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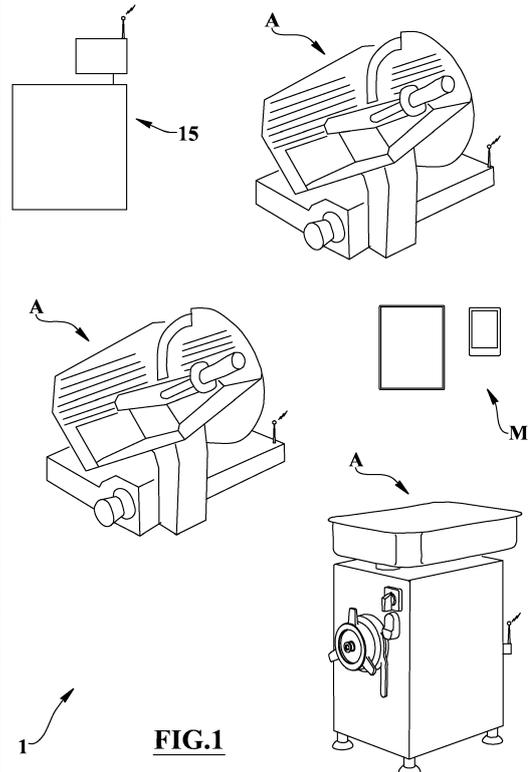
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(54) **CONTROL DEVICE AND SYSTEM FOR APPARATUSES**

(57) A control device (1) for one or more sets of apparatuses (A) comprises, for each apparatus (A), at least:  
- a set of sensors and/or detectors (2 - 8) associated to the apparatus (A) to detect operating parameters thereof and to provide at least respective signals;  
- at least one connection means (13) provided with input gates at least for the signals provided by the sensors and/or detectors (2 - 8) and adapted at least to transmit at least such signals;  
- at least one receiving and processing means (15) adapted at least to receive the signals transmitted by the connection means (13) and to process said signals at least to issue warnings and/or alarms pertaining to one or more of the apparatuses (A), Wide Area Network (WAN) or Global Area Network (GAN).

Said control device (1), for each of the apparatuses (A), it is provided with a detection and/or recognition means (20) of an operator, comprising at least one among radio frequency identification interrogator RFID for identifying a microchip RFID associated to the operator, magnetic badge reader, a barcode or microchip badge reader associated to the operator, fingerprint reader of the operator and/or keyboards for the typing of the operator's code; the detection and/or recognition means (20) of each apparatus (A) is connected to the connection means (13).



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## Description

**[0001]** The present invention relates to the field concerning the management of equipment, tools, electric equipment, and relates to a device and a control system of apparatuses particularly adapted to a fleet of electric equipment in use in food sale centers but advantageously usable in other fields.

**[0002]** In the field of the food sales are in use, even in relatively large amounts, machines for the preparation of foods such as mincer, machines for hamburgers, slicers, bone saws, scales, packaging, etc.

**[0003]** Such machines have maintenance requirements and some of them, such as meat grinder and slicers, must be used with precautions and mode such as to avoid accidents to the operators.

**[0004]** The management and the realization of such maintenance and safety activities are currently assigned, at best, to internal protocols whose actuation depends on the activity and capacity of the operators not always adequate or not sufficiently trained and motivated. Furthermore, the current management mode activate the extraordinary maintenance and repair procedures when a failure is revealed so as to restrict or prevent the functionality of the machines or apparatus as the warning signs, which typically precede a fault, they are not detectable by the operators or they are ignored.

**[0005]** For such a reason the current management and control of the machines and equipment in use nearby one or more centers have the disadvantage of being fragmentary and/or insufficient causing risk for the personnel and costly waste of time and massive repairs that could have been avoided.

**[0006]** The document US 2013/0241743 A1 discloses a monitoring system having the features of the preamble of claim 1 of the present document.

**[0007]** One object of the present invention is to propose a device and a control system for apparatuses able to coordinate and manage in a unitary way the ordinary maintenance of such equipment.

**[0008]** Another purpose is to perform a constant monitoring of the operating parameters of the equipment to detect abnormalities that may precede failures to activate targeted interventions for the prevention of faults.

**[0009]** Further object is to ensure maximum safety of the operators during operation and use of apparatuses to signal and to prevent the occurrence of hazardous conditions.

**[0010]** The characteristics of the invention are highlighted in the following with particular reference to the accompanying drawings in which:

- Figure 1 shows a schematic and partial view of the device, object of the present invention, for controlling apparatuses of which, by way of example, are shown three exemplary associated to the device itself;
- Figure 2 shows a schematic view of the device with only one of the apparatus of Figure 1.

**[0011]** In the following the term device is used to indicate all means, hardware members and their connections provided by the invention, the term apparatus generally means an electrically driven machine such as mincer, slicers, bone saws, vacuum packers, etc. and the term system is used to indicate the assembly of said device with the respective basic software and specific management programs. With reference to Figures 1 and 2, numeral 1 indicates the device, object of the present invention, for controlling one or more sets of apparatuses A. For each apparatus A, the device 1 comprises a set of sensors and/or detectors 2, 3, 4, 5, 6, 7, 8 associated with the apparatus A in order to detect respective operating and/or environmental parameters thereof and to provide respective analog or digital signals.

**[0012]** The sensors and/or detectors 2 - 8 of an apparatus A comprise at least one thermal sensor 2 and/or revolution counter 3 and/or ammeter detector 4 of the absorbed current and/or operation hours counter 5 of a motor of the apparatus A, torque detector 6 to the motor shaft and/or of the engine, accelerometer and/or gyroscope 7 rigidly fixed to the apparatus A, microphone 8 detecting the noise produced by the apparatus A itself and/or the ambient noise.

**[0013]** The device 1 is also provided with at least one signal conditioner means 11 having a set of inputs for analogic signals provided by the analogic sensors and/or detectors and having, for each of such inputs, a normalizer of the signal at the input and an analog-to-digital converter of the normalized signal that provides such digital signal to a respective output.

**[0014]** The signal normalizer is of the type assigned to translate and to amplify or to attenuate the analogic input signal so that the values of such output normalized signal range within the range of acceptable values suitable to the analogic input of the analog-to-digital converter.

**[0015]** Preferably, the signal conditioner means 11 is also provided with digital inputs for the digital sensor or detectors signals to provide to its own unique digital output all the multiplexed digital or digitized signals (for example by means of a Time Division Multiplexing).

**[0016]** The device 1 also comprises at least a connection means 13 provided with digital input gates for the signals provided directly by digital sensors and/or by the signal conditioner means or a single input digital gate for all the multiplexed signals supplied by the respective output of the signal conditioner means 11. The connection means 13 is assigned at least to transmit such digital signals via a wireless channel, for such purpose each connection means 13 comprises a respective communication module of W-LAN, WI-FI, Bluetooth type or the like.

**[0017]** The device 1 is also provided with at least one receiving and processing means 15 comprising a respective bidirectional communication module 16 of WI-FI type or the like, in any case compatible with the connection means 13.

**[0018]** The receiving and processing means 15 and/or the signal conditioner means 11 can comprise a pro-

grammed processor unit, with memories; furthermore the signal conditioner means 11 and the receiving and processing means 15 can be separate and distinct or mutually integrated into a single element.

**[0019]** The communication module 16 is assigned at least to receive the digital signals transmitted from the WI-FI connection means 13 of each of the devices. The receiving and processing means 15 can also comprise a processor means 17 of microprocessor and memory type that receives and processes, through application programs stored therein, said digital signals that are supplied by the communication module 16.

**[0020]** In this way the receiving and processing means 15, thanks to its programs, issue warning, alarms or commands related to the apparatuses and which can be re-transmitted to the apparatus A that originated them via the communication module 16 and the respective connection means 13. If necessary, such a receiving and processing means 15 can also be provided with an ADSL gate for cable or fiber connections and/or a direct connection to the mobile network, such as 3G or LTE or of other type to retransmit such signals and/or warnings, alarms and notifications generated by it through geographical communication channels such as Wide Area Network (WAN) or Global Area Network (GAN) for their use in remote.

**[0021]** The receiving and processing means 15 transmits such signals and/or warnings and alarms via said cable or mobile network connections to mobile devices directly or preferably through a remote distributed system of cloud type. These portable devices are standard, such as smartphones, tablets and the like, and are provided with application software for the viewing and/or management of such signals and/or warnings, alarms and notifications. The use of the cloud also allows to check the historical data, databases and/or warnings and notifications without the need to access to the receiving and processing means 15.

**[0022]** The power supply of each apparatus A can optionally be provided with a disconnecting switch 19, for example, placed downstream of the manual switch of the apparatus, controlled remotely by the signal conditioner means 11, of processor with memories and programmed type, and/or by receiving and processing means 15 via the connection means 13 and/or the signal conditioner means 11. Each apparatus can further comprise alarm means of optical and/or acoustic type actuated by said signal conditioner means 11 and/or by the receiving and processing means 15 via the connection means 13 and/or via the signal conditioner means 11.

**[0023]** Each apparatus A can be provided with a detection and/or recognition means 20 of an human operator.

**[0024]** The detection and/or recognition means 20 can comprise at least one interrogator of radio frequency identification RFID for the identification of a RFID microchip associated to the human operator, and/or the detection and/or recognition means 20 can comprise a mag-

netic badge reader, a bar code or microchip where the magnetic badge, bar code and microchip are associated to the human operator, and/or the detection and/or recognition means 20 can comprise a fingerprint reader of the human operator and/or keyboards for typing a code of identification of a human operator.

**[0025]** Optionally, each apparatus A can be provided with an accumulator means for feeding at least one of the analogic or digital sensors and/or detectors 2 - 8 and connected to the signal conditioner means 11 for supplying the latter 11 of processor and with memory and programmed type. In this case the accelerometer 7 and the signal conditioner means 11 can be active even during the transport and in general during periods of non-use of the apparatus for detecting and memorize shocks and stresses that, in an operative condition, are sent to the receiving and processing means 15 that verifies any risks of damage in case of excessive stress, for example due to the apparatus falls, generating alarms, warnings and/or blocking the apparatus A itself.

**[0026]** The system of the invention, comprising the device described above and one or more sets of apparatuses A provides that each receiving and processing means 15 is equipped with at least a software processing program of the values of the signals of the sensors and/or detectors 2 - 8 and in function of these values it emits alarm signals, apparatus block commands, scheduled maintenance or fault warnings. For example the software of the system, during the operation of an apparatus A, can verify that the values of temperature, speed of rotation, of the absorbed current supplied by the thermal sensor 2, by the revolution counter 3, by the ammeter detector 4 of the engine of such apparatus, range within the respective ranges of values of the normal operation; such software can also take into account the combination of two or more values, for example to verify that the relationship between current, revolutions and temperature remains within certain ranges of safe values. Such software can also verify that the relationship between the absorbed current and torque, the value of which is provided by the torque detector 6, remains below a certain threshold, where the overpassing of said threshold can indicate a malfunction of the engine or of its transmission. When the values supplied by the sensors and/or their relationships exceed the values considered to be normal, the software can be limited to generate alarms for the apparatus and for the portable devices or, through the communication module 16, through the connection means 13, through the signal conditioner means 11 and through the disconnecting switch 19, can switch off the apparatus and issue a notification for a intervention direct, for example, to the portable devices of a apparatuses technical maintenance manager.

**[0027]** Alternatively, the system provides that at least a part of the above mentioned software is assigned to generate local alarms and/or to switch off the apparatus can by installed into the signal conditioner means 11 itself that through the connection means 13 and the commu-

nication module 16 updates the data processing means 17 on the status of the apparatus. The software communication module 16 can also issue alarms and/or notifications and/or can stop an apparatus if the data provided by the respective accelerometer or gyroscope 7 indicate that the apparatus during the transport or during the use, has experienced excessive shocks or if it is placed in a position, for example tilted too far, incompatible with a safe working.

**[0028]** The software can generate notifications of scheduled maintenance on the basis of the data provided by the operation hours counter 5.

**[0029]** The software can analyze, for example by means of a Fast Fourier Transformer algorithm and by a comparison spectral algorithm, the data provided by the accelerometer and/or from the microphone 8 to detect any abnormal vibration or noise and for generating any alarm notifications and/or stops. The software can also contain routines for analyzing the sound signal supplied by the microphone 8 to detect on the base of the frequency, spectra and intensity specific patterns of the human voice and to provide the immediate stop and shutdown of the apparatus if there are predetermined comparison outcomes, for instance corresponding to pain screams.

**[0030]** The software can also prevent or limit the functionality of an apparatus A according to a predetermined compatibility table of the human operators recognized by the detection means and/or recognition 20. For example the software, through appropriate controls of the apparatus A, could enable the operation of an apparatus A to maximum power and speed only in the case of recognition of a human operator with appropriate qualifications.

**[0031]** The device can be equipped with detectors, such as micro switches or Reed and magnet contacts, associated with guards and removable parts, for example to be removed for cleaning, of the apparatus A, said detectors provide the software of the processing means 17 or the signal conditioner means 11 with signal on the status of such protections or parts to turn off the apparatus A by means of the disconnecting switch 19 in case of operation attempts without protection or in the event of attempts of disassembly with the power on.

**[0032]** Obviously the operation of the device and of the system can be changed using the software in a manner that depends on the requirements, scope and operations of the apparatuses.

**[0033]** An advantage of the present invention is to provide a device and a control system for apparatus able to coordinate and manage in a unitary way the ordinary maintenance of such equipment.

**[0034]** Another advantage is to perform a constant monitoring of the operational parameters of the equipment to detect abnormalities that may precede failures to enable targeted intervention to prevent failures.

**[0035]** Further advantage is to provide the maximum safety of the human operators during operation and use of equipment to report and prevent the occurrence of hazardous conditions.

## Claims

1. Control device (1) for one or more sets of apparatuses (A) and comprising, for each apparatus (A), at least:

- a set of sensors and/or detectors (2 - 8) associated to the apparatus (A) to detect operating parameters thereof and to provide at least respective signals;

- at least one connection means (13) provided with input gates at least for the signals provided by the sensors and/or detectors (2 - 8) and adapted at least to transmit at least such signals;

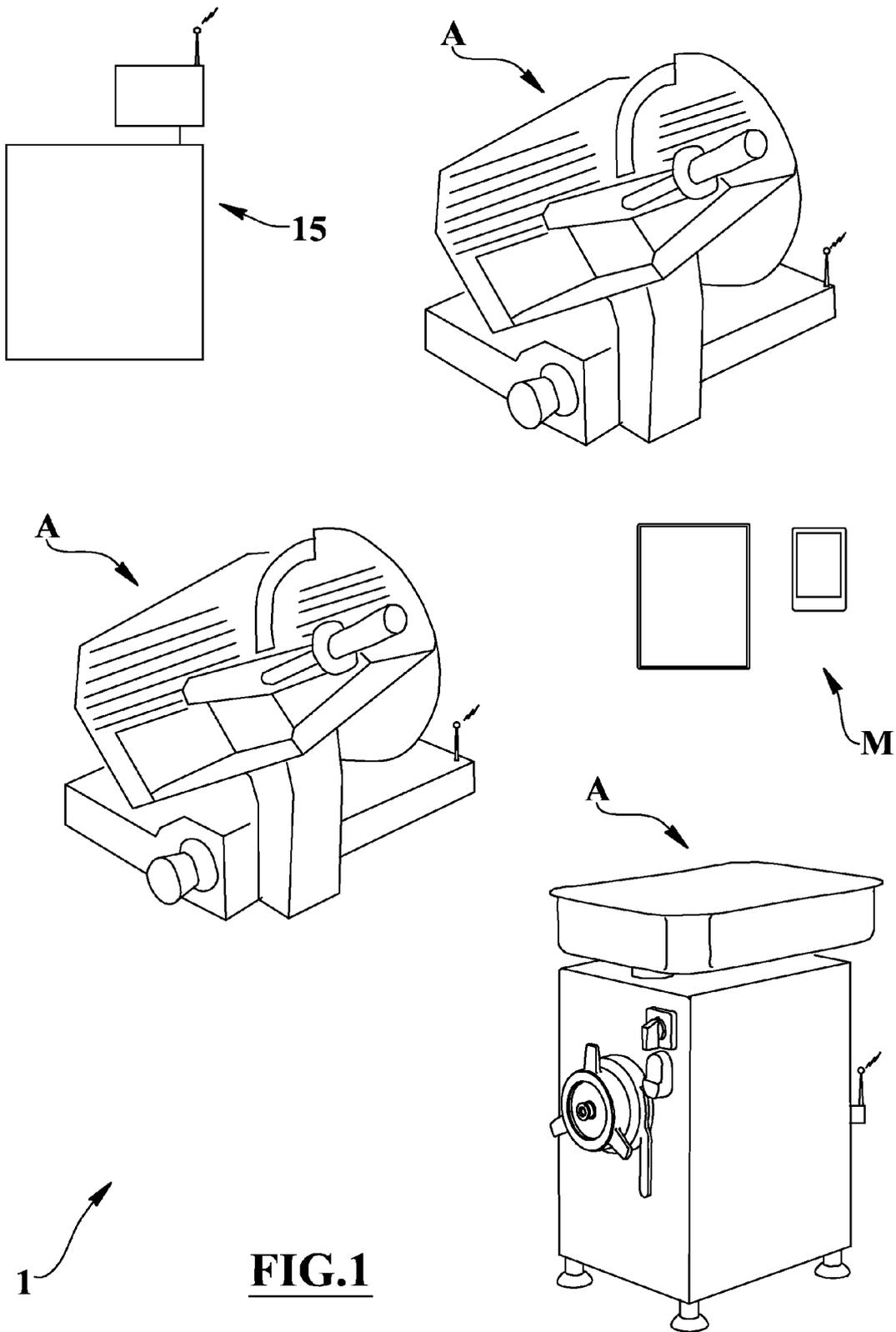
- at least one receiving and processing means (15) adapted at least to receive the signals transmitted by the connection means (13) and to process said signals at least to issue warnings and/or alarms pertaining to one or more of the apparatuses (A);

said control device (1) is **characterized in that**, for each of the apparatuses (A), it is provided with a detection and/or recognition means (20) of an operator, comprising at least one among radio frequency identification interrogator RFID for identifying a microchip RFID associated to the operator, magnetic badge reader, a barcode or microchip badge reader associated to the operator, fingerprint reader of the operator and/or keyboards for the typing of the operator's code; the detection and/or recognition means (20) of each apparatus (A) is connected to the connection means (13).

2. Device according to claim 1, **characterized in that** it comprises at least one signal conditioner means (11) having a set of input analog gates for analog signals supplied by sensors and/or detectors (2-8) of the analog output kind and having, for each of these input gates, a normalizer of the analog input signal and an analog-to-digital converter for the normalized analog signal; each analog-to-digital converter provides the respective output digital signal to a respective input gate of the digital kind of the connection means (13); each sensors and/or detectors (2-8) of the analog output kind is connected to the respective digital input gate of the connection means (13) by means of said at least one signal conditioner means (11).

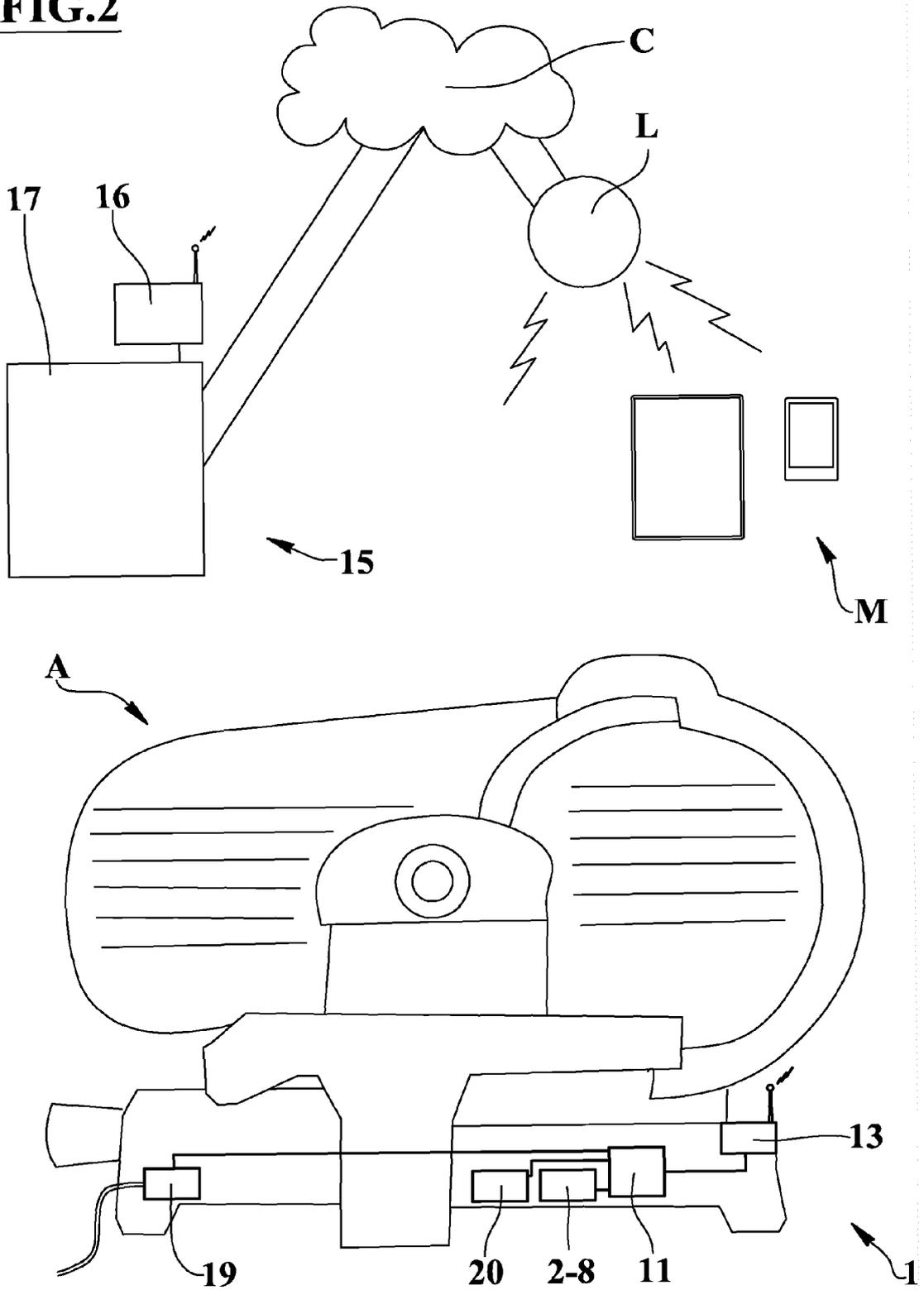
3. Device according to claim 1 or 2, **characterized in that** the connection means (13) further comprises an input digital gate directly connected to a digital output port of each respective digital kind sensor and/or detector (2 - 8) associated to a respective apparatus (A) to detect operating parameters thereof.

4. Device according to any of the preceding claims, **characterized in that** the receiving and processing means (15) is adapted also to retransmit the digital signals provided by the connection means (13) and/or warnings and alarms on communication Wide Area Network (WAN) or Global Area Network (GAN) for their remote use. 5
5. Device according to claim 4, **characterized in that** the receiving and processing means (15) is adapted to transmit such digital signals provided by the connection means (13) and/or warnings and alarms at least through a wireless connection, either directly or through a remote distributed system of cloud type, to portable devices of standard type provided with an application software for the visualization and/or management of such signals and/or warnings and alarms. 10
6. Device according to any of the preceding claims **characterized in that** said set of sensors and/or detectors (2 - 8) of an apparatus (A) comprises at least one among: thermal sensor (2) and/or revolution counter (3) and/or ammeter detector (4) and/or an operation hours counter (5) of a motor of the apparatus (A), torque detector (6) detecting the torque at the drive shaft of the engine and/or of the mechanical load, accelerometer and/or gyroscope (7) rigidly fixed to the apparatus (A), microphone (8) of the noise produced by the apparatus (A) itself and/or of the ambient noises. 20 25 30
7. Device according to any of the previous claims, **characterized in that** each connection means (13) comprises a respective communication module of WI-FI type or similar and **in that** the receiving and processing means (15) comprises a respective communication module (16) of WI-FI type or similar, a possible ADSL gate or of other type for connections via cable or fibre. 35 40
8. Device according to any of the previous claims, **characterized in that** the receiving and processing means (15) furthermore includes processor means (17) of microprocessor and memory and programmed type. 45
9. Device according to any of the previous claims, **characterized in that** the receiving and processing means (15) comprises a connection module for public Wide Area Network (WAN) or Global Area Network (GAN) of 3G, 4G, LTE type, or similar, at least for the cloud services access. 50
10. Device according to any of the previous claims **characterized in that** the power supply of each apparatus (A) is equipped with a disconnecting switch (19) remotely controlled by the signal conditioner means (11), of processor type, with memories and programmed, and/or by receiving and processing means (15) by means of the connection means (13) and/or the signal conditioner (11); each device can also comprise alarm means of optical and/or acoustic type actuated by said signal conditioner means(11) and/or by receiving and processing means (15) by means of the connection means (13) and/or of the signal conditioner (11). 55
11. Device according to claim 6 and any of the previous claims **characterized in that** each apparatus (A) is equipped with an accumulator means for feeding at least one of the analog or digital sensors and/or detectors (2 - 8) and connected to the signal conditioner (11) of processor type, with programmed memories for feeding the latter (11).
12. System comprising the device of any of the previous claims and one or more sets of apparatus **characterized in that** each receiving and processing means (15) is provided with at least a program for processing the signals values of at least one of the sensors and/or detectors (2 - 8) and in function of such values emits alarm signals, apparatus block commands, programmed maintenance intervention or fault warnings.



**FIG. 1**

**FIG.2**





EUROPEAN SEARCH REPORT

Application Number  
EP 15 18 3781

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Place of search Munich		Date of completion of the search 2 February 2016	Examiner Messelken, M
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