoperative position as shown in Fig. 4.

When lever 3 is moved into engagement with stop 9 to move the stripper finger into the cartridge and into engagement with a roll of film, the tip 39 of the finger first swings counterclockwise in an arcuate path about pivot 5 until it contacts the outer convolution of the film. Then the reaction between the film roll and the finger swings the upper portion of the stripper finger clockwise against the biasing force of spring 79 to move the left end of slot 77 into engagement with pin 73. For comparatively small diameter rolls of film (as shown in Fig. 5), the finger contacts the film just before the lever reaches stop 9. Thus there is very little pivotal movement of the finger, and the finger may assume any of the various positions within the range of positions between the positions shown in Figs. 4 and 5.

For film rolls having a larger diameter such as shown in Fig. 6, the stripper 1¹ first pivots as described in connection with Fig. 5, and, thereafter, it pivots about the axis of pin 73 in a clockwise direction. This movement can continue until the right end of slot 75 engages pin 71. Fig. 6 illustrates pin 71 approximately midway between the ends of slot 75, thereby indicating that rolls of film having even greater outside diameters than illustrated in Fig. 6 can be accommodated within the cartridge without exceeding the permissible movement of the stripper finger in a clockwise direction.

Figs. 5 and 6 illustrate the use of film rolls having different diameters but with the same axis of rotation 19 within the cartridge. In such arrangements a spindle mounted on the projector to support the film roll for rotation about this axis will remain in a single position during operation of the projector. In some apparatus the axis of rotation of the roll may change for cartridges of various sizes. In such apparatus the position of the spindle mounted on the projector to support the film roll during operation will

be dependent on the size of the film roll. This is illustrated in Fig. 7 wherein a small roll of film is adapted to rotate about an axis 87 which is offset from the axis 19 of rotation of the larger rolls shown in Figs. 5 and 6. The position and outside diameter of the roll illustrated in Fig. 7 is such that the stripper finger 1^a is moved to its extreme clockwise position for engaging the outer convolution of film.

As will be apparent from an examination of Figs. 5—7, in each case the lower edge 31 of the stripper finger is substantially parallel to the reach 69 of the belt and the spacing 65 therebetween remains substantially constant and uniform for all sizes of rolls in the cartridge and for changes in the axes of rotation of the rolls. Thus, the desired tolerances between the film stripping finger and the belt are maintained even though wide variations are encountered between the diameter and location of the axes of the film rolls.

WHAT WE CLAIM IS:—

1. A film stripping mechanism for separating and guiding a leading end of a strip of material, such as film, from a rotatably supported roll of the strip material, the stripping mechanism comprising a stripper member mounted on a carrier and movable to an operative position in which it can separate the leading end of the strip material from the rotating roll, and drive means for engaging and rotating the roll, the stripper member being mounted for movement about a plurality of axes whereby the stripper member can maintain a predetermined relationship relative to the said drive means for a plurality of roll diameters.

2. A stripping mechanism as claimed in Claim 1 further comprising means biasing the stripper member into a first position with respect to the said carrier, and the stripper member being movable to a second position with respect to the carrier by the reaction between the stripper member and the strip roll when the said carrier moves the stripper member into engagement with the roll.

3. A stripping mechanism as claimed in Claim 1 wherein means coupling the stripper member to the carrier comprises two pins projecting from the carrier in spaced relation to each other, and two arcuate guide slots in the stripper member, each of the guide slots receiving one of the pins thereby to support the stripper member for arcuate movement with respect to the carrier about

axes passing through each of said pins.

4. A stripping mechanism as claimed in Claim 3, wherein means coupling the stripper member to the carrier further comprises a third pin projecting from the said carrier, and a third arcuate slot in the stripper member, the said third slot receiving the third pin thereby to support the said carrier for movement about a third axis passing through the third pin.

5. A stripping mechanism as claimed in Claim 4, wherein each of the three guide slots comprises two angularly disposed arcuate end portions intersecting each other, and the centre of curvature for one of the said end portions of each of two of the said slots is located within the boundary of the third one of the said slots.

6. A stripping mechanism as claimed in Claim 1 wherein the said drive means comprises three spaced pulleys, a drive belt trained about these pulleys and having three reaches, the pulleys being movably mounted so that one of the reaches can be moved into engagement with the strip roll for driving this roll in a direction to unwind strip from the roll, and wherein means coupling the stripper member to the carrier includes guide means for controlling movement of the stripper member with respect to the carrier and with respect to the said one reach of the belt so that the stripper member is located in a predetermined position in spaced relation to the said one reach of the belt when the stripper member and the belt are in engagement with a roll of strip.

7. A stripping mechanism as claimed in any preceding claim, wherein the carrier is mounted on a motion picture projector, and wherein the motion picture projector includes a spindle which remains in a single position on the projector during operation with film rolls of different sizes.

8. A stripping mechanism as claimed in any of Claims 1 to 6, wherein the carrier is mounted on a motion picture projector, and wherein the motion picture projector includes a spindle whose position on the projector during operation is dependent on the size of film roll carried thereby.

9. A stripping mechanism substantially as hereinbefore described with reference to Figs. 1, 2 and 3, Figs. 4, 5 and 6, or Figs. 4, 5, 6 and 7 of the accompanying drawings.

L. A. TRANGMAR, B.S.C., C.P.A.,
Agent for the Applicants.

be dependent on the size of the film roll. This is illustrated in Fig. 7 wherein a small roll of film is adapted to rotate about an axis 87 which is offset from the axis 19 of rotation of the larger rolls shown in Figs. 5 and 6. The position and outside diameter of the roll illustrated in Fig. 7 is such that the stripper finger 1¹ is moved to its extreme clockwise position for engaging the outer convolution of film.

As will be apparent from an examination of Figs. 5—7, in each case the lower edge 31 of the stripper finger is substantially parallel to the reach 69 of the belt and the spacing 65 therebetween remains substantially constant and uniform for all sizes of rolls in the cartridge and for changes in the axes of rotation of the rolls. Thus, the desired tolerances between the film stripping finger and the belt are maintained even though wide variations are encountered between the diameter and location of the axes of the film rolls.

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2. A stripping mechanism as claimed in Claim 1 further comprising means biasing the stripper member into a first position with respect to the said carrier, and the stripper member being movable to a second position with respect to the carrier by the reaction between the stripper member and the strip roll when the said carrier moves the stripper member into engagement with the roll.

3. A stripping mechanism as claimed in Claim 1 wherein means coupling the stripper member to the carrier comprises two pins projecting from the carrier in spaced relation to each other, and two arcuate guide slots in the stripper member, each of the guide slots receiving one of the pins thereby to support the stripper member for arcuate movement with respect to the carrier about

axes passing through each of said pins.

4. A stripping mechanism as claimed in Claim 3, wherein means coupling the stripper member to the carrier further comprises a third pin projecting from the said carrier, and a third arcuate slot in the stripper member, the said third slot receiving the third pin thereby to support the said carrier for movement about a third axis passing through the third pin.

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7. A stripping mechanism as claimed in any preceding claim, wherein the carrier is mounted on a motion picture projector, and wherein the motion picture projector includes a spindle which remains in a single position on the projector during operation with film rolls of different sizes.

8. A stripping mechanism as claimed in any of Claims 1 to 6, wherein the carrier is mounted on a motion picture projector, and wherein the motion picture projector includes a spindle whose position on the projector during operation is dependent on the size of film roll carried thereby.

9. A stripping mechanism substantially as hereinbefore described with reference to Figs. 1, 2 and 3, Figs. 4, 5 and 6, or Figs. 4, 5, 6 and 7 of the accompanying drawings.

L. A. TRANGMAR, B.S.C., C.P.A.,
Agent for the Applicants.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1972.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY,
from which copies may be obtained.



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