Patent number JP1589189 “Imaging device”

[Claims]

(1) An imaging device including an imaging means for optically forming an image from light from a subject and an imaging means for converting the optical image obtained by the imaging means into electrical information or physicochemical information and outputting or recording it as a photographed image, characterized in that the imaging device is equipped with a vibration detection means for detecting vibration of the imaging device and outputting a vibration detection signal, an image vibration suppression signal generating means for receiving the vibration detection signal and outputting an image vibration suppression signal, and an image vibration suppression means configured to receive the image vibration control signal and suppress vibration of the photographed image caused by vibration of the imaging device.

(2) The vibration detection means mechanically vibrates a detection unit at a vibration detection vibration frequency and detects the Coriolis force generated based on this vibration and the rotational motion of the vibration detection means relative to the absolute coordinate system, and (3) the vibration type angular velocity sensor has a plurality of sensor units arranged so that their detection rotation axes are approximately perpendicular to each other.

(4) The photographing device according to claim 3, characterized in that the plurality of sensor units have vibration detection vibration frequencies at least 2f apart when the average detection frequency bandwidth of each vibration detection signal is r.

(5) The photographing device according to claim 3, characterized in that the plurality of sensors have the same vibration detection vibration frequency so that each vibration detection photographing is synchronized.

(6) The photographing device according to claim 1, characterized in that the photographing device has a photographed image display unit that optically or electrically obtains an image corresponding to the photographed image obtained thereby, and has a control display circuit within this photographed image display unit or within the field of view of a finder including this photographed image display unit that displays information detected by the vibration detection means or the angle between the housing of the photographing device and the photographing direction.

(7) The photographing device according to claim 1, characterized in that the image vibration suppression signal generating means has a low-pass filter inside it or between it and the vibration detection means, and does not output the image vibration suppression signal for the low-pass components of the low-pass signal.

(8) The imaging device according to claim 7, characterized in that the low-pass cut filter is configured to pass a wide-band vibration detection signal having a frequency band of at least I Hz or more, and can be set to not pass a low-band vibration detection signal having a frequency band of at least 0.011 Iz or less.

(9) The imaging device according to claim 1, characterized in that the image vibration control signal generating means has a low-pass cut filter and is configured to reduce a fluctuation error signal included in the vibration detection signal output from the vibration detection means.

(10) The photographing device according to claim 1, characterized in that the image shaking control means has a certain suppression control range and is configured to return with a predetermined time constant toward approximately the center of the suppression control range when there is no image shaking 7cT"l='l signal.

(11) The photographing device according to claim 1, characterized in that the photographing device has a housing, and the housing has at least two stages of a bush-type or slide-type operation switch on the external surface, and by moving the switch one stage, the image shaking suppression signal generating means is activated, and by moving the switch another stage, recording is started on the recorder connected to the photographing device.

(12) The image shaking suppression signal generating means has a constant angular velocity drive circuit, and the constant angular velocity drive circuit is configured to drive a coordinate system of a pair of coordinates. The imaging device according to claim 1, characterized in that the image shake suppression means is configured to control the imaging direction to change at a substantially constant angular velocity relative to the imaging system.

(13) The constant angular velocity drive circuit, when it starts to operate, changes the characteristics of the low-pass filter provided in the image shake suppression signal generating means to a lower cutoff frequency or changes it so as to bypass the low-pass filter, thereby starting rotation of the imaging direction and gradually bringing the rotational angular velocity of the imaging direction relative to the absolute coordinate system closer to rotation at a constant angular velocity, and then rotating at a constant angular velocity, decelerating the angular velocity

of the constant angular velocity motion and gradually returning to a stopped state, gradually returning the characteristics of the low-pass filter to the original characteristics. An imaging device as described above.

(14) An imaging device as described in claim 12, characterized in that the constant angular velocity drive circuit is configured so that the set constant angular velocity is changed according to the zoom ratio of the imaging means.

(15) An imaging device as described in claim 12, characterized in that the constant angular velocity drive circuit performs constant constant angular velocity drive only when the angle between the shooting direction and the direction of the imaging device is within a certain range.

(16) The imaging device has a photographed image display unit that optically or electrically obtains an image corresponding to the photographed image obtained thereby, and has a control display circuit within this photographed image display unit or within the field of a finder including this photographed image display unit that displays a control amount according to the angle between the housing of the imaging device and the shooting direction, and further the constant angular velocity drive circuit is The photographing device according to claim 12, characterized in that a constant constant angular velocity drive is performed only when the control amount is within a certain range.

(17) The photographing device according to claim 1, characterized in that the image shaking suppression means has a reflecting section that is rotatable in two axial directions and is provided inside the imaging means or on the incident light side of the imaging means, and the reflecting section is rotated in two axial directions in response to an image shaking suppression signal.

(1B) The photographing device according to claim 17, characterized in that the reflecting section has a detection rotation axis that rotates in conjunction with its pitch rotation axis at a transmission ratio of 2:1 and has a shaking detection section, and this detection rotation axis is controlled by the image shaking suppression generation means so as to always maintain a constant angle with respect to the absolute coordinate system.

<19> The reflecting section has a pitch rotation axis that rotates The photographing device according to claim 17, characterized in that the driving unit driven by an image shake suppression signal generating circuit is directly connected to the connecting rotation shaft, which is connected to a connecting rotation shaft that rotates in the opposite direction by a rotation transmission means, and the inertia moment of the driving unit and the inertia moment of the pitch rotation shaft and the rotation transmission ratio of the rotation transmission means of both are selected so that, for a swing of an angle of 0 with respect to the absolute coordinate system of the photographing device, the rotation force based on the inertia moment of the pitch rotation shaft and the rotation force based on the inertia moment of the connecting rotation shaft cancel each

other out, and the rotation angle of the pitch rotation shaft with respect to the absolute coordinate system is 0/2.

(20) The inertia ratio of the inertia of the pitch rotation shaft to the inertia of the connecting rotation shaft is m, The photographing device according to claim 19, characterized in that, when n is m2/(2m+l), n is approximately n=m2/(2m+l).

(21) The photographing device according to claim 1, characterized in that the imaging means is coupled to the imaging means, and is controlled in accordance with information from the swing detection means, independently of the fixed part including the housing of the photographing device, with the approximate center of gravity of the movable part including the imaging means as the control rotation axis. (22) The photographing device according to claim 21, characterized in that the movable part including the imaging means has a balancer, and the balancer is mechanically controlled to move in a direction to balance with respect to the control rotation axis in accordance with the movement of the optical parts accompanying focus adjustment or zooming, or is electrically-mechanically controlled by a center of gravity correction circuit.

(23) Balancer The imaging device of claim 22, characterized in that the movable section including the imaging means is controlled to move approximately on the central axis of the center of gravity of the movable section including the imaging means.

(24) The imaging device of claim 1, characterized in that the image shaking suppression signal generation means has a fluctuation error correction means including a pendulum in the pitch direction or roll direction to correct a fluctuation error signal included in a swing detection signal output from the swing detection means due to swing in the pitch direction or roll direction of the imaging device.

(25) The imaging device of claim 1, characterized in that the swing detection means has a geomagnetic sensor for correcting a fluctuation error signal included in the swing detection signal output by the swing detection means.

(26) The image shaking suppression signal generation means is a means for correcting a fluctuation error signal output from the swing detection means. The photographing device according to claim 1, characterized in that it has a geomagnetic sensor for correcting the difference signal.

(27) The photographing device according to claim 1, characterized in that the image shake suppression means is controlled by the image shake control signal generating means in accordance with the zoom ratio of the imaging section.

(28) The photographing device according to claim 1, characterized in that the imaging means is mechanically controlled to move in the horizontal or vertical direction in response to the shake detection signal output by the shake detection means.

(29) The photographing device according to claim 28, characterized in that when the shake angle of the photographing device obtained by the shake detection means is 0 and the focal length obtained by the zoom detection section of the imaging system is f, the imaging means is controlled to move by approximately f x tano in response to the shake.

(30) The photographing device according to claim 1, characterized in that the imaging means is configured to charge-convert the optical image obtained by the imaging means, read the charged image information by the electrical reading means, and output an image electrical signal, and the electrical reading means is controlled by the image-shake suppression signal generating means in response to information from the vibration detection means.

(31) The photographing device according to claim 30, characterized in that the image-shake suppression signal generating means controls the electrical reading means in response to the zoom ratio of the imaging means.

(32) The photographing device according to claim 30, characterized in that the vibration angle of the photographing device obtained by the vibration detection means is □, the focal length of the imaging system is f7, and the electrical reading means is controlled by the image-shake suppression signal generating means so that the image on the optical imaging surface of the photographing means moves isometrically by approximately f x tan in response to the change in the vibration angle.

(33) The imaging device according to claim 1, characterized in that the imaging means includes an electron tube type imaging tube, and the horizontal or vertical deflection of the electron beam of the imaging tube is controlled by an image fluctuation suppression signal generating means so that the scanning range of the electron beam of the electron tube type imaging tube changes in response to the fluctuation detection signal of the fluctuation detection means.

(34) The imaging device according to claim 1, characterized in that the image fluctuation control signal generating means has a scanning range changing means for changing the scanning range of the electron beam by controlling the deflection of the electron beam, and the scanning range changing means is configured to perform the scanning range changing operation mainly during the vertical blanking period.

(35) The imaging device according to claim 33, characterized in that the image shaking control signal generating means has a horizontal scanning speed increasing means for increasing the

horizontal scanning speed by controlling the horizontal deflection of the electron beam during the vertical blanking period of the electron beam scanning, and also has a vertical scanning amplitude increasing means for increasing the vertical scanning amplitude by controlling the vertical deflection of the electron beam.

(36) The imaging device according to claim 1, characterized in that the imaging means has a charge transfer type solid-state imaging element having a vertical charge transfer section for transferring charges in the vertical direction and a horizontal charge transfer section for transferring charges in the horizontal direction, and the charge transfer of the vertical charge transfer section or the horizontal charge transfer section is controlled in response to a shaking detection signal of the shaking detection means.

(37) The imaging device according to claim 36, characterized in that the charge transfer of the vertical charge transfer section is performed mainly during the vertical blanking period in response to a detection signal of the shaking detection means.

(38) The photographing device according to claim 36 ia*, characterized in that the charge transfer in the horizontal direction is mainly controlled in response to the detection signal of the vibration detection means during the horizontal blanking period. (39) The charge transfer type solid-state imaging element is configured to be able to transfer the charges of all pixels of one frame or one field in one horizontal transfer direction in addition to one vertical transfer direction in response to an external control signal, and the charges of all pixels of one frame or one field are transferred in one horizontal direction mainly during the vertical blanking period by the image vibration suppression signal generating means in response to the vibration detection signal of the vibration detection means in the pitch direction or yaw direction.

(40) The photographing device according to claim 36, characterized in that the charge transfer type solid-state imaging element has a horizontal charge transfer section whose output section can be switched, and the output section of the horizontal charge transfer section is switched in response to the detection signal of the vibration detection means.

(41) The image pickup device according to claim 36, characterized in that the charge transfer type solid-state image pickup element has a matrix of pixels and is configured to transfer charges in both horizontal and vertical directions in response to an external control signal, and charges are transferred in both horizontal and vertical directions in response to a motion detection signal from the motion detection means.

(42) The image pickup device according to claim 41, characterized in that the charge transfer type solid-state image pickup element has two parts, a light receiving section and a storage section, and the horizontal and vertical charge transfer in response to a detection signal from the motion

detection means is mainly processed in the light receiving section, and charges are transferred from the light receiving section to the storage section in synchronization with vertical scanning.