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(54) SOUND FILM PROJECTOR

- (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 sound film projector and is more specifically concerned with one having a projection window formed in a film gate having an associated intermittently-operated film traction element, such as a claw, and a drive nip formed between a pinch roller and a flywheel driven audio spindle which is associated with the sound side of the projector and which is driven from the same motor as the film traction element.
- 20 In known sound projectors it is common practice, in post synchronization or in subsequent transcription from a magnetic tape to a magnetic track on a strip alongside the film, to place the first image of the scene, which is to be provided with sound, into the image window of the projector, then to reverse the film by a few frames and finally to adjust the recording tape so that the beginning of the audio scene coincides with the film scene after both sets of apparatus have started. This calls for great sensitivity even if the work is facilitated by a time counting mechanism. Despite substantial experience in this technique a user will frequently be unsuccessful in achieving a good match of the scene to the sound and often parts of a preceding sound recording are erased in the course of such work. Synchronization systems have been proposed which utilise electric signals which are periodically transmitted with a running sound tape. In this case a phase shift by one or even more frames of the films with respect to the tape is possible and there are difficulties in obtaining synchronization
- when running the film and/or tape up to speed. Such systems are also relatively sophisticated, complicated and therefore costly and generally act to discourage an amateur from applying sound to a film himself.
- The object of the invention is to facilitate synchronization or transcription of sound recordings used with a sound-film projector.
- In accordance with the present invention there is provided a sound film projector having a motor; a flywheel driven by the motor; a sound spindle rotated by the flywheel; a pinch roller defining with the spindle a strip driving nip; a device operable to prevent rotation of the spindle from being imparted as a drive to the strip between the roller and spindle; a film projection window; an intermittently-operating film traction element producing indexing motion of the film across the window and coupled to be driven by the motor; a de-coupling member operable to disconnect the motor drive to the element; and, quick-start means controlling the device and the member when in their operated conditions and operable, while the flywheel is driven at its running speed by the motor, to restore the nip drive to the strip while simultaneously re-coupling the traction element to the motor drive.
- An advantage of the invention is that the flywheel mass which is primarily responsible for loss of synchronization when running-up to speed, is driven at its operating speed when the film is stationary and the parts which have to be operated when both the film and sound strip are to be run in synchronism are restricted to components having a relatively low mass and which therefore require a negligible time lag to attain their operating synchronized speed. In an extreme case it is merely necessary to start the claw which has only a low mass. Running up to speed can therefore be achieved almost instantaneously and it is sufficient to place the first frame of the scene to which

sound is to be added into the frame window after which transcription may commence immediately the sound is correct. The user of the apparatus is therefore not compelled

5 to estimate the running-up time and the previous professional experience required to obtain good synchronization between the film and sound strip is no longer necessary.

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

15 Figure 1 illustrates, in outline, a sound-film projector and shows diagrammatically and partly in section drives for the projection of the film and a sound strip, and also an electrical energization circuit which is partially broken away;

20 Figure 2 is a view of a three-bladed shutter as viewed in the direction indicated by the arrows II-II in Figure 1;

Figure 3 is a circuit diagram of an alternative energization circuit;

25 Figure 3A is a second alternative energization circuit;

Figure 4 shows a tape recorder which may have its output fed into a sound recording section of the projector and illustrates additional circuitry for this purpose;

30 Figure 5 shows a second arrangement of additional circuitry to that shown in Figure 4;

Figure 6 shows a third arrangement of additional circuitry; and,

35 Figure 7—9 show different ways of using frequencies (f) obtained from an audio tape in a tape recorder, to remote control the electrical energisation circuit of the projector.

40 In the following description of a sound film projector only those parts necessary for an understanding of the invention itself are described; other parts, well-known *per se* but which play no active part in the operation of the invention being omitted for the sake of brevity and clarity.

45 The sound film projector 1 is provided with a motor 2 having a shaft 3 which carries a grooved pulley 4 from which a drive belt 5 extends around a flywheel 6 which, at its centre, is provided with a sound spindle 7 for driving the film past a magnetic sound head (not shown). The shaft 3 carries at its end a clutch disc 8 which faces a coaxially arranged clutch disc 9 which is slidable along a main spindle 10 but is splined to it so that the two rotate together. The clutch disc 9 is resiliently biased towards the disc 8 by a coiled compression spring 12 encircling the spindle 10 and mounted between the disc 9 and an abutment disc 11.

60 At its end opposite the clutch disc 9, the spindle 10 carries a three-bladed shutter disc 13, shown in more detail in Figure 2, and also cams known *per se* for producing film traction movement of a claw 14 associated with a film-gate not shown. The claw 14

produces indexing movement of film frames through an optical path extending between a projection lamp 15 and a projection lens 16. Adjacent the shutter 13 the spindle 10 carries a dimpled cam 38.

70 Intermediate its ends the main spindle 10 has attached to it a pinion 31 which transmits drive by way of an intermediate gear 30 to a gear wheel 29 fixed to an axially slidable control spindle 26. The main spindle 10 also carries a worm gear 84 driving a sprocket wheel 85 as ordinarily provided in a sound film projector. At one end the control spindle 26 carries a flange 40 which, with sliding movement of the spindle 26, cooperates with a pin 41 connected with a lever 43 having a fulcrum 42 and provided with a detent spring 44 which engages the dimpled rim of the cam 38. A resilient spring, not shown, provides a permanent bias to the lever 43 and which acts to hold the spring 44 resiliently out of engagement with the dimpled rim of the cam 38 unless the control spindle 26 is moved to the left in Figure 1 to the position shown in the drawing.

90 The spindle 26 is axially slidable against the thrust of a coiled compression spring 27 engaging between a flange 28 fixed to the spindle 26 and a fixed part of the projector diagrammatically illustrated. At one end the control spindle 26 projects from a rebate in the wall of the projector and contains within the rebate a crank 37 which enables the spindle 26 to be slid to the left. When the crank 37 is located within the rebate the spring 27 slides the spindle 26 to the right so that the flange 40 is disengaged from the pin 41 with the result that the detent spring 44 is disengaged from the cam rim 38; the gear wheel 29 is moved out of mesh with the intermediate gear wheel 30; and, the gap between a pair of spaced collars 32 and 50 mounted on the control spindle 26 is located to the right of the position shown. A first-order lever 35 engages at one end between the collars 32 and 50 and engages at its other end in an annulus provided between the clutch disc 9 and a spaced parallel flange 36. A pair of springs 33 and 34 urge the lever 35 towards a central position at which the clutch disc 9 is able to engage the clutch disc 8 when the crank 37 is located in the projector casing rebate.

120 Also engaging between the clutch disc 9 and the flange 36 is a pawl 45 provided on one end of an angular lever 19 pivoted intermediate its ends at 18 and carrying on its other end a pinch roller 17 which cooperates with the sound spindle 7 for transportation of the sound strip. During such transportation a spring 20 acts on the lever 19 to hold the pinch roller 17 against the sound spindle 7. If strip transport is to cease the lever 19 is rocked against the bias of the spring 20 by energisation of a solenoid 21. Adjacent the

pinch roller 17 the lever 19 carries an arm 80 provided at its end with a filter 79 which locates in the optical path between the lamp 15 and the lens 16 during times when a single film frame is held stationary in the optical path.

The projector 1 is provided with an ON button 22 whose motion is transmitted by way of a tappet 51 to close a microswitch shown diagrammatically at 23. An OFF button 24 adjacent the button 22 operates to open the microswitch 23 by way of an operating lever 25 having a centre fulcrum. A conductive plate 53 on the OFF button 24 stem acts as a contact in an electrical circuit and is engaged by a coiled compression spring which urges the OFF button 24 to the position shown in Figure 1. The tappet 51 associated with the ON button 22 is also responsive to the position of the angular lever 19 which is provided with a tongue 52 engaging beneath one end of the tappet 51. The lever 19 also controls the position of a push rod 48 which controls a self-holding circuit for the solenoid 21 provided by means of a switch 49. The contacts of the switch 49 are connected in series with a pair of contacts bridged by the plate 53, such contacts being in series with a pair of contacts 56 which are opened automatically when a plug is inserted into an associated pair of electrical sockets 55 which shunt the contact pair 56. Also in series in the same circuit is a quick-start button 54 which is capable of being manually operated. The circuit above described and leading from the live pole of the solenoid 21 is shunted by a parallel electrical circuit which extends to a switch 46 controlled by the position of the axially movable control spindle 26. The contacts of the switch 46 are controlled by an extension 47 attached to one of the contacts and which hold the switch 46 closed when the collar 50 of the spindle 26 is in the position shown when the crank is withdrawn from the rebate in the projector casing.

To add a sound background to the film to be projected it is necessary for the film and sound to commence simultaneously in synchronism. To achieve this the first frame of the film scene to which sound is to be added is moved into the optical path of the projection lamp 15. This is effected by withdrawing the cranked handle 37 from its rebate in the casing and subsequently rotating it. The withdrawal of the handle 37 from the rebate simultaneously disengages the clutch discs 8 and 9 by means of the lever 35 and simultaneously engages the drive from the control spindle 26 by way of the meshing gears 29, 30 and 31 to the main spindle 10. When the cranked handle 37 is withdrawn to the left, the switch 46 is closed to energise the solenoid 21 and cause the lever 19 to rotate in a clockwise direction around the fulcrum 18. This

introduces the pawl 45 into the annular gap between the clutch disc 9 and the flange 36 so that the clutch is held in the disengaged position. In this way the slight bias provided by the spring 27 and acting to urge the handle 37 back into the rebate in the projector is not supplemented by the much greater force of the clutch spring 12 acting by way of the lever 35 and the collar 32 on the control spindle 26. The rotation of the angular lever 19 disengages the strip transport provided by the engagement of the pinch roller 17 with the strip drive spindle 7. Additionally the self-holding switch 49 is closed by the push rod 48 acted upon by the lever 19, with a result that the solenoid 21 is held energised even when subsequent opening of the contacts 46 occurs for the following reason.

The introduction of the pawl of the lever 19 into the annulus between the clutch disc 9 and the flange 36 holds the clutch disc 9 in the position shown. As soon as the handle 37 is released the control spindle 26 is allowed to move a small distance towards the right under the action of the spring 27 and also the two centering springs 33 and 34 which cooperate with the lever 35. This motion to the right ceases when the end of the lever 35 has moved from the position where it engages the flange 36 to a position where it engages the rear surface of the clutch disc 9. This motion is sufficient to open the switch 46 but, as previously stated, the solenoid 21 remains energised by way of the self-holding switch 49. The angular lever 19 also causes the motor 2 to run by closing of the microswitch 23 in response to the movement of the tappet 51, such movement either taking place as the result of the movement of the tongue 52 of the lever 19 or, by previous operation of the motor resulting from the depression of the ON button 22.

In order to ensure that the sound commences when the first film frame corresponding to the sound is projected, the user turns the crank handle 37 which allows the main shaft 10 to turn in either direction so that the projected film can be wound forwards and backwards by the handle 37. The light filter 79 prevents the film frame in the optical path from being damaged by its prolonged exposure to the lamp 15.

As is apparant from Figure 2 the shutter has three blades. When the first blade passes through the optical path, the next film frame is moved into the path and, subsequently the other two blades traverse through the light path. Each indexing step of the claw 14 is accompanied by three bright phases but it is necessary for the sound to commence simultaneously with the first bright phase. The purpose of the dimpled cam 38 is to indicate to the operator that the first bright phase is being projected. As the operator turns the cranked handle 37 the detent spring 44

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drops into the dimple 39 at each first bright phase and the operator senses the increased resistance this presents to rotation of the handle 37 so that he is aware that the first bright phase is being projected. When the operator has set up the first frame in the first bright phase he can turn his attention to starting the strip recording from which the background sounds are to be played with the film. As soon as the correct sound scene for the projected film frame is heard, it is merely necessary to interrupt the self-holding circuit of the solenoid 21. The spring 20 rotates the lever 19 promptly in a counterclockwise direction to bring the pinch roller 17 against the sound spindle 7 so that the sounds are recorded in synchronism with the film running. Simultaneously, the movement of the lever 19 releases the clutch disc 9 and its movement towards the clutch disc 8 is accompanied by movement to the right of the control spindle 26 under the action of the lever 35 and the centering springs 33, 34 together with the bias spring 27. Thus just prior to engagement of the clutch discs, the gearwheel 29 disengages from the pinion 30 and the drive from the continuously rotating motor 2 is transferred immediately to the film claw 14. As the parts accelerated by the main spindle 10 are of relatively small mass, the running up time of the film drive and the soundstrip trapped between the spindle and pinch roller 17 is very small indeed. Several different switching facilities are provided for interrupting the self-holding circuit of the solenoid 21. In addition to the switch plate 53 of the OFF button 24, which also switches off the motor 2, the interrupting signal may be provided by way of the sockets 55 or by manual interruption of the quick-start button 54 when the user hears the correct sound commencing.

The plug socket 55 enables transcription of the sound to the sound strip for the film from a separately driven sound tape and in this case it is advantageous to control the self-holding circuit of the solenoid 21 directly from the sound tape or the beginning of the sound scene as will now be described with reference to Figures 4 to 6 which show additional circuitry.

Figure 4 shows a conventional tape recorder 58 having a recording head 59 from which sound signals are fed into the additional circuitry 57. This is provided with a plug 55a which cooperates with the plug socket 55 of the projector and, when so fitted, simultaneous opening of the shunted contacts 56 occurs. The sound signal entering the circuitry 57 at terminal 55b is fed to two circuits the first of which comprises an amplifier and a recording head 60 by way of which the sound signal is applied to the sound strip running through the projector 1. The signals from the terminal 55b are also fed through a threshold

switch 61 to a relay 62 having a contact 63 which is normally closed and is arranged to bridge the plug contacts 55a.

When the tape recorder 58 is started, the leader of the recording tape is played off and no sound is detected by the recording head 59. At the beginning of the sound scene, the incoming audio signal operates the threshold switch 61 which energizes the relay 62 so that the self-holding circuit of the solenoid 21 is broken and, simultaneously, the clutch discs 8 and 9 are engaged and the claw 14 is set in operation.

In a modification of the arrangement shown in Figure 4, instead of the additional circuitry being provided externally of the projector 1, it is incorporated into the projector and the socket 55 of Figure 1 is replaced by the connection 55b of Figure 4. The self-holding circuit of the solenoid 21 is then completed directly through the normally-closed contact 63 of the relay 62.

In the arrangement shown in Figures 5 and 7 the parts of Figure 5 corresponding to those of Figure 4 are similarly referenced. The purpose of the circuitry in Figure 5 is to provide the sound-film projector 1 with synchronising signals in addition to audio signals. The onset of periodically delivered synchronising signals at a frequency S (Figure 7) lying outside of the audio frequency range of the sound signal T, is used to interrupt the self-holding circuit of the solenoid 21. Signals received from the tape recorder at terminal 55b are passed through a low pass filter 64 to the recording head 60, and through a high pass filter 65 set to a frequency above the range of audio frequency signals, to an amplifier 66. The output of the amplifier is fed to the relay 62 which therefore responds to the detection of a synchronizing signal by opening the solenoid self-holding circuit, and simultaneously the synchronizing pulses S are fed to a control circuit for the motor 2 for regulating a speed.

Figures 6 and 8 show a further way of providing the motor 2 of Figure 1 with speed synchronizing signals as well as providing the recording head of the projector 1 with audio signals. As is apparent from Figure 8, the synchronizing signals S are recorded at high amplitude within the audio frequency range rather than external to it as in Figure 7. Incoming signals from the tape recorder are received at terminal 55b of the additional circuitry and are fed through a band-stop filter 67 tuned to provide a high impedance to signals at the frequency S. The audio signals which pass through the filter 67 are supplied to the projector recording head. The signals at the terminal 55b are also fed through a band-pass filter 68 tuned to the frequency S, onwards to a threshold switch 69 controlling with its output energization of the relay 62 whose contact 63 is

normally closed and is located in the self-holding circuit of the solenoid 21. The output of the threshold switch 69 is also fed to a tachometer 70.

5 Signals at the frequency corresponding to the synchronizing signals S are passed by the filter 68 to the threshold switch 69 and if their amplitude is sufficiently large to indicate that they are, in fact, synchronizing signals and
10 not just sounds at the same frequency, they trip the threshold switch 69 to de-energize the self-holding circuit of the solenoid 21. Simultaneously the tachometer 70 provides an output usable to synchronize the speed of the
15 drive motor 2.

Figure 9 shows how camera noise itself, if present in the audio frequency entering the additional circuitry terminal 55b in Figure 6, may be used to de-energize the self-holding
20 circuit of the solenoid 21. As is apparent from Figure 9, the noise produced by a camera filmtraction claw has a maximum at the lower end of the audible frequency range, normally at about 18 Hz. This frequency
25 may be used in a circuit as shown in Figure 6 but having the band-pass and band-stop filters 68, 67 respectively tuned to the peak frequency of camera claw noise.

Figure 3 shows schematically and in very much simplified form an alternative arrangement to that shown in Figure 1. In Figure 3
30 the main spindle 10 is continuously driven by the drive motor 2 and the use of a clutch is avoided. The main spindle 10 carries a first cam 82 and a claw engagement cam 74 which controls the engagement motion of a film
35 traction claw 14 with perforations of a film strip diagrammatically shown at F.

In place of the single solenoid 21 shown in Figure 1, two solenoids 21 and 21a are provided, the first controlling operation of the pinch roller 17 (not illustrated) and the second
40 21a controlling a ratchet tooth 71, for holding the claw away from the perforations in the film F. For this purpose the claw 14 is constructed as a lever having a tooth 73 located at a position where it can be engaged by the
45 tooth 71 when the solenoid 21a is energized. A coil spring 72 holds the tooth 71 out of engagement with the tooth 73 at times when the solenoid 21 is not energized.

The solenoid 21a is connected into a series energization circuit provided with power from a pair of terminals 75. The circuit also
55 includes the second solenoid 21 associated with the pinch roller, and two contacts 76 and 77 respectively associated with press buttons 81 and 78.

Contact 76 is normally closed whereas contact 77 is normally open. As long as the solenoids are not energized, the movement of the claw 14 is controlled by the cam 74
60 together with an associated cam not shown but known *per se*.

65 If button 78 is depressed, the two solenoids

21, 21a are energized and the recording on the strip associated with the film ceases as a result of the pinch roller being moved away from the flywheel spindle 7 (see Figure 1). Motion of the spindle 10 continues until the
70 cam 74 has pushed the claw 14 out of engagement with the perforations and simultaneously the tooth 73 is engaged by the tooth 71 which meanwhile has been raised to the position shown in Figure 3 by energization of the
75 solenoid 21a. The two teeth cooperate with one another to hold the claw 14 disengaged from the film which therefore remains stationary in the optical path between the lamp 15 and the projection lens 16. Depression of the push button 78 simultaneously brings
80 a filter 79 into the optical path to attenuate the light projected through the stationary film.

If the push button 81 is now depressed, the two solenoids 21a and 21 are de-energized and the latter solenoid allows the claw 14 to be controlled by the cam 74 turned by the main spindle 10. However, the other cam 82
85 is also turned and after the claw 14 has completed one cycle the cam 82 causes a rider 83 to reclose the contact 76 so that the energization circuit of the two solenoids is restored and the claw 14 is once again held out of engagement with the film F. The two solenoids 21, 21a are constructed with different
90 operating characteristics.

With the arrangement shown in Figure 3 it is relatively easy to detect the beginning of a scene as successive frames may be examined in turn by pressing the button 81 after the
100 button 78 has been depressed. The arrangement is adaptable for use with the additional circuitry described above with reference to Figures 4 to 6 by providing the holding circuit of the two solenoids with a socket and linking switch 56 corresponding to the
105 socket 55 in Figure 1.

The circuit shown in Figure 3A is substantially the same as that shown in Figure 3 and corresponding parts are correspondingly
110 referenced. However, in place the contact 76 which is mechanically controlled, a relay contact 76a is provided and is controlled by an oscillator 86 which provides output pulses to close the contact 76a and controls a drive
115 87, so that oscillator 86 is synchronised with motion of the main spindle 10 through one revolution so that the film is advanced by one film frame. The oscillator is triggered by a manual switch 77a which, when closed,
120 causes the oscillator pulses to be generated in relatively slow time so that the film is advanced relatively slowly, for example one full frame per second. Synchronization is then obtained by a known synchronizing means in dependence on the rotations of the main spindle 10.
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In the arrangements described above with reference to Figures 7 and 8, it is assumed that the synchronizing signals are provided
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on the same track of the tape recorder as the audio signals. However the synchronizing signals could, if desired, be provided by a separate track on a twin track tape known *per se*.

WHAT WE CLAIM IS:—

1. A sound film projector having a motor; a flywheel driven by the motor; a sound spindle rotated by the flywheel; a pinch roller defining with the spindle a strip-driving nip; a device operable to prevent rotation of the spindle from being imparted as a drive to the strip between the roller and spindle; a film projection window; an intermittently-operating film traction element producing indexing motion of the film across the window and coupled to be driven by the motor; a de-coupling member operable to disconnect the motor drive to the element; and, quick-start means controlling the device and the member when in their operated conditions, and operable, while the flywheel is driven at its running speed by the motor, to restore the nip drive to the strip while simultaneously re-coupling the traction element to the motor drive.

2. A projector as claimed in Claim 1, in which the device operates by opening the nip, and the de-coupling member comprises a disengageable main clutch in the drive transmission from the motor to the film-traction element.

3. A projector as claimed in Claim 2, in which the clutch is resiliently biased to the engaged state, and is capable of being held in the disengaged state by a mechanism positionally controlled by the quick-start means and carrying the pinch roller.

4. A projector as claimed in Claim 3, in which the mechanism comprises a lever rockable between two positions, one of which corresponds to the device and member being at their inoperated positions and towards which the lever is biased by a spring, and the second lever position corresponds to the device and member being at their operated positions and to which the lever is moved electromagnetically against the spring bias.

5. A projector as claimed in Claim 4, in which parts of the lever respond to it being moved to the second position by closing an energization circuit for the motor, by closing contacts in a self-holding circuit for a solenoid which moves the lever to the second position, and by introducing a light filter in an optical path between a projection lens and a lamp to prevent the projected film frame being damaged by heat as a result of its prolonged exposure when the de-coupling member is operated.

6. A projector as claimed in Claim 5, in which the self-holding circuit includes a manually-operable quick-start switch.

7. A projector as claimed in Claim 5 or Claim 6, in which the self-holding circuit

includes a pair of normally-closed contacts which are opened by operation of an "OFF" actuator to open the motor energization circuit.

8. A projector as claimed in Claim 5, Claim 6 or Claim 7, in which the self-holding circuit includes an external circuit connector having two contacts which are shunted by a pair of normally closed auxiliary contacts opened automatically by the application to the connector of a mating connector supplied from additional circuitry.

9. A projector as claimed in any one of Claims 1 to 8, including a control spindle which is movable between two positions at the first of which the main clutch is engaged while at the second position the clutch is disengaged but simultaneously a second clutch is engaged establishing a manually operable drive to the film traction element.

10. A projector as claimed in Claim 9, in which the control spindle is axially displaceable to operate the two clutches and is rotatable by a handle to provide the manually operable drive to the film traction element when the control spindle is at the second position.

11. A projector as claimed in Claim 10, in which the main clutch is disengaged by a control lever operated by the control spindle which also closes contacts when at the second position to complete an electrical energization circuit which holds the member and device in their operated positions and which contains a switch providing the quick-start means.

12. A projector as claimed in Claim 12, in which the control lever is resiliently biased to an intermediate position and the control spindle is resiliently biased to its first position.

13. A projector as claimed in any one of Claims 9 to 12, in which the film-traction element comprises a claw controlled by camming means which are rotated in unison with a shutter having blades which pass the projection window in succession, and a dimpled annular surface is engaged by a spring finger which applies a slight resistance to the rotation of the control spindle when at its second position, such resistance momentarily increasing when the spring finger engages a dimple on the annular surface which occurs simultaneously with the first exposure of a film frame in the window.

14. A projector as claimed in Claim 1, in which the film-traction element comprises a claw whose motion towards and away from the film is controlled by a face cam driven continuously by the motor, the de-coupling member operating by holding the claw out of engagement with the face cam in a position at which it is disengaged from perforations in the film.

15. A projector as claimed in Claim 14,

on the same track of the tape recorder as the audio signals. However the synchronizing signals could, if desired, be provided by a separate track on a twin track tape known *per se*.

WHAT WE CLAIM IS:—

1. A sound film projector having a motor; a flywheel driven by the motor; a sound spindle rotated by the flywheel; a pinch roller defining with the spindle a strip-driving nip; a device operable to prevent rotation of the spindle from being imparted as a drive to the strip between the roller and spindle; a film projection window; an intermittently-operating film traction element producing indexing motion of the film across the window and coupled to be driven by the motor; a de-coupling member operable to disconnect the motor drive to the element; and, quick-start means controlling the device and the member when in their operated conditions, and operable, while the flywheel is driven at its running speed by the motor, to restore the nip drive to the strip while simultaneously re-coupling the traction element to the motor drive.

2. A projector as claimed in Claim 1, in which the device operates by opening the nip, and the de-coupling member comprises a disengageable main clutch in the drive transmission from the motor to the film-traction element.

3. A projector as claimed in Claim 2, in which the clutch is resiliently biased to the engaged state, and is capable of being held in the disengaged state by a mechanism positionally controlled by the quick-start means and carrying the pinch roller.

4. A projector as claimed in Claim 3, in which the mechanism comprises a lever rockable between two positions, one of which corresponds to the device and member being at their inoperated positions and towards which the lever is biased by a spring, and the second lever position corresponds to the device and member being at their operated positions and to which the lever is moved electromagnetically against the spring bias.

5. A projector as claimed in Claim 4, in which parts of the lever respond to it being moved to the second position by closing an energization circuit for the motor, by closing contacts in a self-holding circuit for a solenoid which moves the lever to the second position, and by introducing a light filter in an optical path between a projection lens and a lamp to prevent the projected film frame being damaged by heat as a result of its prolonged exposure when the de-coupling member is operated.

6. A projector as claimed in Claim 5, in which the self-holding circuit includes a manually-operable quick-start switch.

7. A projector as claimed in Claim 5 or Claim 6, in which the self-holding circuit

includes a pair of normally-closed contacts which are opened by operation of an "OFF" actuator to open the motor energization circuit.

8. A projector as claimed in Claim 5, Claim 6 or Claim 7, in which the self-holding circuit includes an external circuit connector having two contacts which are shunted by a pair of normally closed auxiliary contacts opened automatically by the application to the connector of a mating connector supplied from additional circuitry.

9. A projector as claimed in any one of Claims 1 to 8, including a control spindle which is movable between two positions at the first of which the main clutch is engaged while at the second position the clutch is disengaged but simultaneously a second clutch is engaged establishing a manually operable drive to the film traction element.

10. A projector as claimed in Claim 9, in which the control spindle is axially displaceable to operate the two clutches and is rotatable by a handle to provide the manually operable drive to the film traction element when the control spindle is at the second position.

11. A projector as claimed in Claim 10, in which the main clutch is disengaged by a control lever operated by the control spindle which also closes contacts when at the second position to complete an electrical energization circuit which holds the member and device in their operated positions and which contains a switch providing the quick-start means.

12. A projector as claimed in Claim 12, in which the control lever is resiliently biased to an intermediate position and the control spindle is resiliently biased to its first position.

13. A projector as claimed in any one of Claims 9 to 12, in which the film-traction element comprises a claw controlled by camming means which are rotated in unison with a shutter having blades which pass the projection window in succession, and a dimpled annular surface is engaged by a spring finger which applies a slight resistance to the rotation of the control spindle when at its second position, such resistance momentarily increasing when the spring finger engages a dimple on the annular surface which occurs simultaneously with the first exposure of a film frame in the window.

14. A projector as claimed in Claim 1, in which the film-traction element comprises a claw whose motion towards and away from the film is controlled by a face cam driven continuously by the motor, the de-coupling member operating by holding the claw out of engagement with the face cam in a position at which it is disengaged from perforations in the film.

15. A projector as claimed in Claim 14,



in which the de-coupling member operates electromagnetically.

16. A projector as claimed in Claim 15, in which the de-coupling member comprises a solenoid controlled ratchet tooth which locks behind a second ratchet tooth on the claw to prevent it following the face cam when the member is operated.

17. A projector as claimed in Claim 15 or Claim 16, including an electrical circuit containing two solenoids one of which, when energized, moves the device in a nip-opening direction, and the other solenoid, when energized, operates the de-coupling member, the circuit containing a first normally-open switch which is closed by an ON actuator when the member and device are operated the actuator also introducing a filter into an optical path between the film position and a projection lamp, and a second switch which is normally closed by an OFF actuator and is influenced by a rider of a cam operated in unison with the face cam so that, when the OFF actuator is operated to de-energize the solenoids, the rider recloses the second switch to re-energize the solenoids after the face cam has made one revolution.

18. A projector as claimed in Claim 15 or Claim 16, including an electrical circuit containing two solenoids one of which, when energized, moves the device in a nip-opening direction, and the other solenoid, when energized, operated the de-coupling member, the circuit containing a contact of a relay which is responsive to the pulse output of a controlled oscillator whose pulse repetition rate is manually controlled.

19. A projector as claimed in any one of the preceding claims, in which the quick-start means comprises a movable contact in an electrical energization circuit for electro-

magnetic means used to hold the device and member in their operated positions, the movable contact being controlled by additional circuitry having an input terminal for connection to the audio output of a tape recorder, and two channels connected at their input ends to the input terminal and the first of which extends to a magnetic transcription head for recording on a magnetic strip the sound background of the film while the second channel extends to a relay controlling the movable contact.

20. A projector as claimed in Claim 19, in which the first channel includes an audio-frequency range pass-band filter and the second channel includes a pass-band filter tuned to a frequency above the audio range to detect synchronizing signals and feeds such signals to a speed control circuit of the motor.

21. A projector as claimed in Claim 19, in which the first channel includes a narrow frequency range band-stop filter and the second channel includes a band-pass filter tuned to the same narrow frequency range and a threshold switch for rejecting signals in the narrow frequency range of less than a predetermined amplitude.

22. A projector as claimed in any one of Claims 19 to 21, in which the additional circuitry is a separate plug-in unit to the projector.

23. A projector as claimed in Claim 1, arranged and adapted to operate substantially as described with reference to any one of the embodiments or modifications thereof shown in the accompanying drawing.

Agents for the Applicants:

MARKS & CLERK,
Chartered Patent Agents,
57 & 58 Lincoln's Inn Fields,
London WC2A 3LS.

