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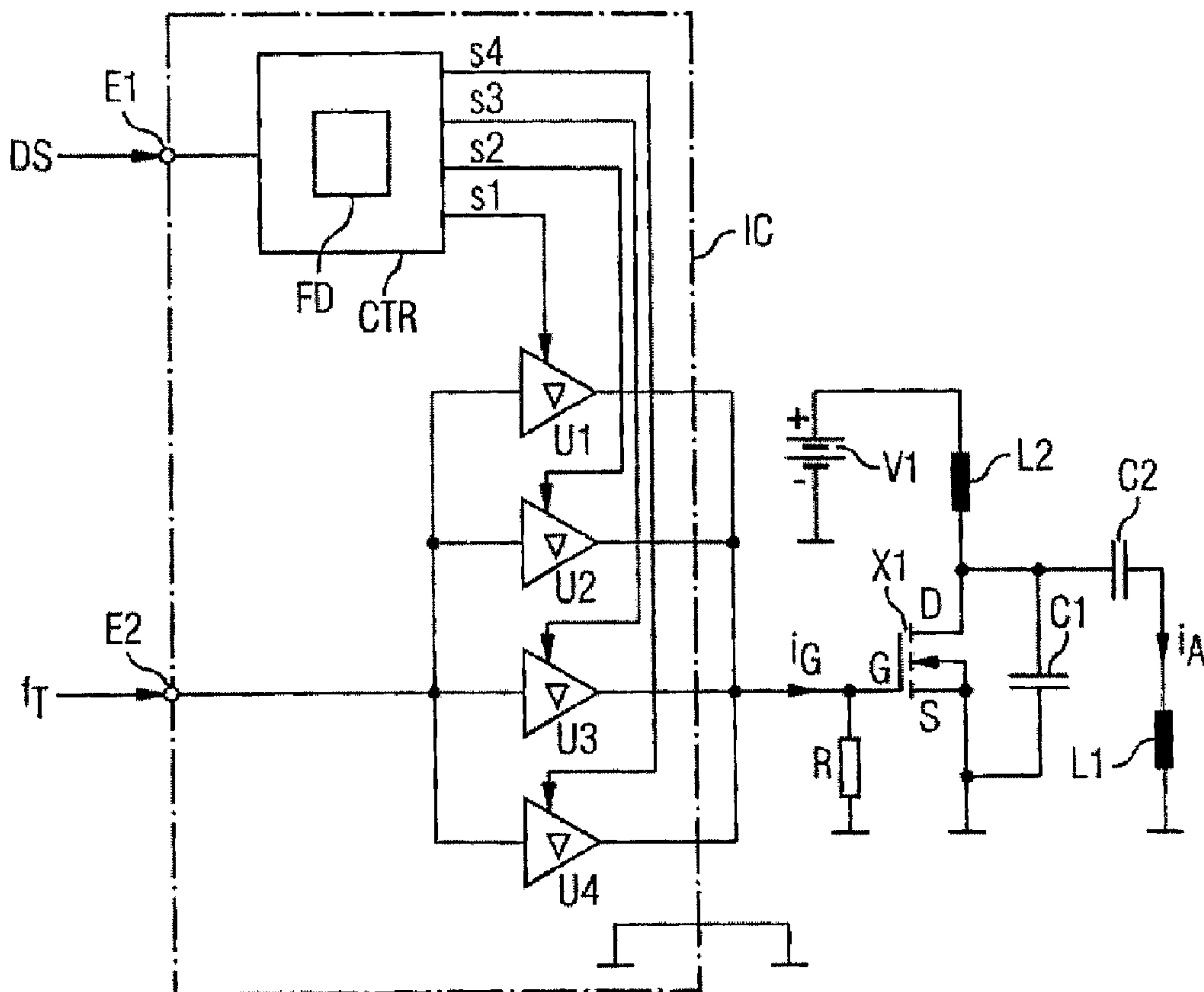
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(54) Titre : DISPOSITIF D'EMISSION DE SIGNAUX HF, NOTAMMENT DANS UN SYSTEME D'IDENTIFICATION

(54) Title: DEVICE FOR EMITTING HF SIGNALS, PARTICULARLY IN AN IDENTIFICATION SYSTEM



(57) Abrégé/Abstract:

The invention relates to a device for emitting HF signals, which has a modulator for the amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna.



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Abstract

Device for Emitting of HF Signals, Particularly in an Identification System

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FIG 2

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Description

Device for Emitting HF Signals, Particularly in an Identification System

The invention relates to a device for emitting HF Signals.

Contactless identification systems use contactless transmission methods. Systems of this type are used, for example, to identify persons or moving goods, e.g., transportation means. The necessary data is transmitted by a read/write device over a contactless data transmission link, e.g., over an air interface, to a mobile data carrier and in opposite direction. The contactless identification method also makes it possible to acquire data while the data carrier moves past the read/write device, without the need for the data carrier to be inserted into, or swiped through, the read/write device. Data carriers of this type are used, among other things, as tickets with an electronically reloadable credit balance, such that the corresponding amount is automatically deducted when the means of transport is used.

German Patent DE 32 42 551 C2 discloses an arrangement for identifying an object. This arrangement has an identification device, which emits the electromagnetic energy in the form of electromagnetic waves via a transmitter equipped with an antenna. The arrangement further has a code carrier disposed on the object to be identified, which picks up the emitted energy via a receiver. The receiver of the code carrier can be switched or adjusted between different loads in accordance with the code, such that, if the load in the code carrier changes, the electromagnetic field on the transmitter emitting the energy is changed according to the identification device and the low-frequency current or

voltage change resulting from the field change is evaluated with respect to the code contained therein.

DE 198 44 631 A1 discloses a system for monitoring, controlling, tracking and handling objects. This prior-art system has at least one stationary or mobile read/write device and at least one mobile data carrier fixed directly to the object. The data carrier has means for storing identification data and object-specific data as well as means for the wireless transmission of the data to the read/write device. The mobile data carrier further has means for acquiring and storing environmental data and/or other measured values. The identification data, object-specific data and/or environmental data or measured values are either sent automatically using a broadcast method or are transmitted to the read/write device upon request by the device. The read/write device has a microprocessor, a memory, an input/output unit, an interface, a transceiver and a power supply.

European Publication EP 0 171 433 B1 discloses an identification system, which has at least one reader/exciter and a passive integrated transponder. The reader/exciter has an exciter, a signal conditioner as well as demodulation and detection circuits. The exciter consists of an AC signal source and an energy amplifier, which supplies an exciter signal with high current intensity and voltage to an exciter/query coil via a capacitor. The query coil and the capacitor are selected such that resonance is present in the exciter signal frequency, so that the voltage applied to the coil is substantially larger than the voltage present at the output of the amplifier. The exciter has a crystal-controlled oscillator, the frequency-divided output signal of which is used to control a high-energy switch driver, which in turn drives the exciter/query coil. The high-energy switch driver contains two MOSFETs, which are interconnected in a push-pull arrangement. The outputs of the

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MOSFETs are connected to the exciter/query coil via a resistor network and coupling capacitors. The resistor network is provided to reduce the losses of the MOSFETs during the switching transitions.

Also known are so-called Class-E amplifiers. They have a transistor which operates as a switch. To reduce power dissipation, an effort is always made to keep the switching time of the transistor as short as possible. The load network connected to the transistor is provided to configure the voltage and current curve in such a way that a high voltage never occurs simultaneously with a high current in the transistor.

The object of the invention is to provide an identification system which can be used in a device for emitting HF signals and which has a reduced number of components.

This object is attained by a device with the features set forth in Claim 1. Advantageous embodiments and further refinements of the invention are set forth in the dependent claims.

The advantages of the invention are, in particular, that the claimed device for emitting HF signals has a reduced number of components compared to the units of the prior art.

Furthermore, the claimed device works more efficiently and requires only a low supply voltage.

Advantageously, suitably controlling the parallel-connected tri-state outputs of a digital integrated circuit makes it possible to connect, disconnect and bring to a high-resistance state each one of these outputs. If, for example, all the tri-state outputs are connected, then a high current flows through the transmitting coil or the transmitting antenna. If

some of the tri-state outputs are high-resistance, then a lower current flows through the transmitting coil or the transmitting antenna. This results in an amplitude shift keying of the current flowing through the transmitting antenna and of the magnetic field generated by this current.

To obtain the shortest possible falling edges of the envelope curve, all the tri-state outputs can be switched off during the initial time of a blanking, such that the switching transistor of the Class-E amplifier is reliably inhibited. Shorter rise times of the edges of the envelope can be obtained correspondingly by activating additional outputs.

If the tri-state outputs are additionally wired with resistors connected in series thereto, it is possible to achieve a different weighting and thereby an even greater range of the possible gate currents of the MOSFETs of the Class-E amplifier.

Using a coil of the Class-E amplifier as the transmitting antenna, as set forth in Claim 9, further reduces the number of the required components.

As an alternative thereto—if required by the corresponding application—the transmitting antenna can be arranged at a distance from the Class-E amplifier and can be connected therewith via a line and a matching network. The role of the matching network is to match the amplifier and the antenna to the ohmic resistance of the line.

A device according to the invention can be advantageously used in an identification system and in that system can be a component of the read/write device, from which modulated data signals are transmitted to a mobile data carrier.

Further advantageous features of the invention are set forth in the description provided by way of example with reference to the figures. The following show:

- FIG 1 a block diagram of an identification system in which the invention can be used,
- FIG 2 a circuit diagram of a first exemplary embodiment of a device for emitting HF signals according to the invention,
- FIG 3 a circuit diagram of a second exemplary embodiment of a device for emitting HF signals according to the invention,
- FIG 4 a circuit diagram of a third exemplary embodiment of a device for emitting HF signals according to the invention, and
- FIG 5 a circuit diagram of a fourth exemplary embodiment of a device for emitting HF signals according to the invention.

FIG 1 shows a block diagram of an identification system I in which the invention can be used.

The system depicted has a read/write device 1 and a mobile data carrier 4. Between the read/write device 1 and the mobile data carrier 4, data DA is exchanged bidirectionally over an air transmission link 3. The read/write device also transmits energy E to the mobile data carrier 4 over the air transmission link 3. This transmission of energy occurs in time intervals when no data is being exchanged. Data and energy are transmitted based on the principle of inductive coupling, such that HF signals are transmitted. For this purpose, the read/write device 1 is equipped with a coil 2 and the mobile data carrier 4 with a coil 5, each of which acts as an antenna.

In the mobile data carrier 4, the transmitted energy is supplied via a rectifier 6 to an energy storing device implemented as a capacitor. The unstabilized DC voltage present at the capacitor 7 is supplied to a voltage stabilizer 8, at the output of which the stabilized DC voltage required to supply the mobile data carrier 4 is provided.

Furthermore, in the mobile data carrier 4, the signal received by the coil 5 is supplied to an evaluation unit 9 in which the data transmitted are analyzed and then routed to a memory 10. The evaluation unit 9 is also provided to generate response signals, which are sent via the coil 5 and are transmitted to the read/write device 1.

The present invention relates, in particular, to the device for emitting HF signals from the read/write device 1 to the mobile data carrier 4, used in the depicted system.

FIG 2 shows a circuit diagram of a first exemplary embodiment of a device for emitting HF signals according to the invention. The depicted device has a modulator for amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna. The Class-E amplifier and the transmitting antenna are components of the modulator and the transmitting antenna is a component of the Class-E amplifier.

The modulator has a digital integrated circuit IC, which has a first input port E1 and a second input port E2. The first input port E1 receives a data signal DS to be modulated, which consists of a sequence of LOW and HIGH levels, e.g., a sequence of zeros and ones. A carrier frequency signal f_T , the frequency of which is, for example, 13.56 MHz, is applied to the second input signal port E2.

The carrier frequency signal f_T is guided within the digital integrated circuit IC to four gates U1, U2, U3, U4, which are connected in parallel to each other and form tri-state outputs of the digital integrated circuit IC. The control signals s1, s2, s3, s4 for the gates U1, U2, U3, U4 are provided by a control unit CTR, at the input of which the data signal DS to be modulated is present. The control unit CTR generates the control signals s1, s2, s3, s4 as a function of the data signals DS to be modulated such that more or fewer of these gates are conducting, so that a respectively desired gate current i_G flows into the gate terminal G of a switching transistor X1.

The switching transistor X1 is a component of a Class-E amplifier and is implemented as a field effect transistor. The source terminal S of the field effect transistor X1 is connected to ground. The source terminal S is further connected via a capacitor C1 to the drain terminal D of the field effect transistor X1. The drain terminal D is further connected via a coil L2 to a DC voltage source V1, which provides a DC supply voltage smaller than 6V. Preferably, the DC voltage source V1 provides a DC supply voltage of 3.3V. This supply voltage, which is low compared to the solutions of the prior art, is sufficient in a device according to the invention to transmit HF signals from the read/write device of an identification system to the mobile data carrier. These HF signals are emitted via a coil L1, which in the depicted exemplary embodiment forms the transmitting antenna and at the same time is a component of the Class-E amplifier. The coil is connected via a capacitor C2 to the drain terminal D of the field effect transistor X1. The other terminal of the coil L1 is connected to ground.

In the device depicted in FIG 2 the input signals DS to be modulated are subjected to an amplitude shift keying. This is accomplished by using a plurality of parallel-connected

tri-state outputs of a digital integrated circuit IC. These tri-state outputs can be individually connected, disconnected or switched to a high-resistance state. This occurs as a function of the input signals using a control unit CTR, which provides control signals for the tri-state outputs. These outputs switch the MOS field effect transistor X1 of a Class-E amplifier at the carrier frequency. As a result, a nearly harmonic current with a constant amplitude is generated in the transmitting antenna L1.

This constant amplitude is also determined by the switching speed of the transistor X1. The higher this speed is, the lower are the losses in the transistor and the higher is the current i_A flowing through the transmitting antenna L1.

To switch the transistor X1 its gate capacitance is charged/discharged. This charging/discharging is effected through the gate current i_G , the magnitude of which also depends on the internal resistance of the driver used. Varying the gate current i_G changes the switching times and consequently also the current i_A flowing through the transmitting antenna.

A low internal resistance can be achieved by simultaneously switching on several of the tri-state outputs of the digital integrated circuit IC. The internal resistance can be increased by switching some of these tri-state outputs to a high-resistance state. The other outputs continue to operate at the carrier frequency clock. This reduces the current i_A flowing through the transmitting antenna L1. The switching to the high-resistance state occurs at the data clock rate with the bit sequence of the input signals to be modulated, which are a digital bit stream.

If all the gates U1, U2, U3, U4 are connected, then a high current i_A flows through the transmitting antenna L1. If a few of these gates are high-resistance then the current i_A is lower. This corresponds to an amplitude shift keying of the current i_A flowing through the transmitting antenna L1 and of the magnetic field generated by this current.

FIG 3 shows a circuit diagram of a second exemplary embodiment of a device for emitting HF signals according to the invention. The depicted device, which largely corresponds to the device shown in FIG 2, has a modulator for the amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna. The Class-E amplifier is a component of the modulator, and the transmitting antenna L3 is further connected to the Class-E amplifier via a line T1 and a matching network C3, C4.

The modulator has a digital integrated circuit IC, which has a first input port E1 and a second input port E2. A data signal DS to be modulated, consisting of a sequence of LOW and HIGH levels or a sequence of zeros and ones, is supplied to the first input port E1. A carrier frequency signal f_T , the frequency of which is, for example, 13.56 MHz, is applied to the second input signal port E2.

The carrier frequency signal f_T is guided within the digital integrated circuit IC to four gates U1, U2, U3, U4, which are connected in parallel to each other and form tri-state outputs of the digital integrated circuit IC. The control signals s1, s2, s3, s4 for the gates U1, U2, U3, U4 are provided by a control unit CTR, at the input of which the data signal DS to be modulated is present. The control unit CTR generates the control signals s1, s2, s3, s4 as a function of the data signals DS to be modulated such that more or fewer of

these gates are conducting, so that a respectively desired gate current i_G flows into the gate terminal G of a switching transistor X1.

The switching transistor X1 is a component of a Class-E amplifier and is implemented as a field effect transistor. The source terminal S of the field effect transistor X1 is connected to ground. The source terminal S is further connected via a capacitor C1 to the drain terminal D of the field effect transistor X1. The drain terminal D is further connected via a coil L2 to a DC voltage source V1, which provides a DC supply voltage smaller than 6V. Preferably the DC voltage source V1 provides a DC supply voltage of 3.3V. This supply voltage, which is low compared to solutions of the prior art, is sufficient in a device according to the invention to transmit HF signals from the read/write device of an identification system to the mobile data carrier. These HF signals are emitted via the coil L3, which in the depicted exemplary embodiment forms the transmitting antenna and is connected to the Class-E amplifier via the line T1 and the matching network C3, C4. The other terminal of the coil L3 is connected to ground. The drain terminal D of the field effect transistor X1 is connected to the line T1 via a capacitor C2 and a coil L1 connected in series thereto.

In the device depicted in FIG 3 the input signals DS to be modulated are subjected to an amplitude shift keying. This is accomplished by using a plurality of parallel-connected tri-state outputs of a digital integrated circuit IC. These tri-state outputs can be individually connected, disconnected or switched to a high-resistance state. This is accomplished as a function of the input signals using a control unit CTR, which provides control signals for the tri-state outputs. These outputs switch the MOS field effect

transistor X1 of a Class-E amplifier at the carrier frequency. As a result, a nearly harmonic current with constant amplitude is generated in the transmitting antenna L3.

This constant amplitude is also determined by the switching speed of the transistor X1. The higher this speed is, the lower are the losses in the transistor and the higher is the current i_A flowing through the transmitting antenna L3.

To switch the transistor X1, its gate capacitance is charged/discharged. This charging/discharging occurs through the gate current i_G , the magnitude of which also depends on the internal resistance of the driver used. Varying the gate current i_G changes the switching times and consequently also the current i_A flowing through the transmitting antenna L3.

A lower internal resistance can be achieved by simultaneously switching on several of the tri-state outputs of the digital integrated circuit IC. The internal resistance can be increased by switching some of these tri-state outputs to a high-resistance state. The other outputs continue to operate at the carrier frequency clock. As a result the current i_A flowing through the transmitting antenna L3 is reduced. Switching to the high-resistance state occurs at the data clock rate with the bit sequence of the input signals to be modulated, which are a digital bit stream.

If all the gates U1, U2, U3, U4 are connected, then a high current i_A flows through the transmitting antenna L3. If some of these gates are high-resistance, then the current i_A is lower. This corresponds to an amplitude shift keying of the current i_A flowing through the transmitting antenna L3 and of the magnetic field generated by this current.

A device according to FIG 3 can be used, in particular, if the transmitting antenna cannot be arranged in the immediate proximity of the modulator or the digital integrated circuit IC and the Class-E amplifier for design reasons. The matching network consisting of the capacitors C3 and C4 serves to match the Class-E amplifier and the antenna to the ohmic resistor of the line T1.

FIG 4 shows a circuit diagram of a third exemplary embodiment of a device for emitting HF signals according to the invention. The depicted device, which largely corresponds to the device shown in FIG 2, has a modulator for amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna. The Class-E amplifier and the transmitting antenna are components of the modulator, and the transmitting antenna is a component of the Class-E amplifier.

The modulator has a digital integrated circuit IC, which has a first input port E1 and a second input port E2. A data signal DS to be modulated, which consists of a sequence of LOW and HIGH levels or a sequence of zeros and ones, is supplied to the first input port E1. A carrier frequency signal f_T the frequency of which is, for example, 13.56 MHz, is applied to the second input signal port E2.

The carrier frequency signal f_T is guided within the digital integrated circuit IC to four gates U1, U2, U3, U4, which are connected in parallel to each other and form tri-state outputs of the digital integrated circuit IC. The control signals s1, s2, s3, s4 for the gates U1, U2, U3, U4 are provided by a control unit CTR, at the input of which the data signal DS to be modulated is present. The control unit CTR generates the control signals s1, s2, s3, s4 as a function of the data signals DS to be modulated such that more or fewer of

these gates are conducting, so that a respectively desired gate current i_G flows into the gate terminal G of a switching transistor X1. With the ohmic resistors R1, R2, R3, R4, one of these resistors being connected in series on the load side of each gate, a different weighting is achieved and the number of possible gate currents i_G of the switching transistor X1 is further increased.

The switching transistor X1 is a component of a Class-E amplifier and is implemented as a field effect transistor. The source terminal S of the field effect transistor X1 is connected to ground. The source terminal S is further connected via a capacitor C1 to the drain terminal D of the field effect transistor X1. The drain terminal D is further connected via a coil L2 to a DC voltage source V1, which provides a DC supply voltage smaller than 6V. Preferably the DC voltage source V1 provides a DC supply voltage of 3.3V. This supply voltage, which is low compared to solutions of the prior art, is sufficient in a device according to the invention to transmit HF signals from the read/write device of an identification system to the mobile data carrier. These HF signals are emitted via a coil L1, which in the depicted exemplary embodiment forms the transmitting antenna and at the same time is a component of the Class-E amplifier. The coil is connected via a capacitor C2 to the drain terminal D of the field effect transistor X1. The other terminal of the coil L1 is connected to ground.

In the device depicted in FIG 4 the input signals DS to be modulated are subjected to an amplitude shift keying. This is accomplished by using a plurality of parallel-connected tri-state outputs of a digital integrated circuit IC. These tri-state outputs can be individually connected, disconnected or switched to a high-resistance state. This occurs as a function of the input signals by means of a control unit CTR, which provides control

signals for the tri-state outputs. These outputs switch the MOS field effect transistor X1 of a Class-E amplifier at the carrier frequency. As a result, a nearly harmonic current with constant amplitude is produced in the transmitting antenna L1.

This constant amplitude is also determined by the switching speed of the transistor X1. The higher this speed is, the lower are the losses in the transistor and the higher is the current i_A flowing through the transmitting antenna L1.

To switch the transistor X1 its gate capacitance is charged/discharged. This charging/discharging occurs through the gate current i_G , the magnitude of which also depends on the internal resistance of the driver used. Varying the gate current i_G changes the switching times and consequently also the current i_A flowing through the transmitting antenna.

A lower internal resistance can be achieved by simultaneously switching on a plurality of the tri-state outputs of the digital integrated circuit IC. The internal resistance can be increased by switching some of these tri-state outputs to a high-resistance state. The other outputs continue to operate at the carrier frequency clock. As a result, the current i_A flowing through the transmitting antenna L1 is reduced. Switching to the high-resistance state occurs at the data clock rate with the bit sequence of the input signals to be modulated, which are a digital bit stream.

If all the gates U1, U2, U3, U4 are connected, then a high current i_A flows through the transmitting antenna L1. If some of these gates are high-resistance then the current i_A is lower. This corresponds to an amplitude shift keying of the current i_A flowing through the transmitting antenna L1 and the magnetic field generated by this current.

FIG 5 shows a circuit diagram of a fourth exemplary embodiment of a device for emitting HF signals according to the invention. The depicted device, which largely corresponds to the device shown in FIG 2, has a modulator for the amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna. The Class-E amplifier is a component of the modulator, and the transmitting antenna L3 is connected to the Class-E amplifier via a line T1 and a matching network C3, C4.

The modulator has a digital integrated circuit IC, which has a first input port E1 and a second input port E2. A data signal DS to be modulated, which consists of a sequence of LOW and HIGH levels or a sequence of zeros and ones, is supplied to the first input port E1. A carrier frequency signal f_T , the frequency of which is, for example, 13.56 MHz, is applied to the second input signal port E2.

The carrier frequency signal f_T is guided within the digital integrated circuit IC to four gates U1, U2, U3, U4, which are connected in parallel to each other and form tri-state outputs of the digital integrated circuit IC. The control signals s1, s2, s3, s4 for the gates U1, U2, U3, U4 are provided by a control unit CTR, at the input of which the data signal DS to be modulated is present. The control unit CTR generates the control signals s1, s2, s3, s4 as a function of the data signals DS to be modulated such that more or fewer of these gates are conducting, so that a respectively desired gate current i_G flows into the gate terminal G of a switching transistor X1. Through the ohmic resistors R1, R2, R3, R4, one of these resistors being connected in series on the load side of each gate, a different weighting is achieved and the number of the possible gate currents i_G of the switching transistor X1 is further increased as a result.

The switching transistor X1 is a component of a Class-E amplifier and is implemented as a field effect transistor. The source terminal S of the field effect transistor X1 is connected to ground. The source terminal S is further connected via a capacitor C1 to the drain terminal D of the field effect transistor X1. The drain terminal D is further connected via a coil L2 to a DC voltage source V1, which provides a DC supply voltage smaller than 6V. Preferably the DC voltage source V1 provides a DC supply voltage of 3.3V. This supply voltage, which is low compared to solutions of the prior art, is sufficient in a device according to the invention to transmit HF signals from the read/write device of an identification system to the mobile data carrier. These HF signals are emitted via the coil L3, which in the exemplary embodiment shown forms the transmitting antenna and is connected to the Class-E amplifier via the line T1 and the matching network C3, C4. The other terminal of the coil L3 is connected to ground. The drain terminal D of the field effect transistor X1 is connected to the line T1 via a capacitor C2 and a coil L1 connected in series thereto.

In the device depicted in FIG 5 the input signals DS to be modulated are subjected to an amplitude shift keying. This is accomplished by using a plurality of parallel-connected tri-state outputs of a digital integrated circuit IC. These tri-state outputs can be individually connected, disconnected or switched to a high-resistance state. This occurs as a function of the input signals by means of a control unit CTR, which provides control signals for the tri-state outputs. These outputs switch the MOS field effect transistor X1 of a Class-E amplifier at the carrier frequency. As a result, a nearly harmonic current with constant amplitude is generated in the transmitting antenna L3.

This constant amplitude is also determined by the switching speed of the transistor X1. The higher this speed is, the lower are the losses in the transistor and the higher is the current i_A flowing through the transmitting antenna L3.

To switch the transistor X1 its gate capacitance is charged/discharged. This charging/discharging occurs through the gate current i_G , the magnitude of which also depends on the internal resistance of the driver used. Varying the gate current i_G changes the switching times and consequently also the current i_A flowing through the transmitting antenna L3.

A low internal resistance can be achieved by simultaneously switching on a plurality of the tri-state outputs of the digital integrated circuit. The internal resistance can be increased by switching some of these tri-state outputs to a high-resistance state. The other outputs continue to operate at the carrier frequency clock. As a result the current i_A flowing through the transmitting antenna L3 is reduced. Switching to the high-resistance state occurs at the data clock rate with the bit sequence of the input signals to be modulated, which are a digital bit stream.

If all of the gates U1, U2, U3, U4 are connected, then a high current i_A flows through the transmitting antenna L3. If some of these gates are high-resistance, then the current i_A is lower. This corresponds to an amplitude shift keying of the current i_A flowing through the transmitting antenna L1 and the magnetic field generated by this current.

A device according to FIG 5 can be used, in particular, if the transmitting antenna cannot be arranged in the immediate proximity of the modulator or the digital integrated circuit IC and the Class-E amplifier for design reasons. The matching network consisting of the

capacitors C3 and C4 serves to match the Class-E amplifier and the antenna to the ohmic resistance of the line T1.

Thus, the invention relates to a device for emitting HF signals, which has a modulator for the amplitude shift keying of input signals, a Class-E amplifier as the transmitting amplifier and a transmitting antenna. The Class-E amplifier is highly efficient and requires only a low DC supply voltage, which is, for example, 3.3V. The device according to the invention requires fewer components for its implementation compared to prior-art devices for emitting HF signals. The transmitting antenna can be a component of the Class-E amplifier, so that the number of required components is further reduced, or can be connected to the Class-E amplifier via a line and a matching network.

The current flowing through the antenna can be readily adjusted during operation as a function of the input signals by software commands via the number of the active digital outputs of the integrated digital circuit. This makes it possible to achieve the desired amplitude shift keying and also to change the output current. The claimed device can be readily integrated into a digital environment, e.g., a FPGA. This does not require a clock faster than the carrier frequency.

As may be seen from the above description, the device according to the invention may be carried out as a function of the control of the tri-state outputs or gates as well as an amplitude shift keying with one modulation depth, i.e., two levels of the output current, as well as an amplitude shift keying with more than one modulation depth, i.e., more than two levels of the output current.

An advantageous further refinement of the invention consists in equipping the control unit CTR arranged in the digital integrated circuit IC with an edge detector FD and taking into account the output signals of the edge detector when determining the control signals s1, s2, s3, s4. This makes it possible to make the falling and rising edges of the envelope curve steeper.

An advantageous further refinement of the invention consists of equipping the control unit CTR arranged in the digital integrated circuit IC with an edge detector FD and taking into account the output signals of the edge detector when determining the control signals s1, s2, s3, s4. This makes it possible to make the falling and rising edges of the envelope curve steeper.

In all of the above-described exemplary embodiments, a high-resistance ohmic resistor R is provided between the gate G of the switching transistor X1 and the ground. This resistor has no influence during regular operation of the corresponding device. Only when the digital integrated circuit IC is without power because of an error or when the power supply is connected and disconnected, this ohmic resistor R blocks the switching transistor X1 and prevents an open gate with an undefined level.

List of Reference Numerals

1	read/write device
2	antenna; coil
3	air transmission link
4	mobile data carrier
5	antenna; coil
6	rectifier
7	capacitor
8	voltage stabilizer
9	evaluation unit
10	memory
C1, C2, C3, C4	capacitors
CTR	control unit
D	drain terminal
DA	data
DS	data signal
E	energy
E1	input port
E2	input port
fD	edge detector
f_t	carrier frequency signal
G	gate terminal
I	identification system
i_A	antenna current
IC	digital integrated circuit
i_G	gate current
L1, L2, L3	coils
R	ohmic resistance
R1, R2, R3, R4	ohmic resistors
S	source terminal
T1	line
X1	switching transistor; FET
U1, U2, U3, U4	gate; tri-state outputs

Claims

1. Device for emitting HF signals, which has a modulator for the amplitude shift keying of input signals, a Class-E amplifier and a transmitting antenna.
2. Device as claimed in Claim 1, characterized in that the Class-E amplifier has a switching transistor (X1), which is controlled with varying power as a function of the input signals.
3. Device as claimed in Claim 1 or 2, characterized in that the switching transistor is a field effect transistor.
4. Device as claimed in Claim 3, characterized in that the drain terminal (D) of the field effect transistor (X1) is connected via a coil (L2) to a DC voltage source (V1).
5. Device as claimed in any one of the preceding claims, characterized in that the input signals (DS) are supplied to the Class-E amplifier via a digital integrated circuit (IC), which has a plurality of parallel tri-state outputs (U1, U2, U3, U4), which can be individually connected, disconnected or switched to the high-resistance state as a function of the input signals.
6. Device as claimed in Claim 5, characterized in that the digital integrated circuit (IC) has a control unit (CTR), which generates control signals (s1, s2, s3, s4) for the tri-state outputs (U1, U2, U3, U4).

7. Device as claimed in Claim 6, characterized in that the digital integrated circuit (IC) has an edge detector (FD) and the control unit (CTR) generates the control signals (s1, s2, s3, s4) for the tri-state outputs (U1, U2, U3, U4) as a function of the edges contained in the input signals.

8. Device as claimed in any one of Claims 5 to 7, characterized in that the control unit (CTR) generates the control signals (s1, s2, s3, s4) for the tri-state outputs (U1, U2, U3, U4) in such a way that an amplitude shift keying occurs with more than one modulation depth.

9. Device as claimed in any one of the preceding claims, characterized in that the transmitting antenna is formed by a coil (L1) of the Class-E amplifier (FIG 2; FIG 4).

10. Device as claimed in any one of Claims 1 to 8, characterized in that the Class-E amplifier is connected to the transmitting antenna (L3) via a line (T1) and a matching network (C3, C4) (FIG 3; FIG 5).

11. Device as claimed in any one of the preceding claims, characterized in that it is a component of an identification system (I), which has a read/write device (1) and a mobile data carrier (4).

12. Device as claimed in Claim 11, characterized in that the DC voltage source (V1) connected via a coil (L2) to the drain terminal (D) of the field effect transistor (X1) provides a supply voltage smaller than 6V.

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13. Device as claimed in Claim 12, characterized in that the supply voltage is 3.3V.

14. Device as claimed in any one of Claims 5 to 13, characterized in that an ohmic resistor (R1, R2, R3, R4) each is connected in series to the tri-state outputs (U1, U2, U3, U4), wherein these ohmic resistors have difference resistance values.

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FIG 1

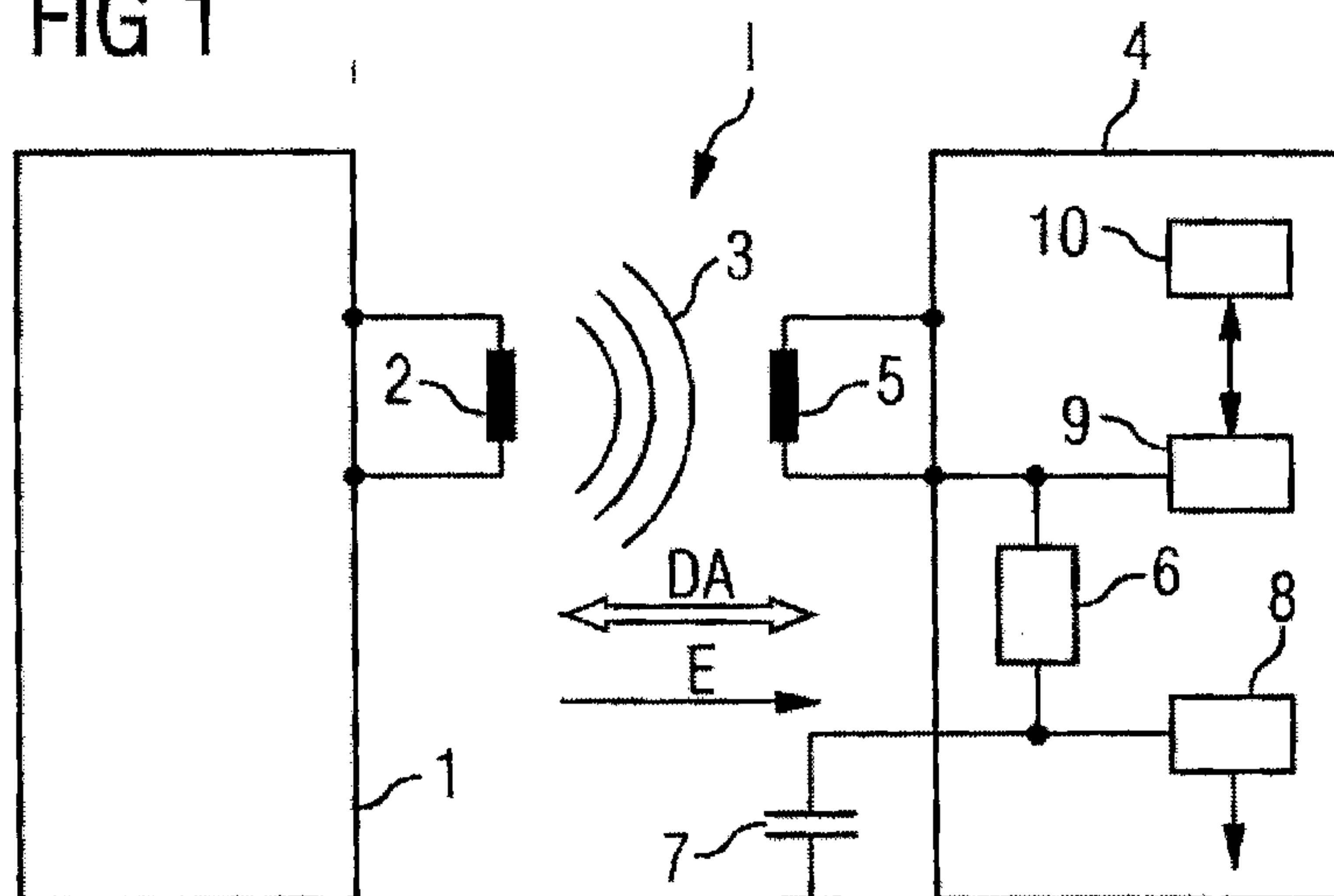
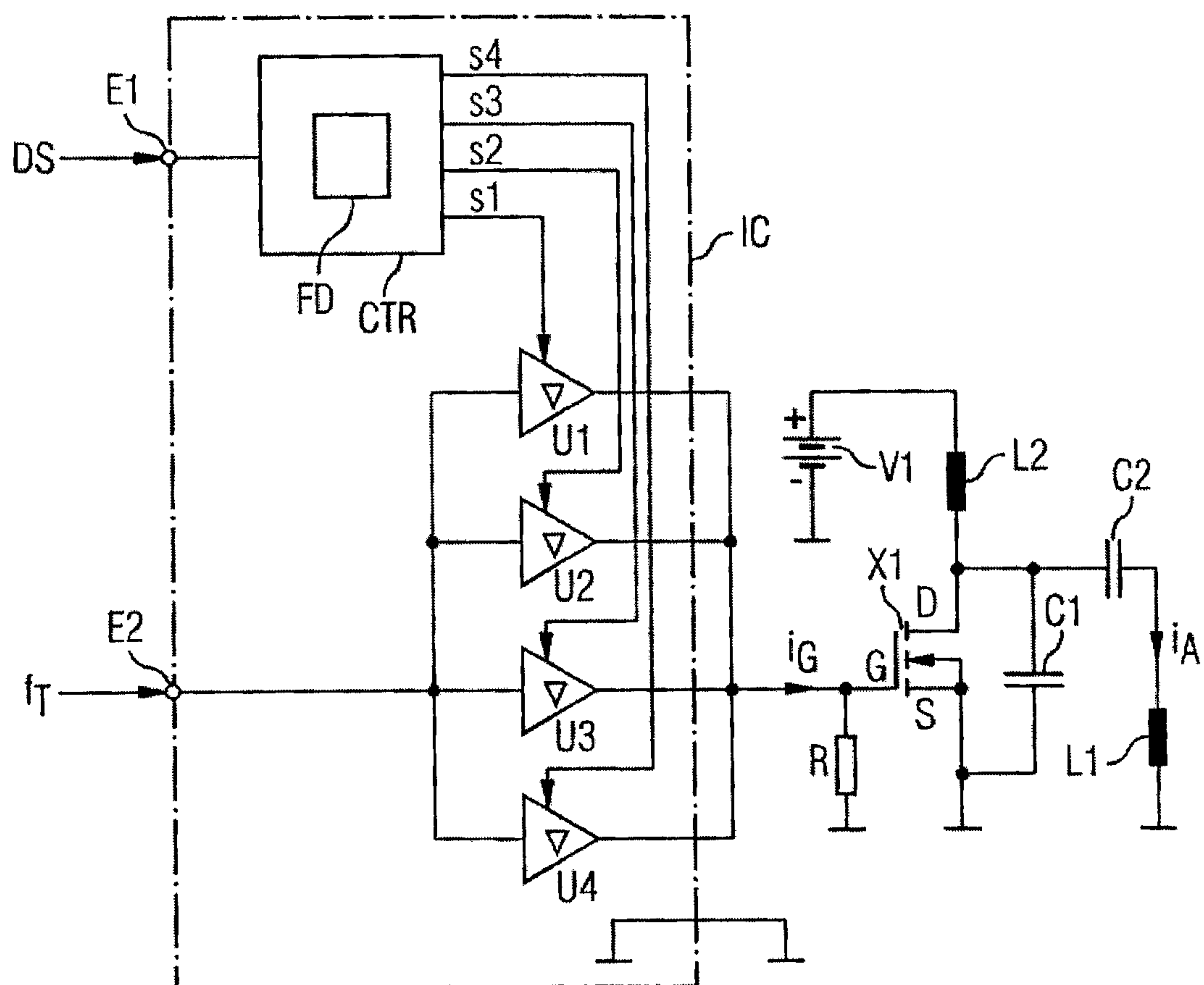
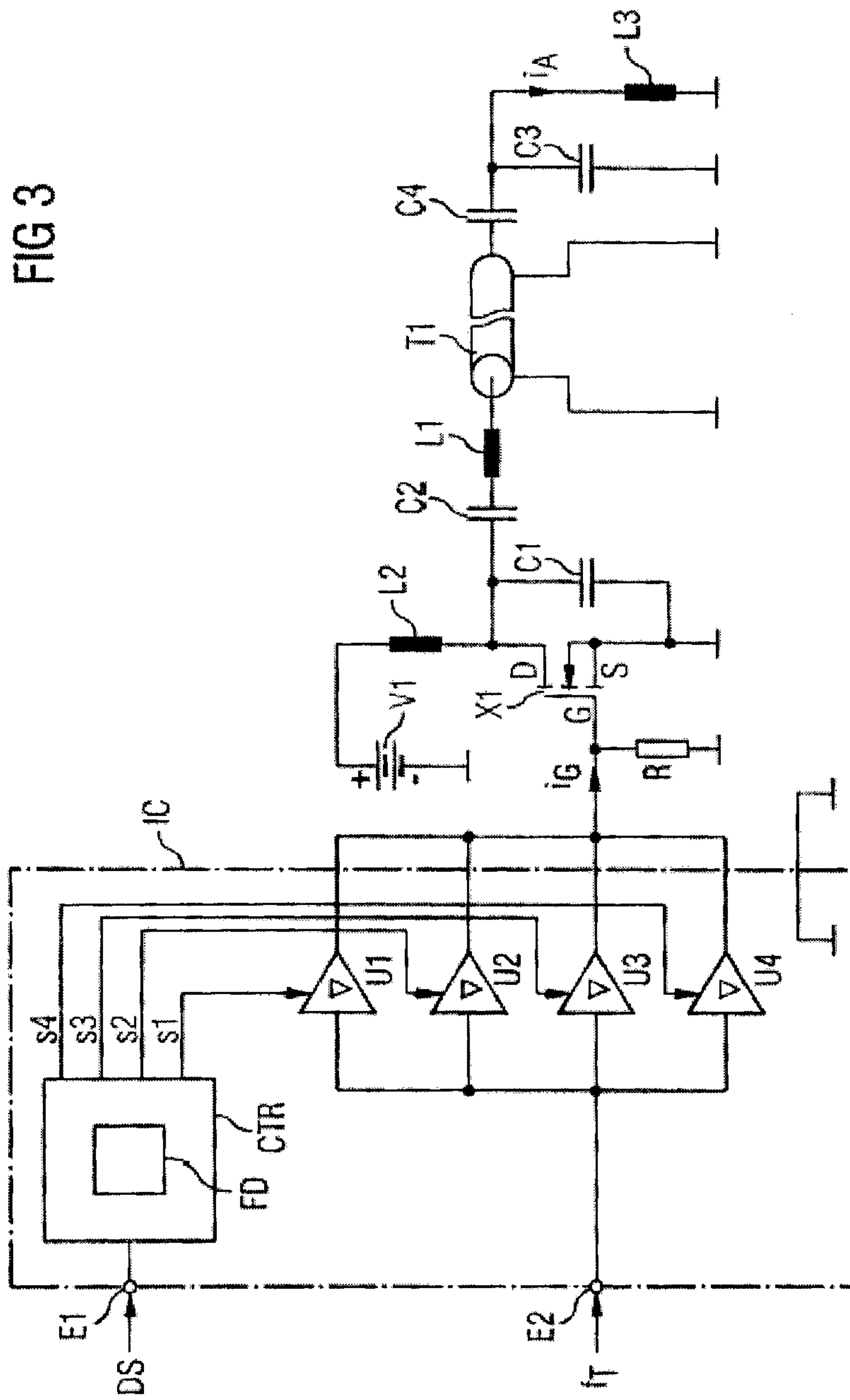


FIG 2



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FIG 4

