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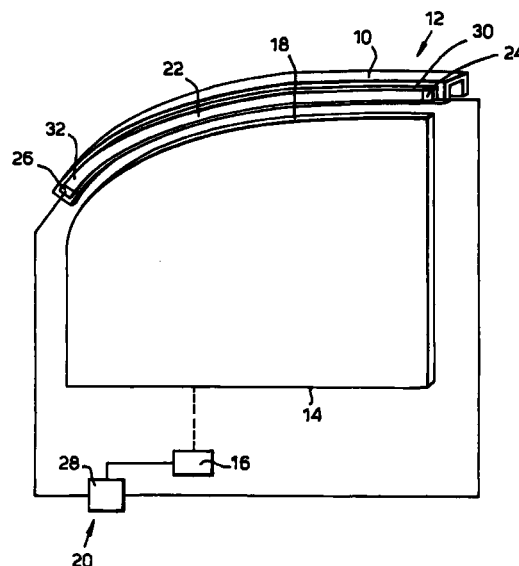
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(54) **Obstruction detection for a window**

(57) A system (20) for the detection of an obstruction in the path of a closing window (14) which is movable by an electric motor (16) and which has an edge (18) receivable in a portion (10) of a window frame (12) on closing of the window, the system comprising a dielectric waveguide (22) mountable on the portion of the window frame; a high frequency transmitter (24) connected to one end (30) of the waveguide for transmitting a high frequency signal into the waveguide to produce an evanescent field; a high frequency receiver (26) connected to the other end (32) of the waveguide for receiving the evanescent field; and a control unit (28) for monitoring the evanescent field received by the receiver, the control unit being connectable to the electric motor to control the operation of the motor dependent on the signal received by the receiver.

Fig.1.



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Description

Technical Field

[0001] The present invention relates to a system for an electrically operated window which can detect the presence of an obstruction in the path of the window during closing, and which can stop the window. The present invention has particular application for use with an electrically operated window in a motor vehicle.

Background of the Invention

[0002] Electrically operated windows, especially in motor vehicles, are well known. During closing of the window, there is a risk that an object, such as a person's hand, may become trapped between the window and the frame. A known obstruction detection system monitors the torque developed by the electric motor which drives the window, and, on detection of increased torque, assumes that an obstruction is preventing closing of the window. The system then stops the electric motor, and, in some cases, reverses the electric motor to open the window.

Summary of the Invention

[0003] It is an object of the present invention to provide an alternative system for obstruction detection for a closing window.

[0004] A system in accordance with the present invention for the detection of an obstruction in the path of a closing window which is movable by an electric motor and which has an edge receivable in a portion of a window frame on closing of the window, comprises a dielectric waveguide mountable on the portion of the window frame; a high frequency transmitter connected to one end of the waveguide for transmitting a high frequency signal into the waveguide to produce an evanescent field; a high frequency receiver connected to the other end of the waveguide for receiving the evanescent field; and a control unit for monitoring the evanescent field received by the receiver, the control unit being connectable to the electric motor to control the operation of the motor dependent on the signal received by the receiver.

[0005] The present invention also includes a method of detecting an obstruction in the path of a closing window.

Brief Description of the Drawings

[0006] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a window and upper frame having an obstruction detection sys-

tem in accordance with the present invention.

Description of the Preferred Embodiment

[0007] Referring to the drawing, the upper portion 10 of a window frame 12 is shown, along with a window 14 which is moved by an electric motor 16. In general, the upper portion 10 of the window frame 12 is substantially U-shaped in cross-section. The window 14 is mounted on a support system (not shown) and can be raised and lowered by the electric motor 16. In the fully closed position of the window 14, the upper edge 18 of the window is positioned inside the upper portion 10 of the window frame 12. Such an arrangement is well known (and has particular use in motor vehicles) to those skilled in the art, and will not be described in further detail.

[0008] The obstruction detection system 20 in accordance with the present invention comprises a dielectric waveguide 22, high frequency transmitter 24, a high frequency receiver 26, and a control unit 28. The waveguide 22 mounted on the upper portion 10 of the window frame 12. The transmitter 24 is positioned at one end 30 of the waveguide 22. The receiver 26 is positioned at the other end 32 of waveguide 22. The transmitter 24 and the receiver 26 are connected to the control unit 28, which is also connected to the electric motor 16.

[0009] At least during closing of the window 14 by the electric motor 16, the transmitter 24 transmits a high frequency signal along the waveguide 22, which produces a leaky or evanescent field, to the receiver 26. The control unit 28 monitors the receiver 26. If an obstruction is present between the upper edge 18 of the window 14 and the upper part 10 of the window frame 12, the evanescent field produced by the transmitter 24 is damped. If the receiver 26 indicates no damping of the evanescent field, then the control unit 28 notes that there is no obstruction between the upper edge 18 of the window 14 and the upper part 10 of the window frame 12 and allows the window to close. If, however, the receiver 26 indicates that the evanescent field has been damped, then the control unit 28 monitors that an obstruction is present, and stops operation of the electric motor 16 to prevent closing of the window 14. If required, in the latter case, the control unit 28 may cause the electric motor 16 to reverse to move the window 14 in an opening direction.

[0010] By high frequency signal is meant a signal in the range 2.45 to 25 GHz, and preferably in the range 22 to 25 GHz.

[0011] The present invention provides a low cost obstruction detection system which has the benefits of easier installation when compared to previously known systems which monitor electric motor torque.

Claims

1. A system (20) for the detection of an obstruction in the path of a closing window (14) which is movable by an electric motor (16) and which has an edge (18) receivable in a portion (10) of a window frame (12) on closing of the window, the system comprising a dielectric waveguide (22) mountable on the portion of the window frame; a high frequency transmitter (24) connected to one end (30) of the waveguide for transmitting a high frequency signal into the waveguide to produce an evanescent field; a high frequency receiver (26) connected to the other end (32) of the waveguide for receiving the evanescent field; and a control unit (28) for monitoring the evanescent field received by the receiver, the control unit being connectable to the electric motor to control the operation of the motor dependent on the signal received by the receiver.
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2. A system as claimed in Claim 1, wherein the transmitter (24) transmits the high frequency signal along the waveguide (22) only during closing of the window (14).
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3. A method of detecting an obstruction in the path of a closing window (14) comprising the steps of transmitting a high frequency signal along a waveguide (22) mountable on a portion (10) of a window frame (12) which receives an edge (18) of the window on closing of the window; monitoring the evanescent field produced by the waveguide due to the high frequency signal transmitted along the waveguide; and stopping the closing of the window when the monitored evanescent field is damped.
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4. A method as claimed in Claim 3, comprising the additional step of moving the window in an opening direction on monitoring damping of the evanescent field.
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Fig.1.

