

[54] TAKE-UP DEVICE FOR A STRIP OF WEB MATERIAL

[75] Inventors: Robert B. Johnson; Craig E. Smith, both of York, N. Y.

[73] Assignee: Eastman Kodak Company, Rochester, N. Y.

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[51] Int. Cl.G03b 1/04, G11b 15/32

[58] Field of Search242/195, 205, 76; 352/157, 352/158; 226/91, 92

[56] References Cited

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3,312,407	4/1967	Goldberg.....	242/195
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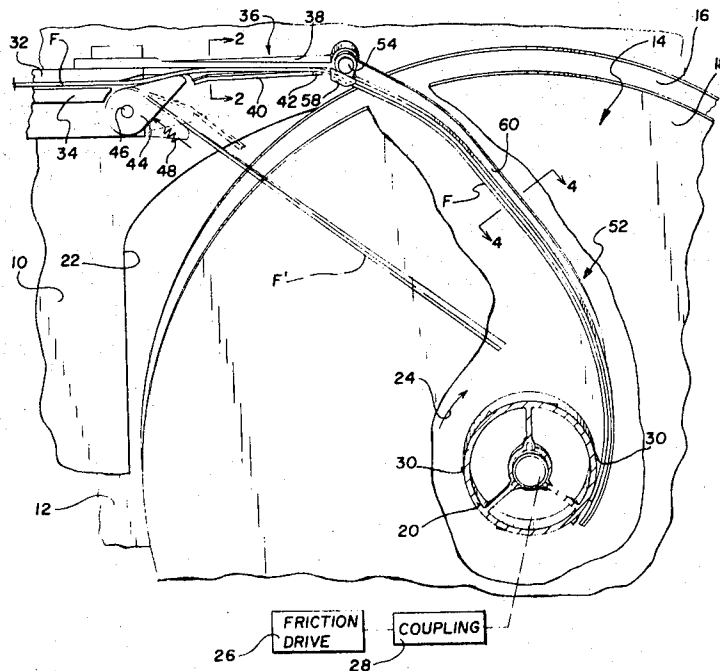
Primary Examiner—Leonard D. Christian
Attorney—W. H. J. Kline and Milton S. Sales

[57] ABSTRACT

A take-up device for a strip of web material includes a

friction driven take-up reel having a pair of spaced flanges and a hub rotatably mounted on a housing. A plurality of teeth extend radially from the hub for engaging the leading end portion of a strip of web material. After leaving the open end of a threading channel having an open end spaced from the hub, the leading end portion of the strip of web material enters a link for guiding the strip to an arm which in turn directs the strip between the reel flanges to the hub. The strip is pulled away from the arm and out of the web guide link by tension applied thereto by the rotating hub to define a new path for the strip from the open end of the threading channel to the hub. A snubber positioned adjacent the open end of the threading channel has a first position for guiding the leading end portion of an advancing strip of web material from the open end of the threading channel to the web guide link and a second position spaced transversely from the first position in a direction perpendicular to the web material's plane. The snubber is spring biased toward its first position and is moved toward its second position by web tension. When the strip is being rewound from the take-up reel, the snubber is effective to accommodate instantaneous differences in the velocity of the strip in the threading channel and the velocity of the web material being unwound from the take-up reel.

10 Claims, 5 Drawing Figures



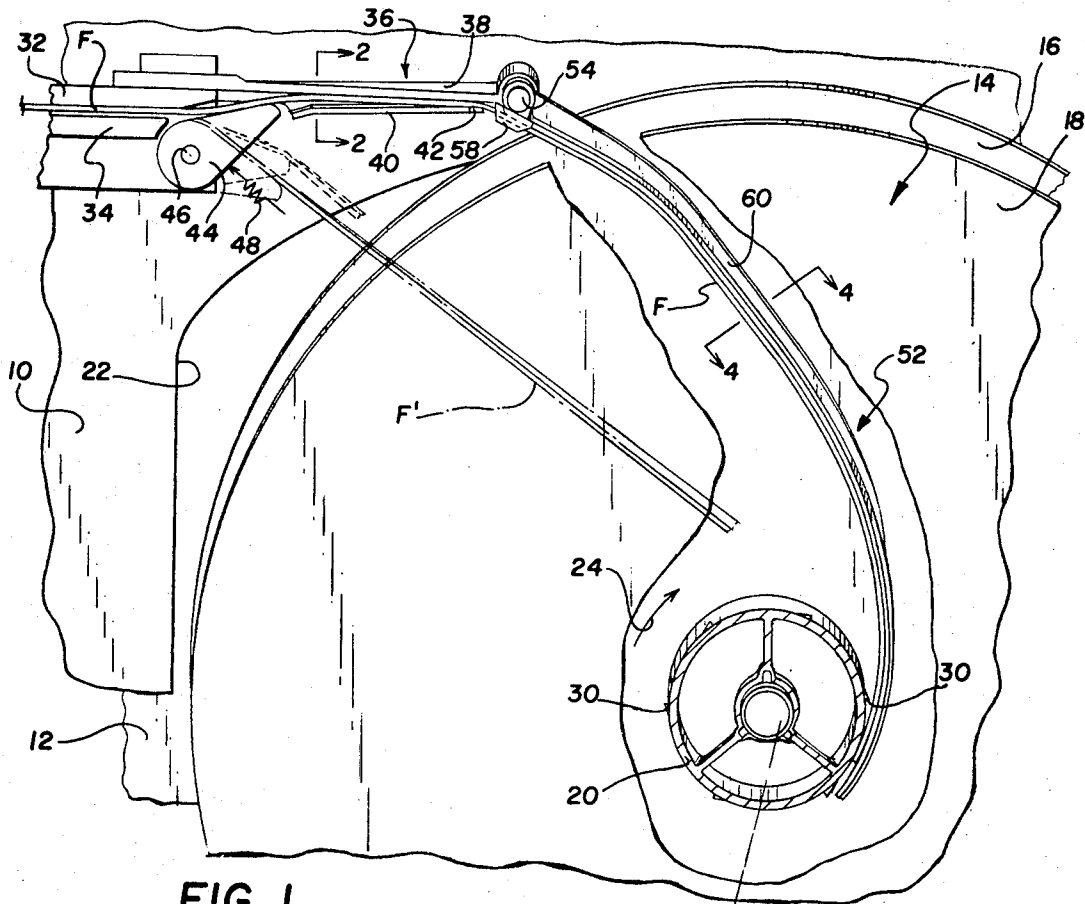


FIG. 1

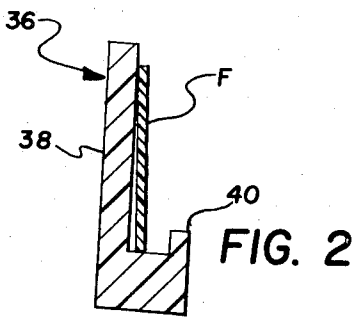
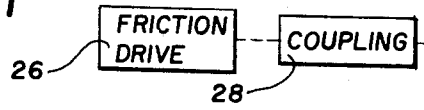


FIG. 2

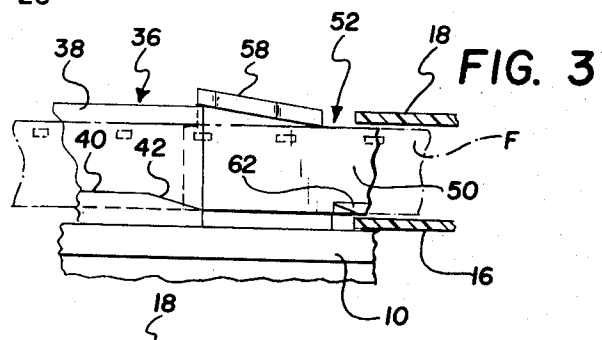


FIG. 3

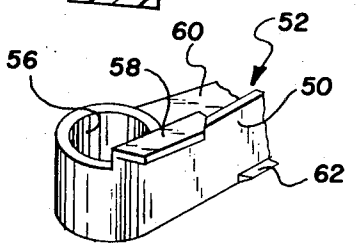


FIG. 5

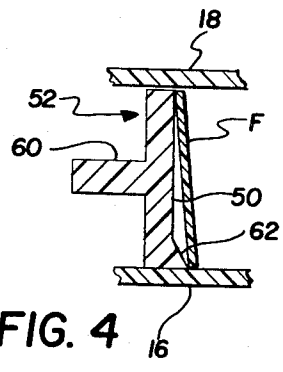


FIG. 4

ROBERT B. JOHNSON
 CRAIG E. SMITH
 INVENTORS

BY *Milton S. Sales*
H. K. J. Kline
 ATTORNEYS

TAKE-UP DEVICE FOR A STRIP OF WEB MATERIAL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to take-up devices for strips of web material, and more particularly to apparatus for delivering the leading end portion of a strip of web material to the hub of a take-up reel, and for guiding the web material away from the hub.

2. Description of the Prior Art

In motion picture apparatus of the type adapted to automatically thread the leading end portion of a film-strip onto a take-up reel, it is common to provide a guide arm for directing the leading end portion of the film from the threading channel to the hub of the take-up reel. Examples of such guide arms are disclosed in coassigned U.S. Pat. No. 3,468,498 in the name of L. J. Bunting and in British Pat. No. 1,206,043 in the name of L. Butler. The film guide arm in each of the projectors shown in these patents is pivotally mounted on the apparatus adjacent the open end of the film threading channel and is spring biased toward the take-up reel hub. Film emerging from the open end of the threading channel follows the guide arm to the hub where it is engaged by the hub. As additional film is advanced toward the take-up reel, the film continues to follow the guide arm which rides on the outer convolution of film wound about the hub and pivots against the force of the spring as the film convolutions build up. During rewind, film that is unwound from the hub follows the guide arm back to the film threading channel even though the guide arm serves no useful function once the leading end portion of the film has been engaged by the take-up reel. Thus, frictional drag is needlessly imposed on the film by the guide arm during modes of projector operation when the guide arm serves no useful purpose.

U.S. Pat. No. 1,346,356 in the name of W. Wenderhold is exemplary of a number of patents disclosing apparatus wherein members which are used during the film threading cycle of projectors are physically removed from the film path during other modes of operation. While such apparatus overcomes the above-mentioned disadvantage of unnecessary drag on the film during non-threading operation, the mechanism for withdrawing the film guide members from the film path after the leading end portion of the film has been engaged by the reel hub includes complicated sensing and positioning members which increases the complexity and cost of the projectors.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide simple and inexpensive apparatus for directing the leading end portion of a strip of web material to the hub of a take-up device, such apparatus being constructed so as not to impose significant frictional drag on the web material after engagement with the hub.

It is a further object of the present invention to provide apparatus for guiding the leading end portion of a strip of web material to the hub of a take-up device, the web material being removable from contact with the guide apparatus upon engagement of the leading end portion with the hub.

It is still another object of the present invention to provide such apparatus with means to accommodate instantaneous differences in the web material speed in the threading channel and the speed of the web material being unwound from the hub.

In accordance with a preferred embodiment of the present invention, a take-up device for apparatus having a housing and a threading channel having an open end through which the leading end portion of a strip of web material includes a hub rotatably mounted on the housing and having means for engaging the leading end portion of a strip of web material. A web guide means defines a path for guiding the leading end portion of the strip of web material from the open end of the threading channel to the hub. The guide means is formed to permit the strip to be withdrawn from the path in a direction transverse to the web material's plane by tension applied to the strip by the hub. A snubber positioned adjacent the open end of the threading channel has a first position for guiding the leading end portion of an advancing strip of web material from the open end of the threading channel to the guide means and a second position spaced transversely from the first position in a direction perpendicular to the web material's plane. The snubber is spring biased toward its first position and is moved toward its second position by web tension. When the web material is being rewound from the take-up reel, the snubber is effective to accommodate instantaneous differences in the web material speed in the threading channel and the speed of the web material being unwound from the take-up reel.

The invention, and its objects and advantages will become more apparent in the detailed description of the preferred embodiment presented below.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description of the preferred embodiment of the invention presented below, reference is made to the accompanying drawings in which:

FIG. 1 is a partial view of a web material handling apparatus incorporating a take-up device in accordance with the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a side view of a portion of the apparatus shown in FIG. 1, partially in section;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 1; and

FIG. 5 is a perspective view of a portion of the take-up device shown in FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Although take-up devices for web material having features according to the present invention may be used in conjunction with apparatus for handling various types of web material, such as for example, motion picture film, magnetic tape, punch tape, etc., the illustrated embodiment of the invention contemplates use of the take-up device according to the present invention on a motion projector. Because projectors are well known, the present description will be directed in particular to elements forming part of, or cooperating more directly with, apparatus in accordance with the present invention. It is to be understood that projector

elements not specifically shown or described may take various forms well known to those skilled in the art.

A projector housing includes a pair of spaced, parallel plates partially shown at 10 and 12 in the drawings. In the following description it will be assumed for convenience that plates 10 and 12 are disposed in generally horizontal planes during normal operation of the projector. A take-up reel 14 has a pair of spaced flanges 16 and 18 and a hub 20 which is mounted on a spindle extending from plate 12. The flanges of reel 14 extend through an opening 22 in plate 10 at an angle of approximately 19° to that plate to provide space above plate 10 for a supply reel, not shown, to overlap the lower portion of reel 14.

The spindle and hub 20 are rotated in a web-winding direction shown by arrow 24 by a friction drive 26. Drive 26 may selectively be connected to the spindle by a coupling 28. Hub 20 is provided with a plurality of teeth 30 extending radially therefrom between flanges 16 and 18 to engage perforations in the leading end portion of a strip of film F.

The projector has a pair of upstanding guide members 32 and 34 which define one end of film threading channel through the projector mechanism. Guide members 32 and 34 are perpendicular to plate 10 so that the threading channel defined thereby and the plane occupied by the film is also perpendicular to plate 10. Means are provided for defining a guide path for the leading end portion of the film between the open (right) end of the threading channel and hub 20. Immediately adjacent the open end of the threading channel, a web guide link 36 is mounted on plate 10. Guide link 36 has a pair of upstanding walls 38 and 40 defining a film guide channel therebetween. The walls are formed such that the film passing therebetween is turned through an angle of 19° to align the film with flanges 16 and 18 of take-up reel 14.

As shown in FIGS. 2 and 3, wall 40 is somewhat shorter than wall 38. The left end of wall 40 as viewed in FIG. 1 is curved away from wall 38 to provide a relatively wide mouth at the entrance to link 36, thereby to assure that the leading end portion of film F will enter the guide path smoothly and surely. The other end of wall 40 is tapered downwardly at 42 as shown in FIG. 3 so that the wall 40 ends at the bottom of the film guide channel in link 36. Wall 40 is tapered at 42 for reasons to be explained hereinafter.

A film snubber 44 is mounted on the housing for rotation about a pin 46 in a direction transverse to the path of film F. A spring 48 resiliently urges snubber 44 toward the film path to the full line position shown in FIG. 1. In that position, snubber 44 completes the path for directing film from the open end of the threading channel defined by guides 32, 34 into the guide path partially defined by web guide link 36.

Upon exiting from the right side of guide link 36, the leading end portion of film F engages surface 50 of a web guide arm 52 which completes the guide path. The guide arm is pivotally mounted on plate 10 by a pin 54 which extends through a hole 56 (FIG. 5) in one end of the arm. Pin 54 also is disposed at an angle of about 19° relative to plate 10. A tab 58 extends from the upper edge of surface 50 to overlie the film as it exits from link 36. The lower surface of tab 58 tapers downwardly, and it cooperates with link 36 to guide the

side edges of the film between flanges 16 and 18 of take-up reel 14. Arm 52 defines an arcuate path between link 36 and hub 20, and it is shaped so that frictional force on the arm created by rotation of reel 14 in the direction of arrow 24 lightly urges the arm about pin 54 in a clockwise direction to rest against the hub. Another factor tending to move the arm toward the hub includes gravity due to the position of the arm on a 19° angle to vertical axis of rotation. A web 60 extends outwardly from the back side of the arm to add rigidity. Surface 50 is substantially the same width as film F, and the surface has a protruding portion 62 to prevent the film from rubbing against the surface, thereby protecting the emulsion coating of the film from scratches. The effect of protruding portion 62 can best be seen by referring to FIG. 4.

FILM THREADING OPERATION

As film is advanced through the projector threading channel, the last portion of which is defined by guide members 32 and 34, hub 20 is coupled to friction drive 26 and is rapidly rotated in the direction of arrow 24. Snubber 44 is urged to the position shown in solid lines in FIG. 1 by spring 48 so that it will guide the leading end portion of the film into the first portion of the guide path defined by web guide link 36. Web guide arm 52 is pivoted about pin 54 in a clockwise direction to rest upon the surface of hub 20. The leading end portion of film F exits from link 36 and follows surface 50 of arm 52 to hub 20 where the perforations in the film are engaged by teeth 30 extending from the hub surface. Since the rate at which the film emerges from the guide path is controlled by the speed of the projector film advance mechanism, and since that rate is slower than the rate at which film can be taken up onto hub 20, friction drive 26 will tension the film and begin to slip, thereby maintaining a constant tension on the film.

As tension is applied to the film, it is drawn away from arcuate surface 50 of arm 52 until it forms a straight line between the right end of wall 40 and the periphery of hub 20. As this happens, the film begins to ride up tapered surface 42 of wall 40 and ultimately withdraws from behind wall 40. Withdrawal of the film is permitted by tab 58 which is inclined (see FIG. 3) at the same angle at ramp 42. Now the tension in the film forces snubber 44 to rotate in a clockwise direction about pin 46 against the force of spring 48 to the lowest position shown in phantom lines in Fig. 1. At that time, the film assumes the path shown in phantom lines as F' in FIG. 1, and it will continue to be taken up by reel 14 as it emerges from the guide channel without encountering additional frictional drag which would be imposed by guide line 36 and guide arm 52 were it not withdrawn therefrom. As convolutions of film continue to build up on the hub 20, guide arm 52 rides upon the outermost convolution and is pivoted in a counterclockwise direction about pin 54.

REVERSE OPERATION

During operation of the projector to unwind film from hub 20, such as for example during rewind and reverse projection modes of operation, coupling 28 between friction drive 26 and the spindle is released to permit reel 14 to be rotated in a counterclockwise direction as viewed in FIG. 1 by the film being pulled

from the hub. The spindle is preferably mounted on the housing so that there is some frictional drag to prevent the film from unwinding from the hub faster than it is withdrawn through the guide channel. This drag will apply a slight tension to the film so as to pull snubber 44 to a position intermediate the full line position for film threading and the phantom line position for normal forward projection. In this position, snubber 44 will be effective in a known manner to isolate the film advancing mechanism from momentary overloads which might be imposed on the film because of inertia of take-up reel 14 and reel "pick" which occurs when the film frictionally engages a reel flange momentarily because of a bent flange or a wobbling reel.

The invention has been described in detail with particular reference to a preferred embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.

We claim:

1. A take-up device for apparatus having a housing and a threading channel having an open end through which the leading end portion of a strip of web material may be advanced, said take-up device comprising:
 - a hub rotatably mounted on the housing and spaced from the open end of the threading channel;
 - means on said hub for engaging the leading end portion of a strip of web material and for holding the leading end on the hub;
 - web guide means defining a path for guiding the leading end portion of a strip of web material from the open end of the threading channel to said hub, said web guide means including means for permitting a strip of web material to be withdrawn from said path in a direction transverse to the web material's plane by tension applied to the strip; and
 - means for rotating said hub in a direction to wind an engaged strip of web material thereabout and to tension the strip in said path, whereby the strip is withdrawn from said web guide means after the leading end portion is engaged on said hub.
2. A take-up device as defined in claim 1 wherein said web guide means includes a link defining at least a portion of said path, said link comprising:
 - means defining a first surface substantially perpendicular to the plane of a strip of web material being advanced through said path for guiding the edge of such a strip;
 - a first wall having a second surface upstanding from said first surface; and
 - a second wall having a third surface spaced from and facing said second surface for defining a space between said second and third surfaces for receiving a strip of web material, said second wall upstanding from said first surface a shorter distance than said first wall to permit a strip of web material to be moved over said second wall and out of said path by tension applied to the strip.
3. A take-up device as defined in claim 2 wherein said second wall is tapered at one end toward said first surface.
4. A take-up device as defined in claim 2 wherein: said link further comprises an open end through which the leading end portion of an advancing strip of web material may emerge from the space defined by said second and third surfaces; and

said web guide means further includes an arm pivotally mounted on the housing, said arm having a surface extending generally from the open end of said link to said hub for guiding the leading end portion of an advancing strip of web material from said link to said hub.

5. A take-up device as defined in claim 1 further comprising:
 - a snubber mounted for movement between (1) a first position for guiding the leading end portion of an advancing strip of web material from the open end of the threading channel into said path in said web guide means and (2) a second position spaced transversely from said path in a direction perpendicular to the web material's plane, said snubber being movable from its first to its second position by the strip when the strip is withdrawn from said path by tension applied thereto by rotation of said hub.
6. A take-up device as defined in claim 5 further comprising spring means for urging said snubber from its second position toward its first position.
7. A take-up device for apparatus having a housing and a threading channel having an open end through which the leading end portion of a strip of web material may be advanced; said take-up device comprising:
 - a hub rotatably mounted on the housing and spaced from the open end of the threading channel;
 - means on said hub for engaging the leading end portion of a strip of web material and for holding the leading end on the hub;
 - web guide means defining a path for guiding the leading end portion of a strip of web material from the open end of the threading channel to said hub, said web guide means including means for permitting a strip of web material to be withdrawn from said path in a direction transverse to the web material's plane by tension applied to the strip;
 - drive means;
 - means for selectively (1) coupling said drive means and said hub for rotating said hub in a winding direction as the strip is advanced through the threading channel to said hub to tension the strip in said path, whereby the strip is withdrawn from said web guide means and (2) uncoupling said drive means and said hub for permitting said hub to be rotated in an unwinding direction as the strip is advanced through the threading channel away from said hub; and
 - a snubber mounted for movement between (1) a first position for guiding the leading end portion of an advancing strip of web material from the open end of the threading channel to said path and (2) a second position spaced transversely from said path in a direction perpendicular to the web material's plane, said snubber being movable from its first to its second position by the strip of web material withdrawn from said path by tension applied to the film by rotation of said hub.
8. A take-up device as defined in claim 7 further comprising spring means for urging said snubber from its second position toward its first position, whereby said snubber assumes a third position intermediate said first position and said second position when said strip is advanced away from said hub, said snubber in said third position being effective to accommodate instan-

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taneous differences in the strip's velocity in said threading channel and the velocity of the strip being unwound from said hub.

9. A take-up device as defined in claim 8 wherein said web guide means includes a link defining at least a portion of said path, said link comprising:

means defining a first surface substantially perpendicular to the plane of a strip of web material being advanced through said path for guiding the edge of such a strip;

a first wall having a second surface upstanding from said first surface; and

a second wall having a third surface spaced from and facing said second surface for defining a space between said second and third surfaces for receiving a strip of web material, said second wall up-

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standing from said first surface a shorter distance than said first wall to permit a strip of web material to be moved over said second wall and out of said path by tension applied to the web material.

10. A take-up device as defined in claim 9 wherein:

said link further comprises an open end through which the leading end portion of an advancing strip of web material may emerge from the space defined by said second and third surfaces; and

said web guide means further includes an arm pivotally mounted on the housing, said arm having a surface extending generally from the open end of said link to said hub for guiding the leading end portion of an advancing strip of web material from said link to said hub.

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