

SPECIFICATION

Improvements in and relating to apparatus for taking and reproducing moving pictures

The invention relates to apparatus for recording moving pictures on a movable record support.

Proposals have for many years been made and attachments are known for taking particular subjects on cine film only as still pictures and projecting them as stills, for the purpose of saving on film. Thus, for example, in the age of silent films it was a widespread practice to project sub-titles as stills. More recently, systems have become known in various forms of audio-visual apparatus, especially in teaching machines, which offer learning programmes on a single film partly as stills and partly as moving pictures, with the corresponding signals for the film transport being derived either from marks on the film which can be scanned by optical means, or from magnetic signals on a pulse track of a magnetic sound tape controlling projection.

A common factor with all these methods and known forms of apparatus is that they are not accessible to the average amateur photographer and film-maker, since the apparatus is complex and therefore expensive. The preparation of programmes in particular is impossible for the average user with the equipment which is commercially available, and they are generally produced and marketed by specialist firms.

It is also a known procedure to provide reproduction apparatus with standstill devices or slow-motion devices which make it possible to interrupt the recorded movements at any desired point and to reproduce the corresponding phase of movement in slow-motion or as a still. For this purpose the transport of the image support is slowed down or halted, respectively.

A commercial cine film prepared in cassettes, when run at a normal speed of approximately 18 frames per second, gives a good three minutes' running time. A slide film, which costs approximately the same, gives thirty-six individual pictures. Proceeding on the basis that a moving picture scene lasts about fifteen seconds, approximately fifteen scenes are produced with the cine film. Assuming, furthermore, that a slide is viewed for approximately fifteen seconds—in general the viewing time will be rather longer—the result is that the slide film, for the same price, gives the user approximately three times as much viewing time as a cine film.

This ratio can be altered in favour of the cine film by means of the known slow-motion and standstill devices of the reproduction apparatus. For this, however, the viewer must in each case await a suitable moment and slow down or halt the film transport by actuating a

control on the reproduction apparatus. His attention is therefore required throughout the duration of projection.

For the reasons mentioned above, automatic extension of the duration of reproduction of a cine film would be welcome, since it would offer the user a great increase in the duration of reproduction without any further action on his part.

In addition, it would be desirable for the average occasional photographer and film-maker to be able to use a single simple apparatus for taking moving and still pictures and a single apparatus for their reproduction. Furthermore, there is the enormous saving in cost which results when still scenes are taken on a cine film, and also the corresponding saving in space when storing such records.

The invention provides apparatus for recording moving pictures on a movable record support, which includes means, actuated by means of a release member for effecting picture taking, for applying a mark to the record support in association with the last picture of each moving picture scene for co-operation with suitable projection or other viewing apparatus to arrest transport of the record support at those individual pictures and reproduce them as still pictures.

The invention also provides recording apparatus according to the invention in combination with projection or other viewing apparatus for viewing moving pictures from the movable record support, the reproducing apparatus comprising means for detecting the mark on the record support associated with an individual picture, and means for arresting transport of the record support in response to the detection of a mark by the detecting means in order to reproduce that individual picture as a still picture.

This allows improved utilisation of the image support. The invention permits the user the maximum convenience of operation, and the apparatus can be simple and inexpensive.

In the viewing apparatus, therefore, the last picture or frame of a scene in each case is reproduced as a still. After a pre-selected period of time, the transport can be started up again by means of an automatic delay device. Even when the transport is started up again by means of a manual control, this is considerably less tiring for the viewer than when he has to stop the transport, as is usually the case.

The viewer also has the opportunity to view the last frame as a still at the end of each scene and if necessary to discuss it with other viewers. It has proved in practice that the viewing time is increased not just by the factor of three calculated above, but by an even greater amount. In particular, the film-maker can restrict himself to relatively short scenes when filming, thereby increasing the degree of utilisation of the filmed record even

further.

The reduction in length of the scenes may be carried to the point where the film-maker takes obvious still subjects as individual still pictures. The release mechanism of the camera is actuated in order to film each individual still picture, and thus not only the end of each scene but also each individual still picture is provided with a mark. In an extreme case, a particularly economical user can thus take over three thousand individual pictures with a single conventional cassette of film, and also has the opportunity of filming cine scenes. This saving is enormous compared with slide film; a factor of approximately a hundred is involved, although a loss of quality due to the reduction in size must be taken into account.

Cine cameras constructed in accordance with the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 shows a diagrammatic view of a camera, reproduction apparatus and film, illustrating the basic principles of the invention;

Figures 2a to 2k show various types of optional marks applied to film in accordance with the invention;

Figures 3 to 3d show one form of camera for producing optical marks on film;

Figure 4 shows a diagrammatic view of another form of camera for producing optical marks on the film;

Figures 5a to 5c show further types of optical marks applied to film;

Figure 6 shows an electronic delay circuit of a camera suitable for applying the marks shown in Figs. 5a to 5c;

Figures 7a and 7b show mechanical marks applied to film; and

Figures 8 and 8a show a form of cine camera for producing the marks of Figs. 7a and 7b and a device for scanning the marks.

Fig. 1 shows diagrammatically the principles of one form of cinematography. First of all, as shown in Fig. 1a, by means of a cine camera 1 which contains a film cassette 3, the film situated therein is exposed through an objective 2 by pressing a release member 9. By means of a selector switch 4 a choice can be made between filming moving pictures or individual pictures. Cameras of this type are known.

The camera 1 is provided according to the invention with a device which applies a special mark to the film on actuation of the release member 9. Various forms of camera having such a marking device will be described hereinafter.

The film F bearing the additional marks, having been exposed in the camera, is then developed in the usual manner and in its developed form has the basic structure illustrated in Fig. 1b. As can be seen from the illustration in Fig. 1b, various scenes and

individual pictures are arranged on the film F and identified by different symbols. The direction of travel of the film is indicated by L. The perforations P are shown on an enlarged scale, and the side-to-height ratio does not correspond to that of the film used. The last picture or frame S1_n of the first scene, which is indicated by crosses, is provided with a mark M on the edge. There then follows a scene which is marked with rectangles. This moving picture scene naturally consists of more than the five individual frames shown. The last frame of this scene S2_n is also provided with an edge mark M. The individual pictures E1, E2, E3 which follow also carry corresponding marks M on the edge. The next moving picture scene which is identified by semi-circles and begins with the frame S3₀, has no marks on its frames; as in the case of the first scene, the last frame is marked, and this is not shown.

In Fig. 1c, a reproduction apparatus 5 is provided which accommodates the film strip and projects each of the individual pictures marked M as stills, no matter whether the marked picture is the last frame of a scene or an individual picture taken as a still. In the Figure, the picture S1_n is shown on the screen. The reproduction apparatus has a further marking device which makes it possible to apply additional marks on the edge of the film. The film running through the reproduction apparatus is provided with additional marks if required and after passing through the apparatus has the appearance illustrated in Fig. 1d. It can be seen that the individual pictures S1_n, S2_n and E2 in each case have an additional mark M' on the edge. Also a mark M' is associated with the individual picture S3₀ which has no "still" mark M. The additional marks M', which are applied in the reproduction apparatus 5, are used to mark individual pictures on the film from which prints are to be made. It is of course possible for any frame of a moving picture scene which has not been provided with the mark M in the camera to be provided with a printing instruction M' in the reproduction apparatus.

In the next stage of the method, by means of a conventional printer 6 (Fig. 1e), which has a scanning device for the marks M', the required number of prints of the correspondingly identified individual pictures on the film is produced (Fig. 1f) and despatched to the customer. The individual picture B1 corresponds to the film frame S1_n, the picture B2 to the film frame S2_n, the picture B3 to the film frame E2, and the picture B4 to the film frame S3₀.

Apparatus for carrying out the method described is explained in greater detail below. An advantage of the method is that the user can effortlessly select and mark from the large number of pictures taken those which seem to

him to be suitable for making prints.

In principle, the marking device in the camera could be coupled to the selector switch at the individual picture setting, rather than to the release member. It has been found, however, that the viewer generally finds that when stills and moving picture scenes with different subjects or settings follow one another without any transition, the effect is too discordant.

It is better for the viewer if at the end of each moving picture scene the last frame of that scene is also projected as a still. In a special viewing apparatus which is described below, there is the possibility of optionally stopping the picture transport either at each marked picture or only at each actual still.

It should be pointed out that in the case of the apparatuses hitherto described the mark was shown immediately adjacent to each picture which was to be marked. This was done for the sake of clarity. As will be apparent from the explanation and description of the apparatuses given below, for the technical execution of the method it is expedient and advantageous to provide a definite phase shift between picture and mark which works in a similar manner to the phase shift of 18 frames known from the process of direct sound recording on magnetic sound films. More details concerning this phase shift will be given hereinafter.

Figs. 2a to 2k show various types of marks on the edge of the film which can be applied by cameras according to the invention. As can be seen in Figs. 2a and 2b, in the case of commercially available films there are identification marks 7 or 8 exposed onto the perforation edge, between the perforations P, and these should not of course coincide with the marks that are to be applied. The following arrangements for the exposure of the marks M are possible: in Figs. 2c and 2d, the marks M are arranged in the region of an edge of the perforation. This region is not normally used for film identification marks.

In the arrangements shown in Figs. 2e to 2i, the spaces between the perforations are used for the identification marks M. Care should be taken to ensure that the area of the marks M is greater than the area taken up by the film identification marks 7 or 8 shown in Fig. 2a and Fig. 2b. It is necessary to ensure that the perforations do not themselves activate the scanning device. This can be done either if the scanning device is so constructed that it can only respond in a particular transport phase of the film which is passing through, in precise association with the location of the marks or, more simply, if the transport marks, as shown in Figs. 2f, 2h and 2i, are considerably larger than the perforations.

A further arrangement for the application of more complex codings M is shown in Fig. 2g. In this case the mark M consists of several

individual lines (or dots) which are exposed sequentially on to the film by the camera during a transport phase of the film. In the reproduction apparatus these more complex marks can be identified by means of a suitable counting circuit and can be used to produce and send corresponding signals to the transport means.

A further method of applying the markings which are distinguishable from identification marks on the film is described with reference to Fig. 2k. In contrast to the marks hitherto described, which consist of light areas exposed onto the edge of the film, in this case the film edge is continuously exposed by means of a suitable light source. The marks are made by interrupting the continuous exposure. There is therefore produced on the film edge (or, if desired between the perforations) a continuously exposed strip, which is transparent after the reversal process, and which is interrupted only by the black marks M. The advantage of this method is that the markings 7 or 8 previously exposed onto the film as shown in Figs. 2a or Fig. 2b are erased and only the black marks are visible. As far as subsequent marking is concerned, this method offers the advantage that additional marks can easily be applied by means of a felt pen or similar marking instrument. It should be noted that this method is particularly suitable for films which have no previously exposed identification marks on the perforated edge.

Figs. 3 to 3d show a mechanical/optical marking device in a camera according to the invention. Only those parts which are necessary for understanding the invention are shown. In the camera there is situated in a known manner a film cassette 3 with a picture gate BF which is arranged behind an objective 2. Between the objective 2 and the picture gate there is a known blade shutter 22 which is also provided in a known manner with two stops 22a and 22b to control continuous running and single picture operation. The drive for the blade shutter is not shown, for the sake of clarity. The blade shutter 22 is rotatable about the spindle 23 supported in the camera. Against the stops 22a, 22b there can be placed, as required, a lever 18 which is pivotally supported by a pivot point 16 fixed to the camera and which is rigidly connected to a further angled lever 15. The lever 15 rests with its lower end 15a against the rear face of the camera release member 9.

The lever 18 is pulled against the housing 1 by means of a spring 17 and rests on a bearing surface 13b of a further lever 13 supported by a pivot point 13a fixed to the camera, which lever 13 is in turn connected to a rack 12 by way of a link member 14. The rack 12 is supported by pin 1c fixed to the housing and is movable in one direction. The rack 12 is angled at the lower end and

carries two bearing surfaces 12a and 12b which with a control cam are situated within the range of action of a pin 4b of the selector switch 4 of the camera. By rotating the selector switch 4 together with the pin 4b, the rack 12 can be pushed upwards against the action of a tension spring 12c attached to the housing 1. The selector switch 4 is also provided with teeth 4c which mesh with a toothed

section of a rack 11. The rack 11 is in turn movably supported by pins 1b fixed to the housing, and has a notch 11a. The notch 11a is within the range of the end 24a of a mask (or cover) 24 which is pivotally supported on the housing 1 by means of a spindle 25. In a particular position, which is explained below, the lower end 24a of the mask 24 can drop into the notch 11a. The other end 24b of the mask 24 lies in front of the inlet of a light-conductor 26 which is built into the mount 2a of the objective 2. The outlet end 26b of the light-conductor 26 is situated in the region of the edge of the film contained in the cassette 3. The camera also has a release member 9 which is in turn movably supported by pins 1a fixed to the housing. The release member is spring biased away from the housing 1 by means of a compression spring 9a. On the release member a pawl 10 is rotatably attached on a pin 10b. The pawl is pre-tensioned in a clockwise direction by means of a tension spring 10a and its movement is limited by a resilient stop 9b on the release member 9.

The free end of the pawl 10 has two oblique surfaces 10c and 10d which are normal to one another, and the position of which can be seen in Fig. 3b. As shown in Fig. 3a, the mask 24 is held by a spring 24d against a stop 1d fixed to the housing 1.

The method of operation of the cine camera is as follows.

Briefly, the selector switch 4 can be displaced from the central position illustrated in Fig. 3 to two positions A1, B1 and A2 B2 on each side thereof. When the selector switch is in position A1 or A2, the rack 12 is displaced upwards (as seen in the Figure) from the position shown in Fig. 3 to one where the stop 13b is lowered compared to the position shown in Fig. 3, and when the selector switch is in the position B1 or B2, the rack is displaced further up and the stop 13b is lowered further. These two positions of the stop 13b correspond to positions of the lever 18 where the lower end thereof lies between the pins 22a and 22b (for taking cine shots) and where the lower end lies in the range of the pin 22b (for taking stills).

The film is marked when the selector switch is set to the positions A2 and B2, but not when the switch is set to the positions A1 and B1. In the positions A1 and B1, and in the central position illustrated in Fig. 3, the mask 24 covers the light conductor 26 and cannot

be moved therefrom since the lower end of the mask lies in front of the slider 11 and cannot pivot to uncover the light conductor: in the positions A2 and B2, the rack 11 is displaced to the left from the position in Fig. 3 so that the notch 11a is level with the lower end of the mask (as shown in Figure 3a), thereby allowing the mask to pivot.

The operation will now be described in more detail. If the selector switch 4 is turned through an angle to the position A1 (by means of a manual control which is not shown), by means of the control cam 12a the rack 12 is pushed upwards for a short distance and this causes the stop 13b to move downwards correspondingly.

If the release member 9 is now pressed into the camera in the direction of the arrow 21 the lever 15 is pivoted anticlockwise until the lever 18 which is rigidly connected to the lever 15 again rests on the bearing surface 13b of the lever 13. The end of the lever 18 thereby lies between the pins 22a and 22b of the blade shutter 22 and allows the latter to rotate unhindered under the influence of the camera drive which is not shown. This is the position for normal cine operation of the camera.

If the control 4 is further rotated clockwise to a second engaging position (which is characterised by the angle α shown in Fig. 3), the pin 4b reaches the position B1 and lifts the rack 12 upwards one further step by way of the control cam 12a. The lever 13 then pivots further in an anticlockwise direction so that the bearing surface 13b is moved downwards further. If the release member 9 is now pushed inwards as before, the lever 18, because the stop 13b is set lower, can pivot further downwards into the range of the pin 22b of the blade shutter 22. The pin 22b serves in a known manner for individual picture control, that is, after the blade shutter has rotated through 360° the other side of the pin 22b meets the end of the lever 18 again and the film transport is halted. It can only be set in motion again for a further individual picture by liberating the release member and pressing again. In both positions A1 and B1 of the control, the pawl 10 fits round the bottom of 24a of the mask 24 and, when the release is pressed inwards, the resilient stop 9b yields.

If the selector switch 4 is turned anticlockwise to the position A 2, however, the slider 11 moves to the left and the notch 11a comes to rest beneath the end 24a of the mask 24. When the release member 9 is pressed inwards in the direction of the arrow 21, the pawl 10 pivots and the end 10d slips through under the end 24a of the mask 24 the spring 10a being relatively weak. The remaining operations are the same as described previously, that is, the lever 18 is displaced to a position between the pins 22a

and 22b and the cine transport of the camera is re-engaged. When the camera user lets the release member 9 go, it moves to the left under the influence of the spring 9a. During

5 this return movement the pawl 10 does not pivot when it meets the end of the mask 24 and slip through under it. Rather, because of the resilient stop 9b and by means of the oblique surface 10d, the pawl 10 pivots the mask 24 clockwise as seen in Fig. 3a during the return of the release member (see Fig. 3b). The pawl 10 pivots the mask 24 into the notch 11a against the action of the relatively weak return spring 24d (see Fig. 3a), and the result is that the end 24b of the pawl 24 uncovers the light entry in front of the light conductor 26 and then, after the pawl 10 has moved past the mask 24, covers the light entry again as a result of the return force of the spring 24d. This movement of the mask occurs in the last phase of the return movement of the release member 9, and it thus also takes place when the last frame of the scene is stationary in the picture gate. A light mark associated with the last frame of the moving picture scene is therefore exposed onto the edge of the film by way of the light-conductor 26.

If the selector switch 4 is further rotated anticlockwise by a further engaging position, so that the pin 4b reaches the position B2, the slider 12 is pushed still further upwards as described previously, and the individual picture control of the camera is rendered operative. A mark is exposed onto each frame in the same way as is described above, and this takes place as before during the return movement of the release member.

Figs. 3c and 3d show a suitable arrangement of the light conductor 26. As can be seen clearly from the Figures, the light conductor is situated outside the range of the blade shutter 22, but is built into the mount 2a of the objective. Since the exposure aperture BF of normal Super 8 cassettes allows only a small amount of room for arrangement of an additional exposure device level therewith, it is desirable to off-set the exposure position for the marks by approximately two perforation intervals with respect to the picture gate, as can be seen in Fig. 3d.

Another camera with a device for exposing on the marks can be seen in Fig. 4. The camera is the same as that described with reference to Figs. 3 to 3d, except that the light conductor 26, the mask 24, the pawl 10 and recess 11a are omitted, and other means to expose the marks onto the film are provided. The slider 11 carries on its leading end a contact 29 which can be positioned within the range of a pawl 30 or clear of the pawl, depending on the position of the slider. The pawl 30 is so constructed, in a similar manner to the pawl 10 in Fig. 3, that when the release member 9 is pressed inwards it does

70 not move the end 29a of a contact spring, but that it closes the contact when the release member 9 is released. For this purpose, the pawl 30 is spring-loaded towards the release member 9 by means of a compression spring 31. By means of the contact, the current circuit between a battery 28, which is preferably the battery which supplies the current for the camera drive, and a luminescent diode 27 which corresponds to the light outlet end 26b of the light conductor of Fig. 3, is closed and briefly supplies the diode with current during the return movement of the release member 9. A brief flash of light is therefore produced during the return movement of the release member, and this exposes the mark onto the edge of the film.

In a camera with a further form of device for exposing marks on the film (not illustrated), the camera is the same as that of Fig. 4, except that the luminescent diode 27 is continuously supplied with current and the contact 29 is so constructed that it opens instead of closing. During normal film transport, therefore, a continuous light band with dark marks is produced on the edge of the film as shown in Fig. 2k, instead of a dark background with light marks. By means of a light conductor, light can be derived from the luminescent diode for a continuous running indication in the camera viewfinder. It is also possible, however, to fit the luminescent diode in the viewfinder and to expose the marking device by means of a corresponding rigid light conductor. The dark period of the continuous running indicator that occurs during the return movement of the release member will cause no disturbance in the viewfinder, since during that brief moment the filming has in any case already stopped.

In the case of the cine camera described hitherto, marking has been effected with dots or lines. For signal processing it may be of advantage, and in particular may allow simple and reliable recognition means to be used, if the markings have a more complex code. In this connection, reference is made to the form of markings shown in Fig. 2g. In order to produce such complicated patterns it is convenient for coding to be carried out in the camera when the film is moving rather than when it is stationary (as hitherto). For this purpose it is of advantage for the marking to be carried out not during or immediately after the exposure of the final frames or pictures of a scene, that is, when the release member has been released, but only at the start of the following scene or following picture.

In order to achieve this, by means of a simple delay circuit the illumination device is energised for a delay period within a picture changing period in the manner necessary for the desired signal. It is also possible to spread the coding operation over several picture intervals.

A cine camera capable of applying such markings is described with reference to Figs. 5 and 6. When the camera release member (not shown) is actuated, a sequence switch S 1 (Fig. 6) is closed and current is supplied to a photodiode D until a transistor T is blocked after a capacitor C has reached an appropriate state of charge. This period of time corresponds at maximum to the duration of one frame as a function of signal processing. This serves to expose an optical mark on the film at the start of the next scene. If a single signal point or a signal group should not be sufficient, due to the marks already exposed onto the film, with this method marking may be spread over several picture steps.

The delay may also be effected by a phase-controlled contact which opens or closes at each claw cycle or each revolution of the blade shutter. If the marks are coded, the signal image can be readily distinguished from the signal values arising from the marks originally exposed onto the film such as in Fig. 2a and 2b.

In Fig. 5, the principle of the camera of Fig. 6 is illustrated by means of a diagram. The numbers G1, G2, G3, G4, F89 and F90 indicate the first four frames of a scene and the last two frames of a preceding scene, respectively. The reference number 27 indicates a light source for exposing the marks in the camera. The phase shift between the light source 27 and the centre of the picture gate, which is marked by the line BF, amounts in this case to 1.5 perforation intervals. Fig. 5a indicates the position of the film in the camera during a stationary phase of the transport. The light source 27 is situated within range of a perforation. If on completion of the last frame F90 of the first scene the next scene is to be filmed, then by way of the time circuit described with reference to Fig. 6 the light source 27 is supplied with current at the start of the picture G1, so that during the exposure and transport phase shown in Fig. 5b a connecting strip M is exposed during transport, between those perforations that are off-set by 1.5 and 2.5 picture intervals with respect to the associated frame or picture. This phase shift must of course be taken into account during scanning in the viewing apparatus. This type of exposure produces continuous bands as shown in Fig. 5 or in Fig. 2h or 2i. When the light source 27 is modulated with a particular signal, for example with rectangular pulses, which is not difficult with luminescent diodes as light sources, a multiple coding corresponding to Fig. 2g is produced.

A further cine camera is illustrated in Figs. 7 and 8. In this case the coding is effected by purely mechanical means. This camera is suitable for marking shots taken as stills, but can also mark the last frame of each scene as a still. The camera has a selector switch for selecting normal cine operation or single

frame exposures.

The perforation edge shown in Figs. 7a, 7b has a section cut out to produce a mark 57, or its incised to produce a mark 58. A device for appropriately executing such cuts is shown in Figs. 8 and 8a. The film F lies on a film pressure plate 62. In a known manner there engages in one of the film perforations P the tooth 63a of a claw 63, which is supported against the film by means of a support spring 64 and is guided in the correct plane by a guide 63d. The claw is accordingly constructed as a known drag claw. The claw 63 is driven in a known manner by way of a slot formed by the extensions 63e in which there is located a pin 64b mounted eccentrically on a rotatable member 64a. The claw tooth 63a is provided with turned over cutting edges 63b and 63c, the profile of which can be seen from the partial section according to Fig. 8a. When the claw is in normal operation, that is, during the film transport, these cutting edges are clear of the film perforation. By means of a pressure lever 65, however, the claw 63 can be pressed deeper into the film perforation in the direction of the arrow 66 by way of a pressure roller 65a. The lever 65 is connected to the release member 68, so that when the release member is released (to return to the illustrated position), the claw 63 strikes the roller 65a in its movement, thereby pushing the cutting edges 63b and 63a into the film. When the claw is pressed in, the film perforation is cut out to correspond to the mark 57 in Fig. 7 by means of the two cutting edges 63b and 63c which are shown.

One of the cutting edges, that is, the lower one 63c, seen in the direction of travel of the film, may also be omitted. The film perforation is then only cut to correspond to the mark 58 in Fig. 7b. A tongue 58a is thus produced, which, in order to ensure that it does not rise up during film transport (which might lead to breakdowns) points in a direction opposite to the direction of travel L of the film.

The punching carried out by the claw is shorter than the length of a perforation, so that the use of splicing presses is not restricted thereby. Punching takes place during the pull phase of the film transport and ends approximately in the centre of the transport path, so that there is no adverse effect on the centering of the picture. During the punching operation, the cutting member 63b, 63c of the claw supports itself against the inside of the perforation P and thus equalises lateral cutting forces. The angle of the cutting edges is selected so that the film or the film pressure plate is not pushed away. As already mentioned, the punching operation is carried out automatically when the release member is released; equally, however, it could be carried out automatically when the release member is depressed. If desired, however, the punching

operation may also be carried out manually with the picture transport stopped by pressing in the cutting member of the claw, with a corresponding hand control being provided on the camera. In addition, marking may also be effected subsequently with coupling to the release member, even when the camera motor is switched off. No adverse effect on the centering of the picture is possible with separate manual actuation, due to the fact that because of the starting-up behaviour of a film transport means the transport stop takes place approximately in the middle of the distance to be travelled.

Particular advantages offered by this type of marking include the fact that the problem of the risk of confusion with the edge inscription of the perforation does not arise. Mechanical punching and scanning makes it possible to construct particularly simple scanning apparatuses. Operation is not affected by a foil splicing point, since the flexible splicing foil yields. Finally, it is particularly simple to carry out such punching in the reproduction apparatus. It has proved unexpectedly that excisions or incisions of the type illustrated cause no disturbances of any consequence during film transport. It is expressly pointed out that with this system there is no phase shift between the picture and the edge mark associated therewith, and this in turn offers particular advantages for the cutting and splicing of the films.

A further cine camera, capable of applying markings to magnetic sound tracks, will now be described. As is known, films provided with either one or two magnetic sound tracks have been commercially available for a long time. Some of these films are supplied in special sound film cassettes with an additional aperture for the sound recording device, but more recently some have also been housed in conventional film cassettes with only one exposure aperture. These films ordinarily have two sound tracks, that is, an actual sound track on the edge of the film furthest from the perforations and a so-called equalisation track on the perforation edge. The camera utilises the unused equalising track for the purpose of picture coding.

The pulse head used for marking the magnetic track is mounted in the vicinity of the picture gate in the interests of compatibility between the different types of cassettes, that is, in a similar arrangement to the optical arrangements previously described for exposing marks onto films. The intermittent movement of the film in the vicinity of the picture gate does not affect the marking of the film, as would be the case with sound recording, since there are no sound signals but only individual pulses or series of pulses to be recorded.

One advantage of this type of coding is that the marks applied can easily be erased again

at any time. Furthermore, it is possible with relatively simple means to apply pulses of different types. The pulses may in particular differ in frequency and pulse length from each other. The arrangement of such a magnetic sound head in the vicinity of the picture gate is fundamentally the same as the optical coding devices described, and the optical marking devices described with reference to Figs. 3 to 3d, 4, 5 and 6, may be replaced by magnetic marking devices.

In order to produce the necessary signals for the magnetic head, the camera contains a corresponding electronic modulation device which is connected to the sound head in the corresponding phase of film transport (that is, when the film is stationary in the picture gate or at the start of filming the next scene), by way of a switch controlled by the release member. There is therefore produced on the equalising track a short pulse which is picked up in the reproduction apparatus by means of a sound head. The pulse is preferably recorded at the beginning of the following scene, as already described above in the case of optical coding. It is also of advantage for the pulse or a series of pulses to be fed to the sound head when the release member is depressed.

It is also possible in principle to use the sound track for the marks instead of the equalising track. An advantage of this is that the sound track lies on the side of the film platform remote from the claw, and the spatial arrangement of the sound head is therefore easier. There is, however, the disadvantage that the sound track cannot be used in addition for sound recording without taking further measures, but it is possible to overlay the sound recording by means of relatively high or low frequency pulses, that is, pulses which are outside the range of maximum sensitivity of the human ear. However there is a risk that the pulses may also be erased during subsequent processing of the sound track by re-recording.

As already stated in connection with the individual sample embodiments, the various proposals according to the invention offer different advantages. The more convenient solutions are also more complex, whilst the technically simple solutions involve limitations as to convenience of handling, for example, or as to the possibility of indicating more complex order commands. However, all the systems proposed according to the invention are considerably simpler from the point of view of handling and the type of apparatuses used than the systems which are known and widely used.

The apparatuses described are based on cinematographic recording apparatuses, but it is also possible to produce video recording units which work by means of magnetic or optical recording of video signals on a moving

record support in accordance with the invention. In the case of current video recording systems which work by means of oblique track recording on magnetic tape or by means of rotating, so-called "image plates", it is in principle also possible to take and reproduce still pictures, with the record support transport being stopped and the series of pulses corresponding to an individual picture being scanned and reproduced several times. Here again, such pictures may have an additional mark applied for example to the synchronisation track or the synchronisation tape which is adjacent to or superimposed on the tape carrying the picture signals, and can be evaluated accordingly.

CLAIMS

1. Apparatus for recording moving pictures on a movable record support, which includes means, actuated by means of a release member for effecting picture taking, for applying a mark to the record support in association with the last picture of each moving picture scene for co-operation with suitable projection or other viewing apparatus to arrest transport of the record support at those individual pictures and reproduce them as still pictures.

2. Recording apparatus as claimed in claim 1, wherein the marking means is arranged to apply the marks outside the spatial or frequency range used for image recording.

3. Recording apparatus as claimed in claim 1 or claim 2, wherein the marking means is arranged to apply the mark to the record support during the stationary phase for the last picture of each moving picture scene.

4. Recording apparatus as claimed in claim 1 or claim 2, wherein the marking means is arranged to apply the mark to the record support during the transport phase for the first picture of the succeeding scene.

5. Recording apparatus as claimed in any one of claims 1 to 4, wherein the marking means is actuated by depression of a release member for effecting transport of the movable record support.

6. Recording apparatus as claimed in any one of claims 1 to 4, wherein the marking means is actuated by releasing a release member for effecting transport of the movable record support.

7. Recording apparatus as claimed in any one of claims 1 to 6, wherein the apparatus is suitable for use with a photo-sensitive record support, and the marking means is arranged to apply the marks photographically.

8. Recording apparatus as claimed in claim 7, wherein the marking means includes a light conductor having a light outlet end in the region of an edge of the record support.

9. Recording apparatus as claimed in claim 8, wherein the marks are modulated and a cover for removably covering the light

inlet end of the light conductor, the cover being removable by a release member for effecting picture taking during actuation thereof to produce the photographic mark, is provided.

10. Recording apparatus as claimed in claim 9, wherein the cover is arranged to cover the light conductor to produce the mark as an interruption in a continuous exposure at the edge of the record support.

11. Recording apparatus as claimed in claim 9, wherein the cover is arranged to uncover the light conductor to produce the mark as an exposure of the edge of the record support.

12. Recording apparatus as claimed in claim 10 or claim 11, wherein the light conductor is situated within the region of the objective mount of the recording apparatus and its light outlet is outside the range of the blade shutter of the recording apparatus.

13. Recording apparatus as claimed in any one of claims 9 to 11, wherein the outlet end of the light conductor is off-set with respect to the picture gate of the recording apparatus by at least one picture interval in the direction of travel of the record support.

14. Recording apparatus as claimed in any one of claims 9 to 13, wherein the cover is removable by the release member when it is released to terminate picture taking.

15. Recording apparatus as claimed in claim 7, wherein the marking means includes a light source for the exposure of an edge of the film and means for supplying it with current, which means are rendered operable by means of a release member for effecting picture taking to produce the mark.

16. Recording apparatus as claimed in claim 15, wherein the light source is a light-emitting diode.

17. Recording apparatus as claimed in claim 16, wherein the light-emitting diode also serves to indicate when picture taking is continuing.

18. Recording apparatus as claimed in any one of claims 15 to 17, wherein the light source is off-set with respect to the picture gate of the recording apparatus by at least one picture interval in the direction of travel of the record support.

19. Recording apparatus as claimed in any one of claims 1 to 6, wherein the apparatus is suitable for use with a record support having perforations, and the marking means includes a cutting tool for making a cut between a perforation and the film edge to mark the film.

20. Recording apparatus as claimed in claim 19, wherein the cutting tool is mounted on a transport claw, the depth of engagement of the claw with the record support being variable to permit engagement of the cutting tool with the record support.

21. Recording apparatus as claimed in



record support in accordance with the invention. In the case of current video recording systems which work by means of oblique track recording on magnetic tape or by means of rotating, so-called "image plates", it is in principle also possible to take and reproduce still pictures, with the record support transport being stopped and the series of pulses corresponding to an individual picture being scanned and reproduced several times. Here again, such pictures may have an additional mark applied for example to the synchronisation track or the synchronisation tape which is adjacent to or superimposed on the tape carrying the picture signals, and can be evaluated accordingly.

CLAIMS

1. Apparatus for recording moving pictures on a movable record support, which includes means, actuated by means of a release member for effecting picture taking, for applying a mark to the record support in association with the last picture of each moving picture scene for co-operation with suitable projection or other viewing apparatus to arrest transport of the record support at those individual pictures and reproduce them as still pictures.
2. Recording apparatus as claimed in claim 1, wherein the marking means is arranged to apply the marks outside the spatial or frequency range used for image recording.
3. Recording apparatus as claimed in claim 1 or claim 2, wherein the marking means is arranged to apply the mark to the record support during the stationary phase for the last picture of each moving picture scene.
4. Recording apparatus as claimed in claim 1 or claim 2, wherein the marking means is arranged to apply the mark to the record support during the transport phase for the first picture of the succeeding scene.
5. Recording apparatus as claimed in any one of claims 1 to 4, wherein the marking means is actuated by depression of a release member for effecting transport of the movable record support.
6. Recording apparatus as claimed in any one of claims 1 to 4, wherein the marking means is actuated by releasing a release member for effecting transport of the movable record support.
7. Recording apparatus as claimed in any one of claims 1 to 6, wherein the apparatus is suitable for use with a photo-sensitive record support, and the marking means is arranged to apply the marks photographically.
8. Recording apparatus as claimed in claim 7, wherein the marking means includes a light conductor having a light outlet end in the region of an edge of the record support.
9. Recording apparatus as claimed in claim 8, wherein the marks are modulated and a cover for removably covering the light

inlet end of the light conductor, the cover being removable by a release member for effecting picture taking during actuation thereof to produce the photographic mark, is provided.

10. Recording apparatus as claimed in claim 9, wherein the cover is arranged to cover the light conductor to produce the mark as an interruption in a continuous exposure at the edge of the record support.
11. Recording apparatus as claimed in claim 9, wherein the cover is arranged to uncover the light conductor to produce the mark as an exposure of the edge of the record support.
12. Recording apparatus as claimed in claim 10 or claim 11, wherein the light conductor is situated within the region of the objective mount of the recording apparatus and its light outlet is outside the range of the blade shutter of the recording apparatus.
13. Recording apparatus as claimed in any one of claims 9 to 11, wherein the outlet end of the light conductor is off-set with respect to the picture gate of the recording apparatus by at least one picture interval in the direction of travel of the record support.
14. Recording apparatus as claimed in any one of claims 9 to 13, wherein the cover is removable by the release member when it is released to terminate picture taking.
15. Recording apparatus as claimed in claim 7, wherein the marking means includes a light source for the exposure of an edge of the film and means for supplying it with current, which means are rendered operable by means of a release member for effecting picture taking to produce the mark.
16. Recording apparatus as claimed in claim 15, wherein the light source is a light-emitting diode.
17. Recording apparatus as claimed in claim 16, wherein the light-emitting diode also serves to indicate when picture taking is continuing.
18. Recording apparatus as claimed in any one of claims 15 to 17, wherein the light source is off-set with respect to the picture gate of the recording apparatus by at least one picture interval in the direction of travel of the record support.
19. Recording apparatus as claimed in any one of claims 1 to 6, wherein the apparatus is suitable for use with a record support having perforations, and the marking means includes a cutting tool for making a cut between a perforation and the film edge to mark the film.
20. Recording apparatus as claimed in claim 19, wherein the cutting tool is mounted on a transport claw, the depth of engagement of the claw with the record support being variable to permit engagement of the cutting tool with the record support.
21. Recording apparatus as claimed in



26

claim 20, wherein the deeper engagement of the claw is produced by means of movement of a release member for effecting picture taking.

- 5 22. Recording apparatus as claimed in any one of claims 19 to 21, wherein the cutting tool consists of two cutting edges arranged to cut out a piece from the section of film between the perforation and the edge.
- 10 23. Recording apparatus as claimed in any one of claims 19 to 21, wherein the cutting tool consists of a cutting edge arranged to make a cut from a perforation to the edge of the film, the cutting edge being so off-set on the claw with respect to the centre of the perforation that the tongue formed on the edge of the perforation in the record support points in the opposite direction to the direction of travel of the record support.
- 20 24. Recording apparatus as claimed in any one of claims 1 to 6, wherein the apparatus is suitable for use with a record support in the form of a cine film with a magnetic sound track, and the marking means includes a sound head arranged to apply magnetic marks to the equilising track.
- 25 25. Recording apparatus as claimed in claim 24, wherein the marking means is arranged to apply a modulated signal.
- 30 26. Recording apparatus as claimed in any one of claims 1 to 25, wherein the apparatus is video recording apparatus.
- 35 27. Recording apparatus as claimed in any one of claims 1 to 25, wherein the apparatus is a cinematographic camera.
- 40 28. Recording apparatus as claimed in any one of claims 1 to 27, in combination with projection or other viewing apparatus for reproducing moving pictures from the movable record support, the viewing apparatus comprising means for detecting the mark on the record support associated with an individual picture, and means for arresting transport of the record support in response to the
- 45 detection of a mark by the detecting means in order to reproduce that individual picture as a still picture.
- 50 29. The combination of claim 28, wherein the transport means of the viewing apparatus allows the marks to be read off at the appropriate point during only a particular phase of the transport cycle.