(19) DANMARK

(10) **DK/EP 3844886 T3**

(12) Oversættelse af europæisk patentskrift

Patent- og Varemærkestyrelsen

(51) Int.Cl.: ***H 04 B 3/54 (2006.01)***

(45) Oversættelsen bekendtgjort den: **2025-04-07**

(80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2025-03-12**

(86) Europæisk ansøgning nr.: **19765820.6**

(86) Europæisk indleveringsdag: **2019-08-09**

(87) Den europæiske ansøgnings publiceringsdag: **2021-07-07**

(86) International ansøgning nr.: **PL2019000067**

(87) Internationalt publikationsnr.: **WO2020046151**

(30) Prioritet: **2018-08-29 PL 42684018**

(84) Designerede stater: **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**

(73) Patenthaver: **Amica S.A., ul. Mickiewicza 52, 64-510 Wronki, Polen**

(72) Opfinder: **MIZERSKI, Lukasz, ul. Pakos aw 90, 64-310 Lwowek, Polen**
WOJNAROWSKI, Lukasz, ul. Wierzbowa 26, 62-571 Stare Miasto, Polen
SWITALA, Wojciech, ul. Szamotulska 71 B, 62-081 Baranowo, Polen

(74) Fuldmægtig i Danmark: **AWA Denmark A/S, Strandgade 56, 1401 København K, Danmark**

(54) Benævnelse: **KOMMUNIKATIONSSYSTEM MELLEM DØREN OG KROPPEN AF OVNEN**

(56) Fremdragne publikationer:
EP-A1- 3 348 909
US-A- 5 089 974

DESCRIPTION

Description

[0001] The present invention is a communication system between the door and the body of the oven, intended for bidirectional transmission of information between an electronic module that controls the operation of the appliance, located in its body, and electronic modules located in the door or door handle of the oven, receiving signals from the user of the appliance and transmitting these signals to the electronic control unit, and allowing for the transmission of signals from the electronic control unit, informing the user on status of the appliance.

[0002] In known solutions used in household appliances, communication between the door and the body of the appliance is enabled by the wireless transmission modules installed in the communicating components of the appliance or data are transmitted via dedicated wire bundle. The international patent WO2016105312A describes a dishwasher, which has a capacity touch sensor on the door cover. When the user touches the door cover, the sensor transmits a signal to the control system, which enables the door opening mechanism. The capacity touch sensor and the control unit are located in the appliance door. In the description of the solutions, the connection method between the sensor and the power supply system inside the body of the dishwasher is not indicated, thus it is assumed that they are connected via a dedicated wire bundle.

[0003] In the European patent application EP3136002 we find a description of the oven, wherein data between the door and the body of the appliance are transmitted via wireless communication Wi-Fi, Bluetooth or ZigBee. Power to the module installed in the door is supplied through a contact strip, which connects to the body of the oven with the door when the door is closed. Upon opening the door, there is no electrical connection between the door and the body of the appliance.

[0004] Document US5089974A discloses a building power management controller comprises a plurality of modules connected by a two-wire network. Each module comprises a data transceiver device, controlled by a microprocessor to both transmit data to the other modules and to a central unit via the two-wire network, and to receive information via this two-wire network. The modules are supplied with power by the two-wire network. When two modules transmit simultaneously, one takes priority so as not to disturb the messages transmitted.

[0005] The state of the art closest to the subject of the present invention is described in the European patent application EP 3 348 909 A1. This document discloses a communication system between the door and the body of the oven, comprising an electronic control unit located in the body of the oven and an electronic user module, wherein the control unit takes from the power grid AC voltage of 230 VAC and after conversion to DC voltage of 12 VDC,

transmits it to the isolated from the oven housing hinge housings mounted inside the body of the oven hinged to the oven door and further through the conductive element connecting hinge housings to metal door components that are electrically connected to the user electronic module.

[0006] Data transfer between the body and the door via a dedicated wire bundle complicates the oven design, makes it impossible to dismantle the door, for example, to clean the appliance. In addition, wire bundle connecting the door and the body of the appliance is subject to repeated bending during door opening and closing, which significantly reduces the life of the connecting cables.

[0007] The use of wireless communication requires that electronic modules must be equipped with systems enabling wireless communication, which complicates their design. In order to supply power to the electronic module in the door of the oven, it is also required to install an additional power source, such as battery. In addition, wireless communication is more susceptible to interference and increases the congestion of ISM bands used by Wi-Fi, Bluetooth or ZigBee.

[0008] The purpose of the present invention is to develop a system for electronic modules communication, where one module is located in the body and the other in the oven door, using the existing components and electrical connections of the oven.

[0009] This objective has been achieved by using the existing electric circuit to transfer data between the body and door of the oven, connected to the power source in the body of the oven and supplying power to electrical receivers in the door of the oven described in the Polish patent PL 227417.

[0010] Communication system between a door and a body of the oven according to the invention comprising of an electronic control unit located in the body of the oven and an electronic user module that receives signals from the user and showing the user the status of the appliance, which is located in the door of the oven, and transmits signals to the electronic control unit and also receives signals from the electronic control unit. The electronic control unit is supplied with an alternating voltage of 230 VAC, taken from the power grid, converted to DC voltage of 12 VDC, which is wire-transmitted to hinge housings, mounted inside the body of the oven and connected by means of hinges to the oven door and further through a conductive element connecting the hinge housings and metal structural components of the door of the oven to the electronic user module. Communication system between the door and the body of the oven is characterized in that the electronic control unit is electrically connected to the at least one electronic user module which can receive signals from the user to present his state of the device, wherein between said electronic control unit and electronic user module is enabled signals processing modules, electrically connected to each other via a two-wire power line receivers in the oven door, using existing components of the oven, such as hinge housings, conductive elements connecting the hinge housings with metal structural components of the door of the oven. Signal processing units connected to each other create a communication

path between the control units and the user electronic module in the oven door.

[0011] The solution according to the invention allows for the use of the existing components and electrical connections of the oven to transmit information. Thus, the functionality of the appliance is improved after minor changes in the design of the oven door.

[0012] The subject of this invention is described in detail on the embodiment in the figure, where fig. 1 shows a general view of the oven from the front with schematically indicated components of the communication system between the door and the body of the oven, figure 2 shows a block diagram of the communication system between the door and the body of the oven, and fig. 3 is a simplified schematic diagram of the data transmission path.

[0013] Oven **1** is equipped with an electronic control unit **MS** controlling the operation of the appliance, located in the body of the oven **2** and an electronic user module **MU** in the door **3** closing the oven cavity, receiving signals from the user and transmitting them to the electronic control unit **MS,** and at the same time, allowing the user to see on the electronic user module **MU** the appliance status sent by the electronic control module **MS.** The oven supply voltage is taken from the power grid 230 VAC and supplied to the electronic control unit **MS,** where it is converted to a DC voltage of 12 VDC and transmitted via electrical conductors **4 and 5** to the hinge housings **6,** mounted inside the oven housing **1** on both sides of the door **3** closing the oven cavity and isolated from the housing of the oven **1.** Hinge housings are hinged to the oven door **3.** Voltage from the hinge housings **6** is further transmitted via a conducting element connecting hinge housings **6** to the metal structural components **7** of the door **3,** electrically connected by means of connecting elements **8** to the electronic user module **MU** installed in the door **3** of the oven **1.** The circuit supplying the electronic control unit **MS** located in the body **2** of the oven **1** and an electronic user module **MU** located in the door **3** of the oven **1,** includes signal processing modules **MPE1** and **MPE2.** Signal processing modules **MPE1** and **MPE2** are electrically connected to each other via the two-wire line **AB** using the existing components of the oven **1** such as: hinge housings **6,** conductive side strips of the oven door **7** and the interconnecting conductive elements, and they create a communication path between the electronic control units **MS** and the electronic user module **MU.** Lines **A** and **B** allow transfer of both power from the electronic control unit **MS** to the electronic user module **MU,** as well as signals that serve as carriers of information, bidirectionally from the electronic control unit **MS** to the electronic user module **MU** and vice versa. Transmission of power supply and information via the same electrical connection, lines **A** and **B** is achieved by applying on the supply voltage of 12V DC, an AC voltage VAC, which is the result of modulation of the carrier signal by the TX signal representing data being transmitted.

[0014] Power supply from the electronic control unit **MS** through the filter system **L2, C4** goes to the line (connection) **A.** Line **B** is permanently connected to the 0V potential. In this way, between the lines **A** and **B** there is a constant potential difference, which for the DC gives **A** line voltage relative to line **B** of 12VDC. At the same time, elements **L2** and **C4** block signals of varying waveform, modulated transmission signal, in order to prevent passage of the signal towards the power source and to prevent interference in the supply system. On the signal

processing module **MPE1** side, elements **L1, C1** filter out the varying component of the waveform applied on the supply signal so that, after passing through these elements a supply voltage of 12V is obtained, which then supplies the electronic user module **MU.**

[0015] Digital data transmitted from the electronic control unit **MS** pass on the **TX input** of the 3-state buffer **U2.** High state, logic state '1' unlocks the buffer and transfers to its output a carrier signal of a defined frequency. In a situation when there is a low state at the input, logic '0', the 3-state buffer is locked and the carrier signal is not transmitted to the buffer output. The buffer output is connected by means of **R2, C5** to line **A** of the transmission path through which the information signal is applied on a constant supply voltage gets to the input of the signal processing module **MPE1.** At the input of the signal processing module **MPE1** the signal, by means of **C3** is filtered out from the waveform constant component and the signal goes further to the input of the electronic user module **MU,** that on the basis of this signal produces binary data signal transmitted by the electronic control unit **MS.**

[0016] If data is transmitted by the electronic user module **MU,** the situation is similar, wherein data from the electronic user module **MU** goes to the input of the 3-state buffer **U1,** where the modulation is performed to generate an alternating signal of a defined frequency, which via elements **R1, C2** is further passed to line **A** of the transmission path. Similarly, this signal at the input of the signal processing module **MPE2** is filtered out by **C6** and further goes to the input of the electronic control unit **MS,** where it is converted into a binary signal carrying data transmitted by the electronic user module **MU.**

[0017] Both electronic control unit **MS** and the electronic user module **MU** detect collision in the transmission to enable two-way communication in the half-duplex mode.

[0018] The list of designations in the drawing:

1 - oven,

2 - body of the oven,

3 - door of the oven,

4 - electrical connection between the hinge and the electronic module in line A in Fig. 3.

5 - electrical connection between the hinge and the electronic module in line B in Fig. 3.

6 - hinge housing,

7 - metal structural component of the door,

8 - electrical connection between the metal structural component of the door and the electronic user module MU,

S - electronic control unit controlling the operation of the appliance,

MU - electronic user module receiving signals from the user and/or presenting data on the appliance status, provided by the electronic control unit MS

MPE1 and MPE2- signal processing modules,

A, B - two-wire electric line, connecting signal processing modules MPE1 and MPE2.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO2016105312A [0002]
- EP3136002A [0003]
- US5089974A [0004]
- EP3348909A1 [0005]
- PL227417 [0009]

P A T E N T K R A V

1. Kommunikationssystem mellem en dør og en krop af en ovn omfattende en elektronisk styreenhed placeret i kroppen af ovnen og et elektronisk brugermodul, hvor den elektroniske styreenhed tager AC spænding på 230 VAC fra elnettet og efter konvertering til DC spænding på 12 VDC, overfører den til hængselhuse, som er monteret inde i kroppen af ovnen og forbundet til en dør af ovnen via et hængselled, og yderligere til det elektroniske brugermodul gennem ledende elementer, som forbinder hængselhusene og strukturelle metalkomponenter i døren af ovnen, og desuden er hængselhusene isoleret fra kroppen af ovnen, **kendetegnet ved, at**

en elektronisk styreenhed (MS) er elektrisk forbundet med mindst ét elektronisk brugermodul (MU) i døren (3) af ovnen (1), og desuden, at mellem den elektroniske styreenhed (MS) og det elektroniske brugermodul (M2) er der signalprocesseringsmoduler (MPE1 og MPE2), som er elektrisk forbundet til hinanden ved en totrådsledning (A, B), som transmitterer en spænding med overlejrede signaler, som bærer de transmitterede data, og som sammen med signalprocesseringsmodulerne (MPE1 og MPE2) skaber en kommunikationsvej mellem den elektroniske styreenhed (MS) og det elektroniske brugermodul (MU), hvor totrådsledningen (A, B) indbefatter hængselhusene (6) og de strukturelle metalkomponenter (7) i døren (3) af ovnen (1), som er elektrisk forbundet til hængselhusene (6), og desuden er hængselhusene (6) og de strukturelle metalkomponenter (7) i døren (3) af ovnen (1) elektrisk isoleret fra kroppen (2) af ovnen (1).

DRAWINGS

Drawing

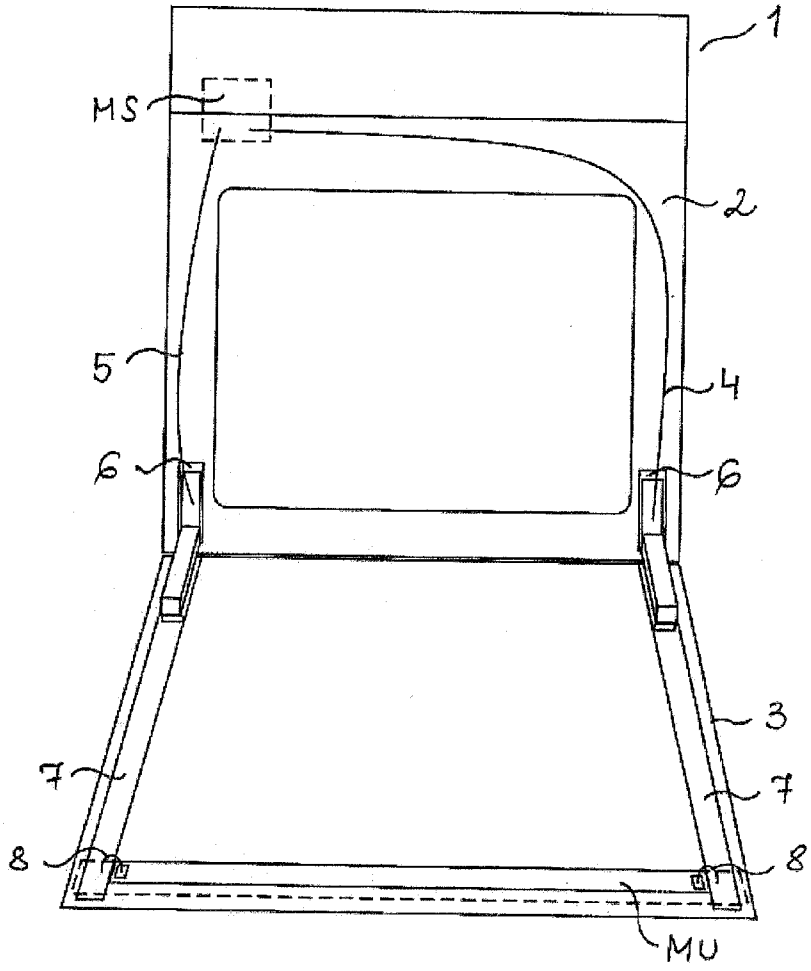


Fig. 1

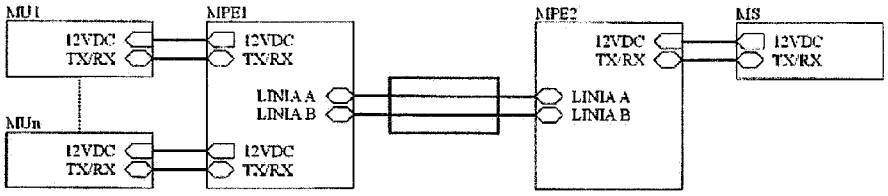

MU1
MPE1
MPE2
MS
12VDC
TX/RX
LINIA A
LINIA B
MUn

Fig. 2

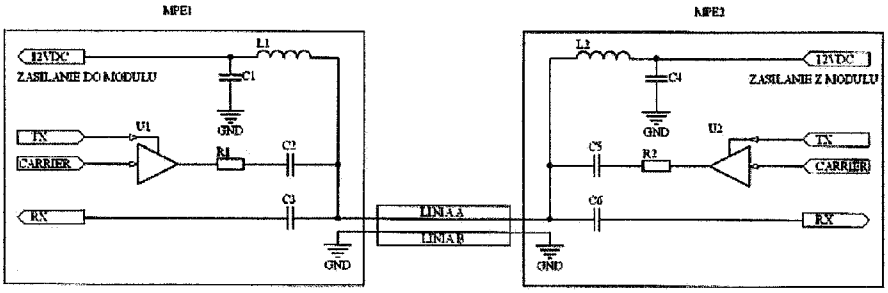

MPE1
MPE2
12VDC
ZASILANIE DO MODULU
ZASILANIE Z MODULU
L1
L2
C1
C2
C3
C4
C5
C6
R1
R2
U1
U2
TX
CARRIER
RX
LINIA A
LINIA B
GND

Fig. 3