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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN/OR RELATING TO FILM CARTRIDGES

(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 motion picture film cartridges in which a roll of film is sealed before, during and after exposure in a camera, and to cameras arranged to receive such cartridges. More particularly this invention relates to such cartridges having a disengageable anti-backup mechanism for the take-up spool, and to cameras adapted to disengage the anti-backup mechanism for driving the film in reverse to photograph overlapping "fade, lap and dissolve" sequence.

Many commercially available movie camera cartridges include a substantially rectangular housing in which a supply roll of film and a take-up spool are rotatably mounted in a side-by-side coaxial relation, such as disclosed for example in our Letters Patent No. 1,031,930. As initially loaded, a film leader is pulled from the supply roll, threaded past an exposure aperture in an end wall of the cartridge and then attached to the take-up spool. After being so loaded with unexposed film, the housing is closed and sealed by one or more covers.

When the film in such a cartridge is to be exposed, the cartridge is placed in a motion picture camera adapted to accommodate the cartridge, and a film advancing mechanism in the camera engages perforations in the film during operation of the camera intermittently to pull film from the supply coil and transport it past the exposure aperture to the take-up spool. A take-up drive in the camera is coupled to

the take-up spool of the cartridge positively to drive the spool to wind up the exposed film.

Usually such cartridges include an anti-backup mechanism to overcome the tendency of coiled film to clockspring when the cartridge is subjected to sharp movements. The term "clockspring", as used herein, means radial displacement of successive outer convolutions of a film roll, caused by the tendency of the roll to unwind. Anti-backup mechanisms in the take-up chamber of most commercial cartridges operate on the take-up spool in such a manner that reverse rotation of the spool is prevented, so that film on the spool cannot be unwound. Such mechanisms often comprise a ratchet arrangement wherein a shuttle with a plurality of teeth engages teeth on the spool to prevent rotation of the spool in one direction. However, such mechanisms prevent the film from being driven in a reverse direction for photographing double exposure "fade, lap and dissolve" sequences or for removal of the exposed film through the exposure aperture of the cartridge.

To produce "fade, lap and dissolve" sequences with presently available commercial cartridges, some cameras have been provided with a feature permitting the operator to advance a predetermined number of frames of film past the exposure aperture, during which the exposure aperture is gradually reduced and the take-up drive in the camera is stopped. The film thus exposed is collected loosely in the take-up chamber, and the camera can then be driven in reverse the predetermined number of frames to enable the operator then to make a second sequence of exposures on the previously exposed film with the exposure aperture gradually increased to obtain a "fade, lap and dissolve" sequence. The difficulty with such an arrangement is

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that it requires space within the take-up chamber to receive film without winding it up. Yet, when almost all of a roll of film has been exposed, there is very little space remaining in the take-up chamber to receive the unwound film, so that an attempt to produce a "fade, lap and dissolve" sequence near the end of the roll will frequently cause the film to jam in the cartridge. Accordingly, it is preferred to wind exposed film onto the take-up spool and then to disable the anti-backup mechanism and drive the film in reverse, for subsequently taking an overlapping "fade, lap and dissolve" sequence.

Such an anti-backup mechanism would also permit easier unloading of exposed film from the cartridge, since the exposed film could be unwound from the take-up spool and removed through the exposure aperture without breaking the cartridge open.

It is an object of this invention to provide a film cartridge having an improved anti-backup mechanism, and to provide improved means in a camera for disabling the anti-backup mechanism of such a cartridge, when it is placed in the camera, to permit photographing "fade, lap and dissolve" sequences.

According to the present invention there is provided a motion picture film cartridge, having a housing defining an exposure aperture, means defining a take-up chamber within the housing, and means for guiding film past the exposure aperture to the take-up chamber, comprising a take-up spool rotatably mounted in the take-up chamber, and an anti-backup mechanism, as herein defined, comprising a first member mounted in the cartridge for movement transverse to the axis of rotation of the spool, and a second member mounted on the spool for rotation therewith, the second member being movable along the axis of rotation between a first position in which the members cooperate to render the anti-backup mechanism effective, and a second position in which the anti-backup mechanism is disabled.

The invention also provides a motion picture camera arranged to receive a film cartridge of the above invention, the camera comprising a reversible drive motor, a rotatable drive plate drivingly engaged with the drive motor, a drive lug on the drive plate offset from the axis of rotation of the drive plate drivingly to engage the spool of a cartridge received in the camera and a means movable along the axis of rotation of the drive plate for engaging and moving the second member of the anti-backup mechanism of the cartridge to its second position in which the anti-backup mechanism of the cartridge is disabled.

Figure 1 is a perspective view of a cartridge according to the invention;

Figure 2 is a cross-sectional view of the cartridge shown in Fig. 1 taken along the lines II-II;

Figure 3 is a cross-sectional view of a portion of the cartridge shown in Fig. 4 taken along the lines III-III, and

Figure 4 is a view to an enlarged scale, of a portion of the cartridge shown in Fig. 2 but with an anti-backup device shown disabled by a projection on a camera according to the invention.

As shown in the drawings, a film cartridge 10 according to a preferred embodiment of this invention is shown having an anti-backup mechanism for the take-up spool, which can be disengaged from the exterior of the cartridge. As shown in Fig. 1 the cartridge 10 has a rectangular housing 12, an exposure aperture 13, and an aperture 14 through which the take-up spool 11 is engagable from the exterior of the cartridge housing 12.

As seen in Fig. 2 the cartridge 10 includes an internal partition 15 which divides the housing 12 into a supply chamber 16 and a take-up chamber 17. Located in the supply chamber 16 is a hub 18 mounted on the partition 15 for locating a supply roll of film (not shown). Mounted on the inside of the hub 18 is a post 19 extending through an aperture 20 in the partition 15 and into the take-up chamber 17. The take-up spool 11 is mounted for rotation on the post 19 for receiving and winding up exposed film F. As initially loaded, a film leader is pulled from the supply roll, threaded past the exposure aperture 13 and guided through a film path to the take-up chamber 17 where the lead end of the film is attached to the take-up spool 11.

To prevent film wound on the take-up spool from clockspringing, the cartridge 10 includes an anti-backup mechanism, which in the disclosed embodiment is a ratchet comprising a shuttle member 21, in the form of a flat plate, mounted in the cartridge between the hubs 18 and the internal partition 15, for movement transverse to the axis of rotation of the spool. As shown in Fig. 3 and Fig. 4, the shuttle 21 has ears 44 which engage in cooperating recesses 46 in the hubs 18, to prevent rotation of the shuttle 21. A slide member 22 is mounted on the spool for rotation therewith and for axial movement with respect to the shuttle 21. The slide member 22 has one or more fingers 23 extending parallel to the axis of rotation of the spool. Each finger 23 has a detent 24 that is engagable within a notch 25 defined by the spool 11. The notch 25 has a ramp surface 26 inclined with respect to the axis of rotation of the spool.

As seen more clearly in Fig. 3 the shuttle

21 has inwardly extending teeth 27 which are engagable with the fingers 23 of the slide member 22 in the position of that member shown in Fig. 2. The teeth 27 define gradually inclined surfaces 28 and sharply inclined surfaces 29, such that rotation of the take-up spool in a clockwise direction as viewed from the supply side of the cartridge would cause the shuttle 21 to oscillate transversely to the axis of rotation of the spool with little resistance provided by the gradually inclined surfaces 28 of the teeth 27. However, rotation of the spool in a counterclockwise direction would cause in the position of the slide shown in Fig. 2 a finger 23 on the slide 22 to engage the sharply inclined surface 29 of one of the teeth 27 on the shuttle so that rotation of the slide member and the spool would be prevented in that direction and film could not be unwound from the spool.

As seen in Fig. 3 and 4 the anti-backup mechanism of the cartridge 10 can be disabled by depressing the slide member 22 to a position in which recesses 30 in the fingers 23 are aligned with the shuttle 21 to enable the spool to be rotated in a counterclockwise direction without interference with the shuttle. When the slide member 22 is depressed, the detent 24 on the finger 23 rides outwardly on the ramp 26 of the notch 25 and flexes the finger 23 radially outwardly. The resiliency of the finger 23 biases the detent radially inwardly against the ramp, and thereby biases the detent 24 in to the notch 25 to urge the slide member into a raised position in which the anti-backup mechanism is operative. When the slide member is in its raised position the resiliency of the finger 23 releasably retains the detent 24 in the notch 25 to hold the slide member in that position.

The slide member 22 includes a cup-shaped portion 40, engagable from the exterior of the cartridge and defining an interior bore 41 that slidably fits on a cylindrical projection 42 on the spool 11. This cup-shaped portion permits the slide member to be depressed by a member engaging it on the axis of rotation which reduces the friction required to turn the spool when the slide member is depressed. The sliding engagement of the projection 42 of the spool in the bore 41 of the cup-shaped portion also ensures correct alignment of the slide member with respect to the spool, which is particularly important when the cartridge is being inserted in the camera or when the slide member is being depressed.

A camera mechanism according to the invention for depressing the slide member if such a cartridge operatively positioned in the camera is shown at Fig. 4 with the anti-backup mechanism disabled to enable an operator to photograph overlapping

"fade, lap and dissolve" sequences. Such a camera, a portion of which is indicated at 31, would include a reversible drive motor 32, and an exposure control system (not shown) for gradually varying exposure conditions during a "fade, lap and dissolve" sequence. Such a reversible motor and exposure control system are well known in the art and need not be described in detail herein.

The motor 32 drives a reversible pull-down claw (not shown) and a shaft 33 to which a rotatable driving plate 34 is attached. When the cartridge is loaded in the camera, the spool 11 is positioned with its axis of rotation substantially aligned with the axis of rotation of the shaft 33 and plate 34. A drive lug 35 on the plate 34 extends toward the spool and is offset from the axis of rotation of the plate to drivingly engage either side of a drive lug 36 on the spool to drive the spool in either direction. The slide member 22 is shown depressed by a pin 37 which extends through an axial bore 38 in the shaft 33. The pin 37 could be mounted on the shaft 33 or on plate 34, but in most commercially available movie cameras the drive plate is biased axially toward the spool to assure engagement of the drive lugs 35 and 36. The cup-shaped portion 40 of the slide member 22 enables the slide to be depressed by a camera projection mounted independently of the bias on the drive plate 34 and permits the slide to be depressed to any desired depth without requiring the drive lug 35 to be extended. A further advantage of the camera mechanism shown in Fig. 4 is that the slide member 22 is depressed by engagement of pin 37 along the axis of rotation of the slide and spool. This arrangement reduces friction and avoids the application of additional stress on the plate 34 and lug 35, and consequently wear and strain on these and other drive parts is reduced. In a camera which is not provided with a reverse drive, the drive plate 34 would not be provided with a pin 37, and the slide member 22 would remain in a raised position in which the anti-backup mechanism would be operative to prevent reverse rotation of the spool.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined by the appended claims.

WHAT WE CLAIM IS:—

1. A motion picture film cartridge, having a housing defining an exposure aperture, means defining a take-up chamber within the housing, and means for guiding film past the exposure aperture to the take-

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21 has inwardly extending teeth 27 which are engagable with the fingers 23 of the slide member 22 in the position of that member shown in Fig. 2. The teeth 27 define gradually inclined surfaces 28 and sharply inclined surfaces 29, such that rotation of the take-up spool in a clockwise direction as viewed from the supply side of the cartridge would cause the shuttle 21 to oscillate transversely to the axis of rotation of the spool with little resistance provided by the gradually inclined surfaces 28 of the teeth 27. However, rotation of the spool in a counterclockwise direction would cause in the position of the slide shown in Fig. 2 a finger 23 on the slide 22 to engage the sharply inclined surface 29 of one of the teeth 27 on the shuttle so that rotation of the slide member and the spool would be prevented in that direction and film could not be unwound from the spool.

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The slide member 22 includes a cup-shaped portion 40, engagable from the exterior of the cartridge and defining an interior bore 41 that slidably fits on a cylindrical projection 42 on the spool 11. This cup-shaped portion permits the slide member to be depressed by a member engaging it on the axis of rotation which reduces the friction required to turn the spool when the slide member is depressed. The sliding engagement of the projection 42 of the spool in the bore 41 of the cup-shaped portion also ensures correct alignment of the slide member with respect to the spool, which is particularly important when the cartridge is being inserted in the camera or when the slide member is being depressed.

A camera mechanism according to the invention for depressing the slide member if such a cartridge operatively positioned in the camera is shown at Fig. 4 with the anti-backup mechanism disabled to enable an operator to photograph overlapping

"fade, lap and dissolve" sequences. Such a camera, a portion of which is indicated at 31, would include a reversible drive motor 32, and an exposure control system (not shown) for gradually varying exposure conditions during a "fade, lap and dissolve" sequence. Such a reversible motor and exposure control system are well known in the art and need not be described in detail herein.

The motor 32 drives a reversible pull-down claw (not shown) and a shaft 33 to which a rotatable driving plate 34 is attached. When the cartridge is loaded in the camera, the spool 11 is positioned with its axis of rotation substantially aligned with the axis of rotation of the shaft 33 and plate 34. A drive lug 35 on the plate 34 extends toward the spool and is offset from the axis of rotation of the plate to drivingly engage either side of a drive lug 36 on the spool to drive the spool in either direction. The slide member 22 is shown depressed by a pin 37 which extends through an axial bore 38 in the shaft 33. The pin 37 could be mounted on the shaft 33 or on plate 34, but in most commercially available movie cameras the drive plate is biased axially toward the spool to assure engagement of the drive lugs 35 and 36. The cup-shaped portion 40 of the slide member 22 enables the slide to be depressed by a camera projection mounted independently of the bias on the drive plate 34 and permits the slide to be depressed to any desired depth without requiring the drive lug 35 to be extended. A further advantage of the camera mechanism shown in Fig. 4 is that the slide member 22 is depressed by engagement of pin 37 along the axis of rotation of the slide and spool. This arrangement reduces friction and avoids the application of additional stress on the plate 34 and lug 35, and consequently wear and strain on these and other drive parts is reduced. In a camera which is not provided with a reverse drive, the drive plate 34 would not be provided with a pin 37, and the slide member 22 would remain in a raised position in which the anti-backup mechanism would be operative to prevent reverse rotation of the spool.

The invention has been described in detail with particular reference to preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the scope of the invention as defined by the appended claims.

WHAT WE CLAIM IS:—

1. A motion picture film cartridge, having a housing defining an exposure aperture, means defining a take-up chamber within the housing, and means for guiding film past the exposure aperture to the take-





up chamber, comprising a take-up spool rotatably mounted in the take-up chamber, and an anti-backup mechanism, as herein defined, comprising a first member mounted in the cartridge for movement transverse to the axis of rotation of the spool, and a second member mounted on the spool for rotation therewith, the second member being movable along the axis of rotation between a first position in which the members cooperate to render the anti-backup mechanism effective, and a second position in which the anti-backup mechanism is disabled.

2. A cartridge as claimed in Claim 1 wherein the second member has a projection extending substantially along the axis of rotation of the spool and engagable from the exterior of the cartridge for movement between the first and second positions.

3. A cartridge as claimed in Claim 2 wherein the take-up spool has a cylindrical projection extending along the axis of rotation of the spool, and the second member has a portion defining a cylindrical bore that slidably fits over the cylindrical projection of the spool to align the second member with the axis of the spool.

4. A cartridge as claimed in Claim 3 wherein the portion of the second member defining the cylindrical bore is the projection engagable from the exterior of the cartridge.

5. A cartridge as claimed in any of Claims 1 to 4 wherein the second member has a detent portion biased radially toward engagement with a notch of the take-up spool releasably to retain the second member in one of such positions.

6. A cartridge as claimed in Claim 5 wherein the notch has an inclined surface engagable by the detent to urge the second member toward that position in which it is releasably retained when the second member is in the other of the positions.

7. A cartridge as claimed in Claim 6 wherein the second member has a plurality of resiliently flexible finger portions extending parallel to the axis of rotation of the spool, each of the finger portions having a respective detent biased by the resiliency of the fingers toward engagement with one of a plurality of the notches provided in the spool, the second member being movable between its first position in which the detents are engaged within the notches in the spool and in which the

fingers cooperate with the first member to prevent rotation of the spool in one direction and permit rotation of the spool in the opposite direction for winding up film, and its second position in which the detents engage the inclined surfaces of the notches to flex the fingers radially outwardly against the resilient bias of the fingers and in which the fingers are disengaged from the first member to disable the back-up mechanism, the second member being biased toward the first position by the bias of detents against the inclined surfaces of the notches in the spool.

8. A cartridge as claimed in Claim 7 wherein the detents have ramp surfaces inclined at an angle with respect to the axis of rotation of the spool, the ramp surfaces being engagable with the inclined surfaces of the notches to resist axial movement of the second member from the first position to the second position, and to urge the second member toward the first position when it is in the second position.

9. A motion picture film cartridge substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

10. A motion picture camera arranged to receive a film cartridge according to any preceding claim, the camera comprising a reversible drive motor, a rotatable drive plate drivingly engaged with the drive motor, a drive lug on the drive plate offset from the axis of rotation of the drive plate drivingly to engage the spool of a cartridge received in the camera, and a means movable along the axis of rotation of the second member of the anti-backup mechanism of the cartridge to its second position in which the anti-backup mechanism of the cartridge is disabled.

11. A camera as claimed in claim 10 wherein the motor has a rotatable drive shaft having a bore extending along its axis, and the movable means comprises a pin mounted on the camera independently of the shaft and the plate and extending through the bore to engage the projection.

12. A motion picture camera substantially as hereinbefore described with reference to and as illustrated in Fig. 4 of the accompanying drawing.

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