

# PATENT SPECIFICATION

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## (54) IMPROVEMENTS IN CINE-CAMERAS

(71) We, KARL VOCKENHUBER, of 118 Pötzleinsdorferstrasse, Vienna 18, Austria, and RAIMUND HAUSER, of 2 Goldeggasse, Vienna 4, Austria, both Austrian citizens, do hereby declare the invention for which we pray that a patent may be granted to, 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 cine-camera.

In accordance with the present invention, there is provided a cine-camera for use with sound-film having a photo image track and a marginal sound-track and being contained in a sound-film cartridge having a recess through which a loop of the film is accessible, an optical system defining an optical axis; the cine-camera comprising a film gate in the optical axis; shutter means for intercepting intermittently the optical axis; drive means for the film having an operative condition for moving the film and an inoperative condition for stopping the film and comprising an intermittent drive mechanism for driving the film intermittently past the film gate during the interceptions of the optical axis by the shutter means; continuous drive means including a capstan for drivingly engaging the film loop, and a pinch roller device for pressing the film into engagement with the capstan, the pinch roller device and the capstan having at least two relative positions, in the first position being spaced one from another for enabling insertion of the sound-film therebetween, in the second position at least one of them being displaced towards the other in comparison with the first position, at least one motor for providing power for the intermittent drive mechanism, the continuous drive means and the shutter means, and manually operable release means for controlling said conditions; detecting means for detecting the condition of the drive means, the release means included, and the moved and

stopped condition of the film; biasing means for urging at least one of the pinch roller device and capstan into the second position of the pinch roller device and capstan; latching means for holding the pinch roller device and capstan in the first position against the bias of the biasing means in a latching position and for releasing at least one of the pinch roller device and capstan in an unlatching position to assume the second position of the pinch roller device and capstan, the positions of the latching means being controlled by the detecting means, the latching means being in latching position with the film stopped and/or the drive means in inoperative condition; and a tensioning device for providing tension to the biasing means.

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

Figure 1 shows a cine-camera in broken outline and, within the camera, an optical system defining an optical axis, a film gate in the optical axis, shutter means and parts which co-operate with one another to control approach movement of a pinch roller to a capstan,

Figure 2 shows in sketches A to D the way some of the parts shown in Figure 1 co-operate with other parts during operation of the camera in order to obtain control of the pinch rollers movement,

Figure 3 shows in sketches A to C a number of parts which co-operate with one another to control movement of a pinch roller towards a capstan and which respond to a driven spirally grooved disc,

Figure 4 shows a further system for enabling approach movement of a pinch roller to a capstan in a recessed portion of a cassette casing to be controlled by manual controls on the cine-camera, the sketches A to D of the Figure illustrating operational parts in different operating conditions,

Figure 5 shows an alternative assembly for serving the same purpose as that shown in Figure 4,

Figure 6 shows yet a further arrangement for controlling the approach movement of a pinch roller to a capstan in accordance with the sensed profile of a film cassette loaded in the cassette reception chamber, and

Figure 7 is a view of part of Figure 6 as seen from the right to explain operation of a toggle linkage.

It is desirable to shorten the starting time for the film drive in the zone of the sound recording device. An arrangement for doing this is shown in Figures 1 and 2. It has a take-up spool in a sound-film cassette 2 provided with a ratchet drive 300 which is accurately synchronized with movement of a film traction claw 107 as is described in detail in Austrian Patent Specification No. 296,021 hereby inserted by way of reference. It should be mentioned, however, that the ratchet drive 300 for the take-up spool need not necessarily be derived from the film traction claw 107 as described in the Austrian Specification as it may instead be derived from torque from a flywheel mass 311 coupled to a capstan 108.

Since the claw mechanism 107 is always stopped in a defined position a ratchet drive 300 and an extension 312 associated therewith also stops in a defined position illustrated in Figure 1. The extension 312 is hinged to a pawl 313 and retains a pinch roller 109, rotatably journaled on a lever 314, in the position in which it is lifted off the capstan 108 when the camera 101 is in the "off" position. The lever 314 is supported so as to be pivotable about a shaft 315 and is biased towards the capstan in the position illustrated in Figure 1 by a relatively powerful spring 316. A second spring 317 associated with the lever 314 is relaxed when the lever is in this inoperative position and does not therefore act in any way on the lever, as shown in Figure 2A.

If the camera 101 is started, for example by the release 120, the motor 106 is switched on and the claw mechanism 107 drives the capstan 108 and its associated flywheel mass 311. The driving torque is mechanically transmitted to the film take-up drive 300 and the locking pawl 313 is therefore removed from its locking position into a position which releases the lever 314. The spring 316 pulls the lever 314 upwards as shown in Figure 2B and moves the pinch roller 109 against the capstan 108. The spring 317, which is weaker than the spring 316, is simultaneously tensioned.

A cam 318 is driven at constant speed by the flywheel mass 311 via a gear transmission shown in broken outline only, and rotates in the clockwise direction in Figure 2B. If the camera is to be stopped a locking pawl 319 for a lever 320 is briefly disengaged by the release 120. Since the other end of the spring 316, which is still

stressed, continues to act on the lever 320 it pivots about a shaft 321 until a guide surface 322 of the lever engages the cam 318 as shown in Figure 2C. The lever 320 bearing upon the cam 318 is initially pivoted by it in the clockwise direction until the circular rim of the cam 318 is opposite the surface 322 as shown in Figure 2D. In this extreme position of the lever 320 the spring 316 is completely relaxed so that the stressed spring 317, which acts on the lever 314, pulls it back to its reset position trapped behind the pawl 313 and causes the pinch roller 109 to be pivoted away from the capstan. Since the locking pawl 313 is moved into the position which locks the lever 314 after the camera had been switched off it follows that the pinch roller remains in its inoperative position (Figure 2D). The cam 318 however continues to rotate so that the cam rise acts on the surface 322 and moves the lever 320 back into its starting position. In this position it is again locked by the pawl 319 as shown in Figure 2A. When the lever 320 is locked the cam 318 rotates past the surface 322 without touching it because a sloping portion 323 on the pawl 319 causes the lever 320 to lift slightly — by an amount referenced "b" in Figures 2A and B — from the cam 318 during the locking motion.

During the release operation the pawl 319 must be held clear of the lever 320 for a half rotation of the cam 318 because in some circumstances the cam lobe may be in a position at the time of the release action in which the reset motion of the lever 320 is initiated. The spring 316 would then not assume the relaxed state and the spring 317 would never be able to lift the pinch roller 109 off the capstan 108.

At the end of this resetting motion the camera 101 is again ready to take photographs. This could be signalled to the camera operator by an indicating device or by unlocking a locking device associated with the release.

A mode selector switch 324, shown in Figure 1, pivotable about the pivoting axis 315 of the lever 314 is provided to enable the camera 101 to be operated without the pinch roller being pivoted against the capstan 108. Sound film operation is possible with the position I of the mode selector switch as illustrated in Figure 1 when a hairpin spring 325 is completely relaxed. One member 326 of the spring bears upon a stop abutment 327 of the lever 314 and the second member 328 bears upon a stop abutment 329 of the mode selector switch 324. If the switch 324 is moved into position II the stop abutment 329 bears upon the member 326 to raise it from the lever stop 327. On the other hand, the

member 328 of the spring engages with the stop abutment 327 and overcomes the force of the spring 316. The switch 324 is locked in position II (not shown) and therefore retains the lever 314 which supports the pinch roller 109 in a second inoperative position. Releasing the pawl 313 has no effect when the camera is started. It will be clear that this switch 324 can also be used as a threading up switch in order to increase the space between the pinch roller 109 and the capstan 108. The cassette 2 with the film F which is freely guided in the recess 3 can then be inserted more readily into the camera.

Another embodiment is shown in Figures 3A to 3C. By contrast to the system illustrated in Figures 1 and 2 the lever 314a carrying the pinch roller 109 is provided with a bracket 330 at the end of which a lug 331 is supported so as to be pivotable about an axis 332 (Figure 3B). Two extensions 333 and 334 of the lug 331 define the pivoting motion permitted, the extensions bearing on one side edge of the bracket 330 depending on the switching position of the lug 331.

The lug 331 also supports a hairpin spring 335 the legs of which are clamped at each end to a cam tracer 337 which extends through a bore 336 of the bracket 330. The lug 331 can therefore only be moved into the two positions in which an extension 333 or 334 bears on the side edge of the bracket 330, the tracer 337 being simultaneously movable into a position shown in solid lines Figure 3A and into a position which is shown in broken lines.

If the camera is started and the locking pawl 313a is freed, the pinch roller 109 will pivot against the capstan 108 under the action of the spring 316. The lug 331 will then be in the position shown in dash dot lines in Figures 3A, the extension 334 bearing upon the bracket 330. At the same time the tracer 337 will be in its position shown in broken lines. At the end of operation a switch 369, not shown in detail, and controlled, for example by the release 120, is briefly pivoted to the left and tilts the lug 331 that bears upon it into its position shown in solid lines. This causes the tracer 337 to move into the radially innermost path of a spiral groove 338 (Figure 3C) which may be provided on the flywheel mass 311 itself. In addition to its radially outward moving shape the said groove also has an axial pitch. Figure 3A illustrates the situation which exists when the pinch roller 109 is lifted off the capstan 108. The radial path of the cam 338 therefore causes the pinch roller 109 to be lifted off the capstan 108, the axial cam path at the end (radially outermost part) having risen to such an extent that the hairpin spring 335

again moves the lug 331 via the tracer 337 into the starting position (position in broken lines in Figure 3A). At the same time the lever 314a is locked by the locking pawl 313a while the spring 316 is stressed.

Figures 4A to 4D show an arrangement where two locking devices 313 and 319 are freed by the release 339.

After the release 339 is depressed a motor switch 340 is closed and the film claw and capstan 108 respectively are driven. A cone 342, disposed on a release bar 341 is simultaneously displaced to the right with reference to Figure 4A. A roller 344 which is rotatable on the locking pawl 313 and is slidable along a slit 343 is moved from the edge 345 along the slit 343, the pawl 313 having pivoted briefly in the anti-clockwise direction about an axis 346 and against a spring 347. An arm 349, which is prestressed by the tension spring 348 and supports the pinch roller 109, is released by this counter-clockwise movement of the pawl 313 and the film drive is engaged. A further cone 350 on the release bar 341 has meanwhile displaced a further roller 351 along a slit 352 of an intermediate lever 353. Since the intermediate lever 353 is urged to rotate in the counter-clockwise direction by a spring 354 and bears on a stop abutment 355 fixed with respect to the apparatus, it follows that the motion of the roller 351 has no effect on the position of the lever 353 and on the lever claw 319 which is hinged to the lever 353. The lever claw 319 therefore continues to hold in position a bar 358 which is slidable in two rectilinear guides 356 and 357 and which is pulled upwards by a spring 361.

To switch off the camera the release 339 is freed and returns into its starting position under the action of a compression spring 359. The simultaneous sliding motion of the release bar 341 to the left does not alter the position of the locking pawl 313 which is retained by the spring 347 in the locked position against a stop abutment 360 which is fixed with respect to the apparatus. By contrast the roller 351 transmits the force of the return spring 359 via the cone 350 to the intermediate lever 353 causing it to rotate clockwise, and from there to the lever claw 319 which then releases the bar 358. The lever claw 319 is retained in the release position until the roller 351 moves into the zone of the conical surface of the cone 350. The roller 351 owing to its weight, re-assumes its position at the bottom end of the slit 352. The return motion of the lever 353 and the lever claw 319 is controlled by the spring 354.

Under the action of the spring 361 which is substantially stronger than a second spring 348 the released bar 358 is displaced upwards along the rectilinear guides 356,

357 until a tracer surface 362 on the bar abuts the cam 318 which is driven by the flywheel mass 311 (Figure 4A). At the same time the spring 348 is tensioned although the spring 361 is still sufficiently stressed to press the bar 358 firmly against the cam 318. If the radially innermost point of the cam 318 is positioned opposite to the tracer surface 362 a pin 363 of the bar 358 engages behind a latch 364 on the rectilinear guide 357 which is axially displaceable. The rectilinearly slidable guide 357 is fixed at 365 to the arm 349 for the pinch roller 109. Therefore engagement of the cam lobe of the cam 318 with the tracer surface 362 causes the entire linkage formed by the bar 358, the guide 357 and the arm 349 to move down in Figure 4A. This causes the pinch roller 109 to lift off the capstan 108 and the spring 361 to be stressed. The spring 348 also remains stressed. When the radially outermost part of the cam 318 is positioned opposite to the tracer surface 362 (Figure 4C) the bar 358 engages with the lever claw 319 and the arm 349 engages behind the locking pawl 313. The latch 364 has a tail which slides against a stationary ramp 366 and is moved thereby to the release position so that the captured pin 363 is freed in the slot in the rectilinearly movable guide 357. When the release 339 is again operated the arm 349 is again released and brings the roller 109 against the capstan 108 under the action of the spring 348.

In similar manner to that already described with reference to Figure 2A to D, the lever claw 319 may have a ramp face in its mouth so that the bar 358 is raised by an amount "b" from the circulating path of the cam when its end is engaged by the lever claw. To ensure that the pinch roller 109 returns to its inoperative position it is necessary for the lever claw 319 to remain in its disengaged position for a defined time, and at least for the duration of a half cam rotation. Otherwise the bar 358 might be engaged by the lever claw if the cam lobe of the cam 318 was engaged with the tracer surface 362. In such an event the pinch roller would remain in the position in which it bears upon the capstan. To prevent this the cone which controls the lever claw 319 is provided with a part-cylindrical groove 367 which maintains the lever claw 319 in the disengaged position via the roller 351 and the lever 353, until the necessary time has elapsed.

In Figure 5 a single lever 370 is used to stress a spring, this lever also supporting the pinch roller 109 for the capstan 108. In the inoperative position the lever 370 is locked by a claw 372 which can be controlled by a tracer 371 for a film loop 373. As soon as the camera is operated the film traction

claw, not shown in Figure 5 but corresponding to claw 107 of Figure 1, transports the film F so that the loop 373 increases. The locking action of the claw 372 is controlled by a dancer roller 374 which is associated with a toggle spring 375. When the claw 372 releases the lever 370, the lever pivots under the action of a spring 376 about a stationary shaft 377 to bring the roller 109 against the driven sound spindle 108.

When the camera is switched off the film traction claw is first stopped and the film F continues to be transported for a brief interval by the flywheel mass 311 of the capstan 108. This causes the dimensions of the loop 373 to be reduced, the dancer roller 374 reverses the toggle spring 375 and thus moves the claw 372 into the locking position. Simultaneous with switching off of the camera, a linkage 378, for example controlled by the release, is displaced in the direction of the arrow 379 so that a double armed lever 380 pivots a gear wheel 381 via its pin 382 through a small angle. The gear wheel 381 has a tooth free gap 383 and in its inoperative state the gap is positioned opposite to a pinion 384 which is driven by the flywheel mass 311. As soon as the gear wheel 381 is pivoted the toothed section meshes with the pinion 384 so that this drives the gear wheel 381 through a complete revolution. The gear wheel 381 is driven together with the cam 318 which returns the lever 370 into the inoperative position and in so doing lifts the pinch roller 109 off the capstan 108. The single revolution of the gear wheel 381 of the cam 318 respectively is precisely defined by a control device 385 the function of which is accurately described in the Austrian Patent Specification No. 306,521 hereby inserted by way of reference.

With this device it is also possible to switch the pinch roller 109 into a second inoperative position, for example to facilitate threading-up of the film F between the capstan and pinch roller. According to Figure 6 a cassette tracer 386 is provided to this end and is retained by a compression spring 387 in a reception chamber of the film camera. The tracer 386 displaces a control groove 388 into which a pin 389 engages. If no cassette is disposed in the reception chamber of the camera the pin 389 bears on the end of the control groove 388 which is at the right-hand upper end in Figure 6. A slide 390 that supports the pin 389 is jointed at the opposite end to a double armed lever 391 shown more clearly in Figure 7. The lever 391 is pivotable about the same axis 377 as a lever 370 carrying the pinch roller 109, and is loaded by a spring 392 in such a way that the action of the compression spring 387 is

assisted by the spring 392, i.e. the slide 390 is biased upwards. Since the tracer 389 and therefore the slide 390 are in their upper limiting position in the absence of a cassette, a point 393 at which the spring 376 acts and which coincides with the joint between the double armed lever 391 and the slide 390, is situated at a level above the pivoting point 377 of the lever 370 as shown in broken outline. The lever 370 which supports the pinch roller 109 is then raised off the hook 372 into a threading-up position.

If the cassette 2 is inserted into the camera 101 the tracer 386 is displaced to the right — with reference to Figure 6 — thus initiating the downward motion of the slide 390 which is constrained to move vertically. The downward movement produces clockwise pivoting of the double armed lever 391 against the force exerted by the spring 392. The point 393 at which the spring 376 acts is then disposed below the pivoting point 377 and biases the lever 370 towards the capstan 108 and to a standby position where it is held by the hook 372. The film drive can be started after releasing the lever 370 from engagement with the hook 372.

In principle it would be possible to operate without the double armed lever 391. However, the use of the lever has the advantage that the control groove 388 is not subjected to excessive wear because it is simpler to control the contact pressure between the pin 389 and the groove 388 by a linkage rather than by a spring which acts directly on the pin 389.

#### WHAT WE CLAIM IS:—

1. A cine-camera for use with sound-film having a photo image track and a marginal sound-track and being contained in a sound-film cartridge having a recess through which a loop of the film is accessible, an optical system defining an optical axis; the cine-camera comprising a film gate in the optical axis; shutter means for intercepting intermittently the optical axis; drive means for the film having an operative condition for moving the film and an inoperative condition for stopping the film and comprising an intermittent drive mechanism for driving the film intermittently past the film gate during the interceptions of the optical axis by the shutter means; continuous drive means including a capstan for drivingly engaging the film loop, and a pinch roller device for pressing the film into engagement with the capstan, the pinch roller device and the capstan having at least two relative positions, in the first position being spaced one from another for enabling insertion of the sound-film therebetween, in the second position at

least one of them being displaced towards the other in comparison with the first position, at least one motor for providing power for the intermittent drive mechanism, the continuous drive means and the shutter means, and manually operable release means for controlling said conditions; detecting means for detecting the condition of the drive means, the release means included, and the moved and stopped condition of the film; biasing means for urging at least one of the pinch roller device and capstan into the second position of the pinch roller device and capstan; latching means for holding the pinch roller device and capstan in the first position against the bias of the biasing means in a latching position and for releasing at least one of the pinch roller device and capstan in an unlatching position to assume the second position of the pinch roller device and capstan, the positions of the latching means being controlled by the detecting means, the latching means being in latching position with the film stopped and/or the drive means in inoperative condition; and a tensioning device for providing tension to the biasing means.

2. A camera as claimed in claim 1, wherein the detecting means are interconnected to the intermittent drive means and the latching means.

3. A camera as claimed in claim 1 or 2, wherein the detecting means comprise a film-motion sensing device engaging the film loop.

4. A camera as claimed in any preceding claim, further comprising manually operable means for transferring the pinch roller device and capstan of the continuous drive means from the first into a third position in which the capstan and the pinch roller device have a wider spacing therebetween than in the first position.

5. A camera as claimed in claim 4 further comprising a toggle mechanism connecting the transferring means and the continuous drive means.

6. A camera as claimed in claim 4, wherein the manually operable transferring means comprise a sensing device for sensing whether a sound-film cartridge is inserted by the user.

7. A camera as claimed in claim 5, wherein the toggle mechanism includes a member movable substantially parallel to the direction of movement of the movable continuous drive means by the transferring means the biasing means including spring means fixed with one end to that member and with the other end to the movable continuous drive means, the end fixed to the member being arranged to change the direction of bias to the continuous drive



assisted by the spring 392, i.e. the slide 390 is biased upwards. Since the tracer 389 and therefore the slide 390 are in their upper limiting position in the absence of a cassette, a point 393 at which the spring 376 acts and which coincides with the joint between the double armed lever 391 and the slide 390, is situated at a level above the pivoting point 377 of the lever 370 as shown in broken outline. The lever 370 which supports the pinch roller 109 is then raised off the hook 372 into a threading-up position.

If the cassette 2 is inserted into the camera 101 the tracer 386 is displaced to the right — with reference to Figure 6 — thus initiating the downward motion of the slide 390 which is constrained to move vertically. The downward movement produces clockwise pivoting of the double armed lever 391 against the force exerted by the spring 392. The point 393 at which the spring 376 acts is then disposed below the pivoting point 377 and biases the lever 370 towards the capstan 108 and to a standby position where it is held by the hook 372. The film drive can be started after releasing the lever 370 from engagement with the hook 372.

In principle it would be possible to operate without the double armed lever 391. However, the use of the lever has the advantage that the control groove 388 is not subjected to excessive wear because it is simpler to control the contact pressure between the pin 389 and the groove 388 by a linkage rather than by a spring which acts directly on the pin 389.

#### WHAT WE CLAIM IS:—

1. A cine-camera for use with sound-film having a photo image track and a marginal sound-track and being contained in a sound-film cartridge having a recess through which a loop of the film is accessible, an optical system defining an optical axis; the cine-camera comprising a film gate in the optical axis; shutter means for intercepting intermittently the optical axis; drive means for the film having an operative condition for moving the film and an inoperative condition for stopping the film and comprising an intermittent drive mechanism for driving the film intermittently past the film gate during the interceptions of the optical axis by the shutter means; continuous drive means including a capstan for drivingly engaging the film loop, and a pinch roller device for pressing the film into engagement with the capstan, the pinch roller device and the capstan having at least two relative positions, in the first position being spaced one from another for enabling insertion of the sound-film therebetween, in the second position at

least one of them being displaced towards the other in comparison with the first position, at least one motor for providing power for the intermittent drive mechanism, the continuous drive means and the shutter means, and manually operable release means for controlling said conditions; detecting means for detecting the condition of the drive means, the release means included, and the moved and stopped condition of the film; biasing means for urging at least one of the pinch roller device and capstan into the second position of the pinch roller device and capstan; latching means for holding the pinch roller device and capstan in the first position against the bias of the biasing means in a latching position and for releasing at least one of the pinch roller device and capstan in an unlatching position to assume the second position of the pinch roller device and capstan, the positions of the latching means being controlled by the detecting means, the latching means being in latching position with the film stopped and/or the drive means in inoperative condition; and a tensioning device for providing tension to the biasing means.

2. A camera as claimed in claim 1, wherein the detecting means are interconnected to the intermittent drive means and the latching means.

3. A camera as claimed in claim 1 or 2, wherein the detecting means comprise a film-motion sensing device engaging the film loop.

4. A camera as claimed in any preceding claim, further comprising manually operable means for transferring the pinch roller device and capstan of the continuous drive means from the first into a third position in which the capstan and the pinch roller device have a wider spacing therebetween than in the first position.

5. A camera as claimed in claim 4 further comprising a toggle mechanism connecting the transferring means and the continuous drive means.

6. A camera as claimed in claim 4, wherein the manually operable transferring means comprise a sensing device for sensing whether a sound-film cartridge is inserted by the user.

7. A camera as claimed in claim 5, wherein the toggle mechanism includes a member movable substantially parallel to the direction of movement of the movable continuous drive means by the transferring means the biasing means including spring means fixed with one end to that member and with the other end to the movable continuous drive means, the end fixed to the member being arranged to change the direction of bias to the continuous drive

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5 means with changing the position of the member, the camera further comprising urging means for urging the member and the transferring means into a position corresponding to the third position of the continuous drive means.

10 8. A camera as claimed in any preceding claim, wherein the tension device comprises a support for carrying the movable continuous drive means.

9. A cine-camera constructed, arranged

and adapted to operate substantially as hereinbefore described with reference to any of the embodiments illustrated in the accompanying drawings.

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