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AN AUTOMATIC DOOR SYSTEM AND A
METHOD FOR DRIVING ASSOCIATED INSTRUMENTS
OF AN AUTOMATIC DOOR SYSTEM

This invention relates to a method for driving associated instruments of an automatic door system such as, for example, an air curtain, a chime, a cooling fan for a door drive motor contained in the automatic door, etc., which are disposed adjacent to the automatic door system.

Description of the Prior Art:

In an automatic door system, as shown in Fig. 1, a belt 4 is extended between and wound around a drive pulley 2 which is arranged within a transom at one end thereof so as to be driven by a door drive motor 1 and a driven pulley 3 which is also disposed within the transom at the other end thereof, and a door 5 is connected to the belt 4. In addition, an opening deceleration point sensor switch 6 and an opening end sensor switch 7 are disposed along the belt 4 on the opening side of the door 5, while a closing deceleration point sensor switch 8 and a closing end sensor switch 9 are arranged along the belt on the closing side thereof. Output signals of these respective sensor switches 6, 7, 8 and 9 and a human body sense signal R_1 issued from a human body sensor 10 are inputted to a controller 11, which serves to control opening and closing operations of the door 5 by applying a normal or reverse rotation control signal and a high-speed or low-speed drive

signal to the door drive motor 1.

On the other hand, an air curtain and/or a chime is mounted adjacent to the automatic door system, a cooling fan for the door drive motor is contained in the automatic door system. Thus, during the opening or closing operation of the door 5, the air curtain is allowed to operate, and the chime is made to ring, and further the door drive motor 1 is cooled by the cooling fan.

In order to realize the above-described operations of the associated elements, it is necessary to make a blower for the air curtain, the chime and a motor of the cooling fan for the door drive motor operate jointly with the opening or closing operation of the door 5, and for instance, it may be conceived that the above-referred various sensor switches 6, 7, 8 and 9 are disposed in drive circuits for the air curtain blower, the chime and the motor of the cooling fan for the door drive motor to directly conduct ON and OFF switch operation of the supply of driving electric power to these associated instruments. However, the above-referred respective sensor switches 6, 7, 8 and 9 are normally of low power type for conducting ON and OFF operation of a low voltage and/or a small current, and they are connected in a controller 11 which consists of a control circuit powered, for example, by a D.C. 12V voltage source. Accordingly, if these sensor switches are used for directly conducting ON and OFF switch operation of relatively high power as disposed in the drive circuits for the associated instruments which employ, for

instance, a commercial power line of A.C. 100V or 230V, the switch contacts of these switches would be burnt and destroyed.

Therefore, in the prior art, as shown in Fig. 1, a door closing end sensor switch 12 adapted for conducting ON and OFF switch operation of high power consisting of, for example, a lead switch or a limit switch was specially provided in addition to the low power sensor switches 6, 7, 8 and 9, and this door closing end sensor switch 12 was connected in the drive circuits for the above-mentioned associated instruments so that when the door 5 begins to open, the switch 12 may directly switch ON the drive circuits, i.e., the power supply circuits to drive the associated instruments such as the air curtain, the chime and the cooling fan for the door drive motor.

If provision is made such that the associated instruments may be driven through the specially provided door closing end sensor switch 12 as described above, then the door closing end sensor switch 12 must be additionally provided and wirings for that additional sensor switch must be made, resulting in rise of a manufacturing cost. Moreover, it is compelled to dispose the door closing end sensor switch 12 within a narrow transom or within a narrow engine case and to make wiring thereto, and the work therefor is troublesome.

It is therefore one object of the present invention to provide a novel methods for driving various instruments

associated with an automatic door system such as, for instance, an air curtain, a chime, a cooling fan for a door drive motor, etc., which is free from the above-described disadvantages in the prior art.

5 According to a first aspect of the present invention, there is provided a method for driving associated instruments of an automatic door system, in which the associated instruments are driven in synchronism with a door opening/closing operation by a control circuit for a door drive motor of the automatic
10 door.

 If, as is preferred, ON/OFF
switch operations of the associated instruments are driven as controlled by a control signal issued in the control circuit for the door drive motor, there is no need to provide a special
15 door closing end sensor switch of high power type, hence a manufacturing cost becomes cheap, a work for installation of the automatic door system becomes simple and easy, and moreover, the door and the associated instruments can be driven in a reliably synchronized relationship.

20 According to a second aspect of the present invention there is provided an automatic door system, comprising a control circuit for a door drive motor of said automatic door, the control circuit being adapted and arranged to control driving of associated instruments in synchronism with a door opening/closing operation.

25 The invention will be described by way of example with reference to the accompanying drawings, wherein like references refer to like parts unless the context requires otherwise and wherein:-

Fig. 1 shows a known automatic door system in the prior art in a block form;

Fig. 2 shows one preferred embodiment of the present invention in a block form; and

5 Fig. 3 is a flow chart for the control operation in a controller 11 in Fig. 2.

10 In Fig. 2, similarly to the known automatic door system shown in Fig. 1 and described above, a controller 11 controls a door drive motor 1 so as to drive or stop it, to change the direction of rotation of the door drive motor 1 whether a normal direction or a reverse direction, that is, whether an opening direction or a closing direction, and to select the rotational speed of the motor 1 whether a high speed or a low speed, in response to detection signals issued from
15 a opening deceleration point sensor switch 46, an opening end sensor switch 47, a closing deceleration point sensor switch 48, a closing end sensor switch 49 and a human body sensor switch 410. The mode of control for the door drive motor 1 will be apparent for those skilled in the art by reference to the flow chart in
20 Fig. 3.

25 In the automatic door system according to the present invention shown in Fig. 2, besides the above-described component elements, a relay 13 is included in the controller 11. Relay contacts 13a of that relay 13 are disposed in a drive circuit 15 of a blower 14 of an air curtain associated with the

automatic door so that when the relay 13 is actuated in the controller 11, the relay contacts 13a can connect the blower 14 to a power supply of A.C. 100V or 240V.

As will be seen from the flow chart in Fig. 3, this relay 13 is actuated when a high speed opening operation of the door drive motor 1 has commenced in response to a human body sense signal R_1 issued from the human body sensor 410, and is kept actuated even when the door drive motor 1 stops at the opening end. The relay 13 is released when the door drive motor 1 stops at the closing end after its closing operation. Since the relay contacts 13a can deal with relatively high power, they suffice to switch on and off the power supply of A.C. 100V for the blower 14, and the control circuit itself in the controller 11 would not be burnt or destroyed by the switching operation for the relatively high power.

Therefore, there is no need to provide an additional sensor switch for controlling the blower 14 of the air curtain and to make wirings for the additional switch, hence a manufacturing cost of the automatic door system becomes cheap,

installation work for the automatic door system becomes simple and easy, and moreover, the actuation of the blower 14 can be perfectly synchronized with the door opening/closing operation.

While a relay and relay contacts were employed in the above-described embodiment for isolating a low power control circuit in the controller 11 from a high power drive circuit for a blower of an air curtain, it should not be limited to only

a relay but any conventional isolating means such as a thyristor, a silicon-controlled chopper, a high-power transistor, etc. could be employed.

5 Since many apparently widely different embodiments of the present invention can be made without departing from the present invention, all matter contained in the above description and illustrated in the accompanying drawings shall be interpreted to be illustrative and not as a limitation to the scope of the invention.



CLAIMS:-

1. A method for driving associated instruments of an automatic door system, characterized in that said associated instruments are driven in synchronism with a door opening/closing operation by a control circuit for a door drive motor of said automatic door.
2. A method for driving associated instruments of an automatic door system as claimed in Claim 1, characterized in that said associated instruments are driven by said control circuit via isolating means.
3. A method for driving associated instruments of an automatic door system as claimed in Claim 2, characterized in that said isolating means is a relay whose actuating winding is connected to said control circuit, and whose relay contacts are rendered to control ON/OFF switch operation of a power supply of A.C. 100V or 240V for said associated instruments by a control signal issued in said control circuit.
4. An automatic door system, comprising a control circuit for a door drive motor of said automatic door, the control circuit being adapted and arranged to control driving of associated instruments in synchronism with a door opening/closing operation.
5. An automatic door system as claimed in Claim 4, characterized in that said associated instruments are arranged to be driven by said control circuit via isolating means.
6. An automatic door system as claimed in Claim 5, characterized in that said isolating means is a relay whose actuating winding is connected to said control circuit, and whose relay contacts are rendered to control



ON/OFF switch operation of a power supply of A.C. 100V or 240V for said associated instruments by a control signal issued in said control circuit.
