

SPECIFICATION

Photographic film cartridge assembly and still camera

The present invention relates to photographic film cartridge assemblies of the type including a disk shaped film unit rotatably mounted in a casing. The invention also relates to still cameras for receiving and using such cartridge assemblies.

It is known to provide a photographic apparatus such as cameras which utilise film in disk form and wherein the disk is rotated about its axis to present areas of the disk for exposure at a film gate. Examples of such cameras and film disks can be found in U.S. Specification 1,410,029, 1,946,836, 2,511,334 and 2,625,087. Each of the above arrangements suffered one or more drawbacks in respect of ease of use, simplicity of construction, accuracy of indexing, or ease of manufacture.

It is an object of the present invention to provide an improved photographic film cartridge assembly and a camera therefor.

According to the present invention, there is provided a photographic film cartridge assembly comprising a film unit including a disk of photographic film secured to a rigid core, the core including engageable structure for receiving a force tending to rotate the film unit, a casing enclosing the film unit and having an exposure window whereat image areas of the disk may be sequentially presented on rotation of the film unit in the casing, and positioning discontinuities on the film disk each corresponding to a respective image area and whereby said image areas may be positioned in the exposure window on presentation thereto.

The invention also provides a photographic still camera arranged to receive a cartridge assembly as stated above and comprising a housing for receiving the cartridge assembly in a predetermined orientation therein, an indexing mechanism for supplying a force to the film unit tending to rotate the same and positioning means for engaging one of the positioning discontinuities of the film disk to position the respective image area of the film disk at the exposure window of the cartridge assembly.

The invention will be described further, by way of example with reference to the accompanying drawings, in which:-

Figure 1 is an exploded perspective view of an unassembled photographic film cartridge assembly in accordance with the present invention;

Figure 2 is an exploded vertical sectional view of the photographic cartridge assembly in accordance with the present invention;

Figure 3 is an enlarged perspective view, partially broken away, of a film unit of the

cartridge assembly of Fig. 1 and 2;

Figure 4-6 are enlarged views of details of the photographic cartridge assembly of Figs. 1 and 2;

Figure 7 is a top plan view partially broken away of the photographic cartridge assembly of Figs. 1 and 2;

Figure 8 is a front perspective view of a camera for use with the cartridge assembly of Figs. 1 and 2;

Figure 9 is a view of the camera of Fig. 8 with a door of the camera open to show a cartridge assembly receiving chamber;

Figure 10 is a fragmentary front view of the camera of Figs. 8 and 9 showing details of a film unit indexing mechanism thereof;

Figure 11 is a view of a portion of the camera of Figs. 8 and 9 showing details of a film disk support surface and a positioning mechanism;

Figure 12 is a fragmentary front view of an alternative embodiment of a camera according to the present invention;

Figure 13 is a plan of a latch usable with the camera of Fig. 12; and

Figure 14 is a fragmentary front view of a further embodiment of a camera according to the present invention.

A cartridge assembly, shown in exploded perspective in Fig. 1 and in sectioned elevation in Fig. 2, includes a disk shaped film unit 10, a separator layer 12, a cover member 14, and a casing 16 with top and bottom parts 18 and 20, respectively. When assembled, the top and bottom parts 18 and 20 of the casing form walls which enclose the film unit, the separator layer and the cover member.

The film unit 10, shown enlarged and in partial section in Fig. 3, includes a rigid core 22, a film disk 24, and a mounting ring 26. The film disk is illustrated as having a generally circular outer perimeter, but other non-circular (e.g. polygonal) shapes, such as hexagonal or octagonal may be used.

The film disk 24, comprises a moderately flexible but self-supporting base sheet formed of, for example, cellulose acetate or poly(ethylene terephthalate) and carries photosensitive layers on a face thereof. It is constructed to record photographic images in a plurality of image areas which are spaced along an annular exposure region concentric with the film unit axis. The image areas can be defined by surrounding borders which have been photographically pre-exposed.

The core 22 is preferably moulded of a plastics material and includes an inner raised ring 28, surrounding a central opening, and an outer raised ring 30. A post 32 (Figs. 2 and 3) projects upwardly between the rings to form part of a final locking system explained hereinafter.

According to Fig. 3, a plurality of widely spaced teeth 34 and closely spaced upstanding teeth 35-38 are located radially inwardly

from outer raised ring 30. These teeth cooperate with a ratchet pawl 40 (shown in Fig. 1 and detailed in Fig. 4) on the casing top part 18 in a manner disclosed hereinafter to inhibit rotation of the film unit 10 in other than one desired direction. In the illustrated embodiment, the angular spacing between the teeth 35-38 is eight degrees, while the other spaces between teeth are each twenty-four degrees.

A plurality of equally circumferentially spaced discontinuities in the form of recesses 42 are provided in the core 22 radially outwardly of the ring 30 for receiving a force tending to rotate the film unit 10. The perimeter of film disk 24 contains a series of arcuately spaced positioning discontinuities, for example, notches 44 for use in termination of the indexing function and accurate positioning of each image area.

An annular projection 46 (Fig. 3) of the core 22 rotatably rides in a groove 48 (Fig. 1) in the casing bottom part 20. The film disk 24 projects radially outwardly from the core 22 and lies in an annular recess 50 in the casing bottom part. An opening 52 through the bottom part 20 in the region of the recess 50 is covered by an opaque flexible membrane 53 to prevent light and dirt from entering the cartridge assembly. The opening is provided so that a camera pressure pad may exert pressure, through the membrane, to push the film disk 24 against a film plane locating structure of the camera.

Referring now to the casing top part 18, an annular wall 56 extends around a central opening and a second annular wall 58 is spaced radially outwardly from wall 56. The top part includes the aforementioned ratchet pawl 40, two apertures 60 and 62, a tooth 63, an exposure window 64, a rib 66 surrounding exposure window 64, and a recess 70.

The cover member 14 has a central opening 72 sized to receive the annular wall 58 of the casing top part 18 so that the cover member can rotate about the axis of the annular wall which is also the axis of the film unit 10. The cover member is formed of suitably thin but relatively stiff, opaque sheet plastics material and includes a generally fan-shaped leaf portion 74 sized to cover the exposure window 64. The passage of light rays through the exposure window 64 and onto the photosensitive film disk 24, when the cartridge assembly is not protectively encased by a camera, is precluded by means of the leaf portion 74 and the separator layer 12. The lips 76 and 78 extend over portions of the rib 66 to form a light baffle and to limit rotation of cover member 14.

The exposure window 64 is deliberately larger in size than the desired image area. In this way, the image area and its respective discontinuity or notch 44 is exposed and the

window can receive not only a film support frame 126 (described hereinafter) of a camera but also a film discontinuity sensing member 150 (also described hereinafter). The light-tight integrity of the cartridge is, in this way, only interrupted at one location and only one light baffle arrangement is consequently required.

A locking mechanism, for preventing inadvertent rotation of the cover member when the cartridge assembly is not in a camera, includes a tab 80 (detailed in Fig. 5) on the cover member. The tab is aligned with the aperture 60 and engages the tooth 63 of the casing top part when the leaf portion 74 is aligned with the exposure window 64. The tab 80 is depressable by a camera pin 82 to disable the locking mechanism when the cartridge assembly is received in a camera.

Another discontinuity, illustrated as a hole 84 in cover member 14, is aligned with the aperture 62 and is engageable by a camera indexing mechanism, for example, a pin 86 (Fig. 9) for rotating the cover member. A ratchet pawl 88 (detailed in Fig. 6) extends from the cover member 14 toward the core 22 and is aligned with the recesses 42 on the core. As explained below, the pawl 88 is an engaging structure associated with the cover member 14 which cooperates with the recesses 42, to rotate the film unit 10 in response to reciprocative rotation of the cover member 14 on a path about the annular wall 58.

The separator layer 12 is formed of an opaque sheet material and has a central aperture 90 sized to admit the outer ring 30 of the core 22 and to conform to the inside diameter of the annular wall 58 of the casing top part. A recess 92 in the separator layer 12 receives the core 22, and a framing window 94 is aligned with exposure window 64. An aperture 95 is aligned with recesses 42 on the core 22.

Before the cartridge assembly is loaded into a camera, the cover member 14 is held against rotation in one direction in casing 16 by engagement of the lip 78 and the rib 66, and, in the other direction, by the tab 80 engaging the tooth 63. Rotation of film unit 10 in the casing 16 is inhibited by the pawl 40 on the casing top part 18 lying between closely spaced teeth 35 and 36 as shown in Fig. 4 such that engagement between the pawl and the tooth 36 prevents counter-clockwise rotation of the film unit and engagement between the pawl and tooth 35 inhibits clockwise.

As shown in Fig. 7, the leaf portion 74 of cover member 14 is in light blocking relationship with exposure window 64 and the separator layer window 94 (Fig. 1). Inasmuch as the leaf portion 74 is larger than the aligned windows 64 and 94 between which it is interposed, a labyrinthine light baffling ar-

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rangement is created to restrict the access of light to the film disk 24 through the windows.

The cartridge assembly is receivable in a camera shown schematically in Figs. 8-11 and referred to by the numeral 100. The camera front (Fig. 8) has a taking lens 102, view finder 104, a shutter release button 106, a door opening tab 108, and a manually accessible film advance member 110 which extends through an arcuate slot 112 in the camera front. Camera 100 could also include an electronic flash device (not shown). The flash device could be positioned in the upper corner furthest from lens 102 to reduce the possibility of red-eye and to leave the lower two corners free for holding the camera during picture taking.

Referring to Fig. 9, the rear of the camera is shown with its door 114 open to show a cartridge receiving chamber 116. The chamber is asymmetrically shaped to ensure that the cartridge assembly can be inserted therein in only a single position, with its exposure window 64 in a predetermined orientation.

A stationary post 118 extends into the chamber 116 to extend through the central opening in the core of a received cartridge assembly. The post 118 projects into a recess 120 in the door 114. When the cartridge assembly is inserted in the chamber 116 and the door is closed, a rectangular pressure pad 122 attached to the door 114 by a pair of resilient spring arms 124 enters the opening 52 of an inserted cartridge assembly to urge the film disk 24 toward a film support frame 126. As mentioned above, the film support frame 126 is received in the exposure window 64 of the cartridge assembly so that, when the cover member is moved, the frame 126 bears on the surface of the film disk 24. As is described later a discontinuity sensing member 150 is located in the frame 126 so as to sense each notch 44 as the respective image area of the film disk is presented for exposure. During film indexing (explained hereinafter, the force of the pressure pad 122 against the film disk is at least partially relieved by a pin 128 so that the film disk is free to rotate in the casing 16. The pin 128 is moved by means (not shown) alternately to permit rotation of film disk 24 for indexing thereof and to restrict movement during picture taking.

A pin 86, which is shown in Figs. 9 and 10, is mounted on a rotatable sector 130 and adapted to engage the cover member 14 by entering the hole 84 through the slot 62 in the casing top part 18. The sector 130 is biased by a spring 132 to rotate in a clockwise direction as viewed in Fig. 10. The sector has a cam surface 134 against which a follower lever 136 is held by a spring 138. A slot 140 in the sector 130 slidably receives a pin 142 on a pivoted latch lever 144 which forms part of a latch for the door 114. Film advance member 110 is attached to the sec-

tor 130 for movement therewith.

When the door 114 of the camera is open, sector 130 and the pin 86 are in respective first positions which are rotated from their Fig. 10 positions, and the pin 142 is in a trapped condition in a region 146 of the slot 140. The door latch lever 144 is in a position which is rotated from its illustrated position (Fig. 10) to clear a latch plate 148 on the door 114. The film advance member 110 is positioned at the other end of the slot 112 from that shown in Figs. 8 and 10, and the pin 86 is positioned as shown in Fig. 9.

Upon insertion of a cartridge assembly into the camera 100, the camera pin 82 enters the hole 60 in the hole casing top part 18 and depresses the tab 80 to release the lock and free the cover member 14 for one-way rotation. Simultaneously, the camera pin 86 enters the hole 84 in the cover member through the slot 62 in the casing top part 18. After the camera door 114 has been closed, the operator manually moves the tab 108 toward its position in Fig. 8 to move the door latch lever 144 into the hole in the latch plate 148 and to withdraw the pin 142 from the region 146 of the slot 140. Thereupon, the spring 132 rotates sector 130 (and the pin 86) clockwise from its first position toward its Fig. 10 position. As the sector 130 and the pin 86 rotate, they move the cover member 14 along its operative path. The leaf portion 74 is removed from alignment with both the exposure window 64 and the separator layer window 94 so that scene light may be imaged by the camera lens 102 upon the film disk 24 when the camera's shutter (not shown) is opened.

During the initial part of the travel of the cover member 14 from its exposure window covering position (Fig. 7), the pawl 88 slides across the surface of the separator layer 12. After camera sector 130 and the pin 86 have passed a second position in which the pin 142 is at the discontinuity of the slot 140, the pawl 88 reaches the separator layer aperture 95 and bears against the core 22 in alignment with the recesses 42. When the camera sector 130 and the pin 86 have slightly more than eight degrees of rotation remaining to reach a third position (shown in Fig. 10), the pawl 88 reaches and engages the recess 42' aligned with aperture 95. Continued rotation of the sector 130 and the pin 86 toward their third position rotates the film unit 10 within the casing 16 by the interaction of complementary engaging structures, the pawl 88 and the recesses 42. As the sector approaches its third position (Fig. 10), one of the notches 44 on the periphery of disk 24 comes into alignment with a film discontinuity sensing member, for example, a positioning pawl 150 in the film support frame 126. The pawl 150 is spring urged toward the film disk 24 and rides on the disk

until reaching the notch 44. When the positioning pawl enters a notch 44, the film unit 10 continues to rotate until the trailing edge of the notch engages and is urged against the pawl to stop further film disk rotation.

Once the pawl 150 is in a notch 44, a conventional double exposure prevention mechanism (not shown) is deactivated and the camera's exposure mechanism can be activated to expose the image area of the disk 24 aligned with the window 64. After an image area has been exposed, the camera film indexing mechanism can be actuated to rotate the film disk 24 to align the next succeeding image area with the exposure window 64. When the operator is ready to index the film disk, the member 110 (and, therefore, the sector 130) is manually moved from its Fig. 10 position until the pin 142 reaches the discontinuity of the slot 140, inhibiting further rotation of the sector 130 in that direction.

As the sector 130 rotates from its Fig. 10 position, one end of the follower lever 136 rides up the cam surface 134. The other end of the lever 136 cams the pawl 150 from the notch 44 of the film disk, as shown in Figs. 10 and 11. Also, as the sector 130 moves from its Fig. 10 position, the pin 86 moves from its third position to its second position, rotating the cover member 14. The pawl 88 rides out of both the recess 42' and the aperture 95 to again ride on the separator layer 12. Any tendency for the film unit 10 to rotate with the cover member 14 because of friction is opposed by the ratchet pawl 40 in engagement with the tooth 35. When the member 110 is released by the operator upon the sector 130 reaching its second position the sector 130 is again rotated toward its third position by the spring 132. The cover member 14 is rotated with the sector by the pin 86, and the pawl 88 picks up the next succeeding recess 42 which is spaced twenty four degrees from the first recess 42' and which came into alignment with aperture 95 during the preceding film indexing operation. After dropping into that next succeeding recess 42, the pawl 88 advances the film unit 10 until the second image area is aligned with exposure window 64 and the positioning pawl 150 falls into another notch 44. Now the cartridge assembly is ready for a second exposure.

The pawl 150 may be removed from the notch by other mechanisms which operate in the picture taking and indexing cycle. For example, actuation of the shutter, the shutter release mechanism, a high energy lever or a structure associated with the pin 128 could all be used to remove the pawl 150, with the spring 132 carrying the notch 44 beyond the pawl 150 when so removed so that it will not reenter the same notch.

Note that the force of spring 132 is sufficient to rotate film unit 10, but insufficient to

tear or deform the film when the notch 44 is engaged by the pawl 150. The whole mechanism stops when the notch is engaged with the spring 132 holding disk 24 tight against the pawl 150.

In another alternative embodiment the pawl 150 can be designed also to prevent reverse movement of the film unit 10 thereby eliminating the need for the pawl 40 and the teeth 34 on the cartridge assembly. The pawl 150 can then be removed at the beginning of film unit movement by an appropriate shape on the cam surface 134.

The above-described indexing procedure is repeated with each exposure until fifteen pictures have been taken. After any one of the exposures, the operator may desire to remove the cartridge assembly temporarily from the camera to load the camera with a cartridge containing a different type of film (i.e. slide vs. print film, colour vs black and white, or one A.S.A. value vs. another). To remove the cartridge without fogging the film disk, the operator begins rotating the member 110 from its Figs. 8 and 10 position, in a counter-clockwise direction, until the pin 142 is at the discontinuity in the slot 140. To continue rotating the member 110 beyond that position, the operator must push the tab 108 toward the centre of the camera. Now, further rotation of the member 110 rotates the cover member 14 to its position wherein the leaf portion 74 blocks the exposure window 64.

When the sector 130 has rotated to a position to align the pin 142 with the end of the slot 140, the tab 108 may be pushed further so that the pin 142 enters the region 146 of the slot and the door latch lever 144 clears latch plate 148. Only then can the door 114 be opened. The cartridge assembly may now be removed from the camera, whereupon the tab 80 abuts the tooth 63 on the casing top part 18 to inhibit inadvertent rotation of the cover member 14 while the cartridge assembly is out of the camera.

Upon reloading the cartridge assembly into the camera, closing the door 14 and moving the tab 108 outwardly, the sector 130 returns to its Fig. 10 position, indexing the film unit and moving the leaf portion 74 out of alignment with the exposure window 64. The cartridge assembly is now conditioned for exposure of the next image area.

When the last, fifteenth, image area is exposed, the ratchet pawl 40 is between the teeth 37 and 38. Now the operator once more rotates the member 110 from its Fig. 10 position and releases it so that the spring 132 can advance the film. However, after the film unit 10 has rotated only eight degrees, post 32 (Fig. 3) abuts against the post 98 (Fig. 1) on the casing top part 18 to inhibit further film movement. Now the ratchet pawl 40 is between the teeth 36 and 37 to lock the film unit against rotation in one direction

while the posts 32 and 98 finally lock the film unit against rotation in the opposite direction.

An alternative camera structure can be used in which the cover member is driven open to advance the film directly by the operator or by an electric motor and a spring returns the cover member to its original position. With such structure, means can be provided to prevent tearing of the notch 44 by the pawl 150. For example, a positive lock on the drive can be effected in response to the pawl 150 sensing a notch 44, or a slip clutch can be inserted in the drive mechanism. Design of both such structures are well within the capability of those skilled in the art.

Other camera indexing structures are shown in Figs. 12 and 13 and in Fig. 14. In the embodiment shown in Figs. 12 and 13, the pin 86 connected to the rotatable sector 230 controls movement of the cover member as in the Fig. 10 embodiment. However, the film advance member 110 is connected to a flexible arm 229 of the sector 230 by a pin with a narrow neck 203 and a wide neck 204. The member 110 and the sector 230 move with the pin in a slot 205 having a wide portion capable of receiving the wide neck 204 and a narrow portion capable of receiving only the narrow neck 203. The arm 229 has a natural resilience which urges the member 110 toward a position at which the wide neck 204 restricts the pin from entering the narrow portion of slot 205.

As the member 110 is moved reciprocally over the wide portion of the slot 205, the pin 86 moves between its second and third positions and the film unit is indexed as in the Fig. 10 embodiment. To open the camera, the member 110 is depressed allowing the narrow neck 203 to enter the narrow portion of the slot 205 and be moved by the operator to the far end remote from the wide portion. This moves the pin 86 to its first position, closes the cover member and brings an arm 201 on the sector 230 into engagement with a latch 220 shown in detail in Fig. 13. The arm 201 engages a surface 221 of a latch member 222 pushing it against the urging of a spring 223 to the right until the latch member is free to rotate about a pin 224 in a clockwise direction forcing the cover 114 open and trapping the arm 201 on a hook 225.

When the door 114 is closed, a surface 226 on the door rotates the latch member 222 counterclockwise about the pin 224 releasing the arm 201 and permitting the spring 223 to move the latch member 222 to the left to latch the door. With this structure, the cover member is moved to an open position and the film unit is indexed to the first image area as a result of the act of closing the door. Further indexing, closing the cover member and unlatching of the door are accomplished by manipulation of the member 110.

In the embodiment shown in Fig. 14, a sector 330 is free to move relative to the member 110 and is engaged by a pin 300 attached to the member 110 for film unit indexing only. A latch 302 for the door (not shown) is manually moved through a long path so as to unlatch the door (by means not shown), simultaneously engaging an arm 301 and rotating the sector 330 through its complete cover slide closing movement via the pin 86. The latch 302 is held in an open position by a mechanism similar to that shown in Fig. 13 until the door is shut again, which, in turn, releases the latch to be moved by the arm 301 and the spring 132 to its upward position as the pin 86 moves from its first position to its third position opening the cover member and indexing the film unit.

From the time that the cartridge assembly was first loaded into the camera to its finally locked condition, the film unit 10 has been rotated through an angle of three hundred fifty two degrees, and is eight degrees from its initial position. The angles of rotation of eight degrees from the film unit's initial position to the first image area, twenty four degrees between image areas, eight degrees final rotation, and eight degrees between the final and the initial positions are chosen to accommodate fifteen exposures on the disk and to ensure that the final position is different from the initial position. Of course, other angles may be chosen to permit more or less images on a film disk. To adapt a cartridge assembly for more or less exposures than that disclosed (fifteen), one would adjust the spacing between the notches 44, the recesses 42, and the teeth 34-38. The dimension of the aperture 95 would also have to be changed; all of which changes are within the capabilities of those having ordinary skill in the art.

It is within the broad concept of the embodiments of the invention shown in the drawings that the cover member could move along a path in which it is returned to an exposure window covering position each time the film disk is indexed i.e. from its third to its first position. The film disk may then be indexed in response to uncovering (or covering) movement of the cover member 14. However, the embodiment shown in the drawings in which the cover member moves along a path having three distinct positions and does not ordinarily return to a covering position between ordinary indexing operations has the substantial advantage of reducing wear on the light baffle associated with the exposure window.

With a slight modification, the discontinuities 42 can be used both for advancement and for preventing reverse movement. For example, the discontinuities 42 can be in the form of rectangular apertures extending through the core and engageable on one side by the advancing ratchet pawl 88 and on the other side of the core by the pawl 40. The

pawl 40 may alternatively be constructed in the bottom part 18 and arcuately spaced from the pawl 88.

With any of the embodiments, complexity in the cartridge assembly does not generally add substantial cost, because the core, cover member and casing are all made of plastic in which pawls and discontinuities can be readily moulded or otherwise formed. However, the resultant simplifying of the camera structure results in fewer total parts in the camera, which does save cost.

Accuracy in positioning the film disk for sequential exposure of the image areas is important, especially when such areas have pre-exposed borders. This accuracy is enhanced by controlling image area positioning by means which utilise discontinuities in the film disk itself, for example, the notches 44 in the periphery of the film disk. The force tending to rotate the film unit for indexing is applied to the core which is a more sturdy structure than the film disk, but with positioning being controlled by the film disk discontinuities, tolerances between the disk and the core are not critical.

An alternative structure, not shown in the Figures, includes a keyway associated with the central opening of the core. The keyway is directly accessible to a key or spline on a rotatable drive shaft in the camera (which replaces post 118 in the embodiment shown in the drawings). The force tending to rotate the film units is applied through the shaft, key and keyway. The pawl 150 continues to control positioning using the notches 44. It can also be used to initiate indexing. For example, an exposure is made upon the initial stroke of a shutter release button. On return movement of the shutter release button, an electrical motor is energized, applying a torque to the drive shaft through a slip clutch or other tendency drive. Using a suitable timing structure, the pawl 150 is then momentarily removed from one of the notches 44 allowing the film unit to rotate. The pawl is returned into contact with the film disk to engage the next notch to stop the film unit for the next exposure. The motor can be turned off in response to movement of the pawl into the notch, or other suitable timing apparatus. A resilient rotational force may be maintained on the film unit to keep the notch edge urged against the pawl for precise positioning.

This structure involves a more efficient application of energy from an electric motor to the core of the film unit than does the first embodiment, while maintaining the indexing accuracy achieved through use of the positioning discontinuities (notches). However, it requires a separate structure to engage the cover member and uncover the exposure window. When indexing is performed manually the first embodiment, in which indexing is performed through the cover member, lends

itself to more simple camera structure.

The casing top and bottom parts are sealed together to ensure light tightness. Separation of the top and bottom parts for removal of the film unit 10 for processing can be facilitated by incorporating fracture channels (not shown) in the casing which lead in opposite directions annularly around the periphery of the disk. Similarly, holes and a lip (not shown) can be constructed in, for example, the top part. The holes permit insertion of an opener to mate with the bottom part, while the lip is engaged by the opener. With this structure, the parts can be pryed sufficiently apart to permit insertion of a wedge which causes the casing to tear along the fracture channels.

The film cartridge assembly has been shown in the drawings with a moulded battery clip 160 for receiving a cylindrical battery 162 shown in broken lines in Fig. 1. The battery may be inserted in the clip just before packaging the cartridge assembly to maximize shelf life, and may be used to power various camera mechanisms such as electronic exposure control and flash mechanisms. The clip is provided with a notched fracture line so that the user may disconnect the clip and battery from the cartridge casing before sending the cartridge assembly to the processor, or so that the processor may disconnect the clip before opening the casing. Other forms of battery clips will readily occur to those skilled in the art. For example, the clip may be provided with snap-on features and/or be shaped to receive rectangular or other shaped batteries.

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 in the appended claims.

CLAIMS

1. A photographic film cartridge assembly comprising a film unit including a disk of photographic film secured to a rigid core, the core including engageable structure for receiving a force tending to rotate the film unit, a casing enclosing the film unit and having an exposure window whereat image areas of the disk may be sequentially presented on rotation of the film unit in the casing, and positioning discontinuities on the film disk each corresponding to a respective image area and whereby said image areas may be positioned in the exposure window on presentation thereto.

2. An assembly as claimed in Claim 1, wherein the positioning discontinuities comprise notches adjacent the circumference of a circular film disk.

3. An assembly as claimed in Claim 1 or 2 wherein each positioning discontinuity is located relative to its respective image area such that both are presented simultaneously



pawl 40 may alternatively be constructed in the bottom part 18 and arcuately spaced from the pawl 88.

5 With any of the embodiments, complexity in the cartridge assembly does not generally add substantial cost, because the core, cover member and casing are all made of plastic in which pawls and discontinuities can be readily moulded or otherwise formed. However, the
10 resultant simplifying of the camera structure results in fewer total parts in the camera, which does save cost.

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15 important, especially when such areas have pre-exposed borders. This accuracy is enhanced by controlling image area positioning by means which utilise discontinuities in the film disk itself, for example, the notches 44 in
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25 core are not critical.

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30 directly accessible to a key or spline on a rotatable drive shaft in the camera (which replaces post 118 in the embodiment shown in the drawings). The force tending to rotate the film units is applied through the shaft, key
35 and keyway. The pawl 150 continues to control positioning using the notches 44. It can also be used to initiate indexing. For example, an exposure is made upon the initial stroke of a shutter release button. On return movement
40 of the shutter release button, an electrical motor is energized, applying a torque to the drive shaft through a slip clutch or other tendency drive. Using a suitable timing structure, the pawl 150 is then momentarily removed from one of the notches 44 allowing
45 the film unit to rotate. The pawl is returned into contact with the film disk to engage the next notch to stop the film unit for the next exposure. The motor can be turned off in
50 response to movement of the pawl into the notch, or other suitable timing apparatus. A resilient rotational force may be maintained on the film unit to keep the notch edge urged against the pawl for precise positioning.

55 This structure involves a more efficient application of energy from an electric motor to the core of the film unit than does the first embodiment, while maintaining the indexing accuracy achieved through use of the positioning discontinuities (notches). However, it requires a separate structure to engage the cover member and uncover the exposure window. When indexing is performed manually the first embodiment, in which indexing is
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75 constructed in, for example, the top part. The holes permit insertion of an opener to mate with the bottom part, while the lip is engaged by the opener. With this structure, the parts can be pryed sufficiently apart to permit insertion of a wedge which causes the casing to
80 tear along the fracture channels.

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85 162 shown in broken lines in Fig. 1. The battery may be inserted in the clip just before packaging the cartridge assembly to maximize shelf life, and may be used to power various camera mechanisms such as electronic exposure control and flash mechanisms. The clip is
90 provided with a notched fracture line so that the user may disconnect the clip and battery from the cartridge casing before sending the cartridge assembly to the processor, or so that
95 the processor may disconnect the clip before opening the casing. Other forms of battery clips will readily occur to those skilled in the art. For example, the clip may be provided with snap-on features and/or be shaped to
100 receive rectangular or other shaped batteries.

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
105 within the scope of the invention as defined in the appended claims.

CLAIMS

1. A photographic film cartridge assembly
110 comprising a film unit including a disk of photographic film secured to a rigid core, the core including engageable structure for receiving a force ending to rotate the film unit, a casing enclosing the film unit and having an
115 exposure window whereat image areas of the disk may be sequentially presented on rotation of the film unit in the casing, and positioning discontinuities on the film disk each corresponding to a respective image area and
120 whereby said image areas may be positioned in the exposure window on presentation thereto.

2. An assembly as claimed in Claim 1, wherein the positioning discontinuities comprise notches adjacent the circumference of a circular film disk.

3. An assembly as claimed in Claim 1 or 2 wherein each positioning discontinuity is located relative to its respective image area
130 such that both are presented simultaneously



at the exposure window.

4. An assembly as claimed in Claim 1, 2 or 3, wherein the engageable structure comprises a central opening in the core having a keyway and engageable by a corresponding key on a drive shaft of a camera mechanism.

5. An assembly as claimed in Claim 1, 2 or 3 wherein the cartridge assembly comprises a cover member movable between an exposure window covering position and a further position in which the exposure window is uncovered.

6. An assembly as claimed in Claim 5 wherein the cover member comprises means for engaging the engageable structure to rotate the film unit in the casing on movement of the cover member in one direction between its two positions.

7. An assembly as claimed in Claim 6 including means on the casing cooperating with the film unit for preventing rotation of the film unit in the opposite direction.

8. An assembly as claimed in Claim 5, 6 or 7 further including means on the casing for inhibiting rotation of the film unit in either direction prior to insertion of the assembly into a camera therefor.

9. An assembly as claimed in Claim 6 or any Claim appendant thereto wherein the casing is arranged to permit access of a camera drive mechanism to the cover member to move the same and means are provided on the cover member for engaging the core of the film unit to rotate the same during such movement.

10. An assembly as claimed in Claim 9 wherein the cover member is movable between an exposure window covering position and intermediate position in which the exposure window is uncovered and an end position in which the exposure window is uncovered, and the engaging means on the cover member serve to rotate the film unit upon movement of the cover member, in one direction, between the intermediate position and the end position.

11. An assembly as claimed in Claim 10 further including a separator layer between the cover member and the film disk for inhibiting engagement of the engaging means and the core on movement of the cover member between the exposure window covering position and the intermediate position.

12. An assembly as claimed in Claim 9, 10 or 11 wherein the cover member and the film unit are mounted for rotation about the same axis and the engaging means cooperates with the core through a pawl and ratchet.

13. An assembly as claimed in Claim 12 wherein the pawl is an integral part of the cover member, and the ratchet comprises a series of discontinuities in the core member.

14. An assembly as claimed in Claim 13 wherein there is a ratchet discontinuity for each image area of the film disk.

15. An assembly as claimed in any preceding Claim wherein the image areas of the film disk are defined by pre-exposed borders.

16. An assembly as claimed in any preceding Claim further including a final locking means for preventing further rotation of the film unit after rotation of the film unit relative to the casing through a predetermined arc.

17. An assembly as claimed in Claim 16 wherein the predetermined arc is less than 360 degrees.

18. An assembly as claimed in Claim 5 further including an externally releasable lock between the cover member and another portion of the cartridge assembly to hold the cover member in its exposure window covering position.

19. A photographic film cartridge assembly substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 7 of the accompanying drawings.

20. A photographic still camera arranged to receive a cartridge assembly as claimed in any of Claims 1 to 19, and comprising a housing for receiving the cartridge assembly in a predetermined orientation therein, an indexing mechanism for supplying a force to the film unit tending to rotate the same and positioning means for engaging one of the positioning discontinuities of the film disk to position the respective image area of the film disk at the exposure window of the cartridge assembly.

21. A camera as claimed in Claim 20 wherein the indexing mechanism comprises a drive shaft with a key arranged to mate with a corresponding keyway of a central aperture of a core of the cartridge assembly.

22. A camera according to Claim 20 wherein the indexing mechanism includes means for directly engaging a cover member of the assembly and for moving the cover member between exposure window covering and uncovering positions.

23. A camera according to Claim 22 wherein the engaging means is reciprocally movable to move the cover member in a reciprocating motion between the positions.

24. A camera according to Claim 21 or 22 wherein the means for engaging the cover member movable through three positions, a first position in which the cartridge assembly exposure window is covered by the cover member and intermediate and end positions in both of which the exposure window is uncovered.

25. A camera according to Claim 24 wherein the indexing mechanism is coupled to a latch for a door closing a cartridge receiving chamber, the latch being movable to an unlatching condition only when the means for engaging the cover member is in its first position.

26. A camera according to Claim 24 or 25 including means for restricting the cover

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member engaging means for movement only between its intermediate and end positions.

27. A camera according to Claim 21 and 22 wherein the latch includes means for overcoming the restricting means to permit movement of the engaging means to said first position.

28. A camera according to any of Claims 22 to 27 wherein the means for engaging the cover member is a pin receivable in a hole in the cover member.

29. A camera according to any of Claims 20 to 28 wherein the positioning means is a positioning pawl for engaging a positioning discontinuity and for stopping film unit rotation when an image area has been aligned with the exposure window by the indexing mechanism.

30. A camera according to Claim 29 wherein the positioning pawl is spring urged toward a received film disk and wherein the camera includes means responsive to a camera function for withdrawing the positioning pawl from a positioning discontinuity prior to each discrete rotation of the film disk.

31. A camera according to any of Claims 22 to 30 characterized by a release mechanism for releasing a lock to permit initial movement of a cover member of a received assembly by the indexing mechanism.

32. A camera according to Claim 31 wherein the release mechanism includes a pin arranged to engage and release a lock in response to insertion of the cartridge assembly into the camera.

33. A photographic still camera substantially as hereinbefore described with reference to and as illustrated in Figs. 8 to 11 or Figs. 8 to 11 as modified by Figs. 12 and 13 or as modified by Fig. 14 of the accompanying drawings.