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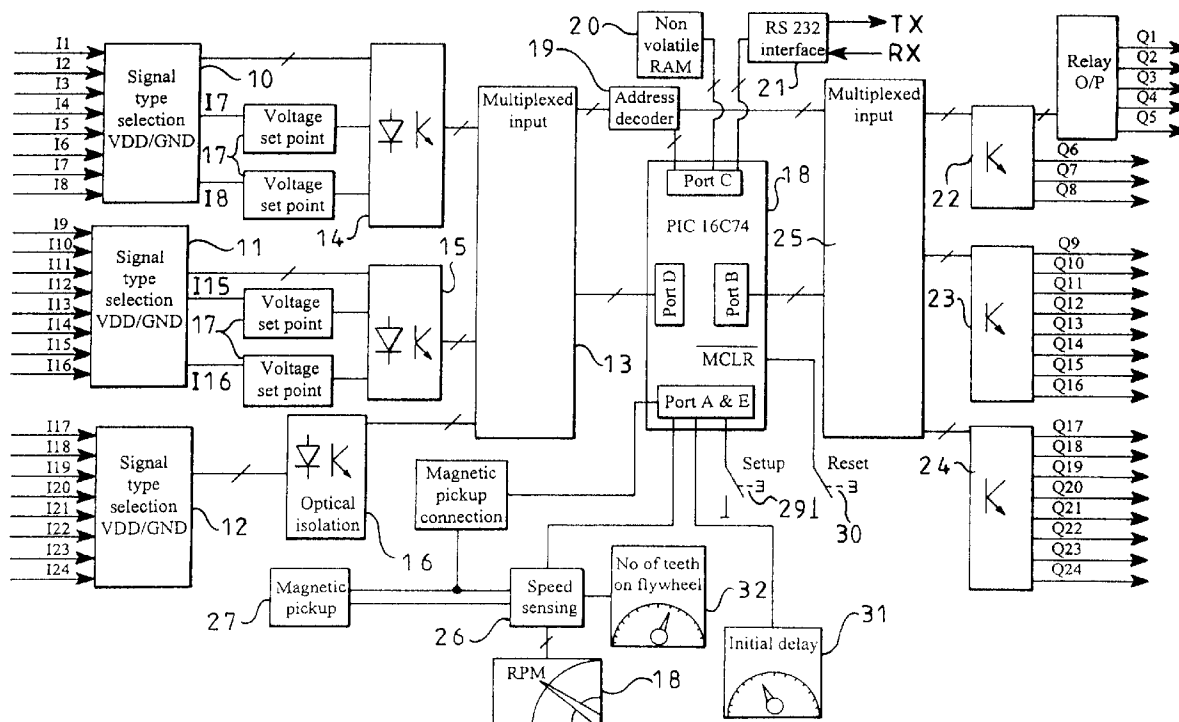
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(54) Fire pump control system and method of controlling a fire fighting sprinkler system

(57) A fire pump control system comprises one or more outputs 22, 23 and 24 for operating one or more relays for starting a fire pump engine, sensor inputs I1 to I24 for receiving inputs from sensors representative of the condition of the engine, a pressure sensor input

for receiving a signal indicative of the pressure in a sprinkler line, and a programmable micro-controller 18 programmed to operate according to a particular set of fire rules and regulations. A method of controlling a fire fighting sprinkler system is also disclosed.



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Description

This invention relates to a fire pump control system and to a method of controlling a fire fighting sprinkler system.

Electrical control systems for fire pumps have to be manufactured to the highest engineering standards and need to be specifically designed to meet the detailed requirements of the different fire rules and regulations in force around the world. For example, most systems include two battery sets. However, according to one set of rules and regulations in force the pump engine is cranked initially using one of the battery sets. If this battery set is unable to crank the engine to sufficient speed, the one set of rules and regulations requires the control system to revert to the other battery set and continue with this other battery set regardless of whether or not it is able to crank the pump engine to sufficient speed. According to another set of rules and regulations, the control system is required to alternate between the two battery sets until one of the battery sets cranks the engine to sufficient speed. Also, for example, different sets of rules and regulations specify different alarms. In order to meet these different fire rules and regulations, many different control systems are presently made and this causes stock problems.

According to a first aspect of the present invention there is provided a fire pump control system comprising one or more outputs for operating one or more relays for starting a fire pump engine, sensor inputs for receiving inputs from sensors representative of the condition of the engine, a pressure sensor input for receiving a signal indicative of the pressure in a sprinkler line, and a programmable microcontroller programmed to operate according to a particular set of fire rules and regulations.

With such a system, only the microcontroller needs to be changed if conformance with other fire rules and regulations is required.

Preferably, the control system also comprises a plurality of further outputs for operating warning lights.

Preferably, the control system is mounted on a single control board.

Preferably, the control system includes a tachometer for receiving an input signal the frequency of which varies according to the speed of the engine and for converting the input signal into a voltage signal which is fed to the microcontroller.

According to a second aspect of the invention there is provided a fire pump control system according to the first aspect of the invention in combination with a fire pump and pump engine.

According to a third aspect of the invention there is provided a method of controlling a fire fighting sprinkler system provided with a pump and a pump engine for supplying water under pressure to the sprinkler system, the method comprising using a fire pump control system according to the first aspect of the invention and includ-

ing the step of selecting the microcontroller of the fire pump control system from a plurality of differently programmed microcontrollers in order to operate the control system according to a specified set of fire rules and regulations.

The invention will now be more particularly described, by way of example, with reference to the accompanying drawing which is a circuit diagram of one embodiment of a fire pump control system according to the invention.

Referring to the drawing, the control system shown therein has a plurality of inputs I1 to I24 connected to signal type selection components 10, 11 and 12 which switch inputs to be to ground or to a positive voltage.

The signal type selection components 10, 11 and 12 are connected to a multiplexed input component 13 via optical isolation components 14, 15 and 16. In the case where a positive voltage is used to switch an input, voltage set point components 17 are provided in the appropriate lines between the selection components 10, 11 and 12 and the optical isolation components 14, 15 and 16 to select the voltage level at which the transition is made.

The multiplexed input component 13 consists of three multiplex chips and is connected to a programmable microcontroller 18. An address decoder 19 is provided to access the required multiplex chip. Non-volatile RAM 20 in the form of an EEPROM chip is provided to hold data when power is disconnected from the control system. An RS 232 interface 21 is connected to the microcontroller 18 to talk to other boards, or a personal computer if required.

The microcontroller 18 is connected to transistorised output components 22, 23 and 24 via a multiplexed output component 25 also consisting of three multiplex chips.

A speed sensing circuit includes a tachometer 26 which receives an input signal from a magnetic pickup 27 and converts the frequency signal from the pickup 27 into a voltage signal which is fed to the microcontroller 18. The number of flywheel teeth on the engine affects the speed sensing circuit and, therefore, this parameter must be set correctly on the board using a potentiometer 32. The tachometer 26 also provides a reading of the speed of the engine on an external display 28.

The optical isolation components 14, 15 and 16 protect the microcontroller 18 from voltage spikes and noise. The multiplexed input and output components 13 and 25 allow sixteen lines on the microcontroller 18 to provide twenty four inputs and twenty four outputs.

The input signals I1 to I24 to the control system include a signal from a pressure sensor which senses pressure in a sprinkler line of a static fire fighting system. Pressure is maintained in the sprinkler line by a small jockey pump and when, for example, the wax of a wax impregnated valve in sprinkler line melts through heat produced by a fire, the pressure in the line falls. One of the input signals is received from a remote start switch

or button. Other input signals typically relate to the condition of the fire pump engine such as fuel level, oil pressure, engine temperature and battery condition. There is also an option for an engine stop solenoid input. Some input signals are provided to test the LED's to be referred to hereinafter and one input is received from an auto-start isolator which prevents the engine starting in the event of a pressure drop signal from the pressure sensor during maintenance of the engine.

The transistorised output components 22, 23 and 24 provide output signals 06 to 024 for illuminating the LED's (referred to previously) which indicate the condition of the engine and, for higher current capacity, five relay outputs 01 to 05 are provided for starting the fire pump engine.

Typically, the microcontroller 18 is a 40-Pin EPROM - Based 8 - Bit CMOS Microcontroller such as a PIC 16C74 sold by Microchip Technology Inc. Typically, the optical isolation components 14, 15 and 16 are phototransistor optocouplers such as IDL615 or IDQ615 sold by Siemens. The multiplexed input chips are, typically, octal bus transceivers such as a SN74A5245 sold by Texas Instruments and the multiplexed output chips are, typically, octal transparent latches such as a SN 74A5573A also sold by Texas Instruments. The address decoder 19 is, typically, a 74138 sold by Siemens and the tachometer is, typically, a 2917 sold by RS Components Limited of Corby, England.

The microcontroller 18 is the heart of the board and is programmed to perform any task desired. This chip can be changed if conformance with other fire rules and regulations is required. All other components referred to above can be common to a number of different control systems and this almost eliminates the stock problems of control systems known hitherto. Therefore, a microcontroller can be selected from a plurality of differently programmed microcontrollers in order to provide a control system which will operate according to a specified set of fire rules and regulations.

A setup button 29 can be used to access a setup routine within the program and a reset button 30 can be used to reset the microcontroller to a known state.

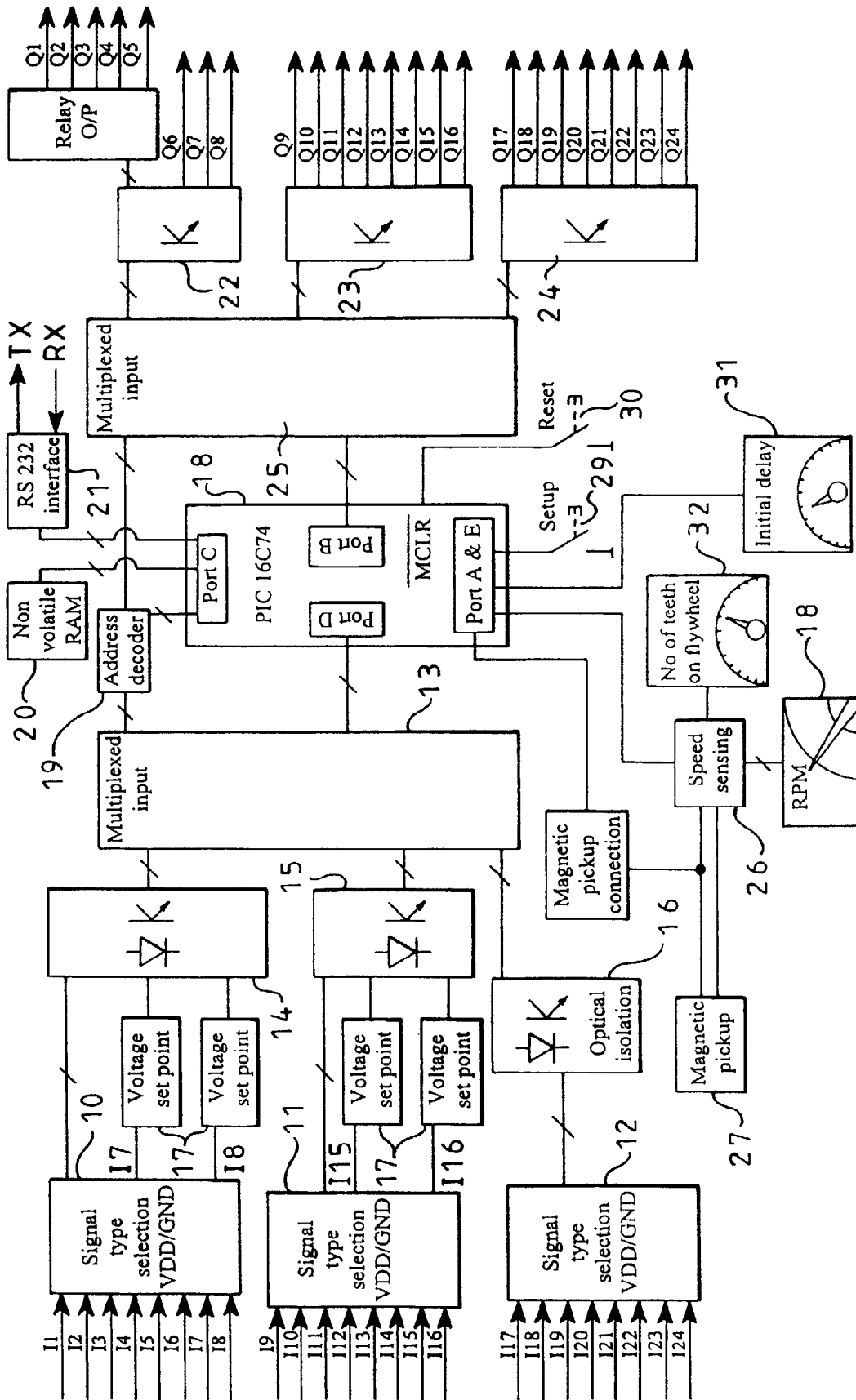
The pressure in the sprinkler line is constantly monitored. If the pressure drops for more than a predetermined time period, the control system starts the engine. A potentiometer 31 is provided so that this time period can be altered.

Claims

1. A fire pump control system comprising one or more outputs (22,23,24) for operating one or more relays for starting a fire pump engine, sensor inputs (11 to 124) for receiving inputs from sensors representative of the condition of the engine, a pressure sensor input for receiving a signal indicative of the pressure in a sprinkler line, and a programmable microcon-

troller (18) programmed to operate according to a particular set of fire rules and regulations.

2. A fire pump control system as claimed in claim 1, further comprising a plurality of further outputs (06 to 024) for operating warning lights.
3. A fire pump control system as claimed in claim 1 or claim 2, the control system being mounted on a single control board.
4. A fire pump control system as claimed in any one of the preceding claims, further including a tachometer (26) for receiving an input signal the frequency of which varies according to the speed of the engine and for converting the input signal into a voltage signal which is fed to the microcontroller (18).
5. A fire pump control system as claimed in any one of the preceding claims in combination with a fire pump and pump engine.
6. A method of controlling a fire fighting sprinkler system provided with a pump and a pump engine for supplying pressurised liquid to the sprinkler system, the method comprising using a fire pump control system as claimed in any one of claims 1 to 5 and including the step of selecting the microcontroller (18) of the fire pump control system from a plurality of differently programmed microcontrollers in order to operate the control system according to a specified set of fire rules and regulations.
7. A method as claimed in claim 7, wherein only the microcontroller (18) of the fire pump control system is changed if the control system is required to operate according to a different set of fire rules and regulations.





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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 2466

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y	DE 38 17 018 A (IVECO MAGIRUS) 30 November 1989 * the whole document *	1	A62C37/00
Y	US 4 611 290 A (HENNINGSEN LEE A ET AL) 9 September 1986 * the whole document *	1	
A	GB 2 182 849 A (JAMISON WILLIAM ANDREW) 28 May 1987 * the whole document *	1	
A	US 5 221 189 A (HENNINGSEN LEE) 22 June 1993 * the whole document *	1	
A	WO 94 27046 A (LEYBOLD AG ;ROLFF RANDOLF (DE); SCHUETZ GUENTER (DE); HODAPP JOSEF) 24 November 1994 * the whole document *	1	
A	US 5 316 444 A (WICNIENSKI MICHAEL F) 31 May 1994 * the whole document *	1,4	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A62C
A	US 5 518 402 A (TOMMARELLO DOMENIC A ET AL) 21 May 1996 * the whole document *	1	
A	US 4 253 148 A (JOHNSON WILLIAM D ET AL) 24 February 1981 * column 1, line 5 - column 2, line 24 *	3	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 6 July 1998	Examiner Kelperis, K
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