

Facility Management System or Danger Warning System

5 The invention relates to a building control or danger warning system with a two-core circular bus for voltage supply and for communication with bus users that each comprise a bus user circuit connected to each of the cores of the circular bus via a polarity-reversal protection bridge.

10 Building control or danger warning systems with a two-core circular bus to which bus users, e.g. alarm systems, are connected in parallel, are known. In case of an interruption of the circular bus, two stub lines that may be operated independently from each other remain. In case of a short-circuit, the segment concerned may be disconnected by separate circuit breakers that are controlled by a central control station of the building control or danger warning system, so that, for example, shortened but
15 operational stub lines still remain available.

In the following, the term "signal system" is used to include building control or danger warning systems.

20 In the course of assembly of signal systems of this kind, the bus users connected to the circular bus, and the circuit breakers, must be looped-into the circular bus. Bus users that are provided with polarity reversal protection and can be connected rapidly are known. However, the circuit breakers must be connected with correct polarities.

25 Color-coded conductors simplify the assembly of the circuit breakers only to a limited extent, because there is no world-wide uniform standard for color coding. Therefore time-consuming determination measurements on individual cores cannot be avoided, in particular when existing plants are being extended.

30 Furthermore, signal systems are known in which circuit breakers, usually in the form of relays or FETs, are incorporated in the bus users. Bus users of this kind are connected in series into the circular bus, care having to be taken to ensure correctness of polarity. Although the incorporation reduces the outlay of assembly work, it is still necessary to perform time-consuming determination measurements on the individual cores. Signal
35 systems of this kind are known from DE 36 14 692 A1, DE 43 22 841 A1, CH 651 688 A5,

and EP 468 097 A2.

5 A bus user circuit that is usable for a signal system of the generic kind mentioned initially is known from DE 198 50 869 A1. This bus user circuit has two circuit breakers, by means of each of which two cores of the circular bus can be connected. Therefore a bus user fed from both sides must be connected to the bus with the same designated polarity despite the polarity-reversal protection bridge, so that in this case too, determination measurements must be performed on the individual cores.

10 The invention is based on the object of simplifying the assembly of building control and danger warning systems.

In accordance with the invention, this object is achieved by each bus user comprising two polarity-reversal protection bridges by means of which it is looped-into the circular bus.
15 The polarity-reversal protection bridges consist of FETs that are, at first, in a non-conducting state. The d.c. voltage terminals of the two bridges are connected in parallel, and a bus user circuit is located between the d.c. voltage terminals. The bus user circuit measures the voltage conditions and their polarities at the a.c. voltage inputs of the bridges, and ensures the operation of the bus user and the circular bus by driving the
20 FETs. Owing to their symmetrical construction, the bus users can be installed very rapidly. Input and output terminals are first determined during operation, and it is therefore immaterial which conductor is connected to which pair of terminals. Furthermore, no additional components are necessary for effecting a circuit-breaking operation, because by means of a switching of the FETs of the output side bridge into a
25 non-conducting state, the bus segment located behind this can be disconnected. Another advantage is that during operation the feeding of the bus user can be effected via its previous output terminal. This may be necessary, for example, when the circular bus is separated into two stub lines.

30 According to patent claim 1, the bus user circuit receives its supply voltage at first via parasitic diodes of two FETs that are located to be diagonally opposite to each other in a bridge. Subsequently the bus user circuit measures the voltage conditions at the a.c. voltage input terminals of the bridges. When a voltage is applied at exactly one bridge, the FETs with current flowing through their parasitic diodes, and two FETs that are
35 located to be diagonally opposite to each other in the other bridge, are switched to be

conducting. Thereby the supply voltage is switched to the next bus user, or the circular bus is closed when the output of the bus user is connected to the central control station of the signal system.

5 In the embodiment according to patent claim 2, the bus user circuit holds all FETs in the non-conducting state when it detects a supply voltage at the a.c. voltage input terminals of both bridges. An equalization of the potential between the two feed voltages is thereby prevented.

10 In Germany there is a regulation that a circular bus of a building control or danger warning system be fed only from one side during normal operation. In other countries, e.g. Great Britain, the feeding of a circular bus, e.g. of a fire alarm system, is effected basically from both sides in order to keep voltage losses as low as possible. This case is taken account of in claim 3. Here a feeding from both sides is detected as being
15 "correct", and the corresponding FETs are rendered non-conducting.

In another advantageous embodiment according to claim 4, the bus user has available a self-sufficient current supply or an energy store, e.g. in the form of a gold cap condenser. This makes possible a rapid restoration of the circular bus following a short circuit.

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In the embodiment according to patent claim 5, the bus user circuit has available a memory. The bus user circuit can store, for example, operating conditions, faults in the bus, or instructions from the central control station in the memory.

25 In the further advantageous embodiment according to patent claim 6, some of the bus users are signaling means. This makes it possible to monitor environmental and operational conditions and to report these to a control station. Signaling means of this kind may be, for example, danger alarms, in particular fire alarms. The operational conditions to be monitored may be, for example, those of doors, locks, windows, or
30 smoke outlets.

In the following the invention will be further illustrated with the aid of schematic drawings. Shown by

35 Fig. 1 is a first embodiment of the invention;

Fig. 2 is a second embodiment of the invention; and
 Fig. 3 is a flow chart.

Figure 1 shows a bus user that is connected into a signal system via a two-core bus to a
 5 d.c. voltage supply, and for communication with a control station. The bus user has two
 pairs of terminals A1, A2 and B1, B2 by means of which it is connected in series into the
 bus system. Each of the pairs of terminals (connections) A and B is connected to a.c.
 voltage input terminals of a bridge rectifier BR1 and BR2, respectively. The d.c. voltage
 output terminals of the two bridge rectifiers BR1 and BR2 are connected in parallel. The
 10 bus user circuit also is disposed to be parallel to these output terminals of the two bridge
 rectifiers BR1 and BR2. The bridge rectifiers each consist of four FETs (BR1 of T1, R2,
 T3 and T4; BR2 of T5, T6, T7 and T8). In order to make clear the manner of operation,
 the parasitic diode paths of the FETs (T1 to T8) have been additionally drawn as diodes
 T1 to T8. The terminals A1, A2, B1 and B2 are each connected to ground via diodes D9,
 15 D10, D11 and D12 and resistors R1, R2, R3 and R4. The bus user circuit determines via
 each of the terminals M_A1, M_A2, M_B1 and M_B2 the voltage drop at the resistors
 M_A1, M_A2, M_B1 and M_B2. The FETs (T1 to T8) are driven in dependence upon the
 measurement results. If, for example, feeding is effected only via the pair of terminals A1,
 A2, then specifically the FETs having current-carrying parasitic diode paths, i.e. either T1
 20 and T3, or T2 and T4, are first switched to be conductive. Subsequently the bus is
 passed on to the connection B by suitable driving (see Fig. 3) of the FETs T5 to T8.

Figure 2 schematically shows an embodiment in which the voltage conditions and the
 signs at the pairs of terminals A1, A2 and B1, B2 are determined by means of four
 25 optoelectronic couplers O1, O2, O3, O4 instead of via the resistors R1 to R4 as in Fig. 1.
 Each of the terminals A, B is connected to two LEDs disposed to be antiparallel (A with
 LED1 and LED2, B with LED3 and LED4). Each of the LEDs (LED1 to LED4) is a
 component of an optoelectronic coupler O1, O2, O3 and O4, respectively. One of the
 output terminals of each optoelectronic coupler O1 to O4 is connected to ground, and the
 30 other to the positive d.c. output terminals of the bridge rectifiers BR1 and BR2 via a
 resistor (O1 via R5, O2 via R6, O3 via R7, and O4 via R8). The bus user circuit
 measures the voltage drop at each of the resistors R5, R6, R7 and R8 via the terminals
 M_A1, M_A2, M_A3 and M_A4, respectively. When a d.c. voltage is applied to a terminal
 (A or B), exactly one optoelectronic coupler supplies a signal "0". The input (A or B) and
 35 its polarity are determined from the information as to which optoelectronic coupler

supplies the signal. If the circular bus is being fed with d.c. from both sides, then exactly two optoelectronic couplers that are assigned to different terminals A, B supply a signal "0". The bus user circuit evaluates the signals from the optoelectronic couplers, and then drives the FETs T1 to T8 in dependence upon the signals, in analogy with the case of Fig. 1.

The driving of the FETs T1 to T8 in dependence upon the signals at the terminals M_A1, M_A2, M_A3 and M_A4 is illustrated as a flow chart in Fig. 3. The chart starts with the bus user receiving a voltage, and all FETs being in a non-conducting state. The voltage at the terminals A1, A2, B1, and B2 is then measured. If the feeding of the bus user is effected via exactly one pair of terminals, then the corresponding FETs become conductive by an application of a suitable gate voltage. Apart from this, the bus is further relayed by driving of the gate of two FETs of the bridge that is not connected to the pair of input terminals. If, for example, the feeding is effected via the terminals A1 and A2 with the voltage at A1 being positive in comparison with that at A2, then a gate voltage is applied to the FETs T1 and T3 via S_T1 and S_T3 in order to reduce the voltage drop at the diode paths. After it has been ensured that no voltage is being applied to the pairs of terminals B1 and B2, the FETs T8 and T6 are driven via S_T8 and S_T6 in order to switch the bus onto the pair of terminals B1 and B2 that is now the pair of output terminals.

If the feeding is effected from both sides, i.e. a voltage is being applied also to the pair of terminals B1, B2, then this is ascertained and memorized, and can be reported to the central control station.

In another programming of the bus user circuit, for example for application in a system with obligatory feeding of the circular bus from both "ends" connected to the central control station, the bus user circuit switches through the corresponding FETs of both bridges BR1 and BR2.

If the voltage supply collapses, and the bus user circuit has available an energy store, for example in the form of a gold cap condenser, then the bus user circuit can detect this as being a fault, and can memorize this and report this to the central control station following a restoration of the circular bus. Thereupon a programmed reaction can occur at the central control station. This may be, for example, a malfunction report, possibly attended

by actuation of a telephone-line selector, or an entry into a event memory.

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Patent Claims

1. Building control or danger warning system with a two-core circular bus for voltage supply and for communication with bus users that each comprise a bus user circuit connected to each of the cores of the circular bus via a polarity-reversal protection bridge, characterized in that the circular bus extends through each bus user via the polarity-reversal protection bridge (BR1) and another polarity-reversal protection bridge (BR2); that the bus user circuit is located between the d.c. terminals, connected in parallel, of the two bridges; and that the branches of both bridges consist of FETs (T1 to T8) initially in a non-conducting state, via the parasitic diodes of which, that are polarized in the direction of current-flow, the bus user circuit at first receives its supply voltage, measures the voltages and their signs on the four connected bus cores, and then switches those two FETs having parasitic diodes through which current flows, and also two FETs located diagonally opposite to each other in the other bridge, to be conducting when a supply voltage is applied to exactly one of the polarity-reversal protection bridges.

2. Building control or danger warning system with a two-core circular bus for voltage supply and for communication with bus users that each comprise a bus user circuit connected to each of the cores of the circular bus via a polarity-reversal protection bridge, characterized in that the circular bus extends through each bus user via the polarity-reversal protection bridge (BR1) and another polarity-reversal protection bridge (BR2); that the bus user circuit is located between the d.c. terminals, connected in parallel, of the two bridges; and that the branches of both bridges consist of FETs (T1 to T8) initially in a non-conducting state, via the parasitic diodes of which, that are polarized in the direction of current-flow, the bus user circuit at first receives its supply voltage, measures the voltages and their signs on the four connected bus cores, and maintains all FETs (T1 to T8) in a non-conducting state when a supply voltage is applied to both bridges (BR1, BR2).

3. Building control or danger warning system with a two-core circular bus for voltage supply and for communication with bus users that each comprise a bus user circuit connected to each of the cores of the circular bus via a polarity-reversal protection bridge, characterized in that the circular bus extends through each bus user via the polarity-reversal protection bridge (BR1) and another polarity-reversal protection bridge (BR2);

that the bus user circuit is located between the d.c. terminals, connected in parallel, of the two bridges; and that the branches of both bridges consist of FETs (T1 to T8) initially in a non-conducting state, via the parasitic diodes of which, that are polarized in the direction of current-flow, the bus user circuit at first receives its supply voltage, measures the voltages and their signs on the four connected bus cores, and closes the circular busses at correct polarity by driving the corresponding FETs when a supply voltage is applied to both bridges (BR1, BR2).

4. System according to any one of the claims 1 to 3, characterized in that the bus user circuit comprises an energy store.

5. System according to any one of the claims 1 to 4, characterized in that the bus user circuit comprises a data memory, memorizes a failure of the supply voltage as a fault, and reports this fault to the central control station as soon as the bus user is reconnected to the central control station.

6. System according to any one of the claims 1 to 5, characterized in that at least some of the bus users are signaling means.