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(54) Condition monitoring system.

(57) A condition monitoring system for monitoring the condition of a two-position switch (SW), e.g. in a car or other vehicle, is arranged to provide selective drive signals to the switch and receive an input signal from the switch, the system responding to the received input signal (IN) to select which drive signal is applied to the switch so that little or no current is drawn from the system by the switch in either of its positions (A or B). Thus in the position shown, a low drive signal is applied to switch terminal (A) and a high drive signal is applied to terminal (B) and little or no current passes through the switch to its common terminal (C): however if the switch is changed to its other position a current passes through the switch from terminal (B) and a high input signal is applied at IN; in response to this the system charges the output drives to apply a high signal on terminal (A) and a low signal on terminal (B). In this manner little or no current is drawn by the switch in either of its positions, but at changeover a high input signal will flow until the monitoring system responds.

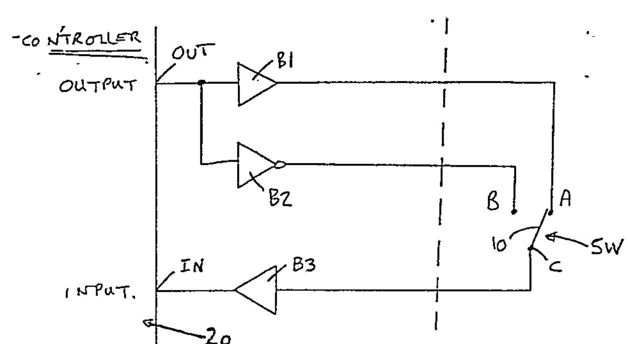

FIGURE 1

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Description

CONDITION MONITORING SYSTEM

This invention relates to a condition monitoring system and has particular reference, but not sole reference, to a system for monitoring the positions of switches in a car or other vehicle.

Hitherto known switch monitoring systems either drive a small current continuously through each switch being monitored, or drive a large current through the switch momentarily. In the systems which drive a small current continuously through each switch, the total current consumption over a period of time can be excessive and cause the vehicle battery to be discharged if the vehicle is left at rest for too many days. In the systems which drive a large current momentarily through each switch, the drive signal is of fixed duration and the monitoring unit has to respond immediately otherwise it will fail to read the condition of the switch.

We have now devised a conditon monitoring system which overcomes the drawbacks outlines above of the known systems.

In accordance with this invention there is provided a condition monitoring system, arranged to provide at least first and second output drives to a device to be monitored and to receive at least first and second input signals from the monitored device, said device having a plurality of states and the system being further arranged to respond to the received input signals to select which output drive signal is applied to the device so that little or no current is drawn from the monitoring system by the device when the device is in any of its said states.

In embodiments to be described herein, the device being monitored is a two-state or two-position switch. In each of its states the switch receives a low level output signal from the monitoring system so that it draws little or no current. When the switch changes position, it receives a high level output signal via the new contact which is made, but an input of the monitoring system responds to this in order to apply a low level signal to the newly made contact. This ensures that little or no current is drawn by the switch in its new position.

Typically the system may be used in a vehicle to monitor lock switches in a central door locking system, or door switches controlling courtesy lamps. The system minimises the consumption of current. An instant of where this is particularly important is in the case of vehicles fitted with a burglar alarm system having a back-up battery, because the battery would be drained quite quickly if all the switches were continually drawing current.

Embodiments of this invention will now be described by way of examples only and with reference to the accompanying drawings, in which:

FIGURE 1 is a circuit diagram of one form of condition monitoring system in accordance with this invention, based on a principle of input sensing;

FIGURE 2 is a flow diagram for use in explaining the operation of the condition monitoring system shown in Figure 1;

FIGURE 3 is a circuit diagram of a modified condition monitoring system in accordance with this invention, based on a principle of output sensing; and

FIGURE 4 is a flow diagram for use in explaining the operation of the condition monitoring system shown in Figure 3.

Referring to Figure 1 of the drawings, there is shown a system for monitoring the condition of a switch SW which in this case comprises a two-position or two-state switch having a contact 10 connected at one end to a common point C and movable so that it makes either with point A or point B. Where the system is employed in a vehicle, the switch SW may form a lock switch in a central door locking system or a door switch controlling a courtesy lamp. Typically the system will comprise a plurality of switches such as switch SW, each with its own set of the components shown which interconnect the switch SW with a central controller 20.

In the example shown in Figure 1, the controller 20 has an output OUT driving a buffer B1 the output of which is connected to the switch contact A. The controller output also drives an inverting buffer B2 having its output connected to the switch contact B. The common point C of the switch is connected through a buffer B3 to an input IN of the controller.

Referring to Figure 2, in operation the controller 20 senses at step 100 whether the input IN is active (i.e. receiving current). Normally the input IN will be inactive: thus whilst the switch SW is in position A normally the output OUT of the controller will be providing a low level signal so that no current will pass through buffer B2 and switch 10 (via contact A) and buffer B3 to the controller input. So if at step 100 the input is found to be inactive, the controller 20 simply repeats step 100.

When however the switch is changed from position A to position B, the high level signal on the output of the buffer B2 will cause current to flow through the switch (via contact B) and buffer B3 to the controller input. Step 110 will then check the status of the output OUT and, finding it inactive, the controller will sense at step 120 that the switch is now in position B. At step 125, the controller responds by driving the output OUT active i.e. to produce a high level signal. However, now that the switch is removed from contact A, no current flows from the output through buffer B2 and switch contact A. Further, the output of inverting buffer B2 is now at low level so that no current flows from this through the switch and back to the controller input. Accordingly, the input IN remains inactive and step 100 will be repeated again until the switch is changed back from position B to position A.

When eventually the switch is changed from position B to position A, step 100 will find that the input has become active, i.e. the high level which has been prevailing on the output OUT will now cause current to pass through buffer B1 and the switch (via contact A) and buffer B3 to the controller input IN.

Step 110 then checks and on finding that the output is in its active condition, the controller determines that the switch is now in position A (step 130). Consequently, step 135 drives the output OUT to its inactive state. In this condition, no current is available to flow through buffer B2 and the switch contact A back to the controller input.

Thus, in operation, normally there is little or no current flow from the controller output. However, upon a change in state of the switch SW, current will flow and will continue to flow long enough for the controller input IN to sense it and respond by changing the status of the output OUT. The change of status of the output OUT returns the system to its normal condition, in which there is no current drain on the controller by the switch.

The controller may comprise a hardware logic circuit or it may comprise a microprocessor, in either case having a low power mode which it normally adopts together with means for responding to the input IN to switch it to a high power mode for effecting the changeover action and then to return it to the low power mode immediately afterwards.

Referring to Figure 3, there is shown a modified monitoring system which responds to output sensing rather than input sensing of the central controller 20. The output OUT of the controller drives the switch contacts A and B through buffer B1 and inverting buffer B2 as in the system of Figure 1, but the common contact C of the switch is connected to ground. Also the contacts A and B are connected to respective inputs INA and INB of the controller through buffer B4 and B5.

In operation and referring to Figure 4, assume firstly that the switch is in position B. At step 200 the output is driven active. Current fails to flow through the switch (contact A being broken), so that step 210 indicates that INA is active. Under this condition step 210 is repeated. Eventually however when the switch is changed from position B to position A, current will pass through buffer B1 and the switch to bring the input of buffer B4 to low level. Step 210 now finds that INA is inactive and step 220 determines that the switch is now in position A. Accordingly step 230 responds by driving the output inactive. This prevents current from flowing through buffer B1 and the switch via contact A. Step 240 will now monitor input INB repetitively, finding it active (high level), because inverting buffer B2 provides a high level signal which is sensed via buffer B5.

Eventually when the switch is changed from position A to position B, step 240 will find that input INB has become inactive and step 250 determines that the switch is now in position B. Step 260 responds to drive the output OUT active. Now with the output at high level, the output of buffer B2 is low so no current is drawn through the switch and meanwhile the output of buffer B1 is high and the input INA registers as active. The controller now returns to the step 210, in effect monitoring for the next change in state of the switch SW.

In the monitoring system of Figure 1 and the modified system of Figure 3, all inputs are high impedance inputs and all outputs are push-pull drivers. The "output" and "inverted output" signals may be generated separately within the controller.

It will be appreciated that the systems which have been described minimise the consumption of current, particularly in the monitoring modes with the switch in either position betwene changeovers, yet will ensure that each change of switch is reliably read.

Claims

1) A condition monitoring system for monitoring the condition of a device which has a plurality of possible states, the system providing a drive to the device and receiving a signal from the device to indicate its state, characterised in that the system provides at least first and second output drives to the monitored device (SW) and receives at least first and second input signals from the device, and the system further responding to the received input signals to select which output drive signal is applied to the device so that little or no current is drawn from the monitoring system by the device when the device is in any of its said states.

2) A condition monitoring system as claimed in claim 1, characterised in that the monitored device (SW) comprises a switch having two positions and the first and second output drives are high and low signals to the respective switch position terminals (A,B) selectively.

3) A condition monitoring system as claimed in claim 2, characterised in that the first output drive is applied to a first or second of the two switch terminals (A,B), and the second output drive is applied to the other switch terminal in dependence upon whether a high or low signal passes through the switch to its common terminal (C).

4) A condition monitoring system as claimed in claim 3, characterised in that the first and second output signals are provided selectively from an output (OUT) which is connected to the first switch terminal (A) and through an inverting device (B2) to the second switch terminal (B), the common terminal (C) of the switch providing the first or second input signal (IN).

5) A condition monitoring system as claimed in claim 2, characterised in that the first output drive is applied to a first or second of the two switch positions terminals (A,B), and the second output drive is applied to the other switch terminal, in dependence upon whether a high or low signal is sensed at one or other of the two switch terminals.

6) A condition monitoring system as claimed in claim 5, characterised in that the first and second output signals are provided selectively from an output (OUT) which is connected to the first switch terminal (A) and through an inverting device (B2) to the second switch terminal (B), the terminals (A and B) of the switch providing the first or second input signals (INA, INB).

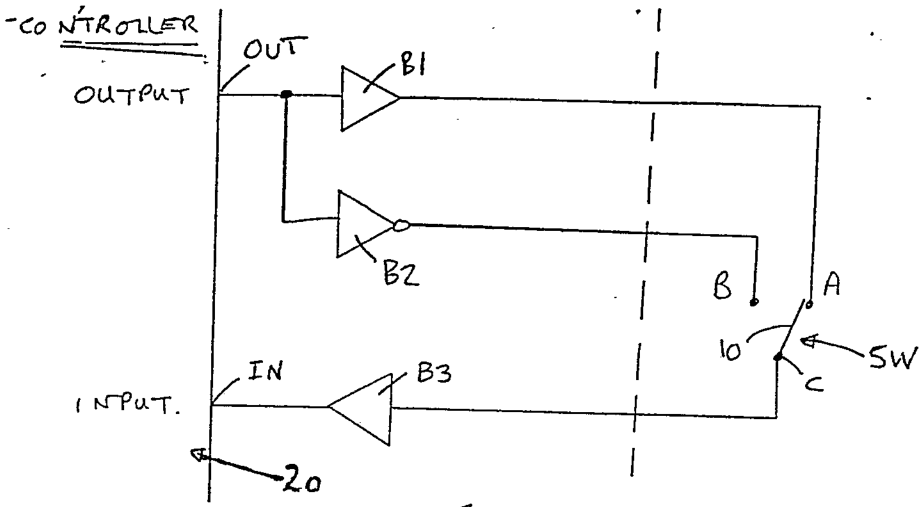

FIGURE 1

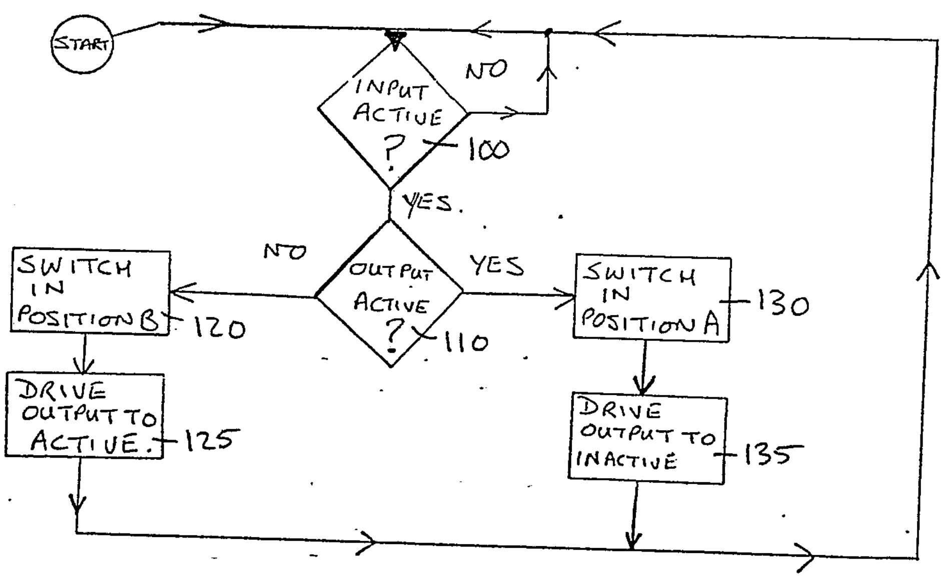

FIGURE 2

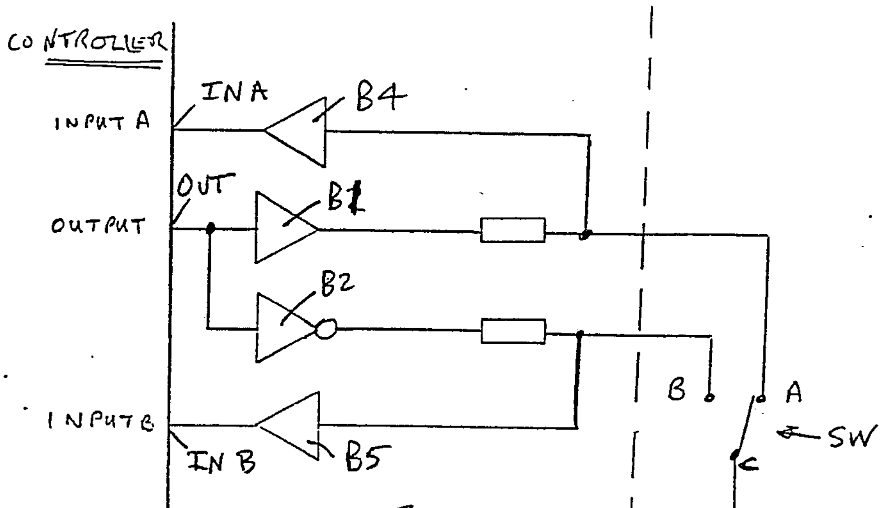

FIGURE 3

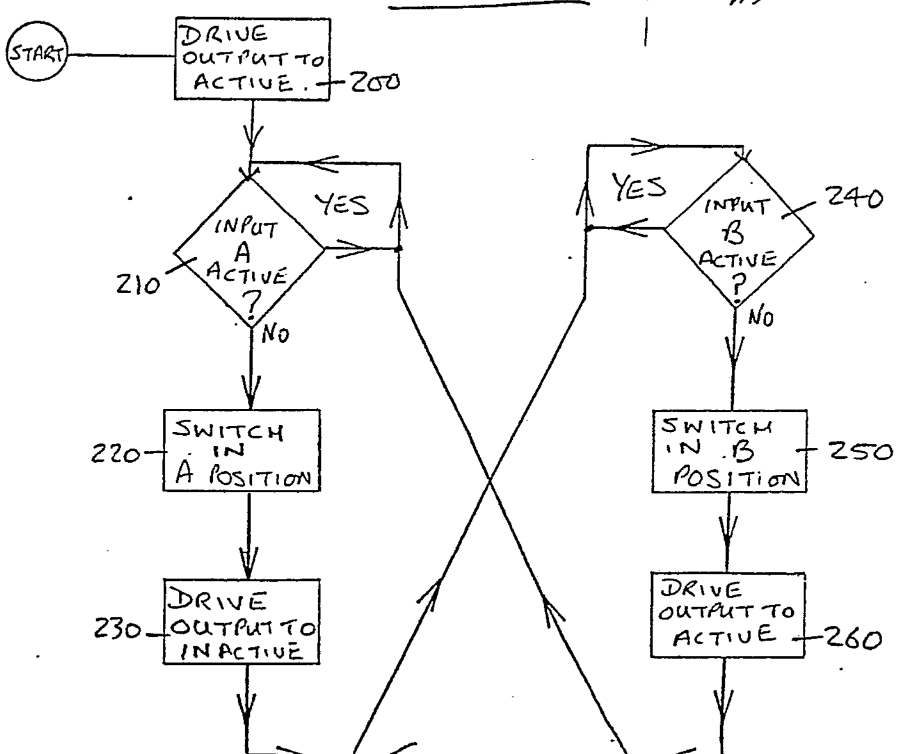

FIGURE 4

OUTPUT SENSING