Siemens Aktiengesellschaft, incorporated in the Federal Republic of Germany, of Wittelsbacherplatz 2, D-8000 Munchen 2, FEDERAL REPUBLIC OF GERMANY, hereby apply for the grant of a standard patent for an invention entitled:

Message Conditioning Device

which is described in the accompanying complete specification.

Details of basic application(s):-

Basic Applic. No: Country: Application Date:
EP89101452.4 AT 27 January 1989

The address for service is:-

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DATED this TWENTY FIFTH day of JANUARY 1990

Siemens Aktiengesellschaft

By:

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 113673
S&F CODE: 61890

REPRINT OF RECEIPT
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5845/2
Title of Invention
Message Conditioning Device

I/we Fraser Patison Old
of Spruson & Ferguson,
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do solemnly and sincerely declare as follows:

1. I am/we are the applicant(s) for the patent
   (or, in the case of an application by a body corporate)
   1. I am/we are authorised by Siemens Aktiengesellschaft
      the applicant(s) for the patent to make this declaration on
      its/their behalf.
   2. The basic application(s) as defined by Section 141 of the
      Act was/were made
      in Austria
      on 27 January 1989
      by Siemens Aktiengesellschaft

3. I am/we are the actual inventor(s) of the invention referred
   to in the basic application(s)
   (or where a person other than the inventor is the applicant)
   3. Hermann Zierhut
      of Waldperlacher Str. 21, 8000 Muenchen 83,
      Federal Republic of Germany
      (respectively)
      is/are the actual inventor(s) of the invention and the facts upon
      which the applicant(s) is/are entitled to make the application are
      as follows:
      The said applicant is the assignee of the
      actual inventor.

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

Declared at Sydney this 25th day of January 1990

To: The Commissioner of Patents

Signature of Declarant(s)
1. Message conditioning device (1) which works with a transformer (2) serving as filter for transmitting DC energy and AC voltage information, having at least two windings on the energy-supplying side, between which a capacitor (5) transmitting information signals is arranged in series, and which are connected at their other ends in each case to a transmission line (6, 7) for DC energy and for AC voltage information, the transformer working with a winding (8) on the side processing the received information, and there being connected between the transmission lines (6, 7) two controllable inverse valves (10, 11) with their output electrodes (12, 13), and the control electrodes (14, 15) thereof being connected during a transmit signal (22) to a load-independent voltage source (16).
FORM 10
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952
COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Complete Specification Lodged:
Accepted:
Published:

Priority:
Related Art:

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Complete Specification for the Invention entitled:

Message Conditioning Device

The following statement is a full description of this invention, including the best method of performing it known to me/us

5845/3
Abstract

Message conditioning device

Message conditioning device (1) which works with a transformer (2) serving as filter for transmitting DC energy and AC voltage information, having at least two windings on the energy-supplying side, between which a capacitor (5) transmitting information signals is arranged in series, and which are connected at their other ends in each case to a transmission line (6, 7) for DC energy and for AC voltage information, the transformer working with a winding (8) on the side processing the received information, and there being connected between the transmission lines (6, 7) two controllable inverse valves (10, 11) with their output electrodes (12, 13), and the control electrodes (14, 15) thereof being connected during a transmit signal (22) to a load-independent voltage source (16).

FIG. 1
Message conditioning device

The invention relates to a message conditioning device which works with a transformer serving as filter for transmitting DC energy and AC voltage information. A device of this type may be used as bus coupler or generally for information-processing devices which are connected to transmission lines, which work on transmission lines carrying DC energy and overlaid AC voltage information.

Stations associated with a bus are connected via bus couplers. The stations may process data, or may also operate sensors, installation equipment or motor-driven equipment such as blinds. Systems of this type may be designed to be central or decentralized, in which case it is also necessary to supply, apart from the information, the messages, the energy for the on-board networks. Digital data may be transmitted for measuring or controlling, or analogue signals may be transmitted. Bus systems are also suitable for voice transmission, as is described in an earlier application (EP 88117678.8).

The object of the invention is to develop a message conditioning device which works particularly economically with a small transformer in relation to the processing output.

The described object is achieved according to the invention by a message conditioning device according to Patent Claim 1. According to this, the transformer has at least two windings on the energy-supplying side, between which a capacitor is arranged in series, and which are connected at their other ends in each case to a transmission line for DC energy and AC voltage information. The capacitor separates the DC voltage and should be designed so that it transmits the information signals, that is is conductive for the latter. The transformer works with a winding on the information-receiving side and it should be designed only for this comparatively low
power requirement. There are connected between the transmission lines controllable inverse valves with their output electrodes. Their control electrodes are connected during the transmission time to a load-independent voltage source. A valve controlled by the transmitting voltage is connected for this purpose at least in one connecting line of the load-independent voltage source. In the arrangement illustrated, in which the controllable inverse valves are arranged between the transformer and the connections for transmission lines or a bus, a transmitting operation which is carried out before the transformer, that is on the bus side, is obtained. The transformer is thus avoided, with the high transmitted power in comparison to the received power, so that it may be designed to be particularly small and economical.

The controllable valves may be an npn transistor and a pnp transistor. The controllable valves may also be as (sic) n-channel FET and a p-channel FET.

According to a further development, the load-independent voltage source is a voltage divider composed of at least three resistors connected in series, the load-independent voltage being supplied at the middle resistor thereof, and which is connected to the terminals of the capacitor at least via one valve controlled by the transmitting voltage. While a transmit signal is present, the inverse valves are controlled to be conductive by means of the coupling via the middle resistor of the voltage divider. In a pnp transistor, positive transmitting voltage can be fed to the control electrode for this purpose. In the transmission breaks, when it is designed as a voltage divider the voltage source is, in contrast, disconnected at all poles, that is from the positive internal transmission line and from the negative internal transmission line. Upon disconnection, zero volts are applied to the middle resistor of the voltage divider, so that it short-circuits the control electrodes of the inverse valves, as a result of which the transmission process is not sensitive to all types of interfering influences, that is both to asymmetrical and
symmetrical interfering influences.

By virtue of the load-independent voltage at the control electrodes of the inverse valves, a load-independent current is drawn via these whose limit is determined by the internal limiting resistance or by a discrete limiting resistor. Voltage limitation for the transmission process is carried out by the voltage divider. Consequently the characteristics of a transformer are simulated, namely of limiting the voltage amplitude by its transformation ratio and limiting the amplitude of the transmitting current by its internal resistance. Current and voltage limitation of the transmission amplitude are advantageous, in particular to protect the transmitter device from damage when there is a short-circuit on the external transmission line, that is a bus, for example. A transmit pulse is shaped further thereby by the complex load on the bus. The voltage divider may also work with other than ohmic resistances. Besides a resistor, the middle part of the voltage divider may also be a Zener diode.

The capacitor on the energy-supplying side of the transformer may advantageously be designed as a reservoir capacitor by means of its dimensioning or by means of its construction; as a result of which it is possible to bridge a short-term failure of the supply voltage.

In connection with the capacitor, the winding on the information-receiving side of the transformer forms at the same time a free-running circuit for the energy taken up in the coil during reception, which is available at the winding ends in the receiving breaks at high voltage with reversed poles with respect to the reception, and could lead to disturbances in the electronic network. It is sufficient here to connect a valve, in the simplest case a diode, in series with the winding and to pick up the receiving voltage between winding and valve.

The invention will now be explained in greater detail with reference to exemplary embodiments reproduced roughly and diagrammatically in the drawing, in which:
FIG. 1 reproduces a circuit arrangement for a message conditioning device; FIG. 2 illustrates another exemplary embodiment for the inverse valves.

The message conditioning device 1 according to FIG. 1 works with a transformer which serves as a filter for transmitting DC energy and AC voltage information. However, according to the invention only the received information is transmitted via the transformer. The transformer 2 has at least two windings 3, 4 on the energy-supplying side, between which a capacitor 5 is arranged in series, which is conductive for received information signals and represents a block for the DC energy to be supplied. If the capacitor 5 has a corresponding capacitance or is designed as a reservoir capacitor, it can buffer the DC voltage respectively the DC energy supplied on the transmissions lines 6 and 7 for the message conditioning device 1 during short external voltage interruptions (sic). The coils 3 and 4 are connected in each case at their end not connected to the capacitor 5 to one of the transmission lines 6 or 7 for DC energy and for AC voltage information. The transformer 2 works with a winding 8 on the side processing the received information.

An arrangement 9 with two controllable inverse valves is connected with their output electrodes 12, 13 between the transmission lines. Their control electrodes 14, 15 are connected during a transmit signal to a load-independent voltage source 16. A transmitter is thereby obtained which is connected, with respect to the transformer 2, on the connection side of the message conditioning device 1. In the exemplary embodiment, the connecting line is a bus line with the busbars 17 and 18. In the exemplary embodiment, a valve 21 controlled by the transmitting voltage is interconnected in one of the connecting lines 19 and 20 for the transmitting operation. It is arranged in the exemplary embodiment in the connecting line 20, which is connected between capacitor 5 and the winding 3 or 4 on the DC
energy-supplying side. In the exemplary embodiment, the valve 21 controlled by the transmitting voltage is arranged in the connecting line 20. A positive transmit signal 22 is fed to the valve 21 via a transmitting line 23.

It is of course also possible for the voltage divider with the resistors 26, 27, 28 to be disconnected before the resistor 26 on both sides symmetrically by means of a valve coupled to the valve 21. The symmetrical behaviour which is insensitive to interference is thereby promoted further.

A receiving line 24 is connected for receiving on one end of the winding 8 on the side processing the received information. A valve 25, in the exemplary embodiment a diode, serves for receiving. The receiving line 24 is connected between the latter and the winding 8 in the exemplary embodiment.

In the exemplary embodiment, the controllable valves 10 and 11 are an npn transistor for the valve 10, and a pnp transistor for the valve 11. In the exemplary embodiment according to FIG. 2, the valve 10 is an n-channel MOSFET, and the valve 11 a p-channel MOSFET (sic).

According to a further development, the load-independent voltage source 16, as illustrated in FIG. 1, is part of a voltage divider composed of at least three resistors 26, 27 and 28 connected in series, the load-independent voltage being supplied at the middle resistor 27 thereof. It is connected to the terminals of the capacitor 5 via a valve 21 controlled by the transmitting voltage.

From the bus line with the busbars 17 and 18, positive DC voltage is fed to the message conditioning device 1 from the busbar 17 and negative DC voltage is fed from the busbar 18. The busbars carry overlaid mutually symmetrical AC voltage signals 29 and 30. The DC voltage is available at the end of the transmission lines 6 and 7 in the message conditioning device. AC voltage of the received information leads, in the case of a negative signal present on the transmission line 6 and a positive
signal present on the transmission line 7, to a current flow across the capacitor 5 and a transmitted voltage in the winding 8. The asterisk indicates in each case the direction of winding, so that, with reference to the drawing, a negative receive signal 31 is present at the top of winding 8 in the case of a negative signal at the top of winding 3. At the end of the signal, the magnetic inertia of the winding 8 causes a comparatively higher positive signal to be present at the top of winding 8, which signal finds a free-running circuit via the diode 25 and the capacitor 5.

When a positive transmit signal 22 is present on the transmitting line 23, the valve 21 controlled by the transmitting voltage becomes conductive, so that the valve 11 of the inverse valves 10 and 11 becomes conductive, and the valve 10 is also controlled to become conductive due to the coupling via the resistor 27. For current limitation, it is expedient to connect a limiting resistor 32 in series with the inverse valves 10 and 11. For reasons of symmetry, it is advantageous to arrange the limiting resistor 32 between the valves 10 and 11.

To operate the inverse valves 10 and 11 by means of the load-independent voltage source 16, it is favourable to design the source for a load-independent voltage as part of a voltage divider with the resistors 26, 27 and 28. Instead of the middle resistor 27, or in conjunction with the latter, it is also possible to use another suitable switching means, for example a Zener diode. Even when transmitting is not taking place, a completely symmetrical load is then present between the transmission lines 6 and 7 when valves 10 and 11 are blocked. As a consequence, no spurious signals can be transmitted on the busbars 17 and 18.

Owing to the load-independent voltage source 16, a message conditioning device according to the invention works with a load-independent current in the arrangement 9 with the two inverse valves 10 and 11. This leads to a transmitting operation which is insensitive to interference.
In the message processing device in the further development with the voltage divider for the load-independent voltage source 16, a voltage limitation is achieved during the transmitting operation and a current limitation by virtue of the limiting resistor 32, which may even be part of the inverse valves 10 and 11, so that the behaviour of a conventional transformer is simulated with respect to these desired characteristics. Owing to a limitation of the amplitude of the transmitting voltage and of the transmitting current achieved in this manner, the transmitting operation becomes insensitive to interference on the bus, in particular to short-circuits on the bus. Moreover, the transformer 2 with the transmitting energy is avoided during the transmitting operation, since the transmitted power is output between transformer and bus. It is thus possible to design the transformer to be small and economical. A bus-side transmitting operation is thereby achieved.
The claims defining the invention are as follows:

**Patent claims**

1. Message conditioning device (1) which works with a transformer (2) serving as filter for transmitting DC energy and AC voltage information, having at least two windings on the energy-supplying side, between which a capacitor (5) transmitting information signals is arranged in series, and which are connected at their other ends in each case to a transmission line (6, 7) for DC energy and for AC voltage information, the transformer working with a winding (8) on the side processing the received information, and there being connected between the transmission lines (6, 7) two controllable inverse valves (10, 11) with their output electrodes (12, 13), and the control electrodes (14, 15) thereof being connected during a transmit signal (22) to a load-independent voltage source (16).

2. Device according to Claim 1, characterized in that the controllable inverse valves (10, 11) are an npn transistor and a pnp transistor.

3. Device according to Claim 1, characterized in that the controllable inverse valves (10, 11) are an n-channel FET and a p-channel FET.

4. Device according to Claim 1, characterized in that the load-independent voltage source (16) is part of a voltage divider composed of at least three resistors (26, 27, 28) connected in series, the load-independent voltage being supplied at the middle resistor (27) thereof, and which is connected to the terminals of the capacitor (5) at least via one valve (21) controlled by the transmitting voltage.

5. Device according to Claim 1, characterized in that the capacitor (5) is a reservoir capacitor.

6. Device according to Claim 4, characterized in that a limiting resistor (32) is connected between the inverse valves (10, 11).

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Patent Attorneys for the Applicant

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