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(54) CAMERA

(71) We, KARL VOCKENHUBER, of 118 Pötzleinsdorferstrasse, Vienna 18, Austria, and RAIMUND HAUSER, of 2 Goldeggasse, Vienna, 4, Austria, both of Austrian Nationality, 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:—

This invention relates to a camera, which may be a cine camera or a photographic camera for taking still pictures, provided with an optical system of variable focal length or with one having interchangeable lenses to enable the same result to be achieved.

With cameras having extended focal ranges there exists the problem that the danger of blurring of the film image becomes progressively greater as the focal length of the objective of the optical system becomes longer. It can happen when using vario-objectives with a continuously variable focal length, that the focal length is accidentally altered when zooming, and then shooting becomes practically impossible without blurring.

Normally the risk of blurring is minimised in conditions where it is likely to occur by resorting to solutions such as the placing of the camera on a tripod stand, increasing the shutter speed, shortening the film exposure time, or finding a fixed support on which to rest the camera while the film is being shot. In the case of flash exposures the danger of blurring can also be reduced by using extremely short flash times.

The correct solution to adopt to avoid blurring in a particular set of circumstances depends on the expertise of the photographer and often an amateur has inadequate experience to make the correct decision.

In accordance with the present invention there is provided a camera having an optical system of which the focal length is changeable and means sensitive to the prevailing focal length for generating a warning indication when the focal length exceeds a

value at which blurring is likely to occur if the camera is hand held.

The advantage of the invention is that the camera can safely be used by an inexperienced amateur photographer under marginal conditions when blurring could occur as a result of camera shake. If the warning is heeded, the camera can be placed on a stable support before the film is actually exposed and in this way blurring prevented.

The warning may take the form of a marker, for example a warning light, visible in the view finder. The warning may also be given by the arrangement immobilising shutter operation, for example, by de-energizing a shutter drive motor. Preferably an overriding device is provided which allows the user to use the camera despite the warning having been given and no precautions having been taken to prevent the risk of blurring.

The camera may be a photographic camera for taking snapshots or a cine camera.

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

Figure 1 is a perspective view of a cine camera showing some of its interior working parts in broken outline and also an optical path through the camera.

Figure 2 shows in simplified form an immobilising circuit used in the camera and actuated by adjustment of the optical system to extend the range beyond a predetermined threshold;

Figure 3 is a side view, partly broken away and partly exploded, to show the positions of certain switches usable in the camera under different operating conditions to influence the immobilising circuit, Figure 3 also showing switches which can be used with a modification of the camera shown in Figure 1;

Figure 4 shows parts of a mechanical linkage used in a photographic camera to control operation of the shutter, and also an electrical warning circuit providing the user

with a warning should the camera range be extended beyond a predetermined threshold value;

5 Figure 5 shows basic parts of circuitry for detecting camera vibration and for controlling operation of an immobilising circuit or warning circuit in response to such vibration, optical paths through the camera also being shown;

10 Figure 6 shows an immobilising circuit arranged to take account of the individual settings of several variable factors each capable of producing blurring under certain circumstances;

15 Figures 7 and 7A show, respectively, a way of triggering operation of an immobilising circuit in response to optical effects produced in a fringe path through the camera optical system, and an enlarged explanatory detail of part of Figure 7;

20 Figure 8 shows how an element responsive to range setting of the optical system of a camera may be combined with a vibration-sensitive device to warn the user of the camera that there is a risk of blurring;

25 Figure 9 shows a modification of Figure 8;

Figure 10 shows a second modification of Figure 8;

30 Figure 11 is a detailed section taken along the line and in the direction indicated by the arrows XI—XI in Figure 10; and,

35 Figure 12 shows a static arrangement for detecting camera vibration in order to operate an immobilising circuit.

In the following description of the drawings corresponding numerals have been used for similar parts which behave in like manner in the different embodiments. In some cases 40 suffix letters have been added when the parts are arranged electrically in parallel with one another.

In Figure 1 a cine camera 1 has an optical system which includes an objective 2. This 45 objective 2 may either have a variable focal length or it may be interchangeable with other lenses of relatively long focal length which require to be fitted to the camera 1. A beam splitter 3 is provided inside the 50 camera to reflect a portion of the incident light towards a viewfinder 4. The objective 2 is equipped with means which indicate that the setting of the focal length is so long that there is a substantial danger of 55 blurring having regard to the setting of the exposure time by the user of the camera 1. For signalling a risk of blurring, a marker in the form of a vane 5 is brought into the path of rays of the viewfinder 4 by a solenoid 6. It is also possible to immobilise operation of 60 a shutter of the camera simultaneously, so that operation of a camera release will not expose the film unless the user decides otherwise. The immobilising circuit may take the 65 form of a shutter locking device or some

other arrangement to prevent the shutter from being operated and it is preferable to provide an override to release the locking device or the inhibiting effect of the immobiliser circuit and, if necessary, the marker, 70 to enable the operator to expose the film despite the warning, should he so wish if he does not wish to take precautions.

However, the warning and/or immobilisation of the shutter does give the operator the 75 opportunity to place the camera on a table if he so wishes or to take the other appropriate steps to avoid blurring.

A knob 8 is provided on the camera to release the locking device when turned, and 80 this knob also removes the marker vane 5 when moved to the position "0". As will be explained later, the locking device or immobilising circuit can be rendered inoperable when the camera is used with a cable 85 release 9, since this is normally only used when the camera is mounted on a stable support. Also the locking device may be prevented from working if the camera has a tripod stand fitted into a tripod socket 10. 90

Figure 2 shows how control by the variable objective of an optical system may be used to trigger an immobilising circuit to prevent camera operation under doubtful conditions. 95 A cam 11 is moved in unison with an adjusting ring for changing the focal length of the camera. The camera 1 has a shutter drive motor 13 whose energization circuit contains a release switch 7a. The cam 11 operates a schematically illustrated switching 100 arrangement 12 which is electrically in series with the release switch 7a. The cam 11 is so shaped that if a short focal length of the objective 2 is selected, the radially broader part of the cam 11 closes the switch 105 12. With the selection of relatively long focal lengths of the objective 2, the radially smaller part 11' of the cam 11 opens the switching arrangement 12 to prevent energisation of the motor 13. 110

Release switch 7a and switching arrangement 12 together form an AND-gate, since 115 the motor 13 only runs and operates the shutter of camera 1 if both switches are closed. The switching arrangement 12 becomes effective to immobilise operation of the shutter, if the objective setting is adjusted to give a camera focal length longer than a threshold focal length which is predetermined.

In a modification of the immobilising circuit, the switching arrangement 12 is 120 arranged to respond to the selection of certain interchangeable lenses instead of to adjustment of a vario-objective optical system. In another modification the motor 13 is used to 125 drive the vario-objective 2, in the correct direction. With such a modification the focal length of the optical system can be adjusted into the tele range but not accidentally as this is prevented by the switching arrange- 130

ment 12. As soon as the vario-objective reaches the tele position, the switching arrangement 12 is opened and the motor 13 de-energized. Simultaneously a switch contact 14 is operated from an open to a closed state to complete an energization circuit for the solenoid 6 which actuates the marker vane 5 to indicate to the user that he must take certain precautions if blurring is to be prevented.

The switching arrangement 12 is shunted by an overriding circuit containing a switching arrangement 15. The switching arrangements 12 and 15 form an OR-gate, because when closing the switch 7a, the motor is energized if at least one of the two switching arrangements is closed. The switching arrangement 15 may be closed manually to allow adjustment of the objective into the tele range but it will be noticed that the marker remains visible to the user until the cam 11 recloses the switching arrangement 12 when a shorter range is once again selected.

In Figure 3 are shown the positions of various switches incorporated into the camera, these switches functioning in different conditions to exercise control over the operation of the immobilising circuit. It will be appreciated that Figure 2 is a greatly simplified circuit and the switches shown in Figure 3 are not illustrated. However, they have the positions indicated by corresponding reference numerals in Figure 2.

In Figure 3 the switch 7a is operated not only by the camera release 7 but also by a cable release 16 which may be screwed into the socket 9. Within the socket 9 is a slide pin 17 which is pressed into the socket by a spring contact 18 of a normally open switch 15a. When screwing in the cable release 16, the pin is displaced to close the switch 15a which is in parallel with the switch 15 of Figure 2. A similar arrangement having a slide pin 19 is provided in the vicinity of the tripod socket 10. This switching arrangement 15b is normally open but is closed by the thrust of the tripod when inserted into the socket 10 against the bias of a leaf spring 20 of the switching arrangement which acts on the slide pin 19.

The objective 2 illustrated in Figure 3 has an interchangeable lens fixture provided with a collar flange 21. If the fixture imparts to the optical system a short focal length the flange is solid whereas if it imparts a relatively long focal length it is provided with an annular recess 22 on the flange surface next to the camera. This flange surface cooperates with a spring bias slide pin 23 which controls operation of a normally open contact pair of the switching arrangement 12. If the fixture fitted to the camera imparts a short focal length to it the switching arrangement 12 is closed by the solid flange 21 whereas if the fitted fixture imparts a long

focal length, then the pin 23 is able to project into the recess 22 of the flange 21 so that the switching arrangement stays open.

A further overriding switch 15c connected in parallel with the other switches 15, 15a and 15b is provided to respond to the fitting to the camera of a flash tube giving a flash of extremely short duration. The flash tube 24, when inserted into its socket, depresses a slide pin 25 against the resilient bias of a leaf spring forming one contact of a normally-open pair of contacts 15c. Thus the immobilising circuit of Figure 2 is overridden in the event that either of the switches 15a or 15b is closed or a flash tube 24 giving a flash of extremely short duration is fitted.

Figure 4 shows part of a photo camera having a shutter release button 7 for operating a shutter mechanism having a shutter setting ring 26 for setting the shutter speed, and a sector drive ring 27. The drive to the ring 27 is provided by a link 29 from a rotatable disc 28.

To operate the shutter the button release 7 is depressed to engage a spring-biased lever 31 fulcrumed at 30. The rotation of the lever 31 in a counterclockwise direction in the figure allows a locking pawl 32 to snap behind a shoulder 33 on the lever 31 and so prevent it from returning to the position shown. Lever 31 is connected by an elbow spring 34 to produce corresponding movement of a locking lever 35 which, in the position illustrated, prevents rotation of the disc 28 in a counterclockwise direction. As the lever 31 rotates, the lever 35 is slid past an abutment face 36 on the disc 28 to free the motion of the disc and allow the shutter to be released.

The lever 35 is subject to the influence of a time-adjusting lever 38 as well as the release lever 31. The lever 38 has a stop face 37 and is provided with a lateral projection 39 arranged, when the lever 38 is in a rest position (partly shown in broken outline), to engage with a fixed stud 40. When the projection 39 engages the stud 40 the stop face 37 of the lever 38 is moved out of the path of movement of the pin 41 so that the lever 35 is free to follow the motion of the release lever 31.

To operate the timer the lever 38 is moved an appropriate distance in a counterclockwise direction which brings the stop face 37 into engagement with the pin 41. This effectively prevents rotation of the lever 35 until the lever 38 is returned under the influence of the timing mechanism to the rest position.

The mechanical side of Figure 4 thus far described is of a prior proposed type and is therefore only described in outline.

The camera is provided with a warning control circuit comprising a battery 42 which is connected to a switching arrangement 12a, a cam operated switch 15d, and a time oper-

ated switch 15e to a signal lamp 43 which, when illuminated, is visible in a viewfinder of the camera.

The switching arrangement 12a is controlled as shown in Figure 3 in dependence upon the focal length of the lens in use. The switch arrangement 12a closes only when a predetermined focal length is exceeded. This causes the signal lamp to be energized to warn the user that unless he takes certain steps there is a risk of the picture being blurred. The operator can then rotate the shutter speed ring 26 to increase the shutter speed to a value such that the camming profile of the ring 26 allows the contact 15d to open. Likewise, if the operator is using the timer, then in general the camera will be placed on a stable support such as a table. The timer lever 38 will then be turned counterclockwise and will open the contacts of the switching arrangement 15e to extinguish the lamp.

The camera 1 illustrated in Figure 5 has a pancratic objective 2 having a control tube 103 driven by a control motor 104 for adjusting the focal length. The motor 104 is energized in one or other direction of rotation by appropriate movement of a lever 105 provided on the camera. The optical path through the pancratic objective 2 includes a beam splitting prism 106 which deflects a portion of the light passing through the objective to a reflecting mirror 107 and from there to an eye piece of a view finder 108.

The control tube 103 has an electrically resistive lining which cooperates with sliding contacts 109 so that a change in the focal length of the objective 2 produces a corresponding electrical resistance change in the circuit of the sliding contact 109.

Vibration of the camera is also detected in the arrangement shown in Figure 5 by means of a double-armed lever 111 carrying arcuate cores 112 at each end and pivoted at its centre 110. The cores 112 are arranged to pass into the interior of coils 113 arranged one at each end of each core 112. The lever 111 is held in its mid-position by opposed balance springs 114. In addition to the lever 111 which rocks about a horizontal axis, a further similar level with corresponding coils and cores may be provided for detecting motion about a vertical axis. Instead of being pivoted, the lever 111 could also be mounted on gimbals.

In operation, the resistance value between the sliding contacts 109 is evaluated together with output signals from the moving coils and which vary with the movement of the lever 111. If the camera is moved in a way, for a particular range setting, such that blurring is going to occur, or if the user is holding the camera too unsteadily, a

signal lamp 43 is illuminated and is visible in the viewfinder 108. The threshold value at which the lamp 43 is illuminated hinges on the focal length selected for the objective 2.

Figure 6 shows an arrangement for comparing the allowable movement of the objective 2 along the optical axis with the depth of field of the objective. The arrangement shown has an electro transducer 116 for detecting vibrations and which, although shown in block outline, may be in the form as shown in Figure 5. Once again, a sliding contact 109 is provided for producing an electrical change in resistance which corresponds to a change in the focal length of the objective 2. A change in the distance setting also produces an electrical resistance change between two contacts one of which is the slider 117 and from which leads extend to a depth of field calculator 119. A portion of the light passing through the optical system is deflected laterally by a beam splitter 106 to a second beam splitter so arranged that part of the light it receives is reflected towards an eye piece of a view finder 108 and a part of which falls on a photo-electric cell 118 which provides an input to the depth of field calculator 119. The diaphragm 120 is provided between the film position and the beam splitter 106. Interposed between the film and the beam splitted 106 is a mirror surfaced conical shutter which, when closed, deflects light onto a photocell arranged in the circuit controlling the diaphragm 120, as known *per se*.

A comparator 121 compares the output of the depth of field calculator with the output of the vibration sensing arrangement 116 and provides an output signal which illuminates a signal lamp 43, also visible in the viewfinder, if the two inputs of the comparator 121 are such that blurring is likely to occur.

Figure 7 shows an objective 2 having four thin lenses 122 to 125 and forming part of an optical system the rest of which is shown simply as a block 126. The thin lenses 123, 124 are displaceable to alter the focal length of the optical system. Behind the front lens 122 and in the path of the marginal rays of the optical system which are not otherwise used, there is provided a lever 111 pivoted about an axis 110. The lever is shown in more detail in Figure 7a as it would be seen when viewed from the left of Figure 7, and from which it will be seen that it has a triangular window 127 and is biased to a mid position by a pair of opposed balancing springs 114. The lower end of the lever 111 is provided with a weight.

The window 127 is so arranged that its image is only partly focused by the optical system onto a photoelectric transducer 128. As the magnification alters with change in the focal length, so the imaging of the win-

dow 127 on the photo-electric transducer alters.

If the camera is vibrated, the lever 111 swings about the axis 110 and momentarily the window 127 is fully pictured on the photoelectric transducer 128 which therefore provides for a brief period a greater output signal. It will be appreciated that the output of the transducer 128 depends on the focal length of the objective as well as on the extent to which the lever 111 is oscillating. The greater these oscillations are, the larger will be the briefly illuminated area of the photo-electric transducer 128, and the more the focal length of the optical system is increased, the larger will be the illuminated area of the photoelectric transducer 128.

Connected in the output of the transducer 128 is a threshold switching circuit 129 so arranged that its threshold value is adjustable by a knob 130 accessible on the side of the camera. The output of the threshold switch 129 controls a switching arrangement 131 which is connected electrically in series with the circuit of a control motor for adjusting the focal length of the objective. If the illumination of the transducer 128 momentarily exceeds the threshold value of threshold switch 129, signifying excessive vibration or an excessively long range, or both, the output of the threshold switch opens the switching arrangement 131 to de-energize the motor control circuit 104 so that a further lengthening of the range is prevented until suitable steps are taken by the user to prevent blurring.

Figure 8 shows a second way of energizing a marker lamp circuit if the vibrations or focal length is excessive for the prevailing conditions. The arrangements for adjusting the focal length is published in Patent Specification No. 943,409 and it will not be described in detail here. Suffice it to say that a shaft 133 controls the focal length of the optical system by movement of an adjusting cam 132. Two curved slots 134 are formed in the body of the cam 132 and in each of these slide a contact pin 135. These pins also pass through aligned slots 136 formed in a plate not shown that is lying in front of the cam 132. With such an arrangement the pins 135 are moved to different positions along the slots 136 with different angular positions of the cam 132 controlling ranging.

Each of the pins 135 lies in the path of free movement of a trembler lever 111 made of electrically conductive material and which is normally held in a mid position by opposed balancing springs 114. An electrical circuit containing a battery 42 is connected between the fulcrum 110 of the lever and the wiper contact 137 which engages the shaft 133 so that the cam 132 and therefore the pins 135 are in effectively electrical contact

with the wiper 137. A signal lamp 43 is connected in the electrical circuit and is visible, by way of a mirror 107, in the viewfinder of the camera.

If the vibration of the camera for a given range setting is such that blurring will result, the lever 111 contacts one or other of the pins 135 so that the circuit of the lamp 43 is completed and the lamp flashes on and off. The degree of vibration allowed for each range setting is different and is determined by the positions of the pins 135 which move towards the lever 111 as the range setting of the objective gets longer.

The arrangement shown in Figure 8 relies on electrical contact which is avoided in the arrangement of Figure 9 where parts serving the same function bear corresponding reference numerals. In Figure 9, the trembler lever 111 carries a diaphragm 139 having a teardrop shaped window formed in it. This window lies between the photoelectric transducer and a light source which may be a part of the objective 2 or a totally separate source of light. The tapering shape of the window is provided for the same reason as the triangular window shown in Figure 7a. However, the motor 104 in Figure 9 drives a rack and pinion assembly for moving a graded neutral wedge 140 between the photo-electric transducer and the diaphragm 139. If the objective of the camera is adjusted to a long focal length setting then the less attenuating part of the wedge lies in front of the photoelectric transducer 128 connected to a power supply 138, whereas with shorter focal length settings of the objective 2 the more attenuating part of the wedge 140 lies in front of the photoelectric transducer 128.

Vibration of the lever 111 causes the teardrop shaped window 127 to swing over the face of the transducer 128 causing it to provide an alternating current output the amplitude of which depends on the magnitude of the swing and also on the extent to which the neutral wedge 114 is moved across the photoelectric cell. The unidirectional current output of the cell is filtered out by a coupling capacitor 141 and the a.c. component is passed through an amplifier 142 and integrator 143 to an adjustable threshold switch 129 controlling the point at which a signal is sent to a switching arrangement 144 constructed as a changeover switch and, in accordance with its position, controlling the direction of rotation of the motor 104. The changeover switch has an intermediate stable position in which it is shown in Figure 9.

The changeover switch 144 normally is controlled manually on the camera by a control such as that referenced 105 in Figure 5. Should however the threshold switch 129 receive a voltage whose magnitude exceeds

the threshold value set, the switching arrangement 144 is automatically switched into a position at which the focal length is reduced by the motor 104 running in the appropriate direction.

Figures 10 and 11 show another arrangement for avoiding the use of the electrical contact necessary in Figure 8. In Figure 10 a cam 132 for controlling the range setting of the optical system is provided with a segment shaped aperture 145. On one side the cam 132 is provided with a friction facing 146 which is sandwiched between the cam and a disc 147 which is pressed by a spring 148 against the friction facing 146. The other end of the spring 148 abuts a wall 149 of the camera and it surrounds a pair of concentric shafts which pass through the wall 149 and carry, respectively, a knob 150 for adjusting the focal length and a second knob 151 for rotating the disc 147.

A curved slot 134, clearly shown in Figure 10, is provided in the disc 147 and the pin also extends through a radial slot 136 formed in a frame member of the camera clearly shown in Figure 11. At its end the pin 135 carries a pack of spaced parallel condenser plates 152 which are interleaved with a second pack of parallel condenser plates 153 carried at one end of a lever 111 pivoted at 110. The lever carries a weight at its other end and it is held in position by opposed balancing springs 114.

As the disc 147 is frictionally held by the ranging cam 132 it rotates with it when the knob 150 is changed for altering the focal length of the camera. However, the knob 151 may also be rotated to vary the radial position of the pin 135 and thus the extent of penetration of the two packs of plates 152, 153 into one another. As the disc 147 normally rotates with the plate 132, the capacity of the condenser formed by the two packs of plates depends not only on the angular position of the plate 132 but also on the amplitude of oscillating movement of the lever 111 if the camera is moved.

The electrical capacity of the condenser controls the response frequency of an oscillator 154 connected on its input side to the fulcrum 110 of the lever 111. A transformer 155 couples the output of the oscillator 154 to a threshold switch 129 which, if its threshold input voltage is exceeded, responds by completing a circuit to a lamp 43. The other terminal of the lamp is connected through a battery 42 to an electrode 137 which wipes against the disc 147 and thus completes the electrical circuit to the pin 135. In practice, the greater the penetration of the pack of plates 153 between the plates 152, the more likely it is for the threshold switch 129 to respond by completing the circuit for the lamp 43. This lamp is visible in the viewfinder of the camera

by way of a mirror 107. The threshold switch 129 may be provided with a manual adjustment knob 130 to enable the voltage at which it responds to be altered, as has already been described with reference to Figures 7 and 9. The degree of control resolution may be adjusted by rotating the knobs 150, 151 relative to one another. This has the effect of limiting the length of the curved slot 134 along which the pin 135 can be moved. The extent of movement of the pin 135 in a radial direction with respect to the shaft of the disc 147 can thus be altered.

Figure 12 shows a further way of detecting vibrations of the camera. A piezo electric strip 56 is held at one end in a chuck and holds a weight 57 at its other end. Changes in the movement of the camera vibrates the piezo electric strip to provide an electrical output signal which is independent of the position of the camera to the horizontal line and depends only on acceleration or deceleration of the camera movement. The electrical output signal of the strip 56 is passed to an integrator 58 providing an output to a comparator 59 which also receives from a transducer 60 an electrical signal indicative of the focal length setting of the optical system. The comparator evaluates the two signals and controls with its output an immobilising circuit shown by the block 131 if the conditions are such that there is danger of blurring occurring. An electrical source 38 is also shown in Figure 12.

WHAT WE CLAIM IS:—

1. A camera having an optical system of which the focal length is changeable, and means sensitive to the prevailing focal length for generating a warning indication when the focal length exceeds a value at which blurring is likely to occur if the camera is hand held.
2. A camera as claimed in Claim 1, in which the warning indication takes the form of a marker visible in the camera viewfinder.
3. A camera as claimed in Claim 2, in which the marker comprises a light visible in the viewfinder.
4. A camera as claimed in Claim 1, Claim 2 or Claim 3, comprising a snapshot camera.
5. A camera as claimed in Claim 4, having a socket for a flash attachment and a device for removing the visible marker from the viewfinder when a flash attachment is fitted to the socket.
6. A camera as claimed in any one of the preceding claims, having a timing unit and a device for rendering the means for generating a warning indication ineffective to prevent camera operation if the timing unit is operated.
7. A camera as claimed in any one of the preceding claims, having interchangeable

the threshold value set, the switching arrangement 144 is automatically switched into a position at which the focal length is reduced by the motor 104 running in the appropriate direction.

Figures 10 and 11 show another arrangement for avoiding the use of the electrical contact necessary in Figure 8. In Figure 10 a cam 132 for controlling the range setting of the optical system is provided with a segment shaped aperture 145. On one side the cam 132 is provided with a friction facing 146 which is sandwiched between the cam and a disc 147 which is pressed by a spring 148 against the friction facing 146. The other end of the spring 148 abuts a wall 149 of the camera and it surrounds a pair of concentric shafts which pass through the wall 149 and carry, respectively, a knob 150 for adjusting the focal length and a second knob 151 for rotating the disc 147.

A curved slot 134, clearly shown in Figure 10, is provided in the disc 147 and the pin also extends through a radial slot 136 formed in a frame member of the camera clearly shown in Figure 11. At its end the pin 135 carries a pack of spaced parallel condenser plates 152 which are interleaved with a second pack of parallel condenser plates 153 carried at one end of a lever 111 pivoted at 110. The lever carries a weight at its other end and it is held in position by opposed balancing springs 114.

As the disc 147 is frictionally held by the ranging cam 132 it rotates with it when the knob 150 is changed for altering the focal length of the camera. However, the knob 151 may also be rotated to vary the radial position of the pin 135 and thus the extent of penetration of the two packs of plates 152, 153 into one another. As the disc 147 normally rotates with the plate 132, the capacity of the condenser formed by the two packs of plates depends not only on the angular position of the plate 132 but also on the amplitude of oscillating movement of the lever 111 if the camera is moved.

The electrical capacity of the condenser controls the response frequency of an oscillator 154 connected on its input side to the fulcrum 110 of the lever 111. A transformer 155 couples the output of the oscillator 154 to a threshold switch 129 which, if its threshold input voltage is exceeded, responds by completing a circuit to a lamp 43. The other terminal of the lamp is connected through a battery 42 to an electrode 137 which wipes against the disc 147 and thus completes the electrical circuit to the pin 135. In practice, the greater the penetration of the pack of plates 153 between the plates 152, the more likely it is for the threshold switch 129 to respond by completing the circuit for the lamp 43. This lamp is visible in the viewfinder of the camera

by way of a mirror 107. The threshold switch 129 may be provided with a manual adjustment knob 130 to enable the voltage at which it responds to be altered, as has already been described with reference to Figures 7 and 9. The degree of control resolution may be adjusted by rotating the knobs 150, 151 relative to one another. This has the effect of limiting the length of the curved slot 134 along which the pin 135 can be moved. The extent of movement of the pin 135 in a radial direction with respect to the shaft of the disc 147 can thus be altered.

Figure 12 shows a further way of detecting vibrations of the camera. A piezo electric strip 56 is held at one end in a chuck and holds a weight 57 at its other end. Changes in the movement of the camera vibrates the piezo electric strip to provide an electrical output signal which is independent of the position of the camera to the horizontal line and depends only on acceleration or deceleration of the camera movement. The electrical output signal of the strip 56 is passed to an integrator 58 providing an output to a comparator 59 which also receives from a transducer 60 an electrical signal indicative of the focal length setting of the optical system. The comparator evaluates the two signals and controls with its output an immobilising circuit shown by the block 131 if the conditions are such that there is danger of blurring occurring. An electrical source 38 is also shown in Figure 12.

WHAT WE CLAIM IS:—

1. A camera having an optical system of which the focal length is changeable, and means sensitive to the prevailing focal length for generating a warning indication when the focal length exceeds a value at which blurring is likely to occur if the camera is hand held.

2. A camera as claimed in Claim 1, in which the warning indication takes the form of a marker visible in the camera viewfinder.

3. A camera as claimed in Claim 2, in which the marker comprises a light visible in the viewfinder.

4. A camera as claimed in Claim 1, Claim 2 or Claim 3, comprising a snapshot camera.

5. A camera as claimed in Claim 4, having a socket for a flash attachment and a device for removing the visible marker from the viewfinder when a flash attachment is fitted to the socket.

6. A camera as claimed in any one of the preceding claims, having a timing unit and a device for rendering the means for generating a warning indication ineffective to prevent camera operation if the timing unit is operated.

7. A camera as claimed in any one of the preceding claims, having interchangeable



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lens fixtures to allow the focal length to be changed, and wherein the means sensitive to the prevailing focal length is a device responsive to the fitting of a fixture giving a focal length less than said value to render the means for generating a warning indication ineffectual in preventing camera operation.

8. A camera as claimed in any one of the preceding claims, including a tripod socket and a device for rendering the means for generating a warning indication ineffectual in preventing camera operation if a tripod is fitted to the tripod socket.

9. A camera as claimed in any one of the preceding claims, including a socket for a cable release and a device responsive to the fitting of a cable release to render the means for generating a warning indication ineffectual in preventing camera operation.

10. A camera as claimed in any one of the preceding claims, including a shutter speed control and a device for rendering the means for generating a warning indication ineffectual if the shutter speed is raised above a preset value.

11. A camera as claimed in any one of the preceding claims, in which the means for generating a warning indication comprises an electrical circuit.

12. A camera as claimed in any one of the preceding claims, in which the means for generating a warning indication is effective to prevent camera operation and an overriding device is provided which, when operated, renders the latter means ineffectual so that the camera can still be operated.

13. A camera as claimed in any one of the preceding claims, in which the means for generating a warning indication is an electrical circuit which responds to the selection of a focal length greater than said value by making a marker visible to the user and by de-energizing a shutter drive motor, the circuit including a battery across which are connected two parallel switching circuits the first of which energizes the marker and the second of which energizes the motor and contains a shutter release switch, the switching circuits containing ganged electrical switches operated in reverse senses by a focal length adjustor passing through said value the ganged switch in the second circuit being opened when said value of focal length is exceeded and being shunted by an override circuit containing a manually closable but normally open switch to allow the motor to be energized despite the ganged switches being in their "warning" positions.

14. A camera as claimed in any one of the preceding claims, in which the means for generating a warning indication responds to a vibration sensing unit as well as to the focal length setting.

15. A camera as claimed in Claim 14, in

which the vibration sensing unit comprises a trembler lever carrying cores which move to vary the inductance of a balanced electrical coil system and an electrical circuit evaluates the output of the coil system together with an electrical output provided by a variable resistance which alters with focal length, and triggers a warning indication if the outputs are such as there is likelihood of blurring occurring if the camera is operated.

16. A camera as claimed in Claim 15, in which two trembler levers are similarly arranged but rotate about mutually perpendicular axes to respond to vibration in the horizontal and vertical planes, respectively.

17. A camera as claimed in Claim 14, Claim 15 or Claim 16, in which the means for generating a warning indication is operated in response to an output of an evaluating and comparing circuit which receives electrical inputs representative of the focal length setting of the optical system; a depth of field setting device; the vibration sensing unit; and a diaphragm setting.

18. A camera as claimed in Claim 14, in which a trembler lever is located in the path of fringe rays through the optical system and its image, which responds to focal length adjustment, is partially incident on a photoelectric transducer which is so arranged that vibration of the trembler lever varies the illumination of the transducer and thus its electrical output.

19. A camera as claimed in Claim 18, in which the trembler has a cut-out which tapers in the direction of its vibration.

20. A camera as claimed in Claim 18 or Claim 19, in which the transducer output is fed to a variable threshold switch whose output, when the threshold is exceeded, opens a shutter-motor energization circuit.

21. A camera as claimed in Claim 14, in which a trembler lever is movable against a displaceable stop whose position, in relation to the lever, is controlled by the focal length setting of the optical system, the stop and lever forming part of an electrical circuit providing the warning arrangement.

22. A camera as claimed in Claim 21, in which two stops are provided respectively on opposite sides of the lever and they are each positionally controlled by the respective positions of two slots through which the pin passes, one of the slots being provided on a plate and the other on a cam plate the profile of which controls the focal length setting of the camera.

23. A camera as claimed in Claim 14, in which a trembler lever of the vibration sensing unit carries a windowed diaphragm which is movable across an optical path containing a graded wedge attenuator and which extends between a light source and a photoelectric transducer arranged to provide an output of variable magnitude and



which controls operation of the means for generating a warning indication.

24. A camera as claimed in Claim 23, in which a focal length adjustment motor controls the position of the graded wedge attenuator in unison with the focal length adjustment, and the output of the transducer is used to prevent the motor changing the focal length of the optical system beyond the value at which likely blurring is on the point of commencing.

25. A camera as claimed in Claim 14, in which a moving plate condenser is provided between plates mounted on a displaceable stop and a trembler lever, respectively, and the electrical capacity of the condenser controls an oscillatory circuit arranged to provide an output to operate a warning device of the electrical capacity changes through a predetermined value.

26. A camera as claimed in Claim 25, in which the displaceable stop is moved by relative motion occurring between two crossing slots one of which is provided on a fixed plate and the other of which is pro-

vided on a plate which is frictionally coupled to a cam controlling focal length and is manually displaceable with respect thereto to vary the focal length setting at which the warning circuit is energized.

27. A camera as claimed in Claim 14, in which the vibration sensing unit comprises a piezo-electric strip weighted at one end and held at the other so that vibration of the strip provides an electrical output from the unit.

28. A camera as claimed in any one of Claims 1 to 3, constructed as a cine camera.

29. A camera as claimed in Claim 1 in which the warning arrangement is substantially as described with reference to any one of the embodiments or modifications thereof, illustrated in the accompanying drawings.

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

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