

The invention relates to an information separation device which is to be inductively coupled which operates with a transformer which serves as separating filter for d.c. energy- and a.c. voltage information transmission, in particular in accordance with the preamble of Claim 1. It comprises at least one coil on the side on which energy is made available, which is connected in series with a capacitor across the terminals of which d.c. voltage for the energy supply is made available. Such a device is known in the form of an arrangement comprising a transmitter supplying binary signals and a receiver connected thereto via conductors (DE-A-2 113 931). In this arrangement a transmitter is in each case connected via conductors to a receiver, a plurality of transmitters being connected in a star formation at a central receiving station in each case by means of a two-conductor network. This network also conveys direct current for the supply of the on-board network of the respective transmitting station. As separating filter for energy and information, a transformer is used in each case at the start and the end of the transmission line, transformer coils being arranged in series in the transmission line. It is not possible to construct a bus system with a two-conductor network in accordance with this arrangement.

Bus systems are known in many different constructions and operating in accordance with many different transmission concepts (see also DE-A-3 631 477). Digital data can be transmitted for measurement or control purposes or analogue signals can be transmitted. Bus systems are also suitable for the transmission of speech. For reasons of symmetry, two coils can be provided on the side on which energy is made available.

Stations connected to a bus are connected via bus couplers. In addition to data-processing stations, it is known also to operate other stations such as sensors, installation devices and motor driven devices such as venetian blinds. The system can be arranged centrally or decentrally and in addition to the information, i.e. the messages, the energy for the on-board networks is also to be supplied.

The consumer energy is also to be supplied to energy consumers such as motors, lights or heating devices.

Of decisive importance with regard to the efficiency of a bus system is the interplay between bus and bus couplers, the number of necessary transmission paths and an economical construction and operation of the devices.

The aim of the invention is to develop an information separation device which is suitably adapted to a bus

system, is to be inductively coupled, and operates using one transformer in a particularly efficient fashion.

In accordance with the invention, the described aim is fulfilled by an information separation device according to Claim 1. The transformer utilizes only one coil on the information processing side, for which purpose, in accordance with the function, four valves are provided. Two of the valves are arranged in a transmitting arm in parallel to the storage capacitor, the coil on the information processing side being connected between the two valves. Two of the valves are likewise arranged in an arm parallel to the storage capacitor, the coil on the information processing side being located between these valves but in phase opposition to the circuit arrangement in the transmitting arm.

As a result, energy stored in the coil on the information processing side can be recovered and transferred to the other side of the transformer, bypassing the transformer. Thus this energy transport relieves the load on the transformer with the result that it can be designed to be smaller or more efficient and the operating point can be positioned more favourably. Therefore the transformer can also be designed to be smaller and more efficient with the result that the information separation device as a whole can be constructed to be smaller and more efficient.

In accordance with the general prior art, basically an individual coil would be required for the transmission and for the energy recovery respectively. In the design according to the invention, however, only one coil is required for both functions due to the special wiring.

In accordance with a further development of the invention, one of the valves in the transmitting arm is driven conductive for readiness to receive during transmission pauses, while the other remains in the blocking state, and the received signal is tapped from that end of the coil on the information processing side to which the conductively driven valve is not connected. In the case of an information separation device of this kind which is to be inductively coupled and which comprises one transformer, the single coil for transmission and energy recovery is also used for the reception of the signals. Normally a further individual coil would need to be made available for this purpose. The device according to the invention for the transmission and reception of signals with simultaneous energy recovery for the coil operates using one single coil. Such an information separation device is thus suitable for the transmission of information and the transmission of energy on a common line, thus in

particular for a two-conductor bus. However, other transmission paths and systems can also be used.

The invention is now to be explained in detail making reference to exemplary embodiments shown roughly schematically in the drawing:

Fig. 1 shows a circuit arrangement for transmission and energy recovery for an inductively coupled information separation device.

Fig. 2 shows the circuit arrangement according to Fig. 1 for the reception of signals in transmission pauses.

The information separation device 1 shown in Fig. 1 is connected to a bus line 2. In the exemplary embodiment the bus line 2 conducts both direct current for the supply of the on-board networks of the station 1 and those of further information separation devices to be connected in parallel. The bus also conveys superimposed signals for the information traffic. The information separation device operates using a transformer 3 as separating filter for d.c. energy transmission and for a.c. voltage information transmission. On the side 4 of the transformer on which energy is made available two windings 6 and 7 are provided for reasons of symmetry. For this purpose a capacitor 8 is connected in series between the windings. It forms a conductive path for information signals. D.c. voltage for the energy supply of the information separation device 1 is made available at the terminals 9 and 10 of the capacitor. The transformer 3 requires only one winding 11 on the information processing side 5. For this purpose, in accordance with the function, four valves 12, 13, 14, 15 are provided. Two valves 12, 13 are arranged in a transmitting arm in parallel to the capacitor 8 in such manner that the winding 11 is connected between these valves on the information processing side 5 of the transformer. Two valves 14, 15 are arranged in a further arm which is parallel to the storage capacitor and in which the winding 11 on the information processing side is located. The winding is arranged between these valves. It is of essential importance that by virtue of these valves 14 and 15 the coil 11 is connected in phase opposition in relation to the valves 12 and 13 in the transmitting arm.

When the capacitor acts as storage capacitor on account of its dimensioning or construction, temporary external voltage failures can be bridged.

From a control terminal of the valve 12 a connection line 16 leads via a two-terminal coupling network 17 to the transmitting arm with the valves 12 and 13. The

two-terminal coupling network can consist of an ohmic resistor or a RC- element. It makes available a negative control potential across the valve 12, which has the form of a pnp-transistor, when a positive transmission signal occurs across the valve 13, which has the form of a npn-transistor, whereby both the valves 12 and 13 are driven conductive.

When a positive transmission signal 18 occurs on the transmission control line 19, the valve 13 is driven conductive so that negative potential is fed to the control electrode of the valve 12, with the result that a positive current flow takes place from the capacitor 8 via the connection line 9, the valve 12, the winding 11 of the transformer on the information processing side 5, via the valve 13 and the connection line 10 back to the negative potential side of the capacitor 8. The winding 11 is here, as oriented in the drawing, connected at the bottom to plus voltage and at the top to minus voltage. In the transmission pause 20 energy recovery takes place:

Due to the electromagnetic inertia of the winding 11 and its polarity reversal at the end of the transmission signal 18, as oriented in the drawing a relatively high positive potential occurs at the top of the winding 11 and a correspondingly negative potential at the bottom. For the energy recovery at the end of the transmission signal 18, then a positive current flow takes place via the valve 14, constructed as diode, via the terminal 9 of the storage capacitor to the storage capacitor 8 and via the terminal 10 of the storage capacitor and via the valve 15, constructed as diode, back to the winding 11 of the transformer 3. As a result energy is conveyed past the transformer to the storage capacitor 8 and via the terminals 9 and 10 is available again for the energy supply of the information separation device 1.

In accordance with Fig. 2 the information separation device 1 can also be further developed in such manner that using the single winding 11 of the transformer on the information processing side, received signals 21 emanating from the bus 2, which are shown as symmetrical a.c. voltage signals in the exemplary embodiment, can be evaluated. For this purpose one of the valves 12, 13 in the transmitting arm is driven conductive for readiness to receive in transmission pauses 20, whereas the other valve remains in the blocking state. In the exemplary embodiment the valve 12 is driven conductive for reception while the valve 13 remains blocked in transmission pauses 20. The received signal 22 in the information separation device 1 is tapped via the receiving line 23 at that end of the winding on the

information processing side 5 of the transformer 3 to which the conductively driven valve 12 is not connected.

In order to drive the valve 12 conductive for readiness for reception in transmission pauses 20, via a resistor 24, which at its other end is connected to the terminal 10, negative control voltage is applied for the pnp-transistor, the valve 12. The receiving line 23 is also connected via a diode 25 to the control electrode of the valve 12, oriented in such manner that the relatively high positive potential across the upper terminal of the winding 11 is supplied to the control electrode in the phase for energy recovery and the valve 12 is reliably blocked. In the exemplary embodiment the received signals 21 from the bus lead to a negative received signal 22 in the information separation device on the secondary side of the transformer 3 on the receiving line 23.

As a result, in the case of a bus transmitting energy and information over one line, it is possible to analyze transmitted signals, carry out energy recovery, and process received signals using one winding on the information processing side of a transformer.

Claims

1. An information separation device (1) which is to be inductively coupled which operates with a transformer (3) which serves as separating filter for d.c. energy- and for a.c. voltage information transmission, which comprises at least one winding (6; 7) on the side (4) on which energy is made available, which is connected in series with a capacitor (8), at the terminals (9, 10) of which d.c. voltage for the energy supply is made available, wherein the transformer (3) comprises only one winding (11) on the information processing side (5), characterised in that, in accordance with the function, four valves (12, 13, 14, 15) are provided, two (12, 13) in a transmitting arm parallel to the storage capacitor (8), where the winding (11) on the information processing side (5) is connected between the two valves (12, 13), two (14, 15) in an arm parallel to the storage capacitor in which the winding (11) on the information processing side is connected between the valves (14, 15) in phase opposition.

2. An information separation device (1) which is to be inductively coupled comprising a transformer (3) according to Claim 1, characterised in that one of the valves (12, 13; 12) in the transmitting arm is driven conductive for readiness to receive in transmission pauses (20), while the other valve (13) remains in the blocking state, and the received signal (22) is tapped from that end of the winding (11) on the information processing side (5) to which the conductively driven valve (12) is not connected.