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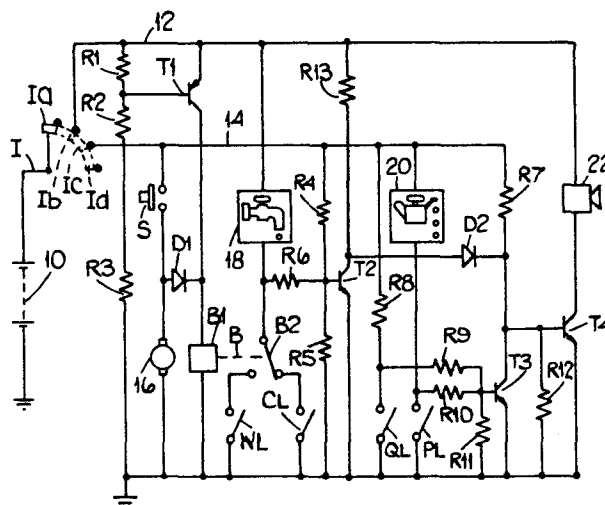
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54 **Motor vehicle fault indication system.**

57 The present invention relates to a motor vehicle fault indicating system and provides such a system including a display device (18) having a face marked with a legend and illuminated by a lamp. The lamp is normally controlled by a transducer (CL) which detects the level of fluid in the engine coolant reservoir, but, in certain circumstances, is controlled by another transducer (WL) which detects the level of fluid in the screen washer reservoir.



The present invention relates to a motor vehicle fault indication system having a display device which includes a face marked with a legend.

In a known type of motor vehicle fault indication system, each fault is indicated by an associated display device having a face marked with a suitable legend, such as a tap for a low level in an engine coolant reservoir, and a lamp for illuminating the face. However, as the number of faults which it is desired to indicate increases, it is becoming difficult to design a suitable legend for each individual fault.

According to the present invention there is provided a motor vehicle fault indication system including a display device comprising a face marked with a legend and a means for illuminating the face and at least two fault detecting transducers associated with the display device for controlling the illuminating means.

As a single display device is associated with at least two fault detecting transducers, it is only necessary to design a single legend for the faults monitored by these transducers.

Preferably, the illuminating means is normally controlled by one of the transducers, but in a predetermined circumstance or in predetermined circumstances controlled by the other transducer or transducers.

The present invention will now be described in more detail by way of example with reference to the accompanying drawings in which:-

Figure 1 is a circuit diagram of a motor vehicle fault indication system embodying the present invention, and

Figure 2 is a truth table of the operation of the system of Figure 1.

Referring now to Figure 1 there is shown a motor vehicle fault indication system which is installed in a motor vehicle. The motor vehicle includes a conventional internal combustion engine having a spark ignition system, and a water cooling system and associated coolant reservoir. The engine is lubricated by an oil lubrication system which is associated with an oil reservoir. The vehicle also includes a screen washer reservoir for providing a jet of water for washing the windscreen of the vehicle. As will now be described the system is capable of indicating a low level in the coolant reservoir or the screen washer reservoir and is also capable of indicating faults in the oil lubricating system.

The system comprises a battery 10 having its negative terminal connected to earth and its positive terminal connected to an input terminal of an ignition switch I having four operating positing positions Ia, Ib, Ic, and Id. The position Ia is an "off" position. In the position Ib, the input terminal is connected to a supply line 12 and in the position Ic the input terminal is connected to the supply line 12 and to a supply line 14. The supply line 14 is also connected to the ignition system, and so the position Ic is the normal driving position of the switch. In the position Id, the input terminal is connected to the supply line 14 and also to a relay, not shown, for operating a starter motor. Thus, the position Id is the position for starting the vehicle.

The supply line 12 is connected through two series connected resistors R1, R2 to the supply line 14 and the supply line 14 is connected through a resistor R3 to earth. The junction of the resistor R1 and R2 is connected to the base of a p-n-p transistor T_1 , the emitter of which is connected to the supply line 12 and the collector of which is connected through a relay coil B_1 of a relay B to earth. The supply line 14 is also connected through a push-button

switch S and the windings of a motor 16 to earth. The motor 16 drives a pump positioned in the screen washer reservoir. The junction of the switch S and motor 16 is connected to the anode of a diode D_1 , the cathode of which is connected to the junction of the collector of transistor T_1 and relay coil B_1 .

The supply line 12 is connected through a lamp 18 forming part of a display device to an input terminal of a relay switch B_2 of the relay B. The display device comprises a face marked with a legend depicting a tap to indicate low water level and a means for illuminating the face in the form of the lamp 18. The relay switch B_2 has two output terminals which are connected respectively through two fault detecting transducers in the form of float switches WL and CL to earth. The input terminal is normally connected to the output terminal associated with the float switch CL but, on energization of the relay coil B, is connected instead to the output terminal associated with the float switch WL. The float switch CL is positioned in the engine coolant reservoir and the float switch WL is positioned in the screen washer reservoir. Each float switch closes when the liquid in its respective reservoir falls below a predetermined level.

The line 14 is also connected through two series connected resistors R_4 and R_5 to earth. The junction of the resistors R_4 and R_5 is connected through a resistor R_6 to the junction of the lamp 18 and the input terminal of the switch B_2 and also to the base of an npn transistor T_2 . The collector of the transistor T_2 is connected via a resistor R_{13} to the line 12 and the emitter is connected to earth. The collector of transistor T_2 is also connected to the anode of a diode D_2 , the cathode of which is connected to the collector of an npn transistor T_3 . The collector of transistor T_3 is also connected to the line 14 through a resistor R_7 and the emitter of transistor T_3 is connected to earth.

The line 14 is also connected through a lamp 20 and an oil pressure switch PL to earth. The lamp 20 forms part of a display device, generally similar to the display device associated with the lamp 18 except that its face is marked with a legend depicting an oil can to indicate low oil pressure. The line 14 is also connected through a resistor R_8 and a float switch QL to earth. The float switch QL is positioned in the oil reservoir and closes when the oil falls below a predetermined level. The junction of the resistor R_8 and the float switch QL is connected to the base of the transistor T_3 through a resistor R_9 and the junction of the lamp 20 and the oil pressure switch PL is connected to the base of the transistor T_3 through a resistor R_{10} . The base of transistor T_3 is connected to earth through a resistor R_{11} .

The collector of transistor T_3 is connected to earth through a resistor R_{12} and also connected to the base of a transistor T_4 , the collector of which is connected through a buzzer 22 to the supply line 12 and the emitter of which is connected to earth.

The operation of the fault indication system will now be described with reference to the truth table shown in Figure 2.

If the ignition switch I is in the position Ia, no fault will be indicated.

If the ignition switch I is moved to the position Ib, the line 12 is energized, the transistor T_1 is rendered conductive, the relay coil B is energized as indicated by "1" in Figure 2, and the float switch WL is connected in series with the lamp 18. If the float switch WL is open, it will prevent illumination of the lamp 18 but current will be supplied to the base of transistor T_2 thereby rendering this transistor conductive. If the float switch WL is closed,

the lamp 18 will be illuminated, thereby providing a visual indication that the water in the screen washer reservoir is below the predetermined level, and the current will be removed from the base of the transistor T_2 , thereby rendering it non-conductive, rendering transistor T_4 conductive and energizing the buzzer 22 to provide an audio indication that the water is below the predetermined level. The current supplied to the line 14 through resistors R_1 and R_2 will be insufficient to illuminate the lamp 20.

With the switch I in the position I_B , the line 14 is at a voltage too low to provide base current to transistors T_2 , T_3 and T_4 . Hence the buzzer 22 is energized only if the switch W_L is closed enabling base current to flow to transistor T_4 through diode D_2 .

Thus, when the ignition switch I is in the position I_B , the condition of the lamp 18 and the buzzer 22 will depend upon the condition of the float switch W_L , as indicated by "WL" in Figure 2, and so the level of water in the screen washer reservoir may be checked by moving the ignition switch into this position.

If the switch I is moved into the position I_C , which is the normal driving position, both lines 12 and 14 will be energized thereby rendering the transistor T_1 non-conductive. With the switch in this position, the float switch CL will normally be connected in series with the lamp 18 with the result that the lamp 18 will be illuminated if the float switch CL is closed, thereby indicating that the water in the coolant reservoir is below the predetermined level. However, if the switch S is depressed to energize the motor 16, relay coil B will be energized and the float switch W_L will be connected in series with the lamp 18, which will now only be illuminated if the float switch W_L is closed. Thus, with the switch I in the position I_B , the condition of the lamp 18 will depend on the condition of the float

switch CL if the switch S is not depressed or upon the condition of the float switch WL if the switch S is depressed. This is indicated in Figure 2 by " $CL.\bar{S} + WL.S$ ".

With the switch I in the position Ic, the lamp 20 will be illuminated if the pressure switch PL is closed, thereby providing a visual indication of low oil pressure. This is indicated in Figure 2 by "PL".

Also with the switch I in the position Ic, the transistor T_2 will be rendered conductive as line 14 is energized and so the condition of the float switch WL and CL will not affect operation of the buzzer 22. If either or both of the switches QL, PL are open, the base of transistor T_3 will receive base current through either or both of the resistors R_8, R_9 , thereby rendering the transistor T_3 conductive, the transistor T_4 non-conductive and preventing energization of the buzzer 22. However, if both switches QL, PL are closed, the transistor T_3 will be rendered non-conductive, and the transistor T_4 will be rendered conductive thereby energizing the buzzer 22 to provide an audio indication of low oil pressure combined with low oil level in the oil reservoir. This is indicated in Figure 2 by " $PL.QL$ ".

If the ignition switch is moved to the position Id, which is the position for starting the engine, the line 12 will no longer be energized and so the lamp 18 and the buzzer 22 will be inoperative, as is indicated in Figure 2 by "0". However, the condition of lamp 20 will still depend on the condition of the float switch PL.

Thus, the lamp 18 is used to indicate both a low level in the screen washer reservoir and in the engine coolant reservoir, the lamp 18 being normally controlled by the float switch CL, but being controlled by the float switch WL in certain predetermined circumstances, namely when the

ignition switch I is in the position Ib, or when the washer switch S is depressed. As the lamp 18 is used for both these purposes it is only necessary to design a single legend.

The fault indication system described above could be extended to include other display devices which are used to indicate two or more faults. For example, this system could include a display device for indicating both a low level in a clutch fluid reservoir and a low level in a brake fluid reservoir, the display device being controlled by a float switch in the brake fluid reservoir when the switch I is in the position Ic and by a float switch in the clutch fluid reservoir when the ignition switch is in the position Ib.

It will be appreciated that the circuit shown in Figure 1 makes use of normally open switches WL, CL, QL, PL, which are standard, readily available float-operated and pressure switches. If desired, however, normally closed switches could be specially made for the circuit, but this would involve some circuit modifications.

A further modification which may be thought desirable is an arrangement for preventing continuous operation of the warning devices with the ignition switch in its "auxiliary-only" position. This would involve incorporating a timer to turn off the warning devices after a predetermined time if the ignition contacts of the ignition switch were not closed.

CLAIMS:-

1. A motor vehicle fault indication system including a display device (18) comprising a face marked with a legend and means for illuminating the face and characterized in that at least two fault detecting transducers (WL, CL) are associated with the display device (18) for controlling the illuminating means.
2. A system as claimed in claim 1 characterized in that the illuminating means is normally controlled by one (CL) of the transducers, but in a predetermined circumstance or in predetermined circumstances controlled by the other transducer or transducers (WL).
3. A system as claimed in claim 2 characterized in that the predetermined circumstance or the predetermined circumstances include at least one driver controllable operation.
4. A system as claimed in any one of the preceding claims characterized in that the illuminating means comprises a single lamp.
5. A system as claimed in any one of the preceding claims characterized in that there are only two fault detecting transducers (WL, CL) associated with the display device (18).
6. A system as claimed in claim 5 characterized in that the fault detecting transducers comprise a transducer (CL) for detecting the level of fluid in an engine coolant reservoir and a transducer (WL) for detecting the level of fluid in a screen washer reservoir.

FIG.1.

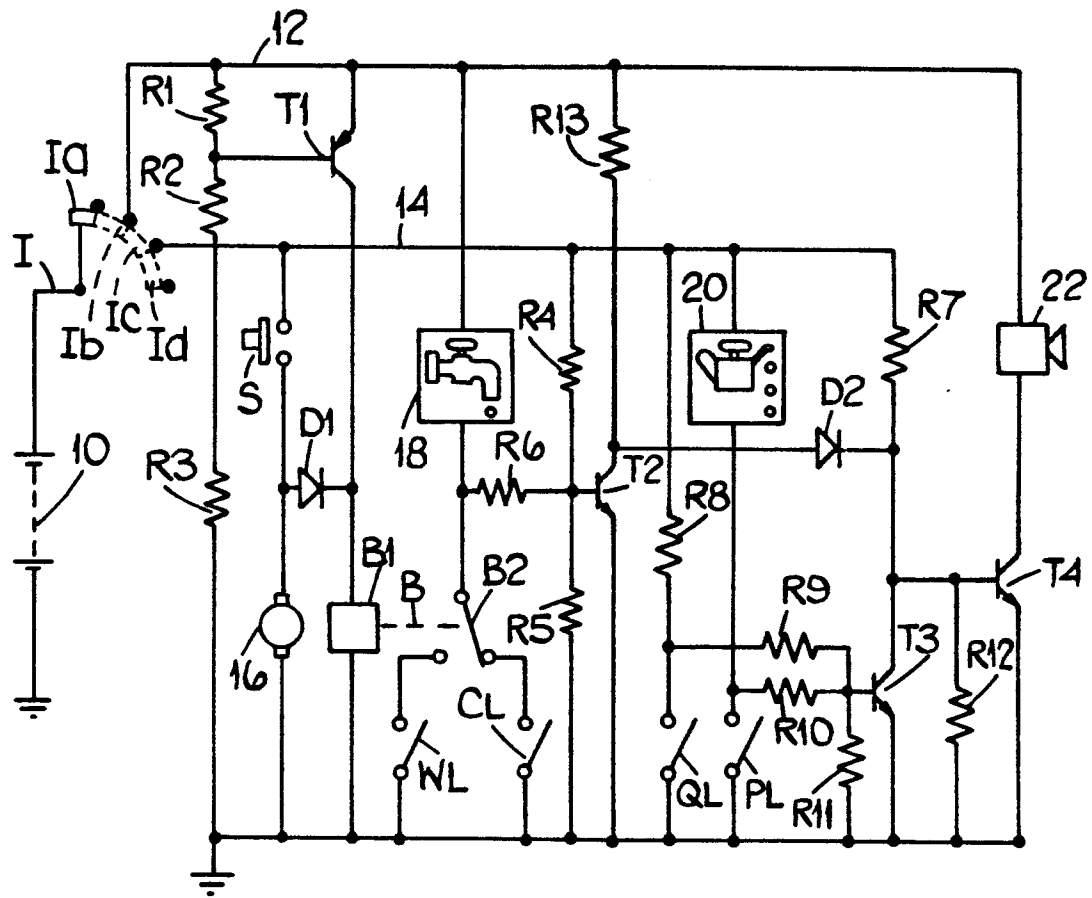


FIG.2.

I	B			
Ib	I	WL	O	WL
Ic	S	CL.S+WLS	PL	PL.QL
Id	S	O	PL	O



European Patent
Office

EUROPEAN SEARCH REPORT

0004437

Application Number
EP 79 30 0402

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ²)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	<u>US - A - 3 302 171 (SENSING)</u> * Column 1, line 55 - column 3, line 27; figures *	1,2,4	B 60 Q 9/00
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	<u>US - A - 4 027 170 (HOLLINS)</u> * Column 4, lines 11-33; figure 2 *	3,5	
	--		TECHNICAL FIELDS SEARCHED (Int.Cl. ²)
	<u>DE - A - 2 428 990 (ARTMANN)</u> * Page 4, line 9 - page 5, line 10 *	3,5	B 60 Q 9/00 11/00
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A	<u>US - A - 2 788 514 (SCHMITT)</u> * Column 1, lines 14-58 *	1,2	CATEGORY OF CITED DOCUMENTS X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
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	<u>US - A - 3 634 881 (CLINE)</u> * Column 1, line 56 - column 3, line 29; figures *	1,2	
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	<u>FR - A - 2 346 183 (CHRYSLER)</u> * Page 5; figures 1,2 *		
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☒ The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search The Hague		Date of completion of the search 19-06-1979	Examiner ONTILLON