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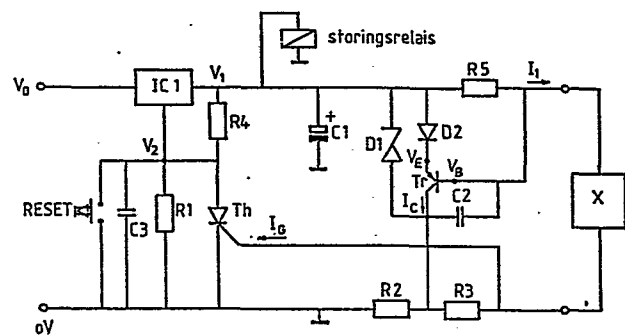
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An auxiliary circuit in a circuitry comprising C-MOS integrated circuit components.

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Detection of failures in an electronic circuit (X), comprising one or more integrated-circuit components of the C-MOS type. For this detection-method an auxiliary circuit (Tr, Th) is provided, which is appropriate for monitoring the current-collection (I_c) by the circuit and generating a failure-signal, as soon as the monitored current-collection exceeds a pre-adjusted thresholdlevel.



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Title: An auxiliary circuit in a circuitry comprising C-MOS integrated-circuit components.

The invention relates to a circuit comprising one or more IC-components of the C-MOS type, means being provided to detect failures in the components of the circuit.

Such circuits are generally used in control-circuits of
5 (control) processes of various nature. As an example, reference may be made to a control circuit for an electronic burner-ignition device.

The so-called double 'fail-safe'-principle may be used as a provision for detecting failures in the components of the circuit. This principle means that two identical circuits must be provided, connected
10 in parallel, in which the outputs of the corresponding sections of the circuits are compared by a comparator and in which a signal, unequal to zero, is considered as a failure. One of the parallel connected circuits may be considered as the proper control-circuit, while the other performs the function of a comparing-circuit. A disadvantage of this principle is,
15 that the failure-chance is doubled, while both circuits are to be adjusted precisely one with respect to the other. In addition, this detection principle involves substantial increase of the cost price in comparison with a single circuit.

The invention aims at overcoming the above-mentioned disadvantage
20 and for this purpose it makes use of the property, that the IC's of the C-MOS type, applied in the circuit, have a low and controlled current-collection and that a failure of such an IC is expressed in a significant increase of the current-collection.

The "fail safe"-circuit proposed by the invention is characterized
25 by auxiliary circuit for detecting failures, which is adapted to monitor the current-collection by the circuit, and to generate a failure-signal, as soon as the monitored current-collection exceeds a pre-adjusted threshold-level.

The said auxiliary circuit may be realised in a simple and inexpensive way. In a practical embodiment, the auxiliary circuit includes a voltage-
30 regulator, having its control-input connected to a thyristor, by which the voltage-regulator may be switched on and off respectively; a transistor with an adjustment-circuit, adapted to make the transistor issue a signal, as soon as the current-collection by the circuit exceeds a pre-adjusted threshold-
35 level, resulting in the voltage-regulator and the power-supply of the circuit being switched off.

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Prefarebly, the components of the auxiliary circuit are selected and connected in such a way, that in the event of a failure in one of the components of the auxiliary circuit, the power-supply of the circuit will be switched off in the same way, as described above with reference to the main 5 circuit.

The invention will be hereinafter further described with reference to the drawing, in which a practical embodiment of the auxiliary circuit is shown.

The circuit shown in the drawing is supplied by a supply-voltage 10 V_0 , which in praxis may have a value between 15 and 24V. The voltage V_0 is transferred to a fixed voltage of 12V by the voltage-regulator IC_1 and the resistors R_1 and R_4 . The resistors R_1 and R_4 are selected in such a way, that there will be a voltage V_2 of 10,8V across the resistor R_1 . Upon the supply-voltage V_0 being switched on, the capacitor C_3 will cause the vol- 15 tage V_1 to increase slowly to a value of 12V. The voltage V_1 is supplied to a 12V failure-relay, so as to energize the latter. The voltage V_1 is also connected to the positive supply-terminal of the circuit X, via resistor R_5 . The circuit X comprises logic IC's of the C-MOS type. The negative supply-terminal of the circuit X is connected to the zero voltage of the 20 power-supply. Under normal conditions, i.e. without failures in the components, the current-flow I_1 received by the circuit X will be very small. The voltage difference $V_E - V_B$ between the emitter and base of the transistor Tr will than be much smaller than 1V, due to which the transistor Tr will be in its blockingstate. There will be no collectorcurrent I_C flowing. The 25 diode D_2 (in this example used as a zener of 0,7V) is applied to get a better adjustment of the voltage V_E and of the threshold-level, at which the transistor Tr begins to conduct. The gate-current I_G to the thyristor Th received from circuit X through the resistors R_2 and R_3 is below the threshold-level, at which the thyristor begins to conduct, sothat the thyristor 30 Th is blocked.

As soon as a failure appears in the circuit X the current-flow I_1 will increase to a value far above 1000 A. The voltage-drop across resistor R_5 will increase to such an extent, that the base-voltage V_B of the transistor will become at least 0,6V below the emitter-voltage V_E , sothat the tran- 35 sistor Tr will get in the conduction-state. As a result of this a current I_C begins to flow, which controls the thyristor Th, via the current-divider achieved by the resistors R_3 and R_2 . The current-divider R_3 , R_2 ensures that the inputcurrent of the thyristor Th, which is applied via transistor Tr from the 12V power-supply, will not become too high. The gate-current I_G

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will now have a value above the threshold-level, at which the thyristor gets in the conduction-state; thus the thyristor Th begins to conduct. The capacitor C_1 ensures that the transistor Tr will put enough energy into the gate of Th, so that the thyristor Th will get into conduction immediately and
5 without oscillation-phenomena. The resistor R_1 is now short circuited by the thyristor Th, due to which the output-voltage V_1 of the voltageregulator decreases rapidly to 1,2V. The power-supply of the circuit X is thereby interrupted. The decrease of V_1 causes the failure-relay (12V), fed by the voltage V_1 , to drop, and this may control a secondary circuit, indicating
10 a failure in the circuit X, for example by means of a sound-or lightsignal.

The auxiliary circuit further comprises a zenerdiode D_1 of 15V and a capacitor C_2 . The capacitor C_2 provides that the currentpulses caused by switching-actions in the circuit X will not cause the transistor Tr to come into conduction, so that false control-signals to the thyristor Th are
15 avoided. The zenerdiode D_1 contributes a protection against a too high value of the supply-voltage V_1 . When the voltage V_1 becomes too high, the diode D_1 controls the thyristor Th, due to which the latter Th gets into conduction and the supply-voltage will be interrupted. Upon removal of the failure in the circuit X the thyristor may be reset into the blocking-state by de-
20 pressing a reset-button, which will short circuit the thyristor, whereafter the voltage V_1 may rise again to 12v, as soon as the reset-button is released.

It is an advantage of the above auxiliary circuit that in case of failures in the components of the auxiliary circuit itself (appearing as
25 an interruption or short-circuiting), a similar effect will occur, as described above with reference to failures in the components of the circuit X. The supply-voltage of the circuit X will then also be interrupted.

It may be understood, that the auxiliary circuit according to the invention is applicable in circuits for various purposes and that the
30 values of the components of the implementation shown are used for illustration only.

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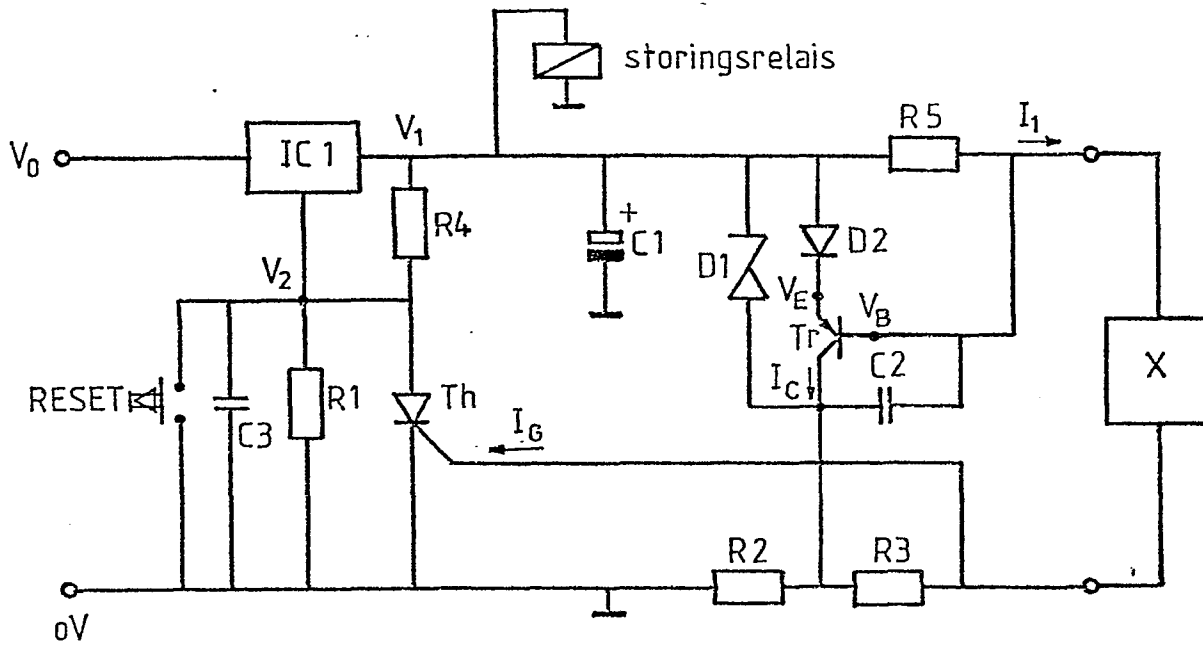
1. Circuit comprising one or more integrated-circuit components of the C-MOS type, characterized by an auxiliary circuit for the detection of failures, which is adapted to monitor the current-collection by the circuit and to generate a failure-signal, as soon as the monitored current-
5 collection exceeds a pre-adjusted threshold-level.

2. Circuit according to claim 1, characterized in that the auxiliary circuit includes a voltage-regulator, having its control-input connected to a thyristor, by which the voltage-regulator may be switched on and off respectively; a transistor with an adjustment-circuit, adapted to
10 make the transistor issue a signal, as soon as the current-collection by the circuit exceeds a pre-adjusted threshold-level, resulting in the voltage-regulator and the supply-voltage of the circuit being switched off.

3. Circuit according to claims 1 and 2, characterized in that the components of the auxiliary circuit are selected and connected in
15 such a way, that, in the event of a failure in one of the components of the auxiliary circuit, the power-supply of the circuit will be switched off in the same way, as described above with reference to the circuit itself.

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EUROPEAN SEARCH REPORT

Application number

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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.4)
X	US-A-3 373 341 (H.B. WATTSON) * Complete document *	1-3	H 02 H 7/20 G 05 F 1/573
A	US-A-3 359 434 (N.P. GALLUZZI) * Figure *	1-3	
A	DE-B-2 049 532 (MATSUSHITA ELECTRIC INDUSTRIAL CO.) * Figures 1,2 *	1-3	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			G 05 F 1/573 H 02 H 7/20
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 21-12-1984	Examiner LEMMERICH J
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			