

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) STRIP THREADING DEVICE

(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 means for presenting the leading end of a length of strip wound in a roll to a threading mechanism or strip guide track of an apparatus. Where the strip is a cinematograph film the apparatus may be a cinematograph projector.

In British Patent Specification No. 1,110,538 published April 18, 1968, a device is disclosed and claimed for moving the leader portion of a roll of strip, such as cinematograph film, to the self-threading mechanism or guide track of a strip-using apparatus, such as a cinematograph projector. This device includes a stripper mechanism arranged to be biased against the outer surface of the roll to deflect from the roll and initially guide the leader portion to the self-threading mechanism or guide track, and a surface drive belt mechanism positioned adjacent to the stripper mechanism for rotating the roll to initiate the stripping action. The stripper mechanism and the surface drive belt mechanism form between them when biased against the roll, mating surfaces of a passageway to guide the film leader to the self-threading mechanism or guide track of the apparatus.

The present invention is concerned with an improvement in or modification of this device.

According to the present invention there is provided a strip-using apparatus in combination with a cartridge enclosing a reel of such strip, the apparatus comprising a threading mechanism or strip guide track, means for removably holding the cartridge in fixed position on the apparatus adjacent to the threading mechanism or strip guide track so that the reel within the cartridge can rotate

about a predetermined axis, and a rotatable drive belt movable from a non-operative position outside the cartridge to an operative position in the cartridge where it can engage the outermost convolution of a roll of strip wound on the reel to rotate the roll about the predetermined axis so that a stripper finger biased against the outermost convolution of the roll can separate the leading end from the rotating roll and then direct it from the cartridge towards the threading mechanism or strip guide track, the drive belt being supported for rotation by pulleys or guides which in the operative position of the drive belt cause this belt to move along a substantially linear path towards the roll as it enters the cartridge, the drive belt then passing part-way round a pulley or guide before engaging the outermost convolution of the roll, the arrangement being such that if the leading end of the roll has moved away from the roll within the cartridge then this leading end will, on engaging the said straight portion of the rotating drive belt, be deflected thereby back to the roll and forwardly to the stripper finger.

That portion of the drive belt moving away from the roll during rotation of the roll may be arranged to define with the stripper finger a channel through which the leading end of the roll can be moved out of the cartridge into the apparatus on which the cartridge is mounted.

The pulleys or guides may be mounted so that the roll radius through the outermost point along the said straight portion of the drive belt which can be engaged by the said leading end within the cartridge is always inclined to the said straight portion when the drive belt engages the outer convolution of a roll in the cartridge, the inclination being such that the leading end engaging the said straight portion is carried both forwardly and radially inwards of the roll thereby.

Apparatus in accordance with the present invention, for use with a cartridge containing a reel of strip material, will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is an elevational view of the cartridge with its cover partly open to show a reel of strip material disposed therein, and with a portion of the cartridge broken away to show the taper of the guide rails adjacent to an opening in the bottom of the cartridge;

Fig. 2 is a top plan view of the cartridge shown in Fig. 1 with the top half of the cartridge removed;

Fig. 3 is a bottom plan view of the cartridge shown in Figures 1 and 2 illustrating the openings through which the strip material drive mechanism and the pick-up mechanism of the apparatus may extend and through which the strip material may pass out of and into the cartridge;

Fig. 4 is a cross-sectional view of the cartridge and reel of strip material taken along line 4-4 of Fig. 1, but with the cartridge closed, and illustrating the support of the reel by the rotatable head portion of an apparatus spindle member;

Fig. 5 illustrates a perspective view of the cartridge and a portion of an apparatus with its pick-up and drive mechanisms extending through the openings in the bottom of the cartridge into engagement with the roll of strip material on the reel;

Fig. 6 is an elevational view of part of the cartridge and the apparatus with a portion of the cartridge broken away to illustrate the positions assumed by the pick-up and drive mechanisms with a relatively full roll of strip material on the reel;

Fig. 7 is a view similar to Fig. 6 and illustrating the positions assumed by the pick-up and drive mechanisms when the initial amount of strip material on the reel is considerably less than the possible capacity of the reel, and further illustrating the possible range of tangential paths within which the leader of strip material may follow when initially guided out of the opening in the bottom of the cartridge;

Fig. 8 is a perspective view of a portion of the cartridge in cross-section and through an opening in the bottom of the cartridge illustrating the relative positions of the pick-up mechanism and the guide rails;

Fig. 9 is a perspective view of a portion of the cartridge in cross-section through an opening in the bottom of the cartridge illustrating the relative positions of the drive mechanism and the guide rails;

Fig. 10 is a side elevational view of part of the cartridge illustrating the latch side and the position of the openings through which the pick-up mechanism will extend;

Fig. 11 is a side elevational view of part of the cartridge illustrating the hinge side and the position of the openings through which the drive mechanism will extend; and

Fig. 12 is an enlarged view similar to Fig. 7 and illustrating the leader of the strip

material being "walked" over to the coil of strip material for subsequent movement out of the cartridge.

The cartridge, shown generally at 31, is in the form of a clamshell housing having a lower casing member 34 and an upper casing member 35 that may be suitably connected to the lower casing member by hinge 32. The upper and lower casing members are releasably held together by latch member 33, the latter being affixed to the lower casing member for locking cooperation with abutment 33a on the upper casing member. In this manner the cartridge may be readily loaded and unloaded. Upon opening the clamshell housing a conventional reel 36 of strip material may be inserted, such as a 50-foot strip material reel having a cylindrical core or hub from which a pair of parallel flanges extend radially outwards. Film strip 37 is wound in a roll 38 with the inner end of the strip being connected to the core of the reel by any suitable means such as a clip member 39, which is disposed within slot 41 in the core of the reel.

The lower casing member 34 includes a tongue 48 and depression 50 for engagement with a supporting rack on the apparatus with which it is used, and includes a notch 300 co-operating with a detector finger 302 of the apparatus.

The reel 36 is received loosely within the chamber of the cartridge 31 and the convolutions of strip material 37 are confined within the diameter of the reel flanges 42 by a pair of inwardly extending rails 43 in the upper and lower casing members, which rails are arranged to extend into close adjacency with the outer strip material convolutions of a full roll, as may be seen in Figs. 2, 4 and 5. The rails confine the relative lateral movement of the reel to the central area of the cartridge chamber so as to facilitate assembly of the reel onto a spindle member of an apparatus on which the magazine is to be used, thereby preventing the reel flanges from coming into frictional contact with either wall surface of the cartridge chamber. The rails perform further and more significant guiding functions to be described later.

The bottom wall of the lower casing member 34 is provided with an elongate slot 46 which defines end portions 46a, 46b that constitute entrance and exit openings for a stripper or pick-up mechanism of the apparatus on which the cartridge is to be loaded and which has an intermediate portion that constitutes an exit opening for the strip material. The strip material passes through the widest or intermediate portion 47 of the slot 46.

The pair of guide rails 43, although shown as being substantially continuous around the inside periphery of the cartridge chamber may also be intermittently spaced around

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the inside chamber periphery. In this manner when the cartridge with its received reel of strip material is loaded on the apparatus, the rails assure that the reel will be confined to the central areas of the cartridge and thus facilitate assembly of the spindle member through the opening 45 in the reel.

In Figs. 5, 6 and 7, the stripper assembly of the apparatus is shown generally at 56. This stripper assembly includes a pivotally-movable roll driving mechanism 64 and a pivotally-movable stripper or pick-up mechanism 65, both being suitable and selectively controlled for movement through openings in the cartridge into and out of engagement with the roll of strip material in the cartridge by mechanism described in copending Patent Application 26873/68. The driving mechanism includes a resilient drive belt 148 of generally circular cross-section, e.g. a so-called "O-Ring", which is stretched around pulleys or other guides (not shown) and projects beyond the upper edges of the side plates of the driving mechanism.

When the cartridge and its reel of strip material are in operational position on spindle 95 with the rotatable spindle head member 51 in reel driving engagement within reel opening 45, the cartridge being suitable held in fixed position on the apparatus will be spaced relatively to the spindle member and to the reel so that the reel will thus be supported out of contact with the chamber wall surfaces of the cartridge.

When the strip material is to be moved out of the cartridge toward the automatic threading mechanism (not shown) of the apparatus, the pick-up and driving mechanisms 65, 64 are selectively moved into the cartridge, respectively through portions 46a, 46b of slot 46 into engagement with the outer convolution of strip material. As the pick-up and driving mechanisms move into the cartridge they are guided into engagement with the roll of strip material by the guide rails 43 (as shown in Figs. 8 and 9) as the mechanisms pass between the rails.

Since the normal tendency of coiled strip material is to clockspring, the guide rails 43 perform still another and important function of confining the clockspringing action of the strip material convolutions to the area within the diameter of the reel flanges (as seen, for example, in Figs. 2 and 4). This confinement action becomes still more significant when it is appreciated that when the pick-up and driving mechanisms move into engagement with the strip material on one side of the roll, the roll may buckle or tend to become distorted on the opposite side of the roll, which result if permitted to occur may interfere with the effectiveness of the strip material feed-out action. The guide rails thus confine and minimize the effect and extent of such buckling or distortion.

There is a further cooperation of the guide rails with the pick-up and drive mechanisms. The guide rails serve to guide the outer convolution of strip material as it is driven around the roll in clockwise manner, as viewed in Fig. 5, until the leading end of the strip material convolution is diverted from the roll periphery by the pointed end 174 of the pick-up mechanism and can enter the channel that is formed between the one surface 175 (Figs. 6, 7 and 12) of the pick-up mechanism on the one hand, and the main drive surface of drive belt 148 of the driving mechanism, whereupon the leading end then passes out of the cartridge through the exit portion 47 of slot 46 to the automatic threading mechanism of the apparatus.

The exit portion 47 is so spaced in the bottom of the cartridge with respect to the reel and its roll of strip material when the reel is mounted on a spindle member, and is of sufficient length along the circumference of the chamber peripheral wall surface that the strip material will readily pass through the exit portion tangentially from the roll irrespective whether there are only a few feet of material wound around the reel or the full roll capacity of the reel is being utilized. In other words, the exit portion 47 is so positioned as to lie within the range of the possible tangential paths that may be taken by the leading end of the outer convolution of strip material. This range is illustrated in Fig. 7 by the angle "A". The guide rails are tapered tangentially relative to the roll of strip material, as shown at 43a, with the end of such tangential taper being adjacent the strip material exit portion 47 of slot 46. The taper is toward the exit portion 47. When the roll of strip material is at its maximum capacity the taper serves to facilitate guiding the leading end of the strip material out of the cartridge.

As illustrated in Fig. 12 one drive surface for the strip is provided by the belt 148 as it moves along a substantially linear path aligned with the line Y-Y' towards the roll. That portion of the belt moving along this path enters the chamber for the strip at the point P as it passes the guide rails 43. The line Y-Y' is inclined to the roll radius at the point P and makes an angle B of more than 90° with the perpendicular ZZ' through point P in a plane transverse to the roll axis. Because of the confining action of the guide rails 43 the point P represents the outermost point along this portion of the belt which can be engaged by the leading edge of the strip.

This applies whether the roll of strip material from which the leader is to be withdrawn is at a maximum capacity, as illustrated at Fig. 6, or is considerably less than the maximum capacity, as illustrated at Figs. 7 and 12.

In this manner, therefore, a locking angle,

which might otherwise result at point "P" is avoided. If the angle B was substantially 90° or less, there would be a tendency, particularly with rolls of strip material of considerably less than maximum capacity, for the leader to be deflected away from the roll engaging portion of the drive belt. As a consequence of this arrangement, if the leader of the strip material should clockspring radially from the roll as far as to the rails, shown in the solid line position of 37 in Fig. 12, then the one surface of the driving mechanism, upon being contacted by the end of the leader when the roll is rotated by the driving mechanism, will progressively deflect the leader end towards the roll, as shown in the successive dotted line positions 37' and 37". After engaging the roll engaging portion of the drive belt, the leader end will be diverted by the finger 174 of the pick-up mechanism 65 into the enclosed channel formed by the pick-up mechanism and the driving belt mechanism with the cartridge for subsequent movement out of the cartridge.

Having regard to the provisions of Section 9 of the Patents Act of 1949, attention is directed to Application No. 26872/68.

WHAT WE CLAIM IS:—

1. A strip-using apparatus in combination with a cartridge enclosing a reel of such strip, the apparatus comprising a threading mechanism or strip guide track, means for removably holding the cartridge in fixed position on the apparatus adjacent to the threading mechanism or strip guide track so that the reel within the cartridge can rotate about a predetermined axis, and a rotatable drive belt movable from a non-operative position outside the cartridge to an operative position in the cartridge where it can engage the outermost convolution of a roll of strip wound on the reel to rotate the roll about the predetermined axis so that a stripper finger biased against the outermost convolution of

the roll can separate the leading end from the rotating roll and then direct it from the cartridge towards the threading mechanism or strip guide track, the drive belt being supported for rotation by pulleys or guides which in the operative position of the drive belt cause this belt to move along a substantially linear path towards the roll as it enters the cartridge, the drive belt then passing part-way round a pulley or guide before engaging the outermost convolution of the roll, the arrangement being such that if the leading end of the strip has moved away from the roll within the cartridge then this leading end will, on engaging the said straight portion of the rotating drive belt, be deflected thereby back to the roll and forwardly to the stripper finger.

2. Apparatus as claimed in Claim 1, wherein that portion of the drive belt moving away from the roll during rotation of the roll is arranged to define with the stripper finger a channel through which the leading end of the roll can be moved out of the cartridge into the threading mechanism or strip guide track.

3. Apparatus as claimed in Claim 1, wherein the pulleys or guides are mounted so that the roll radius through the outermost point along the said straight portion of the drive belt which can be engaged by the said leading end within the cartridge is always inclined to the said straight portion when the drive belt engages the outer convolution of a roll in the cartridge, the inclination being such that the leading end engaging the said straight portion is carried both forwardly and radially inwards of the roll thereby.

4. Strip-using apparatus adapted for co-operation with a cartridge enclosing a roll of strip wound on a reel, constructed and adapted to operate substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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