

PATENT SPECIFICATION

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(54) RECORDING OR PLAYBACK APPARATUS

(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 us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to a recording or playback apparatus, such as a film projector, having a continuous drive and a traction claw for producing step-by-step advance of a perforated strip through a recording or playback station such as a film gate. More particularly the invention is concerned with preventing the formation of dangerously large loops of strip ahead of the station as a result of the claw movement being slowed down or stopped temporarily, while a drive, which is not run intermittently like the claw, continues to advance strip towards the station.

25 If the claw in a film projector is temporarily rendered inoperative by an interruptor cam it means that the film speed in the film gate is reduced without the shutter drive being changed so as to produce a slow motion effect. Different film speeds can be achieved by changing over or selecting different interruptor cams. Although projectors are known having this facility, it is a disadvantage of these film projectors that the film is fed towards the claw mechanism at a uniform rate by a drive sprocket so that the length of a film loop between the sprocket and the claw is increased when the film feed is slowed down by the claw. If the reduced claw speed is maintained over a prolonged period of time damage to the film can result. Proposals have been made for arranging for a different feed rate of the claw to be accompanied by a change in the gearing used for transmitting the continuous drive. How-

ever, owing to the large masses which require to be moved such constructions are unsuitable for frequent speed changing.

According to the present invention, there is provided apparatus for handling a perforated data strip, comprising means defining a data transfer station, a reciprocable traction claw associated with the station for intermittently engaging the strip perforations to advance the strip step-by-step through the station, claw control means having a first setting at which the claw advances the strip through the station at a first speed and a second setting at which engagement between the claw and the strip is periodically interrupted so that the strip is advanced through the station at a second, lower speed, continuously running drive means for imparting reciprocating motion to the traction claw, a strip feeder coupled to a wheel having a single tooth, a friction clutch operatively connected between the drive means and the toothed wheel, a first lever which, in the second setting of the claw control means is arranged to enter periodically into the path of movement of the tooth to block rotation of the toothed wheel and a second lever positionally controlled by a cam driven by the drive means and operative to engage the tooth to maintain rotation of the toothed wheel blocked after release of the toothed wheel by said first lever and subsequently to release the toothed wheel so as to determine the duration of the blocking period.

The invention will now be described in more detail, by way of examples with reference to the accompanying diagrammatic drawings, in which:—

FIGURE 1 shows, in side view and in a greatly simplified form, parts of a projector adjacent a film gate which control the movement of a perforated strip of film;

FIGURE 2 is a plan view partly in section of the parts shown in Figure 1 to-

gether with some other parts;

FIGURE 3 shows, in a plan view again partly in section and corresponding to Figure 2;

5 FIGURE 4 is a side view taken in the direction of the arrow IV in Figure 3, of a portion of Figure 3;

FIGURE 5 shows, in plan view partly in section, an embodiment of the present 10 invention;

FIGURE 6 is a section taken in the direction of the arrow VI in Figure 5, of a part of Figure 5; and

FIGURE 7 is a timing diagram showing 15 the relationship between the movements of the parts shown in Figure 6.

In the accompanying drawings the various parts shown form part of a projector otherwise known *per se* and which is 20 therefore not illustrated. It will however be understood as having a film gate through which successive frames of a film to be projected are intermittently drawn by a traction claw driven by a drive obtained from 25 a continuously running motor, a mode switch or other setting device being provided to allow the rate of the step-by-step advance of film through the film gate to be altered.

30 In the drawings, only Figures 5, 6 and 7 relate to the present invention; Figures 1 to 4 being incorporated to explain the principles underlying the invention.

Referring to Figures 1 and 2, the film 35 projector (not illustrated) is provided with a sprocket 1 which is adapted to transport a perforated film strip 2 to a traction claw mechanism 3. The sprocket 1 is fixed to a shaft 4 on which a gearwheel 5 is also 40 keyed. The gearwheel 5 is coupled via a slip clutch to a worm wheel 6 which is loosely supported on the shaft 4 and is driven via a worm 7 from a continuously driven shaft 8 which supports at one end a 45 disc cam 9. The face of the disc cam is provided with a lobe 10 which cooperates in known manner with a claw 11 to produce the step-by-step advance of the film 2 through the film gate where the projection 50 of successive frames of the film takes place.

An interruptor cam 12 shown in Figure 2 operates a cam follower 13 which in turn actuates a lever 14 to temporarily prevent 55 the claw 11 engaging in the perforation of the film 2. At the same time lever 14 actuates a second lever 15 which is provided with a nose 16 that engages between the teeth of the gearwheel 5 when the lever 15 is in the appropriate position and thus 60 blocks the gearwheel against rotation so that the sprocket 1 also ceases to move. The lever 15 is biased clockwise by a spring 18.

During normal projection of the film the 65 parts illustrated in Figures 1 and 2 occupy

the positions shown and the step-by-step advance of the film through the film gate is affected by the claw 11 which, with the sprocket 1 is driven by the shaft 8.

If it is desired to change the step-by-step 70 advance rate, a mode switch (not shown) or similar setting device is effective to rotate the cam 12. The cam follower 13 is resiliently biased against the cam 12 and thus at all rotational 75 positions of the cam 12, other than that shown, the spring 18 rocks the lever 15 clockwise in Figure 2, so that the nose 16 engages between the teeth of the gearwheel 5 and the lever 14 is rocked counterclock- 80 wise to maintain it in contact with the cam follower 13 and to hold the claw 11 at a position at which it is out of contact with the film 2. The drive shaft 8 continues to rotate under these conditions but the face 85 of the cam 9 no longer is followed by a rider on the claw 11 and the rotational drive imparted via the worm 7 to the worm wheel 6 is prevented by the nose 16 from rotating the gearwheel 5 and is instead absorbed by the slipping clutch acting between them. Thus the sprocket 1 remains stationary as long as the claw 11 is held inactive and the growth of a large film loop 90 in advance of the film gate, as depicted in line-and-dot in Figure 1, is prevented. The frame-by-frame advance is controlled by the cam 12 and is restored as soon as the cam 12 returns to the position shown in Figure 2. 95

In the arrangement illustrated in Figure 3 the gearwheel 5 is integral with one end of a hollow shaft 17 which is journaled on the drive shaft 8 controlling rotation of the cam 9. A slip clutch is disposed between 100 the cam 9 and the gearwheel 5. The other end of the hollow shaft 17 is provided with a worm 7 for transmitting drive to a worm wheel 6 keyed to the shaft 4 of the film sprocket 1. A similar arrangement of cam 12, cam follower 13 and levers 14 and 15 is used as in the previous example. However the length of the lever 15 is substantially shorter thus providing a clear definition 105 of the time during which the gearwheel 5 is stopped. As is clear from Figure 4 the width of the nose 16 substantially corresponds to the width of one tooth gap of the gearwheel 5 so that precise positioning of the gearwheel 5 is defined when the nose 16 engages between its teeth. 110

The operation of the second arrangement is similar to that of the first arrangement. The position of the interruptor cam 12 115 illustrated ensures the film is to be driven at normal speed. Movement of the cam 12 from the illustrated position allows the lever 14 to release the lever 15 so that the nose 16 engages between the castellated teeth of the gearwheel 5 and simultaneously the 120 130

claw is held ineffective so that film advance through the gate ceases. The slipping clutch allows the drive shaft 8 to rotate and thus the cam 9, but the hollow shaft 17 is held stationary with the gearwheel 5 and thus the sprocket 1 is held stationary also.

The embodiment of the invention illustrated in Figures 5 and 6 differs from the arrangement of Figure 3 by the replacement of the gearwheel 5 by a wheel 19 which, as shown in Figure 6, has a single inwardly directed tooth 20 which engages with the nose 16 of the lever 15 after release of the lever 14. The lever 15 is biased by the spring 18 into the locking position at which such engagement occurs. A third lever 21 is provided with a bias spring and is positionally controlled by a cam follower 22 which runs on a cam track 23 on the back of the disc cam 9 and which may, if desired, be adjustable. The cam follower 22 is slidably supported on the lever 21 by a sleeve 24 and can be displaced by an operating element 26, which engages in a guide 25, so that it is moved outside of the effective zone of the cam track 23.

If the projector is operated at the normal film speed the cam follower 22 is displaced by the operating element 26 into a position such that it does not bear on the cam track 23 and the nose 27 of the lever 21 is held out of the path of the tooth 20 the nose 16 on lever 15 being maintained out of engagement with the tooth 20 by the stationary cam 12. However, in slow-motion operation the cam follower 22 is displaced into the position illustrated so that the lever 21 is pivoted in the clockwise sense in Figure 5 to bring the nose 27 into the path of the tooth 20 once for each rotation of the face cam 9. The interaction of the tooth 20 with the noses 16 and 27 will be now explained with reference to Figure 7.

The path of motion of the nose 27 is shown in the curve 28 in Figure 7 and is determined by the profile of the cam 23. A high point on the curve 28 indicates that the nose 27 is out of the path of the tooth 20. As in the previously described arrangements the interrupter cam 12 (not shown) actuates the lever 15 via the lever 14 so that the nose 16 of the lever 15 is pivoted by a bias spring 18 into the path of the tooth 20 to cause the wheel 19 and therefore the film sprocket to stop. The path of motion of the nose 16 is illustrated in the curve 29 of Figure 7 and is controlled by the interrupter cam 12 rotation. A high point on the curve 29 indicates that the nose 16 is out of the path of the tooth 20. The two paths are super-imposed on each other as shown in curves 30 of Figure 7 as also is the position where the tooth 20 is released. The initiation of locking of the wheel 19 is determined by clockwise motion

of the lever 15 under the control of the interrupter cam 12. The crossover region of the curves 28 and 29 indicates when the tooth 20 is released by the nose 16 but rotation of the wheel 19 continues to be impeded by engagement of the nose 27. The release of the wheel 19 is determined by counterclockwise motion of the lever 21 under the action of the cam 23. As is clear then from the curve 30 in Figure 7, the tooth 20 and thus the wheel 19 are held against rotation during a period α the commencement of which is defined by the interrupter cam 12 acting via the lever 15, and the cessation of which is precisely determined by the cam 23 acting on the lever 21 to release the wheel 19 whose tooth 20 is held by the nose 27 of the lever 21. If the cam follower 22 is adjustable, the duration of the period α may be varied.

As in the arrangement of Figures 3 and 4 the locking of the wheel 19 interrupts the drive to the sprocket 1 but the continued rotation of the drive shaft 8 is permitted by the slipping clutch between the face cam 9 and the wheel 19.

An advantage of the embodiment of the invention in Figures 5 and 6 over the arrangements of the earlier figures is that the time during which the sprocket is held stationary is not affected by the fit of a nose between teeth of the gear-wheel 5 and a more precise synchronisation of the speed of the film through the film gate with the speed of the film past the sprocket can be obtained so that the film loop between the claw and sprocket is better maintained.

WHAT WE CLAIM IS:—

1. Apparatus for handling a perforated data strip, comprising means defining a data transfer station, a reciprocable traction claw associated with the station for intermittently engaging the strip perforations to advance the strip step-by-step through the station, claw control means having a first setting at which the claw advances the strip through the station at a first speed and a second setting at which engagement between the claw and the strip is periodically interrupted so that the strip is advanced through the station at a second, lower speed, continuously running drive means for imparting reciprocating motion to the traction claw, a strip feeder coupled to a wheel having a single tooth, a friction clutch operatively connected between the drive means and the toothed wheel, a first lever which, in the second setting of the claw control means is arranged to enter periodically into the path of movement of the tooth to block rotation of the toothed wheel and a second lever positionally controlled by a cam driven by the drive means and operative to engage the tooth to maintain rotation of the toothed wheel blocked

claw is held ineffective so that film advance through the gate ceases. The slipping clutch allows the drive shaft 8 to rotate and thus the cam 9, but the hollow shaft 17 is held stationary with the gearwheel 5 and thus the sprocket 1 is held stationary also.

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after release of the toothed wheel by said first lever and subsequently to release the toothed wheel so as to determine the duration of the blocking period.

- 5 2. Apparatus as claimed in claim 1, in which the friction clutch is driven from a rotational drive of a face cam controlling engagement of the claw with the strip perforations and in which the claw control means in its second setting serves to interrupt periodically the driving connection between the claw and the face cam.
- 10 3. Apparatus as claimed in Claim 2, in which the claw control means includes an interrupter cam which in the second setting of the claw control means periodically lifts the claw from the face cam to a position at which it is disengaged from the strip perforations.
- 15 4. Apparatus as claimed in any preceding claim in which a cam follower on the

second lever is adjustable to enable adjustment of the period during which the toothed wheel is blocked.

5. Apparatus as claimed in any preceding claim in which the two levers are first order levers pivotable about the same axis each lever having at one end a nose movable into the path of movement of the tooth on the wheel.

6. Apparatus as claimed in claim 2 or any claim appended thereat in which the cam associated with the second lever is formed integrally with the said face cam.

7. Apparatus as claimed in Claim 1 and substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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