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

STEUERUNGSVORRICHTUNG UND -SYSTEM FÜR VORRICHTUNGEN

SYSTÈME ET DISPOSITIF DE COMMANDE POUR DES APPAREILS

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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 whoe 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 retransmitted 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 magnetic 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 appliances and comprising, for each appliance (A), at least:

   - a set of sensors and/or detectors (2 - 8) associated to the appliance (A) to detect operating parameters thereof and to provide at least respective analog or digital signals;
   - at least one signal conditioner means (11) having a set of input analog gates for analog signals supplied by the sensors and/or detectors (2-8) of the analog output kind and having, for each of these analog input gates, a normalizer of the analog input signal and an analog-to-digital converter for the normalized analog signal, said analog-to-digital converter provides such digital signal to a respective output;
   - at least one connection means (13) provided with input digital gates for the signals directly provided by the digital sensors and/or detectors (2 - 8) or by the signal conditioner means (11) and assigned at least to transmit at least such digital signals;

   said control device (1) further comprises at least one receiving and processing means (15) assigned at least to receive the digital signals transmitted by the connection means (13) of each of the appliance and to process said signals at least to issue warnings and/or alarms pertaining to one or more of the appliances (A);
   said control device (1) is **characterized in that**, for each of the appliances (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 appliance (A) is connected to the connection means (13).

2. Device according to claim 1 **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 appliance (A) to detect operating parameters thereof.

3. 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.

4. Device according to claim 3, **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.

5. Device according to any of the preceding claims **characterized in that** said set of sensors and/or detectors (2 - 8) of an appliance (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 appliance (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 appliance (A), microphone (8) of the noise produced by the appliance (A) itself and/or of the ambient noises.

6. 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.

7. 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.

8. 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.

9. Device according to any of the previous claims **characterized in that** the power supply of each appliance (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).

10. Device according to claim 5 and any of the previous claims **characterized in that** each appliance (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).

11. System comprising the device of any of the previous claims and one or more sets of appliances **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, appliance block commands, programmed maintenance intervention or fault warnings.

Patentansprüche

1. Steuervorrichtung (1) für einen Satz oder mehrere Sätze an Geräten und umfassend, für jedes Gerät (A), mindestens:

   - einen mit dem Gerät (A) verbundenen Satz Sensoren und/oder Detektoren (2 - 8), um dessen Betriebsparameter zu ermitteln und mindestens entsprechende analoge oder digitale Signale bereitzustellen;
   - mindestens ein Signalkonditionierungsmittel (11) mit einem Satz analoger Eingangsgatter für von den Sensoren und/oder Detektoren (2 - 8) bereitgestellte analoge Signale vom analogen Ausgangstyp und mit, für jedes dieser analogen Eingangsgatter, einem Normalisierer des analogen Eingangssignals und einem Analog-Digital-Wandler für das normalisierte analoge Signal, wobei der Analog-Digital-Wandler ein solches digitales Signal an einem entsprechendem Ausgang bereitstellt;
   - mindestens ein Verbindungsmittel (13), das bereitgestellt ist mit digitalen Eingangsgattern für durch die digitalen Sensoren und/oder Detektoren (2 - 8) oder das Signalkonditionierungsmittel (11) direkt bereitgestellte Signale, und das zugeordnet ist, um mindestens diese digitalen Signale zu übermitteln; und

   die Steuervorrichtung (1) umfasst weiterhin mindestens ein Empfangs- und Verarbeitungsmittel (15), das zugeordnet ist, um mindestens die durch die Verbindungsmittel (13) des jeweiligen Gerätes übermittelten digitalen Signale zu empfangen und die Si-

gnale zu verarbeiten, um mindestens Warnungen und/oder Alarme betreffend eines oder mehrere der Geräte (A) auszugeben; und
die Steuervorrichtung (1) ist **dadurch gekennzeichnet, dass** sie, für jedes der Geräte (A), mit einem Erfassungs- und/oder Erkennungsmittel (20) eines Anwenders bereitgestellt ist, umfassend mindestens eines aus einer Hochfrequenz-Identifikationsabfragevorrichtung RFID zum Identifizieren eines zu dem Anwender gehörigen RFID-Mikrochips, einem magnetischen Ausweisleser, einem zu dem Anwender gehörigen Strichcode- oder Mikrochipausweisleser, einem Fingerabdruckleser des Anwenders und/oder Tastaturen für die Eingabe des Codes des Anwenders, wobei die Erfassungs- und/oder Erkennungsmittel (20) jeden Geräts mit dem Verbindungsmittel (13) verbunden sind.

2. Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** das Verbindungsmittel (13) weiterhin ein digitales Eingangsgatter umfasst, das direkt mit einem digitalen Ausgangsanschluss von jedem mit einem jeweiligen Gerät (A) verbundenen Sensor und/oder Detektor (2 - 8) vom digitalen Typ verbunden ist, um dessen Betriebsparameter zu ermitteln.

3. Vorrichtung gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Empfangs- und Verarbeitungsmittel (15) angepasst ist, um ebenso die durch die Verbindungsmittel (13) übermittelten digitalen Signale und/oder Warnungen und Alarme an ein Kommunikations-Weitbereichsnetz (WAN) oder globales Netz (GAN) zur Remoteverwendung weiterzuleiten.

4. Vorrichtung gemäß Anspruch 3, **dadurch gekennzeichnet, dass** das Empfangs- und Verarbeitungsmittel (15) angepasst ist, um solche digitalen Signale, die durch die Verbindungsmittel (13) bereitgestellt werden, und/oder Warnungen und Alarme durch eine kabellose Verbindung entweder direkt oder durch ein Remote-Verteilungsnetz vom Cloud-Typ an tragbare Geräte vom Standard-Typ zu übermitteln, die mit einer Anwendungssoftware zur Visualisierung und/oder Verwaltung solcher Signale und/oder Alarme bereitgestellt sind.

5. Vorrichtung gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Satz an Sensoren und/oder Detektoren (2 - 8) eines Gerätes (A) mindestens eines der folgenden umfasst: Temperatursensor (2) und/oder Umdrehungszähler (3) und/oder Strommesser (4) und/oder Betriebsstundenzähler (5) eines Motors des Gerätes (A), Drehmomentzähler (6), der das Drehmoment der Antriebswelle des Motors und/oder die mechanische Last erfasst, Beschleunigungsmesser und/oder Gyroskop (7), das fest am Gerät (A) angebracht ist, Mikrophon (8) für die durch das Gerät (A) selbst erzeugten Geräusche und/oder für die Umgebungsgeräusche.

6. Vorrichtung gemäß Anspruch 1, **dadurch gekennzeichnet, dass** jedes Verbindungsmittel (13) ein jeweiliges Kommunikationsmodul vom WiFi-Typ oder einer ähnlicher Art umfasst sowie dadurch, dass das Empfangs- und Verarbeitungsmittel (15) ein jeweiliges Kommunikationsmodul (16) vom WiFi-Typ oder einer ähnlicher Art, ein mögliches ADSL-Gatter oder einer anderen Art für Verbindungen mittels Kabel oder Glasfaser umfasst.

7. Vorrichtung gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Empfangs- und Verarbeitungsmittel (15) weiterhin ein Prozessormittel (17) vom Mikroprozessor und Speicher und programmierten Typ umfasst.

8. Vorrichtung gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Empfangs- und Verarbeitungsmittel (15) ein Verbindungsmodul für öffentliche Weitbereichsnetze (WAN) oder globale Netze (GAN) vom 3G-, 4G-, LTE-Typ oder ähnliches umfasst, mindestens für den Zugang zu den Cloud-Diensten.

9. Vorrichtung gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Energieversorgung eines jeden Gerätes (A) ausgestattet ist mit einem Trennschalter (19), der ferngesteuert wird durch das Signalkonditionierungsmittel (11) vom Prozessor-Typ mit Speicher und programmiert, und/oder durch das Empfangs- und Verarbeitungsmittel (15) mittels des Verbindungsmittels (13) und/oder des Signalkonditionierungsmittels (11), wobei jedes Gerät weiterhin Alarmmittel optischer und/oder akustischer Art umfassen kann, die ausgelöst werden durch das Signalkonditionierungsmittel (11) und/oder das Empfangs- und Verarbeitungsmittel (15) mittels des Verbindungsmittels (13) und/oder des Signalkonditionierungsmittels (11).

10. Vorrichtung gemäß Anspruch 5 und einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** jedes Gerät (A) ausgestattet ist mit einem Akkumittel zum Versorgen mindestens eines der analogen oder digitalen Sensoren und/oder Detektoren (2 - 8) und das verbunden ist mit dem Signalkonditionierungsmittel (11) vom Prozessor-Typ mit programmierten Speichern zum Versorgen des letztgenannten (11).

11. System umfassend die Vorrichtung gemäß einem der vorhergehenden Ansprüche und einen Satz oder mehrere Sätze an Geräten (A), **dadurch gekennzeichnet, dass** jedes Empfangs- und Verarbei-

tungsmittel (15) bereitgestellt ist mit mindestens einem Programm zum Verarbeiten der Signalwerte von mindestens einem der Sensoren und/oder Detektoren (2 - 8) und in Funktion solcher Werte Alarmsignale, Gerätblockierbefehle, programmierte Instandsetzungseingriffe oder Störmeldungen aussendet.

Revendications

1. Dispositif de commande (1) pour un ou plusieurs ensembles d'appareils et comprenant, pour chaque appareil (A), au moins :

- un ensemble de capteurs et/ou détecteurs (2-8) associés à l'appareil (A) pour détecter des paramètres de fonctionnement de celui-ci et pour fournir au moins des signaux analogiques ou numériques respectifs ;
- au moins un moyen de conditionnement de signal (11) ayant un ensemble de portes d'entrée analogiques pour des signaux analogiques fournis par les capteurs et/ou détecteurs (2-8) du type sortie analogique et ayant, pour chacune desdites portes d'entrée analogiques, un dispositif de normalisation du signal d'entrée analogique et un convertisseur analogique/numérique pour le signal analogique normalisé, ledit convertisseur analogique/numérique fournissant un tel signal numérique à une sortie respective ;
- au moins un moyen de connexion (13) comportant des portes d'entrée numériques pour les signaux fournis directement par les capteurs et/ou détecteurs numériques (2-8) ou par le moyen de conditionnement de signal (11), et conçu au moins pour transmettre au moins de tels signaux numériques ;

ledit dispositif de commande (1) comprend en outre au moins un moyen de réception et de traitement (15) conçu au moins pour recevoir les signaux numériques transmis par le moyen de connexion (13) de chaque appareil et pour traiter lesdits signaux au moins pour délivrer des avertissements et/ou alarmes se rapportant à un ou plusieurs des appareils (A) ;
ledit dispositif de commande (1) est **caractérisé par le fait que**, pour chacun des appareils (A), il comporte un moyen de détection et/ou de reconnaissance (20) d'un opérateur, comprenant au moins un parmi un interrogateur d'identification par radiofréquence (RFID) pour identifier une micropuce RFID associée à l'opérateur, un lecteur de badge magnétique, un lecteur de badge à code à barres ou à micropuce associé à l'opérateur, un lecteur d'empreintes digitales de l'opérateur et/ou des claviers pour la saisie du code de l'opérateur ; le moyen de détection et/ou de reconnaissance (20) de chaque appareil (A) est connecté au moyen de connexion (13).

2. Dispositif selon la revendication 1, **caractérisé par le fait que** le moyen de connexion (13) comprend en outre une porte d'entrée numérique connectée directement à un port de sortie numérique de chaque capteur et/ou détecteur de type numérique respectif (2-8) associé à un appareil respectif (A) pour détecter des paramètres de fonctionnement de celui-ci.

3. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** le moyen de réception et de traitement (15) est également adapté pour retransmettre les signes numériques fournis par le moyen de connexion (13) et/ou des avertissements et alarmes sur une communication en réseau étendu (WAN) ou en réseau global (GAN) pour leur utilisation à distance.

4. Dispositif selon la revendication 3, **caractérisé par le fait que** le moyen de réception et de traitement (15) est adapté pour transmettre de tels signaux numériques fournis par le moyen de connexion (13) et/ou avertissements et alarmes au moins par l'intermédiaire d'une connexion sans fil, soit directement soit par l'intermédiaire d'un système réparti à distance de type nuage, à des dispositifs portables de type standard comportant un logiciel d'application pour la visualisation et/ou la gestion de tels signaux et/ou avertissements et alarmes.

5. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** ledit ensemble de capteurs et/ou détecteurs (2-8) d'un appareil (A) comprend au moins un parmi : un capteur thermique (2) et/ou un compte-tours (3) et/ou un ampèremètre (4) et/ou un compteur d'heures de fonctionnement (5) d'un moteur de l'appareil (A), un détecteur de couple (6) détectant le couple à l'arbre d'entraînement du moteur et/ou de la charge mécanique, un accéléromètre et/ou gyroscope (7) fixé de manière rigide à l'appareil (A), un microphone (8) du bruit produit par l'appareil (A) lui-même et/ou des bruits ambiants.

6. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** chaque moyen de connexion (13) comprend un module de communication respectif de type Wi-Fi ou analogue et **par le fait que** le moyen de réception et de traitement (15) comprend un module de communication respectif (16) de type Wi-Fi ou analogue, une éventuelle porte ADSL ou d'un autre type pour des connexions par câble ou fibre.

7. Dispositif selon l'une quelconque des revendications

précédentes, **caractérisé par le fait que** le moyen de réception et de traitement (15) comprend en outre un moyen de processeur (17) de type microprocesseur et à mémoire et programmé.

8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** le moyen de réception et de traitement (15) comprend un module de connexion pour réseau étendu (WAN) public ou réseau global (GAN) public de type 3G, 4G, LTE, ou analogue, au moins pour l'accès aux services en nuage.

9. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'alimentation électrique de chaque appareil (A) est équipée d'un sectionneur (19) commandé à distance par le moyen de conditionnement de signal (11), de type processeur, avec mémoires et programmé, et/ou par le moyen de réception et de traitement (15) à l'aide du moyen de connexion (13) et/ou du conditionneur de signal (11) ; chaque dispositif peut également comprendre un moyen d'alarme de type optique et/ou acoustique actionné par ledit moyen de conditionnement de signal (11) et/ou par le moyen de réception et de traitement (15) à l'aide du moyen de connexion (13) et/ou du conditionneur de signal (11).

10. Dispositif selon la revendication 5 et l'une quelconque des revendications précédentes, **caractérisé par le fait que** chaque appareil (A) est équipé d'un moyen accumulateur pour alimenter au moins un des capteurs et/ou détecteurs analogiques ou numériques (2-8) et connecté au conditionneur de signal (11) de type processeur, avec des mémoires programmées, pour alimenter ce dernier (11).

11. Système comprenant le dispositif selon l'une quelconque des revendications précédentes et un ou plusieurs ensembles d'appareils, **caractérisé par le fait que** chaque moyen de réception et de traitement (15) comporte au moins un programme pour traiter les valeurs de signaux d'au moins un des capteurs et/ou détecteurs (2-8) et, en fonction de telles valeurs, émet des signaux d'alarme, des instructions de bloc d'appareil, une intervention de maintenance programmée ou des avertissements de panne.

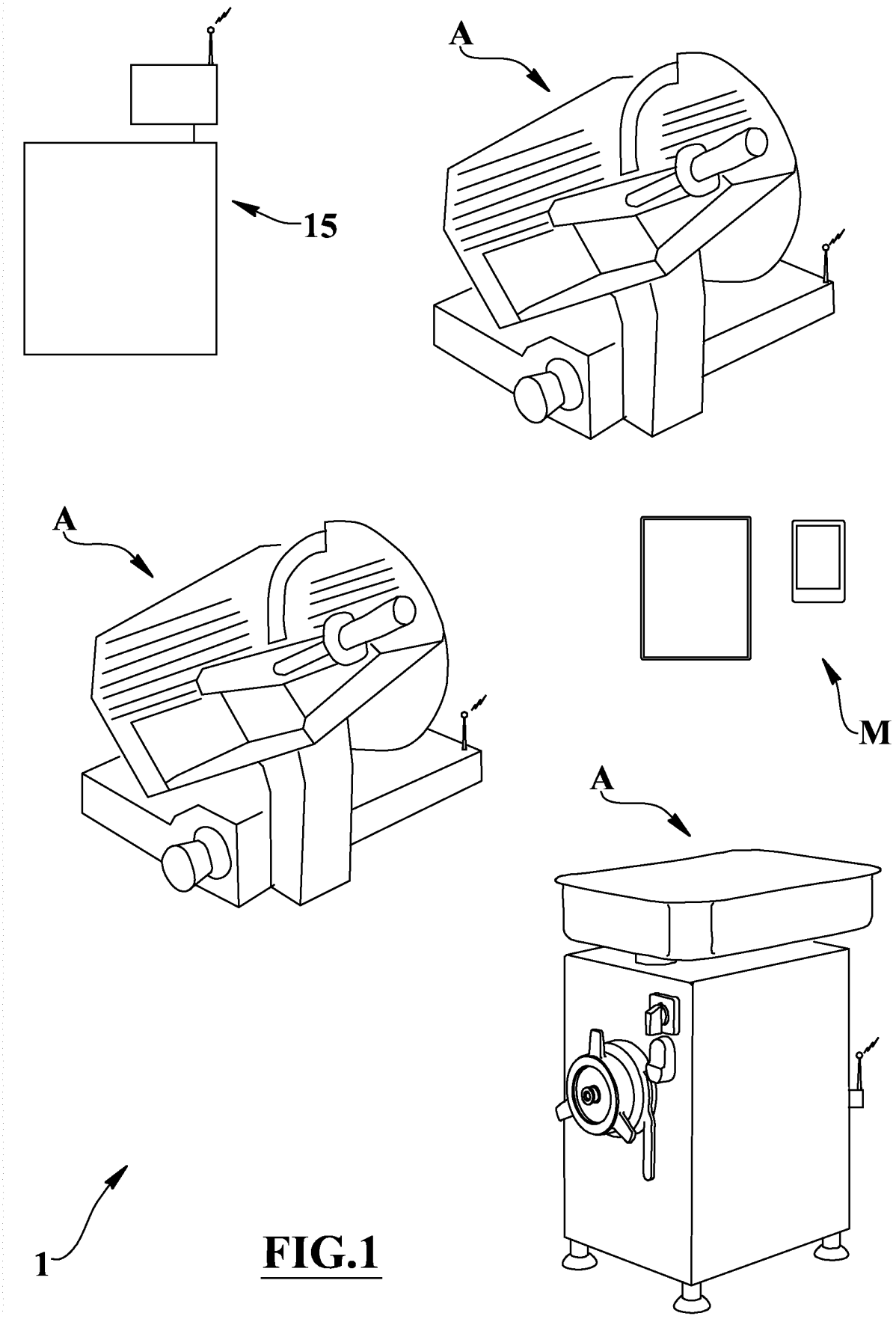
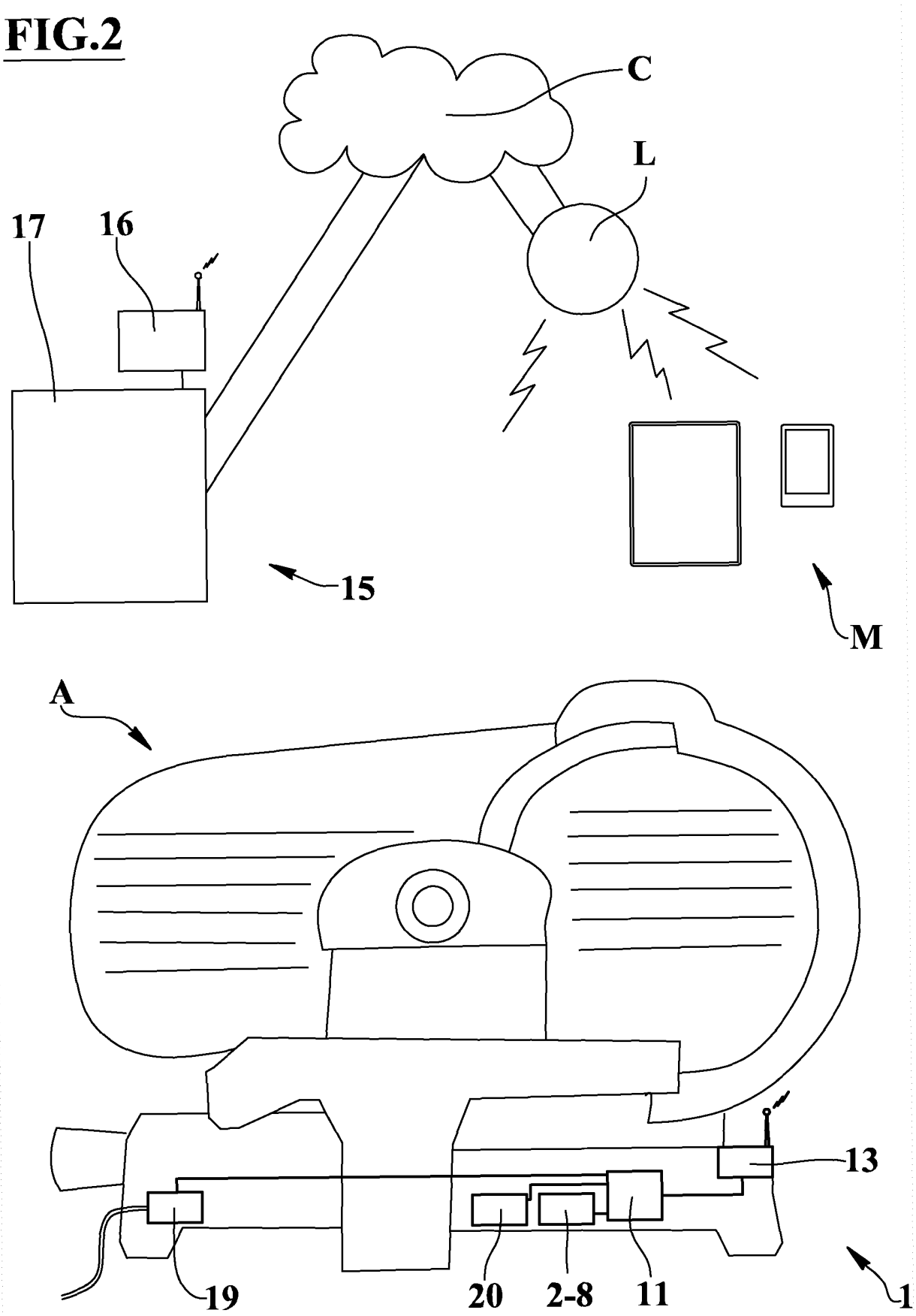


FIG.1

FIG.2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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