

PATENT SPECIFICATION

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- (21) Application No. 54204/72 (22) Filed 23 Nov. 1972
 (31) Convention Application No. 201 825 (32) Filed 24 Nov. 1971 in
 (33) United States of America (US)
 (44) Complete Specification published 10 July 1974
 (51) International Classification G03B 17/26
 (52) Index at acceptance
 G2E A14B A6A2
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(54) CARTRIDGE FOR STRIP MATERIAL

(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:—

The present invention relates to a cartridge for flexible strip material, and more particularly, but not exclusively to a motion picture cartridge.

Cartridges for use in cinematographic and other recording apparatus provide for movement of a tape or strip of recording material along a predetermined path leading from a supply chamber to a recording or reproduction aperture, and then into a take-up chamber. Accurately controlled movement of the strip along such a path, especially in the region of the recording or reproduction aperture, is essential to assure desired registration characteristics.

To smooth undesired movement of a strip material, it is known to use what is referred to generically as a snubber. The term snubber refers to a surface which contacts a strip material to reduce sudden surging movements, suppress undesired movement or otherwise smooth the movement of the strip.

Snubbers have been proposed of a variety of constructions depending upon the ultimate purpose they are to fulfil. One type of snubber proposed has a fixed snubbing surface that is effective to guide a flexible film strip. Such fixed snubbing surfaces may be generally cylindrical or cylindrical with a conical extension and cooperate with other cartridge elements to compensate for different types of movement imparted to the film strip along

the film path.

Another type of snubber that has previously been proposed, is one having a contact surface positioned along the path of the strip material and resiliently biased toward the strip. Numerous snubbers of this type have been proposed, but they may be generally described as having flat or cylindrical contact surfaces which are supported by resilient means.

Some of the aforementioned snubbers have been proposed for use in a cartridge of the type commonly referred to as a super 8 cartridge. When a super 8 cartridge is properly inserted into a motion picture camera designed to receive the cartridge, a film advancing claw in the camera can intermittently engage the film and advance the film from a supply chamber in the cartridge along a film path and into an exposure aperture. Simultaneously, a take-up drive in the camera rotates the core of the take-up reel to wind the film in a cartridge take-up chamber which is coaxial with the supply chamber. With more conventional film the previously proposed snubbers have been effective to isolate the portions of the film at the supply coil, the take-up roll and at the exposure aperture to compensate for the different types of movement imparted to the film strip in these areas. However, experience has shown that when more recently developed thin-base films (e.g., films with a total thickness of about 2.5 mil) have been placed in super 8 cartridges employing such previously proposed snubbers, the cartridge does not always perform satisfactorily when subjected to usual forces exerted by conventional cameras during advancement of film at conventional rates (e.g., 18 frames per second). In operation of such a cartridge loaded with thin-base films, the intermittent forces imparted to the film by the film advancing claw of the

[Price 25p]

camera overcome the inertia and frictional forces of the film in the cartridge in an undesirable manner resulting in unsatisfactory performance of the cartridge. Rather than drastically alter the structure of commercially accepted cartridges or cinematographic apparatus to solve the problem created by such thin films, it is desirable to modify such cartridges in a way which will make them suitable for such film, and preferably in a way which will permit the cartridges to be also loaded with more conventional films having greater thickness (e.g., about 4 to 5 mils. thick).

According to the present invention there is provided a cartridge for flexible strip material having supply and take-up chambers and guide means defining a path therebetween, wherein the guide means includes a snubber non-rotatably carried by a resilient stem secured to a wall of the cartridge and having a surface which is engageable by a strip disposed in said path, said surface being of frusto-conical form and disposed with the base of the generating cone remote from the stem such that upon increase in tension in the strip, the stem flexes and allows the strip to engage a larger area of said surface.

Reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view, partially broken away, of a preferred embodiment of a snubber according to the present invention and illustrating the position of the snubber in a motion picture film cartridge;

Fig. 2 is a fragmentary side view, to an enlarged scale, of the snubber shown in Fig. 1, showing the snubber relative to the cartridge and film (shown in phantom) in a normal rest position;

Fig. 3 is a view similar to Fig. 2 but showing the position of the snubber relative to the cartridge and film when the film is under tension and the snubber is substantially fully deflected; and

Fig. 4 is a section, to an enlarged scale, taken on the line IV-IV of Fig. 2.

Because snubbers, cartridges and related apparatus are well known, the following description is directed in particular to those elements forming, or cooperating directly with, the present invention, elements that are not specifically shown or described herein being understood to be selectable from those known in the art.

Referring now to Fig. 1, a film cartridge 10 comprises a body 12 and a cover 14. Body 12 includes a cylindrical film supply chamber 28 and a cylindrical take-up chamber (not shown), separated by a wall 32. The chambers are located on opposite sides of the wall 32, substantially in coaxial alignment with each other. Wall 32

has an integrally formed central boss 36 projecting into supply chamber 28.

A coreless roll 44 of film 46 is placed in supply chamber 28 over the boss 36 such that one spirally wound edge lies against the flat tray portion of an anti-friction disk (not shown) that rests on wall 32. The other spirally wound edge of the roll lies in a plane substantially parallel to and closely adjacent to the inner surface of wall 20 of the cover 14. By means of this positioning, the spirally wound convolutions of the coil are prevented from being displaced axially relative to one another by an amount which might cause jamming of the film in supply chamber 28 or otherwise adversely affect operation of the cartridge. The cartridge thus far described forms the subject of Letters Patent No. 1 031 930.

According to the present invention the film 46, as it is tangentially unwound from roll 44 and withdrawn from supply chamber 28, is threaded around a snubber 148 (which is hereinafter described) and then along a film path which brings the film into registry with an exposure aperture 24 in wall 22. Suitable guide means in the cartridge, including guide members 150a and 150b, define the path for film through the cartridge. As film 46 is guided from the supply chamber 28 around the snubber 148, it substantially reverses its direction so that tension forces in the portion of the film located on opposite sides of snubber 148 during unwinding of film from roll 44 are exerted in substantially parallel directions. As the film leaves snubber 148 it is guided through a passageway formed beneath the inner surface of an edge wall 16 and aligned with the exposure aperture 24. The film 46 is then guided into take-up chamber where it is wound upon a take-up core (not shown).

In the illustrated preferred embodiment of the present invention, snubber 148 comprises a hollow head 149 having an exterior frusto-conical contact surface 151 which is of larger diameter at end 151a than at end 151b. The head portion 149 is supported by and preferably integral with a resilient stem 153 which projects from the centre of the hollow head to form an annular recess 155 in the head. Stem 153 is anchored securely to a support boss 157 extending from wall 32 or stem 153 can be secured to wall 32 directly in any known manner. In either case, the stem 153 is non-rotatably supported by the cartridge. This mounting fixes the stem axially and, therefore, normally maintains contact surface 151 angularly inclined to the film path, and also provides the desired resiliency or flexing of the stem in response to tension forces in the film portions adjacent the snubber as described in more

detail later.

Snubber 148 is arranged so that the end 151a of larger diameter is remote from that end of the stem 153 which is attached to boss 157. This provides a snubbing effect upon film 46 which is curved around the frusto-conical contact surface 151 as explained in more detail later.

When film 46 is not under tension and snubber 148 is in a normal position (Figs. 1, and 4), film 46 engages only part of the portion of contact surface 151 adjacent to end 151a, i.e., along a line or band at the upper edge of the head. As shown in Fig. 2, end 151a is so positioned relative to film 46 that only one edge of the film contacts the portion of the contact surface 151 adjacent to the end 151a.

When tension force is applied to the portion of the film 46 around the snubber, the head 149 is arcuately deflected due to the resultant force applied to the contact surface by the film which causes the stem to flex. When the tension applied to film 46 is relatively large, snubber 148 will be deflected into the position shown in Fig. 3 wherein substantially the full width of the surface 151 is engageable with the surface of film 46. The deflection caused by the tension forces in film 46 is in opposition to the biasing force exerted by resilient stem 153 attempting to return to its normal position and the resilient biasing force serves to dampen the surges or variations in the tension forces. This in turn allows more accurate registration of film 46 for recording of images thereon. Also, increased surface contact between the film 46 and the frusto-conical surface 151, when snubber 148 is deflected, increases the forces required to move the film through the exposure aperture. Thus the use of snubber 148 in the cartridge allows for smoother movement and better control of the film 46 in the cartridge.

Operation of the invention will now be described in detail. Assume initially that cartridge 10 is loaded into cinematographic apparatus having a claw and drive member (not shown) that are operatively coupled to the film and cartridge take-up member, respectively, for the purpose of moving film past exposure aperture 24 from supply chamber 28 to the take-up chamber. As the film 46 is intermittently pulled from roll 44 in supply chamber 28 by the pull-down claw, the roll will rotate about its axis on boss 36. As this occurs, a tension force is intermittently applied to the film by the film claw, and the inertia of the supply coil (being at rest) will be overcome and the supply coil will begin to rotate. This allows the outer convolution of film to pass tangentially from the roll and along its path about snubber 148. Impulses or

surges in tension imparted to the film 46 by the pull-down claw cause deflection of snubber 148 toward its Fig. 3 position and are at least partially absorbed by the deflection of the snubber. Also, the deflection of the snubber results in increased frictional surface contact area between the film and the snubber due to the frusto-conical shape of the snubber surface 151 and its position with respect to the film path. This friction and the flexing of the snubber dampen the tension forces in the film and cause the supply roll to experience a more uniform force and unwind more smoothly. This substantially prevents the transmission of instantaneous tension forces to the film roll of a magnitude sufficient to cause the roll to unwind more than enough to supply a length of film substantially equal to the length of film advanced by the claw. In other words, it substantially prevents uncontrolled spilling of film from the film roll. Of course, it is to be understood that the friction between the film and the snubber is one factor affecting performance of the snubber. In this regard, a snubber moulded from polyurethane materials has been found satisfactory.

Energy stored in the snubber stem due to flexing of the snubber toward the Fig. 3 position acts on the film and tends to pull film from the roll until the snubber returns to its Fig. 2 (rest) position. The snubber may or may not return to its Fig. 2 position before the film is advanced again by the claw.

It should be noted that it is not necessary for all portions of the contact surface 151 to be of the same configuration, i.e., only that portion of such surface that is engageable with the strip material need be frusto-conical. However, in the preferred embodiment the entire contact surface 151 is frusto-conical in shape in order to simplify manufacture and assembly of the snubber.

While the invention has been particularly described with reference to a film cartridge, the invention may also be used in other flexible strip handling apparatus wherein a web is moved from a supply means to a take-up means located within a cartridge.

WHAT WE CLAIM IS:—

1. A cartridge for flexible strip material having supply and take-up chambers and guide means defining a path therebetween, wherein the guide means includes a snubber non-rotatably carried by a resilient stem secured to a wall of the cartridge and having a surface which is engageable by a strip disposed in said path, said surface being of frusto-conical form and disposed with the base or the generating cone re-



detail later.

Snubber 148 is arranged so that the end 151a of larger diameter is remote from that end of the stem 153 which is attached to boss 157. This provides a snubbing effect upon film 46 which is curved around the frusto-conical contact surface 151 as explained in more detail later.

When film 46 is not under tension and snubber 148 is in a normal position (Figs. 1, and 4), film 46 engages only part of the portion of contact surface 151 adjacent to end 151a, i.e., along a line or band at the upper edge of the head. As shown in Fig. 2, end 151a is so positioned relative to film 46 that only one edge of the film contacts the portion of the contact surface 151 adjacent to the end 151a.

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mote from the stem such that upon increase in tension in the strip, the stem flexes and allows the strip to engage a larger area of said surface.

5 2. A cartridge according to Claim 1, wherein the axis of the frustrum of the cone is coaxial with the stem.

3. A cartridge according to Claim 1 or 2, wherein the snubber and stem are

moulded integrally from a plastics material. 10

4. A cartridge for flexible strip material having a snubber which has a frusto-conical surface and is carried by a resilient stem, substantially as hereinbefore described with reference to, and as shown in, 15 the accompanying drawing.

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Printed for Her Majesty's Stationery Office by The Tweeddale Press Ltd., Berwick-upon-Tweed, 1974.
Published at the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



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