

(19)



(11)

EP 3 755 123 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

23.12.2020 Bulletin 2020/52

(51) Int Cl.:

H05B 37/02 (2006.01)

(21) Application number: **19181154.6**

(22) Date of filing: **19.06.2019**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

BA ME

Designated Validation States:

KH MA MD TN

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Mitscherlich PartmbB

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(54) COMMUNICATION INTERFACE FOR LIGHTING MEANS

(57) The invention relates to a communication interface (100) for lighting means (102), comprising two communication terminals: a first communication terminal (100a) designed for being supplied with mains voltage cycles signal, and a second terminal designed for being supplied with a digital signal (100b). In order to set the

communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is selectively connected to ground, and in order to set the communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is not connected to ground.

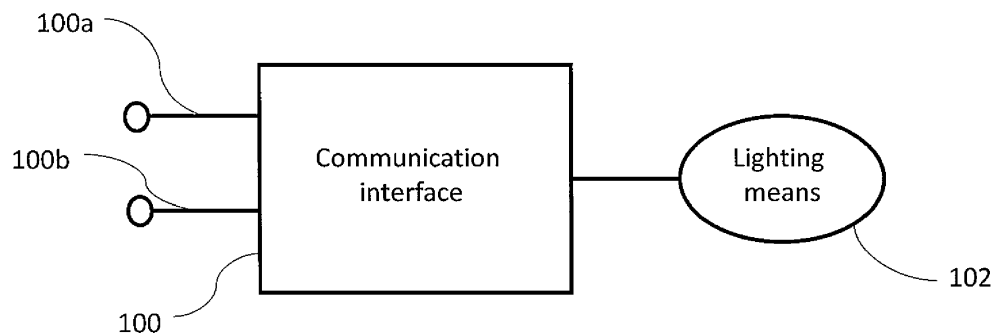


Fig. 1

EP 3 755 123 A1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention generally relates to the field of interfaces for transmitting communication signals for operating devices of building technology, in particular for lighting (gas discharge lamps, halogen, LED, OLED, ...). In particular, the invention relates to a communication interface for operating devices for lighting means having two communication terminals.

BACKGROUND OF THE INVENTION

[0002] In general, an interface for lighting means has a reception branch for incoming signals, for example from a bus, and optionally also a transmission branch. The interface can be designed to receive digital and/or analog signals. The signals may have amplitudes in the low-voltage range (for example below 15 volts) and/or mains voltage range (220 V to 250 volts). The incoming signals can be DC or AC signals.

[0003] From WO 2006/010416 a bidirectional interface is known, via which an operating device for a lighting means can exchange digital data via a bus with a control center. The interface consists of a receiving channel with subsequent potential separation element and a transmission channel. The reception branch and the transmission channel are combined at the ports intended for connection to the bus. This allows the receive channel to read the data given by the transmit channel onto the bus, which is also desirable. Namely, the receiving channel should check the data output from the transmitting channel and - if time errors are detected - correct.

[0004] Moreover, recently, the function poweredDALI was used for the first time. This means that the LED power supplies its own DALI power. Due to the use of the function poweredDALI it was not possible to combine communication standards using a selectively applied (rectified) mains voltage with DALI, since DALI should be isolated and the mains voltage based approaches need a ground GND potential.

[0005] When using the mains voltage as a control signal, the phase of a simple, standard mains voltage sensor with control input DA/L and the neutral conductor with DA/N may be connected at the interface.

[0006] Thus, there is a need for an improved communication interface for lighting means.

SUMMARY OF THE INVENTION

[0007] The object of the present invention is achieved by the solution provided in the enclosed independent claims. Advantageous implementations of the present invention are further defined in the dependent claims.

[0008] According to a first aspect, the invention relates to a communication interface for lighting means, comprising two communication terminals:

- a first communication terminal designed for being supplied with mains voltage cycles signal; and
- a second terminal designed for being supplied with a digital signal.

In order to set the communication interface in a state for processing the mains voltage cycles signal, the first terminal is selectively connected to ground, and in order to set the communication interface in a state for processing the mains voltage cycles signal, the first terminal is not connected to ground.

[0009] In an implementation form of the first aspect, the communication interface comprises a DALI-Power-Supply-circuit.

[0010] In a further implementation form of the first aspect, the communication interface comprises a diode configured to interrupt a current flow between the first terminal and the second terminal.

[0011] In a further implementation form of the first aspect, the communication interface comprises an evaluation circuitry for the mains voltage cycles signal, wherein the evaluation circuitry comprises a rectifier in order to generate a rectified mains signal.

[0012] In a further implementation form of the first aspect, the evaluation circuitry is connected to the first or to the second terminal.

[0013] In a further implementation form of the first aspect, the evaluation circuitry is configured to detect the number of the cycles of the rectified mains signal.

[0014] In a further implementation form of the first aspect, the communication interface comprises a jumper, wherein the jumper selectively connects one of the communication terminals to the ground.

[0015] In a further implementation form of the first aspect, the communication interface further comprises a switch for dimming connected to the jumper.

[0016] In a further implementation form of the first aspect, if the jumper is activated, then the DALI power supply is deactivated.

[0017] In a further implementation form of the first aspect, the digital signal is a DALI signal.

[0018] According to a second aspect, the invention relates to an LED driver comprising a communication interface according to the first aspect or any one of the implementation forms thereof.

[0019] In an implementation form of the second aspect, the LED driver is dimmable with the mains voltage cycles or digital signal, respectively.

[0020] According to a third aspect, the invention relates to a method for a communication interface for lighting means, wherein the communication interface comprises two communication terminals, the method comprising the steps of: supplying a first communication terminal with mains voltage cycles signal; and supplying a second terminal with a digital signal, wherein in order to set the communication interface in a state for processing the mains voltage cycles signal, the first terminal is selectively connected to ground, and in order to set the com-

munication interface in a state for processing the mains voltage cycles signal, the first terminal is not connected to ground.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The invention will be explained in the followings together with the figures, wherein:

Fig. 1 shows a schematic diagram of a communication interface for lighting means according to an embodiment of the invention;

Fig. 2 shows a schematic diagram of a circuit of a communication interface for lighting means according to an embodiment of the invention;

Fig. 3 shows a schematic diagram of a circuit of a powered DALI circuit according to an embodiment of the invention; and

Fig. 4 shows a schematic diagram of a method for a communication interface for lighting means according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0022] Aspects of the present invention are described herein in the context of a communication interface for lighting means.

[0023] The present invention is described more fully hereinafter with reference to the accompanying drawings, in which various aspects of the present invention are shown. This invention however may be embodied in many different forms and should not be construed as limited to the various aspects of the present invention presented through this disclosure. Rather, these aspects are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the present invention to those skilled in the art. The various aspects of the present invention illustrated in the drawings may not be drawn to scale. Rather, the dimensions of the various features may be expanded or reduced for clarity. In addition, some of the drawings may be simplified for clarity. Thus, the drawings may not depict all of the components of a given apparatus.

[0024] Various aspects of a communication interface for lighting means will be presented. However, as those skilled in the art will readily appreciate, these aspects may be extended to aspects of communication interfaces for lighting means without departing from the invention.

[0025] The term "LED luminaire" shall mean a luminaire with a light source comprising one or more LEDs. LEDs are well-known in the art, and therefore, will only briefly be discussed to provide a complete description of the invention.

[0026] It is further understood that the aspect of the

present invention might contain integrated circuits that are readily manufacturable using conventional semiconductor technologies, such as complementary metal-oxide semiconductor technology, short "CMOS". In addition, the aspects of the present invention may be implemented with other manufacturing processes for making optical as well as electrical devices. Reference will now be made in detail to implementations of the exemplary aspects as illustrated in the accompanying drawings. The same references signs will be used throughout the drawings and the following detailed descriptions to refer to the same or like parts.

[0027] Now referring to Fig. 1, Fig. 1 shows a schematic diagram of communication interface 100 for lighting means 102 according to an embodiment of the invention.

[0028] The communication interface 100 for lighting means 102 comprises two communication terminals 100a and 100b.

[0029] The first communication terminal 100a is designed for being supplied with a mains voltage cycles signal, while the second terminal 100b is designed for being supplied with a digital signal.

[0030] In order to set the communication interface 100 in a state for processing the mains voltage cycles signal, the first terminal 100a is selectively connected to ground, and in order to set the communication interface 100 in a state for processing the mains voltage cycles signal, the first terminal 100a is not connected to ground.

[0031] Fig. 2 shows a schematic diagram of a circuit 200 of the communication interface 100 for lighting means 102 according to an embodiment of the invention.

[0032] In this embodiment, the circuit 200 is composed of three different circuitry components: a DALI circuit 204, a switchDIM circuit 202, and a jumper 206;

[0033] In this example, the DALI bus connects to connections X1-b and X1-c. A microcontroller can be connected to the signals DALI_IN_OPTO and DALI_OUT_OPTO.

[0034] By using the bridge rectifier D140, the design is made polarity independent. Both terminals X1-b and X1-c are interchangeable.

[0035] In this embodiment, the upper part of the DALI circuit 204 contains the transmission part of the DALI. It is created around the resistors R142, R145, R148 and R149, the transistors Q140, Q141 and Q145, the capacitors C146 and C148, and the optocoupler U141.

[0036] In this embodiment, the lower part of the DALI circuit 204 contains the reception path of the DALI. It is created around the optocoupler U140, the capacitors C142, C140, C144, the resistors R143, R147, the transistor Q142 and the Zener diode Z140.

[0037] The optocoupler U140 can signal the level of the DALI bus to the microcontroller via DALI_OUT_Opto. The current source can limit the maximal current load the circuit creates when not in transmission mode.

[0038] The Zener diode Z140 and the bridge rectifier D140 can drop the received bus voltage to a level to guarantee that a low level voltage does not drive the op-

tocoupler U141, U140.

[0039] Moreover, through the optocouplers U141 and U140, an isolation is created between the microcontroller side and the DALI bus. The isolation is sufficient for evaluation of the DALI software track when the microcontroller is connected in a non-isolated way to the mains supply.

[0040] This has the advantage of being a cheap and efficient solution

[0041] To the DALI circuit a jumper 206 and a mains control voltage circuit 202 can be connected.

[0042] The jumper 206 selectively connects a terminal of the two communication terminals to the ground of the communication interface 100.

[0043] Since the mains control voltage circuit 202 is used in very rare applications, it can be set on the same pin via the jumper 206. That is, in order to use the mains control voltage circuit 202, the jumper 206 has to be placed on the circuit 200.

[0044] Moreover, if the mains control voltage circuit 202 is used, a DALI power supply circuit 300 may be deactivated and it may be deactivated if the jumper 206 is placed on the circuit 200.

[0045] Therefore, at the stage of the luminaire manufacturing it should be decided whether the DALI power supply circuit 300 is set or the jumper 206 is placed on the circuitry 200.

[0046] This option could be used if there is no space for a separate pin for mains control voltage circuit 202.

[0047] The device automatically detects the connected signal and automatically switches to the correct operating mode. Even a connected sensor on the smart interface is detected automatically.

[0048] The two communication terminals 100a and 100b can be connected to a common reception branch in the communication interface 100 for a digital signal. Furthermore, an evaluation circuit for the looped mains voltage may be connected to one of the two terminals 100a, 100b. For example, this evaluation circuit can detect the number of looped through power waves.

[0049] The evaluation circuit for the loop-through mains voltage supply can comprise a rectifier (diode circuit), so that the switch dimming signal is then a rectified AC signal for further evaluation and the number of cycles can be detected on the software side.

[0050] Advantageously, a terminal can be saved, which otherwise would have to be provided by passing out of the device of the terminal X1-a in the mains control voltage circuit 202.

[0051] The above illustrated embodiments are functional for a DALI interface without the DALI power supply 300.

[0052] If the interface also has the DALI power supply circuit 300, it should be made sure that the DALI power supply circuit 300 is not damaged when a switch dimming signal is applied. For this purpose, as shown in Figure 3, a diode D161 can be provided, which can be designed to be 230 V in a voltage-proof manner in order to prevent

a current flow between the two terminals 100a, 100b.

[0053] Fig. 4 shows a schematic diagram of a method 400 for a communication interface 100 for lighting means 102, wherein the communication interface 100 comprises two communication terminals 100a and 100b, according to an embodiment of the invention.

[0054] The method 400 comprises the steps of:

- supplying 402 the first communication terminal 100a with mains voltage cycles signal; and

- supplying 404 the second terminal 100b with a digital signal.

In order to set the communication interface 100 in a state for processing the mains voltage cycles signal, the first terminal 100a is selectively connected to ground, and in order to set the communication interface 100 in a state for processing the mains voltage cycles signal, the first terminal 100a is not connected to ground.

[0055] All features of all embodiments described, shown and/or claimed herein can be combined with each other.

[0056] While various embodiments of the present invention have been described above, it should be understood that they have been presented by way of example only and not limitation. Numerous changes to the disclosed embodiments can be made in accordance with the disclosure herein without departing from the spirit of scope of the invention. Thus, the breadth and scope of the present invention should not be limited by any of the above-described embodiments. Rather, the scope of the invention should be defined in accordance with the following claims and their equivalence.

[0057] Although the invention has been illustrated and described with respect to one or more implementations, equivalent alternations and modifications will occur to those skilled in the art upon the reading of the understanding of the specification and the annexed drawings. In addition, while a particular feature of the invention may have been disclosed with respect to only of the several implementations, such features may be combined with one or more other features of the other implementations as may be desired and advantage for any given or particular application.

Claims

1. Communication interface (100) for lighting means (102), comprising two communication terminals:

- a first communication terminal (102a) designed for being supplied with mains voltage cycles signal; and
- a second terminal (102b) designed for being supplied with a digital signal, wherein

- in order to set the communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is selectively connected to ground, and
 - in order to set the communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is not connected to ground.
2. The communication interface (100) of claim 1, wherein the communication interface (100) comprises a DALI-Power-Supply-circuit (300). 10
 3. The communication interface (100) of claim 1 or 2, wherein the communication interface (100) further comprises a diode (D161) configured to interrupt a current flow between the first terminal (100a) and the second terminal (100b). 15
 4. The communication interface (100) of any one of the preceding claims, wherein the communication interface (100) comprises an evaluation circuitry for the mains voltage cycles signal, wherein the evaluation circuitry comprises a rectifier in order to generate a rectified mains signal. 20 25
 5. The communication interface (100) of any one of the preceding claims, wherein the evaluation circuitry is connected to the first (100a) or to the second terminal (100b). 30
 6. The communication interface (100) of any one of the preceding claims, wherein the evaluation circuitry is configured to detect the number of the cycles of the rectified mains signal. 35
 7. The communication interface (100) of any one of the preceding claims, wherein the communication interface (100) further comprises a jumper (206), wherein the jumper (206) selectively connects one of the communication terminals (100a, 100b) to the ground. 40
 8. The communication interface (100) of claim 7, wherein the communication interface (100) further comprises a switch for dimming connected to the jumper (206). 45
 9. The communication interface (100) of claims 2 and 7, wherein, if the jumper (206) is activated, then the DALI power supply (300) is deactivated. 50
 10. The communication interface (100) of any one of the preceding claims, wherein the digital signal is a DALI signal. 55
 11. An LED driver comprising a communication interface (100) according to any one of the preceding claims 1 to 10.
 12. The LED driver of claim 11, wherein the LED driver is dimmable with the mains voltage cycles or digital signal, respectively.
 13. Method (400) for a communication interface (100) for lighting means (102), wherein the communication interface (100) comprises two communication terminals (100a, 100b), the method (400) comprising the steps of:
 - supplying a first communication terminal (100a) with mains voltage cycles signal; and
 - supplying a second terminal (100b) with a digital signal,
 wherein in order to set the communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is selectively connected to ground, and in order to set the communication interface (100) in a state for processing the mains voltage cycles signal, the first terminal (100a) is not connected to ground.

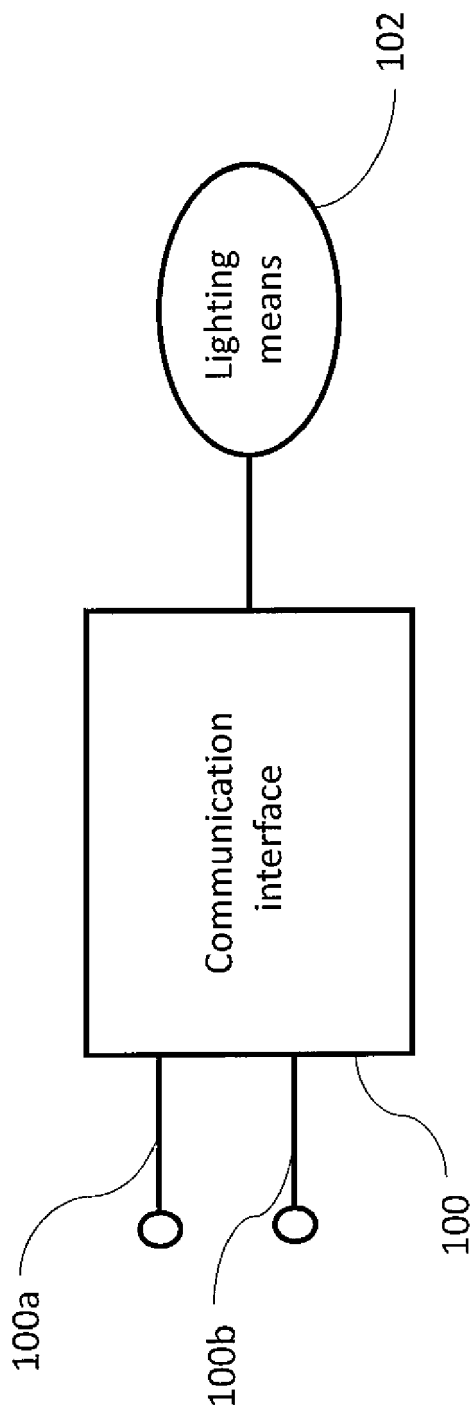


Fig. 1

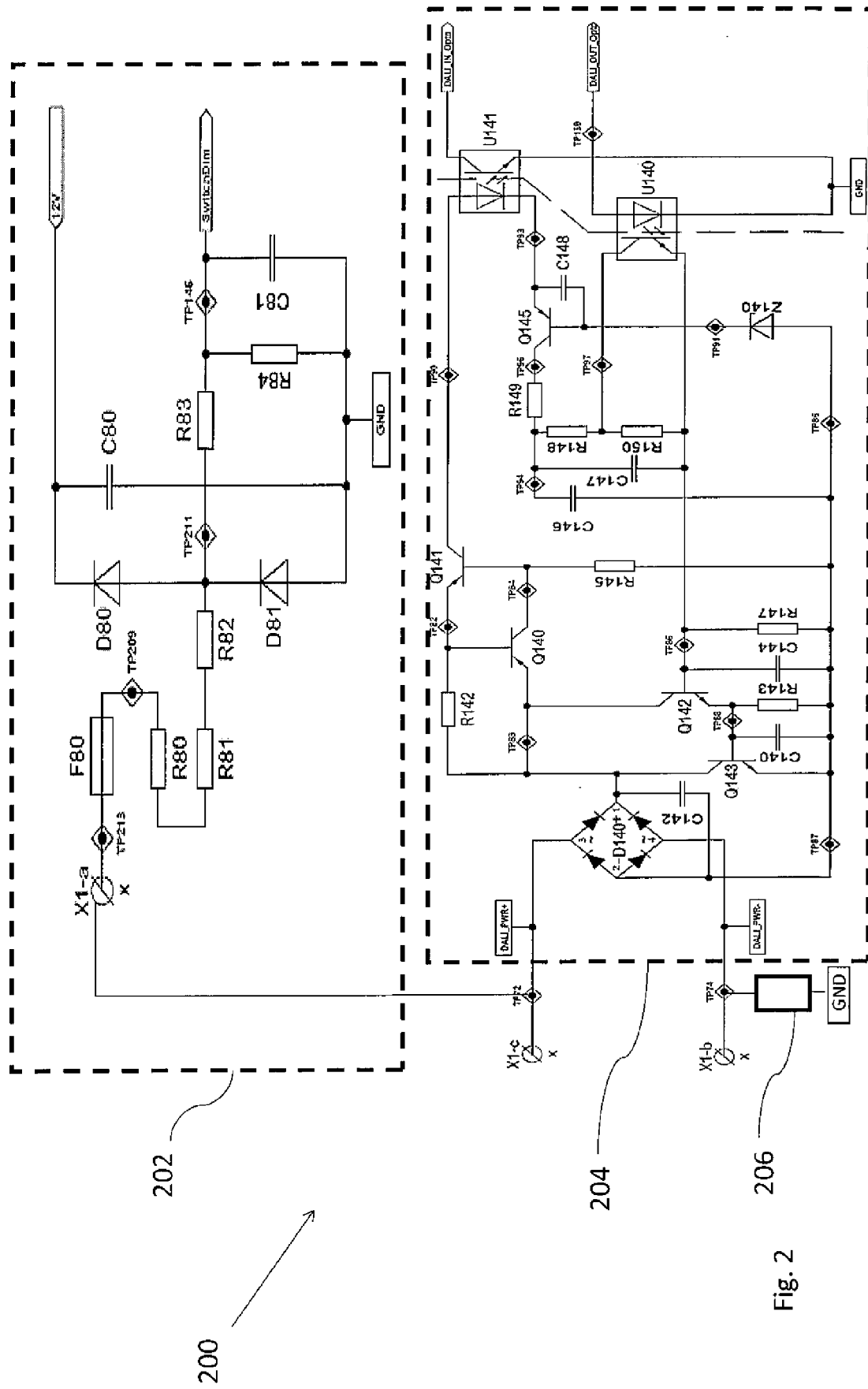
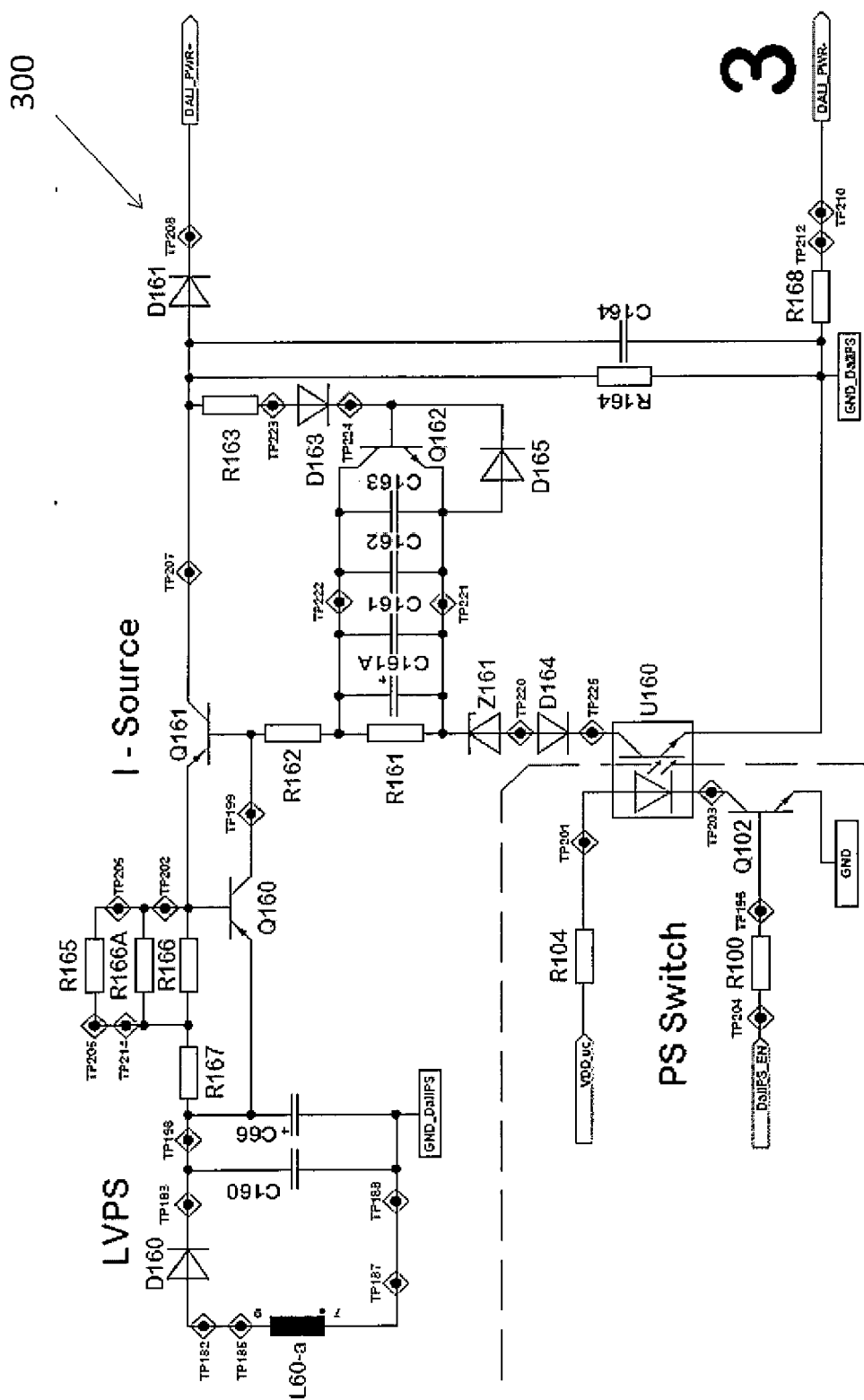


Fig. 2



Fi. 3

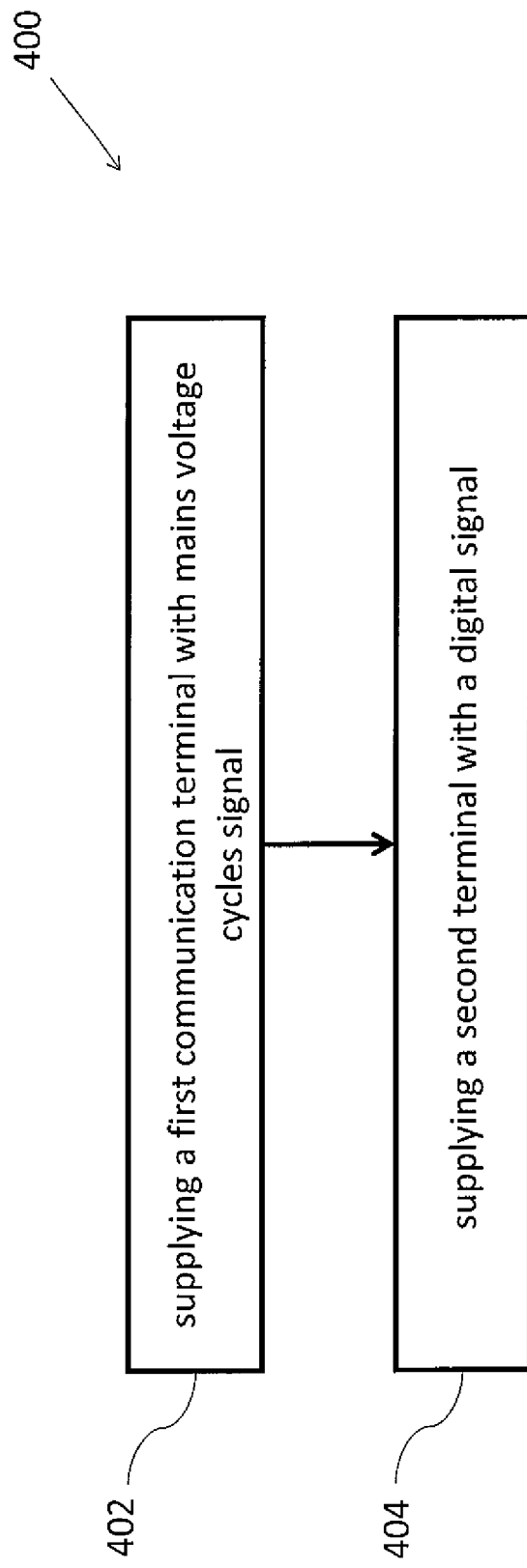


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 19 18 1154

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2012/021060 A2 (ELDOLAB HOLDING BV [NL]; SAES MARC [NL] ET AL.) 16 February 2012 (2012-02-16)	1-7,9-13	INV. H05B37/02
Y	* page 6, line 8 - page 8, line 14; figures 1-5 *	8	
Y	----- DE 10 2006 046489 A1 (TRIDONICATCO GMBH & CO KG [AT]) 3 April 2008 (2008-04-03)	8	
A	* paragraphs [0008], [0038], [0051] - [0059]; figure 2 *	1,13	

			TECHNICAL FIELDS SEARCHED (IPC)
			H05B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 October 2019	Examiner Henderson, Richard
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 18 1154

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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22-10-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012021060 A2	16-02-2012	EP 2604095 A2	19-06-2013
		US 2013320875 A1	05-12-2013
		WO 2012021060 A2	16-02-2012
DE 102006046489 A1	03-04-2008	AT 12863 U1	15-01-2013
		CN 101523986 A	02-09-2009
		DE 102006046489 A1	03-04-2008
		EP 2067382 A2	10-06-2009
		WO 2008040454 A2	10-04-2008

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2006010416 A [0003]