

FILM TRANSPORTING DEVICE AND A CONTROL METHOD THEREOF
ACCORDING TO A SHUTTER OPERATION STATE

FIELD OF THE INVENTION

The present invention relates to a film transporting device and a control method thereof according to a shutter operation state and, more particularly, to a film transporting device and a control method thereof that does not transport film if a shutter does not open even after a shutter release button was pressed due to a mechanical malfunction, foreign materials, or other external causes.

BACKGROUND OF THE INVENTION

A lens shutter is a metallic or plastic device in the shape of a diaphragm which is located in a lens barrel and performs an open/close operation to control the exposure time of a frame of film.

There are generally two types of lens shutters. A between-the-lens shutter has a shutter blade located behind a diaphragm that is positioned in the center of a lens. A camera using a between-the-lens shutter has difficulty in changing lenses. Thus, a behind-the-lens shutter has been proposed. This type of shutter has a shutter blade located on a camera body and a lens is attached in front of the shutter blade.

Another type of lens shutter includes a front shutter that places a shutter blade in front of the lens, such as a thornton shutter.

A conventional camera using any of the above-mentioned shutter systems sets an exposure time first, according to object data such as a distance to the object and the brightness of the object. Then, the camera operates the lens shutter according to the set exposure time and takes a photograph of the object.

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The conventional camera, however, assumes that a photograph has been taken if the set exposure time has passed after a controller has output a signal to operate the shutter. Thus, a film frame is transported without confirming the actual operation of the shutter.

Consequently, even when the shutter was not open after it received an open signal generated from the controller due to a mechanical malfunction of the shutter, a short circuit, or foreign materials, the camera transports another frame of film and misleads the user to believe that a photograph was taken. Thus, the user continues photographing without noticing any malfunctions. This causes an unnecessary waste of film, and the expected photographs are not available since the user may not notice the problem until the film is developed.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a film transporting device and a control method thereof that does not transport a film according to a shutter operation state and prevents film waste if the shutter does not operate upon photographing due to a mechanical malfunction, a short circuit, or foreign materials, in order to substantially obviate one or more of the problems due to limitations and disadvantages of the prior art.

It is another object of the present invention to provide a film transporting device and a control method thereof that enables a user to easily notice the shutter operation status and take appropriate actions by informing the user that the shutter did not operate properly.

To achieve the objects and in accordance with the purpose of the invention, as embodied and broadly described herein, the film transporting of the present invention includes

a shutter operation sensor for sensing a shutter operation state,

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a controller for outputting a signal to operate a shutter, for determining whether the shutter did operate according to a signal generated from the shutter operation sensor, and for outputting a corresponding control signal to inhibit a film transport operation if the shutter did not operate properly, and
a film transport unit that transports a film in response to the film transport signal generated from the controller.

The invention also provides a method for controlling a film transport operation according to a shutter operation state. The method includes the steps of
outputting a signal to operate a shutter;
determining whether the shutter operated properly, and
transporting film only if the shutter operated properly.

BRIEF DESCRIPTION OF THE DRAWINGS

The above objects and features of the present invention will be apparent from the following description of the preferred embodiment with reference to the accompanying drawings:

Fig. 1 is a block diagram of a camera having a film transporting device according to a shutter operation state in accordance with an embodiment of the present invention;

Fig. 2 is a flow chart illustrating a method of controlling a film transport operation according to a shutter operation state in accordance with the embodiment of the present invention;

Fig. 3 is an operation timing chart of a shutter according to a shutter operation state in accordance with the embodiment of the present invention; Fig. 4 is a cross-sectional view illustrating a shutter operation sensor mounted in accordance with the embodiment of the present invention; and

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Fig. 5 represents an operational state of a shutter operation sensor in accordance with the embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention will be described in detail with reference to the accompanying drawings.

As shown in Fig. 1, a camera having a film transporting device according to a shutter operation state in accordance with an embodiment of the present invention includes

a brightness measuring unit 10 for measuring the brightness of an object,
a distance measuring unit 20 for measuring the distance to the object,
a shutter operation sensor 30 for sensing a shutter operation state,
a release switch SW1,
a controller 40, connected to the brightness measuring unit 10, the distance measuring unit 20, the shutter operation sensor 30 and an output terminal of the release switch SW1, for outputting a film transport signal according to the shutter operation state,
a film transport unit 50, connected to an output terminal of the controller 40, for transporting a film frame responsive to the film transport signal,
an information display unit 60, connected to an output terminal of the controller 40, for displaying the shutter operation state in response to a control signal, and
a shutter driving unit 70, connected to an output terminal of the controller 40, for driving a shutter in response to a control signal.

As shown in Fig. 4, the shutter operation sensor 30 is composed of a photo reflector located in a shutter unit. The emitting part 31 of the photo reflector emits light. According to a shutter operation state, the emitted light is received or not



received by the receiving part 33 of the photo reflector. The shutter operation sensor may instead be composed of a switch or any other equivalent element(s).

The operation of the present film transporting device will now be described. One embodiment of the present invention prevents waste of film by not transporting film when a lens shutter does not operate due to a mechanical malfunction.

When a user presses a shutter button after setting an object to photograph, the release switch SW 1 operates at a first state and outputs an electronic signal to the controller 40.

When the release switch SW 1 operates at the first state, the controller 40 directs the brightness measuring unit 10 to measure the brightness of the object, and directs the distance measuring unit 20 to measure the distance to the object (Steps 110 to 120 of Fig. 2).

The controller computes an exposure time enabling a correct exposure of photograph according to the brightness of the object, the distance to the object and the speed of the film (Step 130).

The exposure time is a period of time during which the shutter is open. If the shutter opens longer than the correct exposure time, the picture is over-exposed. If the shutter opens shorter than the correct exposure time, the picture is under-exposed.

After the exposure time has been computed according to the collected data and the release switch SW1 operates at a second state, the controller 40 outputs a control signal to the shutter driving unit 70 (Steps 140 to 150).

After outputting the control signal to operate the shutter, the controller 40 determines whether the shutter opened or not, according to a signal generated from the shutter operation sensor 30.

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If the shutter operates properly, the shutter sector moves from an initial position A to an opening position B, as shown in Fig. 4, when the shutter driving unit 70 operates in response to the signal generated from the controller 40.

When the shutter sector is in the initial position A, the light emitted by the emitting part 31 of the shutter operation sensor 30 is not received by the receiving part 33 of the shutter operation sensor 30 as the light is absorbed by a projecting part 18 of the shutter blade. When the shutter sector moves from the initial position A to the opening position B, as shown in Fig. 5, the light emitted by the emitting part 31 is received by the receiving part 33 by being reflected by the reflecting plate 9.

As described above, the emitted light is received or not received by the shutter operation sensor 30 by means of a projecting part 18 of the shutter blade according to the movement of the blade, so that the shutter operation sensor 30 outputs a corresponding electronic signal to the controller 40.

When the computed exposure time has passed after the shutter has moved to the opening position B, the shutter returns to the initial position A. At this time, the shutter operation sensor 30 again outputs an electronic signal to the controller 40 according to whether the light is reflected by the shutter blade.

If a signal generated by the operation of the shutter is not output or if a signal is output only at the beginning of the shutter opening, the controller 40 determines that the photograph has not been taken due to malfunction of the shutter, and does not perform the film transport operation (Steps 160 ~170).

In other words, the controller does not output a film transport signal to the film transport unit 50.

Then, the controller 40 outputs a control signal to the information display unit 60 to inform the user that the photograph was not taken due to a malfunction of the shutter.

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The information display unit 60 displays the current state that the photograph was not taken due to a shutter malfunction in response to the control signal generated from the controller 40 (Step 180).

Accordingly, the user can easily notice that the photograph was not taken due to a shutter malfunction by seeing the information display and can take appropriate action.

As shown in Fig. 3, if a signal is output from the shutter operation sensor 30 both at the initial opening time and at the completion time, it is determined that the shutter operated normally and a photograph was taken. Therefore, a film frame, which is photographed, is transported by means of the film transport unit 50.

As described above, the present invention prevents waste of film by inhibiting transport of film if the shutter does not operate upon photographing.

In addition, if the shutter fails to operate properly, the shutter operation state is displayed and the user is easily informed of the shutter operation state such that appropriate action may be taken immediately.

Accordingly, the film transporting device and the control method thereof according to the shutter operation state can be provided and adjusted to all cameras using other types of shutters including a lens shutter.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only, with a true scope and spirit of the invention being indicated by the following claims.

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WHAT IS CLAIMED IS:

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1. A film transporting device comprising:
 - a shutter operation sensor for sensing a shutter operation state;
 - a controller for outputting a signal to operate a shutter, for determining whether the shutter operates according to a signal generated from the shutter operation sensor, and for outputting a control signal to transport a film only when the shutter operated properly; and
 - a film transport unit for transporting a film in response to said control signal .
2. The device of claim 1, further comprising an information display unit for displaying a shutter operation state, the information display unit being operated when the shutter fails to operate and informing a user of a current shutter operation status.
3. The device of claim 1, wherein the shutter operation sensor outputs a signal when the shutter is moved from an initial position to an opening position and a signal when the shutter is moved from the opening position to the initial position, if the shutter has operated properly.
4. The device of claim 3, wherein the controller, after having output said signal to operate said shutter, determines that a shutter did not operate when a signal is not output from the shutter operation sensor or when a signal is output from the shutter operation sensor once, and determines that the shutter has operated properly when a signal is output from the shutter operation sensor twice.
5. A method of transporting film according to a shutter operation state comprising the steps of:



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outputting a signal to operate a shutter;
determining whether the shutter has operated; and
transporting a film only when the shutter operated properly.

6. The method of claim 5, further comprising the step of displaying
information indicating
that a photograph was not taken due to a malfunction of the shutter if the shutter did
not operate properly.

7. The method of claim 5, wherein the step of determining whether the
shutter operates properly includes the steps of:

determining that a shutter did not operate when a signal is not output from the
shutter operation sensor or when a signal is output from the shutter operation sensor
once; and

determining that the shutter has operated properly when a signal is output
from the shutter operation sensor twice.



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