

617832

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

CONVENTION APPLICATION FOR A PATENT

(1) Here insert (in full) Name of Applicant or Applicants, followed by Address (es).

XX (1) WERKZEUGMASCHINENFABRIK OERLIKON-BUHRLE AG
of We Birchstrasse 155, 8050 Zurich, Switzerland

(2) Here insert Title of Invention.

hereby apply for the grant of a Patent for an invention entitled: (2)
TRANSIENT AND OVERVOLTAGE PROTECTION CIRCUIT FOR ELECTRONIC DEVICES

(3) Here insert number(s) of basic application(s)

which is described in the accompanying complete specification. This application is a Convention application and is based on the application numbered (3)

02597/88-0

(4) Here insert Name of basic Country or Countries, and basic date or dates

for a patent or similar protection made in (4) Switzerland
on 7th July 1988

Watermark Patent & Trademark Attorneys
My address for service is Messrs. Edward Waters & Sons, Patent Attorneys,
Our 50 Queen Street, Melbourne, Victoria, Australia.

DATED this 5th day of July 1989

(5) Signature (s) of Applicant (s) or Seal of Company and Signatures of its Officers as prescribed by its Articles of Association.

(5)

WERKZEUGMASCHINENFABRIK OERLIKON-BUHRLE AG

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by

L. J. Dyson

Registered Patent Attorney

To:

THE COMMISSIONER OF PATENTS.

Patents Act 1952-1969

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

(1) Here
insert (in
full) Name
or Names of
Applicant or
Applicants

In support of the Convention Application made by⁽¹⁾

Werkzeugmaschinenfabrik Oerlikon-Bührle AG

Birchstrasse 155, 8050 Zürich (Switzerland)

(2) Here
insert title
of Invention.

(hereinafter referred to as the Applicant) for a patent for an invention entitled:⁽²⁾

("Ausgleichs- und Ueberspannungsschutzschaltung für elektronische Geräte") TRANSIENT AND OVERVOLTAGE

PROTECTION CIRCUIT FOR ELECTRONIC DEVICES

~~We~~ ⁽¹⁾ KURT HUNZIKER AND KARL NACHMANSOHN both

of⁽³⁾ Birchstrasse 155, 8050 Zurich, Switzerland

(3) Here
insert (in
full) Address
or Addresses

do solemnly and sincerely declare as follows:

We ~~are~~ ^{I am} authorised by1. ~~We are~~ the applicant for the patent. to make this Declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was

(4) Here insert
basic Country
or Countries
followed by
date or dates
and basic
Applicant or
Applicants.

made in⁽⁴⁾ Switzerland

on the 7th day of July 1988, by

Werkzeugmaschinenfabrik Oerlikon-Bührle AG

~~on the day of 19~~

~~XXXXX~~

3. ~~We are~~ the actual inventors of the invention referred to in the basic application or

(5) Here insert
full Name(s)
and Address(es)
of actual
Inventor(s) if
other than
Applicant(s).

3. (b) Rudolf BÄRTSCH, Hägelerweg 5, CH-8055 Zürich, and
Felix JETZER, Musterleestrasse 11, CH-5442 Fislisbach.

the actual inventors of the invention and the facts upon which ~~We are~~ ^{I am} the Applt. is entitled to make the application, are as follow:

~~We are~~ ^{I am} The Applicant is

~~We are~~ the assignee of the said⁽⁶⁾ actual inventors

(6) Full Name
of actual
Inventor or
Inventors.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Zürich (Switzerland)

this 22nd day of May 1989

Werkzeugmaschinenfabrik

Oerlikon-Bührle AG

Nachmansohn

(7) Signature
of Applicant or
Applicants.

To: THE COMMISSIONER OF PATENTS.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-37926/89
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 617832

(54) Title
TRANSIENT AND OVERVOLTAGE PROTECTION CIRCUIT FOR ELECTRONIC DEVICES

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(56) Prior Art Documents
EP 33368
WO 86/02786
DE 3425235

(57) Claim

1. A transient and overvoltage protection circuit for connection between a current source and electronic devices to be protected, in particular for the braking system of a rail-bound vehicle, characterised by

- an input stage designed as high voltage limiting circuit and being connected in parallel with the input of the protection circuit,

- a voltage divider following the input stage and being connected in parallel with the latter,

- a comparator with an internal reference voltage, following the voltage divider, with the input of said comparator being connected to the output of the voltage divider,

- a stabilised and overvoltage protected power supply for comparator,

- a first electronic switch and second electronic switch, with the first electronic switch, whose switching input is connected to the output of comparator, with the second electronic switch which is connected between input and output of the protection circuit and whose switching input is connected to the output of the first electronic switch, and

- the current source being automatically reconnected to the device after a fault condition has ceased.

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Form 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-69

COMPLETE SPECIFICATION

(ORIGINAL)

Class

Int. Class

Application Number:

Lodged:

Complete Specification Lodged:

Accepted:

Published:

Priority:

Related Art:

Name of Applicant: WERKZEUGMASCHINENFABRIK OERLIKON-BUHRLE AG

Address of Applicant: Birchstrasse 155, 8050 Zurich, Switzerland

Actual Inventor: RUDOLF BARTSCH and FELIX JETZER

Address for Service: ~~XXXXXXXXXXXXXXXXXXXX~~ Watermark Patent & Trademark Attorneys
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Complete Specification for the invention entitled:

TRANSIENT AND OVERVOLTAGE PROTECTION CIRCUIT FOR ELECTRONIC DEVICES

The following statement is a full description of this invention, including the best method of performing it known to : US

Transient and Overvoltage Protection Circuit
for Electronic Devices

The present invention relates to a Transient and overvoltage protection circuit for electronic devices, in particular for the braking system of a rail-bound vehicle.

Various limiting circuits providing protection against overvoltages are known in practice, which switch off a device or interrupt the current supply when a certain fault appears. After the fault condition has ceased, the limiting circuits have either to be replaced, such as, for example, in the case of fuses, or have to be reset manually, such as, for example, in the case of protective circuitbreakers.

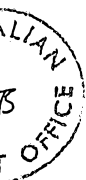
The present invention as described in the claims achieves the object of providing a Transient and overvoltage protection circuit for electronic devices, which is characterised by simple circuit design, and which protects the device against faults and damage caused by transients and overvoltages, and which automatically reconnects the current supply to the device after the fault condition has ceased.

The present invention provides a transient and overvoltage protection circuit for connection between a current source and electronic devices to be protected, in particular for the braking system of a rail-bound vehicle, characterised by

- an input stage designed as high voltage limiting circuit and being connected in parallel with the input of the protection circuit,
- a voltage divider following the input stage and being connected in parallel with the latter,
- a comparator with an internal reference voltage, following the voltage divider, with the input of said comparator being connected to the output of the voltage divider,
- a stabilised and overvoltage protected power supply for comparator,
- a first electronic switch and second electronic switch, with the first electronic switch, whose switching input is connected to the output of comparator, with the second electronic switch which is connected between input and output of the protection circuit and whose switching input is connected to the output of the first electronic switch, and
- the current source being automatically reconnected to the device after a fault condition has ceased.

The advantages offered by the present invention are, essentially, that the protection circuit is practically independent of the magnitude of the fault, and that its power consumption when operating in the case of a fault is small.

An embodiment of the present invention shown by way of example is explained in the following with reference to the single drawing showing a circuit diagram.



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40 According to the single drawing, a protection circuit in accordance with the present invention is designed, by way of example, as an adaptor connected between a current source and a device to be protected, both not being shown in the drawing, and comprises the following stages:

- an input stage 1 connected in parallel to the input and being designed as a high voltage limiting circuit,

45 - a voltage divider 2 following the input stage 1 and being connected in parallel to the latter,

- a comparator 3 following the voltage divider 2 and being connected in parallel to the latter,

- a power supply 4 for the comparator 3,

50 - a first electronic switch 5 following the comparator 3, and

- a second electronic switch 6 connected between input and output of the protection circuit, and being controlled by the first electronic switch 5.



The input stage 1 comprises a transient protection diode V1 and a capacitor C1 connected in parallel with the latter. The voltage divider 2 comprises two resistors R1 and R2 connected in series, and a transient protection diode V2 connected in parallel with resistor R2. The voltage across resistor R2 being the output voltage from voltage divider 2 is applied as input voltage to comparator 3. Comparator 3 is a commercially available component D1. A resistor R8 is connected between the output of D1 and the negative potential of the protection circuit. Comparator D1 is fed from the positive potential of the protection circuit via resistors R3 and R4 connected in parallel, with the supply voltage to comparator D1 being stabilized and protected against voltage surges by a transient protection diode V4 and a capacitor C2 connected in parallel with the latter. The first electronic switch 5 is, for example, a field effect transistor T1, with the gate G of the latter being connected to the output of comparator 3, the source S of T1 being connected directly to the negative potential, and the drain D of T1 being connected via a transient protection diode V5 with the negative potential. Also the second electronic switch is a field effect transistor T2, with its drain D and source S being connected between input and output of the protection circuit, and its gate G being connected via a resistor R5 with its drain D, and via a transient protection diode V3 with its source S, as well as via resistor R6, being allocated in this example to the first electronic switch 5, with the drain D of the first electronic switch 5.

The protection circuit operates as follows: All voltages higher than the breakdown voltage of the transient protection diode V1, whose theoretical reaction time is, for example, of the order of 1 ps, are limited to a permissible voltage level, depending on the leakage current. Capacitor C1 of the input stage 1 together with the line inductivity and the internal resistance of the current source, not being shown here, acts as filter against high frequency interference voltages, with the limit frequency being determined mainly by the inductivity of the line. An input signal is fed via the voltage divider R1, R2 to comparator D1. If the output voltage of voltage divider 2 or the input voltage of comparator D1, respectively, exceeds the internal reference voltage of comparator D1, a voltage from the output of comparator D1 is applied to field effect transistor T1 and switches the latter to the conducting state. Consequently, drain D of field effect transistor T1 lowers, via resistor R6, the voltage level at gate G of field effect transistor T2, such that field effect transistor T2 has now a high resistance. The transient protection diode V3 becomes conducting in the forward direction and thereby discharges capacities acting at the output of the protection circuit, not shown

here, via resistor R6 and the field effect transistor T1. The transient protection diode V3 also protects, in an ideal manner, the gate-source section of field effect transistor T2.

The transient protection diode V5 limits overswinging on switching off of the load, and at the same time protects field effect transistor T1 against impermissible overvoltages at the drain D. In case of a short-circuit of field effect transistor T2, the transient protection diode V5 limits the output voltage U_A of the protection circuit, and thereby protects the load, with the transient protection diode V5 being short-circuited in the case of this fault.

The output voltage U_A is made zero when a predetermined input overvoltage is applied for a length of time exceeding, for example, 1.5 μ s. As soon as the input voltage U_E drops again to the permissible level, the input of the protection circuit is connected to its output by restituting the normal operating state in which there is no output from the comparator D1 and therefore field effect transistor T1 is in the blocked state and, consequently, the gate of field effect transistor T2 maintains the latter in the conducting state via resistor R5. The voltage drop across the drain-source section of field effect transistor T2 is, for example, approximately 4 volts.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A transient and overvoltage protection circuit for connection between a current source and electronic devices to be protected, in particular for the braking system of a rail-bound vehicle, characterised by

- an input stage designed as high voltage limiting circuit and being connected in parallel with the input of the protection circuit,
- a voltage divider following the input stage and being connected in parallel with the latter,
- a comparator with an internal reference voltage, following the voltage divider, with the input of said comparator being connected to the output of the voltage divider,
- a stabilised and overvoltage protected power supply for comparator,
- a first electronic switch and second electronic switch, with the first electronic switch, whose switching input is connected to the output of comparator, with the second electronic switch which is connected between input and output of the protection circuit and whose switching input is connected to the output of the first electronic switch, and
- the current source being automatically reconnected to the device after a fault condition has ceased.

2. A transient and overvoltage protection circuit for electronic devices according to claim 1, characterised by a transient protection diode VI being provided in the input stage and being connected between positive and ^{negative potentials} ~~the negative potential~~ of the protection circuit.

3. A transient and overvoltage protection circuit for electronic devices according to claim 2, characterised by a

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capacitor C1 being connected in parallel with the transient protection diode VI.

4. A transient and overvoltage protection circuit for electronic devices according to one of the preceding claims 1 to 3, characterized by a transient protection diode V2 being connected between the output of the voltage divider and the negative potential of the protection circuit.

5. A transient and overvoltage protection circuit for electronic devices according to one of the claims 1 to 4, characterized by a transient protection diode V4 and a capacitor C2 both connected in parallel with the comparator between the output of the power supply and the negative potential of the protection circuit.

6. A transient and overvoltage protection circuit for electronic devices according to one of the preceding claims 1 to 5, characterized by two field effect transistors T1 and T2 being provided as electronic switches.

7. A transient and overvoltage protection circuit for electronic devices according to claim 6, characterized by a transient protection diode V5 being connected between the drain D of the field effect transistor T1 and the negative potential of the protection circuit.

8. A transient and overvoltage protection circuit for electronic devices according to one of the claims 6 or 7, characterized by a transient protection diode V3 being connected between the gate G and the source S of the field effect transistor T2.



9. A circuit according to claim 1, substantially as herein described with reference to the accompanying drawing.

DATED this 17th day of April 1991

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