

The invention relates to a message-processing apparatus which employs a converter which serves as a splitter for direct-current energy transmission and for alternating-voltage information transmission, in detail in accordance with the generic concept of Patent Claim 1. The message-processing apparatus employs at least two windings on the energy-providing side, between which an information-signal-transmitting capacitor is disposed in a series connection and which are in each case connected at their other ends to a transmission line for direct-current energy and for alternating-voltage information.

In a known arrangement of this type (DE-A-2 113 931) a transmitter is in each case connected via lines to a receiver, a plurality of transmitters being connected in star fashion to a central receiving station, in each case by means of a two-wire network. Said network also carries direct current for supplying the on-board network of the respective transmitting station. A transformer is used as a splitter for energy and messages, in each case at the beginning and end of the transmission line, transformer coils being disposed in series in the transmission line. A bus system having a plurality of subscriber stations of equal status in a two-wire network cannot be constructed by this method.

Bus systems are known in a very wide variety of designs employing a very wide variety of transmission philosophies. Digital data can be transmitted for the purpose of measurement or control, or analog signals can be transmitted. Bus systems are also suitable for speech transmission.

Stations connected to a bus are connected by means of bus couplers. The stations are capable of processing data or even of operating sensors, installation devices or motor-driven devices such as venetian blinds. Such systems can be of a centralized or decentralized design, and not only the information and the messages, but also the energy for the on-board networks can be supplied.

The object of the invention is to develop a message-processing apparatus with bus capability, which apparatus employs a small converter particularly economically with respect to the power to be processed.

The object described is achieved, according to the invention, by a message-processing apparatus in accordance with Patent Claim 1. According to the latter, the converter has at least two coils on the energy-providing side, between which a capacitor is disposed in a series connection and which are in each case connected at their other ends to a transmission line for direct-current energy and alternating-voltage information. The capacitor isolates the direct voltage and is to be designed in such a way that it transmits

the information signals, that is to say it conducts them. The converter employs one coil on the information-receiving side and is to be designed solely for this relatively low power requirement. Connected between the transmission lines by means of their output electrodes are controllable inverting valves. Their control electrodes are connected to an impressed voltage source during the transmission time. For this purpose, a valve controlled by the transmission voltage is switched on in at least one connecting line of the impressed voltage source. In the arrangement described, in which the controllable inverting valves are disposed between the converter and the connections for transmission lines, a transmission mode is achieved which is carried out upstream of the converter, that is to say on the bus side. The converter is therefore bypassed by the transmission power, which is high compared with the receiving power, so that it can be of particularly small and economical design.

The controllable valves can be an n-p-n transistor and a p-n-p transistor. The controllable valves may also be an n-channel FET and a p-channel FET.

According to a further development, the impressed voltage source is a voltage divider comprising at least three resistors connected in series, at whose centre resistor the impressed voltage is provided and which is connected to the terminals of the capacitor at least via one valve controlled by the transmitting voltage. While a transmission signal is present, the inverting valves are turned on by the coupling via the centre resistor of the voltage divider. In the case of a p-n-p transistor, positive transmitting voltage can be supplied to the control electrode for this purpose. In the transmission breaks, on the other hand, in the voltage divider design, the voltage source is all-pole operated, that is to say with respect to the positive internal transmission line and with respect to the negative internal transmission line. On switching off, zero volts are present at the centre resistor of the voltage divider so that it short-circuits the control electrodes of the inverting valves, as a result of which the transmission operation becomes insensitive to interfering effects of all kinds, that is to say to unbalanced and balanced interfering effects.

As a result of the impressed voltage at the control electrodes of the inverting valves, an impressed current is drawn via the latter whose limit is determined by the internal limiting resistor or by a discrete limiting resistor. The voltage of the transmission operation is limited by the voltage divider. As a result, the characteristics of a converter, namely to limit the voltage amplitude by its transformation ratio and to limit the amplitude of the transmitting current by its

internal resistance are reproduced. Current limitation and voltage limitation of the transmission amplitude are advantageous in order to protect the transmitting apparatus against damage, in particular in the event of short circuit on the external transmission line, that is to say, for example, a bus. A transmitted pulse is further shaped at the same time by the complex load on the bus. The voltage divider may also employ resistors other than ohmic ones. The centre part of the voltage divider may also be a zener diode instead of a resistor.

The capacitor on the energy-providing side of the converter may advantageously be designed as a storage capacitor as a result of its dimensioning or its construction, as a result of which a brief failure of the supply voltage can be bridged.

The winding on the information-receiving side of the converter also forms, in conjunction with the capacitor, a freewheeling circuit for the energy which is stored in the coil during the reception and which, in the receiving breaks, is available at high voltage of reverse polarity with respect to the reception across the winding ends and could result in interference in the electronic network. For this purpose it is sufficient to connect a valve, in the simplest case a diode, in series with the winding and to take off the receiving voltage between the winding and the valve.

The invention will now be explained in greater detail with reference to exemplary embodiments shown roughly and diagrammatically in the drawing.

FIGURE 1 shows a circuit arrangement for a message-processing apparatus.

FIGURE 2 illustrates another exemplary embodiment for the inverting valves.

The message-processing apparatus 1 shown in FIGURE 1 employs a converter which serves as splitter for direct-current energy and for alternating-voltage information transmission. According to the invention, however, only the received information is transmitted via the converter. The converter 2 has at least two windings 3, 4 on the energy-providing side, between which a capacitor 5 is disposed in a series connection, which capacitor conducts received information signals and is a barrier to the direct-current energy to be provided. If the capacitor 5 has a suitable capacitance or is designed as a storage capacitor, it is capable of buffering the direct-current energy provided on the transmission lines 6 and 7 for the message-processing apparatus 1 in the event of brief external voltage interruptions. The coils 3 and 4 are connected in each case to one of the transmission lines 6 or 7 for direct-

current energy and for alternating-voltage information at their ends which are not connected to the capacitor 5. The converter 2 employs a winding 8 on the side which processes the received information.

An arrangement 9 comprising two controllable inverting valves is connected between the transmission lines by means of the output electrodes 12, 13 of the controllable inverting valves. Their control electrodes 14, 15 are connected to an impressed voltage source 16 during a transmission signal. As a result, a transmitter is obtained which is switched on with respect to the converter 2 on the connecting side of the message-processing apparatus 1. In the exemplary embodiment, the connecting line is a bus line having the bus wires 17 and 18. For the transmission mode, a valve 21, which is controlled by the transmitting voltage, is inserted in one of the connecting lines 19 and 20 in the exemplary embodiment. In the exemplary embodiment, it is disposed in the connecting line 20, which is connected between the capacitor 5 and the winding 3 or 4 on the side providing direct-current energy. In the exemplary embodiment, the valve 21 controlled by the transmitting voltage is disposed in the connecting line 20. A positive transmission signal 22 is supplied to the valve 21 via a transmitting line 23.

Understandably, the voltage divider comprising the resistors 26, 27, 28 can also be disconnected on both sides in a balanced manner by a valve, coupled to the valve 21, upstream of the resistor 26. The balanced behaviour which is insensitive to interference is further promoted thereby.

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

The controllable valves 10 and 11 are, in the exemplary embodiment, an n-p-n transistor for the valve 10 and a p-n-p transistor for the valve 11. In the exemplary embodiment shown in Figure 2, the valve 10 is an n-channel MOSFET for the valve 10 and a p-channel MOSFET for the valve 11.

According to a further development, the impressed voltage source 16 is, as illustrated in FIGURE 1, part of a voltage divider comprising at least three resistors 26, 27 and 28 connected in series, the impressed voltage being provided at their centre resistor 27. It is connected to the terminals of the capacitor 5 via a valve 21 controlled by the transmitting voltage.

From the bus line comprising the bus wires 17 and 18, positive direct voltage is supplied to the message-processing apparatus 1 from the bus wire 17 and negative direct voltage from the bus wire 18. The bus wires carry balanced alternating-voltage signals 29 and 30 in a superimposed manner. The direct voltage is available at the end of the transmission lines 6 and 7 in the message-processing apparatus. In the case of a negative signal present on the transmission line 6 and a positive signal present on the transmission line 7, received information alternating voltage results in a current flow via the capacitor 5 and a transmitted voltage in the winding 8. The star symbol illustrates in each case the winding sense, so that, with the orientation based on the drawing, a negative reception signal 31 is present at the top of the winding 8 in the case of a negative signal at the top of the winding 3. At the end of the signal, the magnetic inertia of the winding 8 results in a comparatively higher positive signal being present at the top of the winding 8, which signal finds a freewheeling circuit via the diode 25 and the capacitor 5.

If a positive transmission signal 22 is present on the transmitting line 23, the valve 21 controlled by the transmitting voltage becomes conducting, with the result that the valve 11 of the inverting valves 10 and 11 becomes conducting and, because of the coupling via the resistor 27, the valve 10 is also turned on. It is expedient to connect a limiting resistor 32 in series with the inverting valves 10 and 11 for the purpose of current limitation. For balance reasons, it is advantageous to dispose the limiting resistor 32 between the valves 10 and 11.

To operate the inverse valves 10 and 11 by means of the impressed voltage source 16, it is advantageous to design the source for an impressed voltage as part of a voltage divider comprising the resistors 26, 27 and 28. Instead of the centre resistor 27, or in conjunction with the latter, another suitable circuit device, for example a zener diode, may also be used. Even when transmission is not taking place, a completely balanced load is then present between the transmission lines 6 and 7 with the valves 10 and 11 turned off. As a result, no interference signals can be transmitted onto the bus wires 17 and 18.

A message-processing apparatus according to the invention employs two inverting valves 10 and 11 because of the impressed voltage source 16 with an impressed current in the arrangement 9. This results in a transmission mode which is insensitive to interference.

In the case of the message-processing apparatus in the further development comprising the voltage divider for

the impressed voltage source 16, there is achieved, during the transmission mode, a voltage limitation, and a current limitation due to the limiting resistor 32, which may also be a part of the inverting valves 10 and 11, with the result that the behaviour of a standard converter is reproduced in relation to these desired characteristics. As a result of a limitation of the amplitude of the transmitting voltage and of the transmitting current achieved in this way, the transmission mode becomes insensitive to interference on the bus, in particular to short circuits on the bus. On the other hand, during the transmission mode, the converter 2 is bypassed by the transmission energy since the transmission power is delivered between converter and bus. The converter can therefore be of small and economical design. A bus-side transmission mode is therefore achieved.



Patent Claims

1. Message-processing apparatus (1) which employs a converter (2) which serves as a splitter for direct-current energy transmission and for alternating-voltage information transmission, which converter has at least two windings on the energy-providing side, between which an information-signal-transmitting capacitor (5) is disposed in a series connection and which are in each case connected at their other ends to a transmission line (6, 7) for direct-current energy and for alternating-voltage information, the converter employing a winding (8) on the received-information-processing side, characterized in that two controllable inverting valves (10, 11) are connected by means of their output electrodes (12, 13) between the transmission lines (6, 7) and their control electrodes (14, 15) are connected to an impressed voltage source (16) during a transmission signal (22).
2. Apparatus according to Claim 1, characterized in that the controllable inverting valves (10, 11) are an n-p-n transistor and a p-n-p transistor.
3. Apparatus according to Claim 1, characterized in that the controllable inverting valves (10, 11) are an n-channel FET and an p-channel FET.
4. Apparatus according to Claim 1, characterized in that the impressed voltage source (16) is part of a voltage divider comprising at least three resistors (26, 27, 28) connected in series, at whose centre resistor (27) the impressed voltage is provided and which is connected to the terminals of the capacitor (5) at least via one valve (21) controlled by the transmitting voltage.
5. Apparatus according to Claim 1, characterized in that the capacitor (5) is a storage capacitor.
6. Apparatus according to Claim 4, characterized in that a limiting resistor (32) is inserted between the inverting valves (10, 11).