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(54) Filling unit of a container filling machine, having improved storing capability

(57) A filling unit (10) of a filling machine (1) engages at least one container (2) to carry out filling thereof with a product, and has a flow regulator device (14) to regulate flow of the product within the container (2) during filling operations. The filling unit is integrally provided with an electronic control module (30), integrating a computing unit (32), to acquire operating data during the filling operations, relating to the filling operations being performed, and a storage memory (34), coupled to the computing unit (32), to store the operating data, during the filling operations.

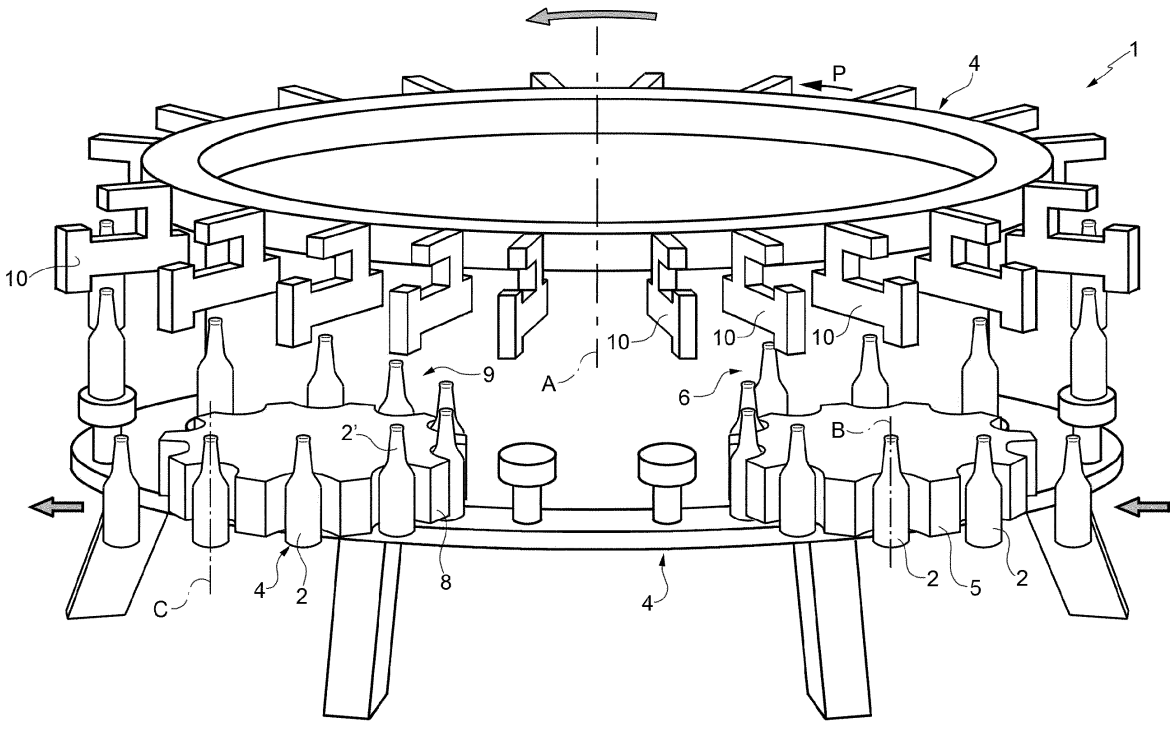


FIG. 1

EP 2 803 625 A1

Description

[0001] The present invention relates to a filling unit of a filling machine, designed for filling containers with a product, for example a carbonated liquid. In particular, the present disclosure relates to a filling unit with analysis and storing capability for improved quality monitoring and data analysis with respect to the filling operations being performed.

[0002] In the field of bottling of carbonated liquid, like beer, in containers, like glass bottles or aluminum cans, a system is known comprising a feed line for feeding a succession of empty bottles to a filling machine, in turn comprising a filling rotating wheel (so called "carousel"), carrying a number of filling units. The filling units are mounted to rotate continuously about a longitudinal axis, engage the empty bottles, feed pressurized gas into the bottles, fill the bottles with the product, decompress the filled bottles, and then feed the bottles to a capping machine, which is connected to the filling machine by at least one transfer wheel and closes the bottles with respective caps.

[0003] The Applicant has realized that known filling machines may suffer from some drawbacks concerning the accuracy and generally the quality of the filling operations.

[0004] Indeed, it may prove difficult to ensure that the correct filling parameters are satisfied during each step of the filling recipe; in this regard, controls and checks performed after the filling process has been completed may not be sufficient to guarantee that the bottled fluid product has the desired properties.

[0005] The aim of the present invention is consequently to solve, at least in part, the problem previously highlighted, and in general to provide an improved solution for a filling unit in a filling machine, particularly with respect to control and monitoring of its operation.

[0006] According to the present invention, a filling unit, and a related filling machine, are thus provided, as defined in the appended claims.

[0007] For a better understanding of the present invention, preferred embodiments thereof are now described, purely by way of a non-limiting example, with reference to the attached drawings, wherein:

- Figure 1 is a schematic view of a filling machine;
- Figure 2 is a schematic block diagram of a filling unit of the filling machine of Figure 1;
- Figure 3 to 5 are perspective views of a filling unit of the filling machine of Figure 1, according to a possible embodiment of the present solution;
- Figure 6 is a schematic block diagram of an electronic control module of the filling unit of the filling machine, according to an embodiment of the present solution;
- Figure 7 is a plot of the pressure in a container being filled, during execution of filling operations;
- Figure 8 is a schematic block diagram of a digital communication system in the filling machine; and
- Figure 9 is a further plot of the pressure in a container being filled, during execution of the filling operations.

[0008] Figure 1 schematically shows a machine, denoted as a whole with 1, for filling liquid into containers 2, for example glass bottles or aluminum cans.

[0009] Filling machine 1 comprises a conveying device, including a carousel 4, which is mounted to rotate continuously (anticlockwise in Figure 1) about a substantially vertical longitudinal axis A.

[0010] The carousel 4 receives a succession of empty containers 2 from an input wheel 5, which is coupled to carousel 4 at a first transfer station 6 and is mounted to rotate continuously about a respective vertical longitudinal axis B, parallel to axis A.

[0011] The carousel 4 releases a succession of filled containers 2 to an output wheel 8, which is coupled to carousel 4 at a second transfer station 9 and is mounted to rotate continuously about a respective vertical longitudinal axis C, parallel to axes A and B.

[0012] Filling machine 1 comprises a number of filling units 10, which are equally spaced about axis A, are mounted along a peripheral edge of carousel 4, and are moved by the same carousel 4 along a path P extending about axis A and through transfer stations 6 and 9.

[0013] Each filling unit 10 is designed to receive at least one container 2 to be filled, and to perform, during its rotation along path P, a number of filling operations according to a filling "recipe", in order to fill the container 2 with a fluid (e.g. a carbonated liquid).

[0014] The filling unit 10 is configured to engage the container 2, at an opening of a neck 2' thereof, and includes one or more fluidic conduits, which are designed to selectively couple the container 2 to one or more feed devices.

[0015] In a possible embodiment, schematically shown in Figure 2 (which refers to a single filling unit 10, for clarity of illustration), filling unit 10 includes: a first fluidic conduit 11a, coupled to a first feed device 12a, designed to supply the liquid that is to fill the container 2, such as beer, from a first feed tank (not shown); a second fluidic conduit 11b, coupled to a second feed device 12b, designed to supply a gas, such as carbon dioxide, from a second feed tank (not shown); and a third fluidic conduit 11c, coupled to an air-suction device 12c (e.g. including a vacuum pump), providing a suction action to extract gases from the bottle during a vacuum phase.

[0016] Each filling unit 10 also comprises at least one flow regulator device 14, designed to define one or more filling passages 15 (only one of which is schematically shown in Figure 2) communicating with the opening at the neck 2' of the container 2, and including a valve group 16, coupled to the above first, second and third fluidic conduits 11a, 11b, 11c, and operable to selectively couple one or more of the same first, second and third fluidic conduits 11a, 11b, 11c (and thus the first feed device 12a, the second feed device 12b and/or the air-suction

device 12c) with the one or more filling passages 15, during filling of the container 2.

[0017] Filling of the container 2 is performed according to a desired plan, the so called "recipe", which may for example envisage one or more of the following operations, e.g. performed in a preset sequence:

a first air-extraction operation to remove air from the container 2 by fluidically coupling the container 2 to the air-suction device 12c;
flushing the container 2, by feeding a stream of carbon dioxide to container 2, via the second feed device 12b;
a second air-extraction operation to remove any remaining air from the container 2, again by fluidically coupling the container 2 to the air-suction device 12c (so called "snift" operation);
pressurizing the container 2, by feeding a stream of carbon dioxide into container 2 via the second feed device 12b;
filling the container 2, by feeding a stream of filling liquid, via the first feed device 12a; and
depressurizing the container 2, by fluidically coupling the container 2 to the air-suction device 12c.

[0018] According to an aspect of the present solution, each filling unit 10 is integrally provided with a sensor element 17, which is arranged so as to be fluidically coupled to the filling passage 15, during filling of the container 2, thereby being able to monitor parameters and quantities associated to the environment within the same container 2; for example, sensor element 17 may be arranged in the flow regulator device 14, within the filling passage 15, or so as to be in fluidic communication with the same filling passage 15.

[0019] In particular, sensor element 17 includes a pressure sensor, which is configured to monitor the pressure (or vacuum condition) within the container 2 during each step of the filling recipe; the presence of the sensor element 17 allows to collect relevant diagnostic information for the analysis and monitoring of the filling operations, and also to perform control actions and adjustments in real time during the same filling operations.

[0020] The presence of sensor element 17 allows to perform a number of operations, among which:

- detecting pressure values during all the steps of the recipe, storing these values, and, e.g. after the filling operations are completed, draw pressure plots, which may displayed on an operator panel, in order to allow analysis of the performance of the filling operations;
- monitoring the occurrence of failures, such as bursting of a container 2, during execution of the recipe steps, e.g. by checking if the sensed pressure values overcome a preset absolute maximum pressure threshold Th_1, or a preset differential pressure threshold Th_2, relating to the difference of pressure between the container 2 and a respective feed tank; in case any one of the absolute or differential pressure thresholds Th_1, Th_2, is overcome (this being indicative of a possible failure), the filling operations may be immediately stopped and suitable actions performed in order to safeguard the filling machine 1. As an alternative, a sudden variation of the sensed pressure associated with burst of the container 2 may be detected by monitoring the pattern of the derivative of the sensed pressure signal;
- monitoring the correctness of the vacuum level during the recipe steps envisaging vacuum within the containers 2, in particular with respect to glass bottles for beer;
- monitoring the correct depressurization of the containers 2 during the recipe steps envisaging depressurization (e.g. during a snift operation). In this case, the sensed pressure values are compared to a decompression pressure threshold Th_3, and decompression is considered successful only if the sensed pressure is found to be below the decompression pressure threshold Th_3 at the end of the recipe step.

[0021] Moreover, the presence of sensor element 17 proves useful also in different operating conditions of the filling machine 1, e.g. during a cleaning/sterilization operation, when dummy containers (e.g. dummy bottles) are placed in the filling machine 1 and a cleaning fluid is introduced.

[0022] Monitoring pressure values at the flow regulator devices 14 allows in this case to check the correct passage of the cleaning fluid through the flow regulator devices 14 into the dummy bottles (and this is particularly useful in case no flow-meters are present at the openings of the containers 2).

[0023] According to a further aspect of the present solution, the sensor element 17 arranged in at least one of the filling units 10 further includes a temperature sensor, which may for example be integrated with the pressure sensor, in order to detect the temperature of the filling fluid during filling operations, and/or of the cleaning fluid during cleaning operations.

[0024] Also in this case, monitoring of the temperature values within the containers 2 allows to perform controls and adjustments in real time during execution of the operations of the filling machine 1, e.g. during filling or recirculation of the filling fluid, or during cleaning/sanitizing of the flow regulator devices 14, in general providing important diagnostic information to be used in real time or at a later stage (during a post-processing stage) to control the filling machine 1.

[0025] A possible embodiment of a filling unit 10 of the filling machine 1 will now be discussed with reference to Figures 3 to 5.

[0026] In this solution, filling unit 10 includes a main body 20, having a vertical extension along a longitudinal axis D, that is substantially parallel to axis A of carousel 4.

[0027] The main body 20 has a bottom part 20a, which ends at a flange 22, that is mechanically coupled to the periphery of the carousel 4, and an upper part 20b, which is coupled to the first fluidic conduit 11a, in order to receive the filling liquid from the first feed device 12a (here not shown).

[0028] The bottom part 20a of the main body 20 defines a container receiving part 24 of the filling unit 10, coupled to the flange 22 and designed to receive the neck 2' of the container 2 that is to be filled.

[0029] The main body 20 internally defines filling passage 15 (not shown in Figures 3-5), from the first fluidic conduit 11a to the opening of the container 2, at the container receiving part 24, which selectively allows the passage of the filling fluid towards the container 2, during preset steps of the filling recipe. Suitable actuatable elements, such as a valve or shutter element (here not shown), are provided within the main body 20, cooperating with the filling passage 15 in order to modify the section of passage to the fluid, e.g. between a fully open, a partially open, or a closed condition, according to the different requirements envisaged by the filling operations.

[0030] The second fluidic conduit 11b of the filling unit 10 is coupled to the container receiving part 24, below flange 22, and allows to receive gas, such as carbon dioxide, from the second feed device 12b (here not shown).

[0031] The flow regulator device 14 of the filling unit 10 includes a housing 26, which has a vertical extension substantially parallel to longitudinal axis D, and is mechanically coupled to main body 20.

[0032] In a manner not shown in detail, within housing 26 of the flow regulator device 14 suitable actuator elements are provided, which are configured to cooperate with the actuatable elements within the body 20, in order to fully open, partially open, or close the filling passage 15.

[0033] Moreover, the flow regulator device 14 carries, at a bottom part 14a thereof, the third fluidic conduit 11c (operating as a decompression channel), having one end coupled to the air-suction device 12c, and the other end fitted into the opening of the container 2, through flange 22.

[0034] According to an aspect of the proposed embodiment, the sensor element 17 (of a known type, here not discussed in detail) is mounted to the flow regulator device 14, so as to continuously monitor the pressure within the internal environment of the container 2.

[0035] For example, the sensor element 17 may be coupled to the third fluidic conduit 11c. In more detail, the sensor element 17 includes a sensing part 17a, housing a suitable sensing arrangement (of a known type), and an input port 17b, coupled to the third fluidic conduit 11c, and allowing fluidic connection between the sensing part 17a and the same third fluidic conduit 11c. Moreover, the sensor element 17 has an end part 17c, coupled to, and extending towards the outside of, the housing 26, carrying suitable electrical connection elements (e.g. in the form of electrical contacts or pads), in order to output the transduced electrical quantity (e.g. a capacitive or resistive variation), indicative of the sensed pressure. The housing 26 of the flow regulator device 14 carries, at an outer surface thereof, a wiring element 28, electrically coupled to end part 17c, and extending along the longitudinal axis toward a top part 14b of the same flow regulator device 14.

[0036] The top part 14b may be releasably coupled to the housing 26, via a suitable mechanical connection, and may house an electronic board of a control module 30 of the filling unit 10 (here schematically shown), integrating suitable electronic circuitry (as discussed in more details below); the wiring element 28 in this case ends at the control module 30, being electrically connected thereto.

[0037] A further aspect of the present solution, which will now be discussed in connection with Figure 6, envisages the filling unit 10 having both electronic intelligence and storage capacity, integrated in suitable electronic circuitry of the control module 30. It is to be noted that some (at least one), or all, of the filling units 10 of the filling machine 1 may be made as it will now be discussed.

[0038] In particular, control module 30 includes:

- a computing unit 32, including a microcontroller, or any other processing unit;
- a storage memory 34, coupled to the computing unit 32, and configured to store operating data relating to the filling operations being performed, e.g. samples of the pressure or temperature values detected by sensor element 17 and/or other sensed data, such as flow rate measures or electrical current measures from a resistive probe, or in general any other operating data available to the computing unit 32, originated from sensors at the flow regulator device 14 or received from external components. For example, storage memory 34 may be a buffer memory, which stores operating data relating to execution of a number of filling recipes, circularly overwriting data previously stored;
- a sensor interface module 35, coupled to the computing unit 32, configured to acquire the electrical signals from the sensor element 17, related to the pressure and temperature readings, to process the same electrical signals (in case it is required, e.g. via an analog to digital conversion), and to provide the same signals to the computing unit 32, which then generates the operating data (e.g. pressure and temperature data) to be stored in the storage memory 34. Sensor interface module 35 may acquire the sensed signals at a preset sampling period;
- an actuator interface module 36, coupled to the computing unit 32 and to actuator elements of the flow regulator device 14, configured to transmit to the same actuator elements commands to actuate the actuatable elements within the main body 20 of the

filling unit 10, these commands being e.g. generated by the computing unit 32 based on the operations to be performed according to the filling recipe;

- a communication interface module 38, coupled to the computing unit 32, operable to receive and transmit data from/to the external environment, in particular from/to a central control unit (here not shown) of the filling machine 1 via a digital communication bus (such as a CAN bus). The central control unit may be able to further process the data, e.g. in order to diagnose faults and problems of the filling unit 10.

[0039] In more details, computing unit 32 may store in storage memory 34 pressure and temperature operating data relating to the filling operations in real time, i.e. during execution of the same operations; to this end, signals from the sensor element 17 may be sampled with a desired sampling frequency and processed to generate the operating data to be stored.

[0040] The stored pressure and temperature operating data may be transferred to the external environment via the communication interface module 38, again in real time, during execution of the filling operations, or after the filling recipe has been completed, for processing and analysis, e.g. by central computing unit, again in real time or as post-processing operations.

[0041] Figure 7 shows an exemplary result of the processing of the stored operating data, i.e. a plot of the pressure values sensed during the various steps of the filling recipe.

[0042] In particular, the plot shows the succession in time of: a first air-extraction operation (denoted with S_1); a first pressurization operation (denoted with S_2); a second air-extraction operation (denoted with S_3); a second pressurization operation (denoted with S_4); the filling operation at a substantially constant pressure (denoted with S_5); and a final depressurization operation (denoted with S_6).

[0043] This plot may be displayed on a user panel at the filling machine 1, or at a remote location from the filling machine, e.g. at a supervisory facility.

[0044] Computing unit 32 may also be configured (e.g. via suitable software and program instructions) to process in real time the operating data, in order e.g. to detect a fault in the filling unit 10, or a serious failure event, such as bursting of the container 2 being filled.

[0045] An alarm signal may thus be promptly generated and suitable corrective actions performed, such as stopping of the filling machine 1.

[0046] In general, the intelligence on-board the filling unit 10 allows to more reliably and promptly identify any problem or anomaly occurring in the filling machine 1, so as to achieve a desired quality control of the operations performed.

[0047] According to a further aspect of the present solution, which will now be discussed with reference to Figure 8, the control modules 30 of a number of filling units 10 in the filling machine 1 communicate with a central control unit 40 of the same filling machine 1 over a communication bus 42.

[0048] In a possible embodiment, central control unit 40 includes an industrial programmable controller (PLC), and communication bus 42 is a digital communication bus (e.g. a CAN bus), transferring digital information, signals and commands.

[0049] As shown in Figure 8, the control modules 30 communicate with the communication bus 42, and thereby with the central control unit 40, via the respective communication interface modules 38 coupled to the respective computing unit 32.

[0050] The central control unit 40 is coupled to the communication bus 42 and may also be coupled with a supervisor unit 45, e.g. located remotely with respect to the filling machine 1, via a remote wireless link 46.

[0051] The central control unit 40 is thus able to receive operating data from the various filling units 10, in real time during execution of the filling recipe, and/or after the same filling recipe has been completed, reading the operating data stored in the respective storage memories 34.

[0052] The communication bus 42 also allows the central control unit 40 to transmit to the various control modules 30 data relating to the operating condition of the filling machine 1 and data regarding the operations to be performed, in order to assist execution of the filling recipe; for example, these data may include pressure values in the feed tanks, relating to the pressure of the filling fluid and/or gas within the same feed tanks (these data may be used by the slave units to control the filling operations and diagnose possible faults and anomalies).

[0053] The central control unit 40 is also provided with suitable software and program instructions in order to process the received operating data, either in real time or as post-processing operations, in order to determine the occurrence of faults, the correctness of the filling operations, the need of performing adjustments, etc.

[0054] For example, the central control unit 40 may be able to execute further plots of the received operating data, such as sensed pressure values, possibly with different time scales and number of samples involved.

[0055] Figure 9 shows an exemplary plot executed by the central control unit 40, which may be displayed on a related display and/or sent wirelessly to the supervisor unit 45. The shown plot relates to a filling step of the recipe, at a substantially constant pressure.

[0056] The advantages that the described solution allows to achieve are clear from the foregoing description.

[0057] In particular, it is again underlined that an improved analysis capability and control on the quality of the filling operations are achieved in the filling machine 1.

[0058] Indeed, the provision of sensor elements 17 integrated in the filling units 10 allows to collect operating data relating to the performance of the individual filling units 10, during the filling operations, thus allowing to closely monitor the performance of the filling machine 1.

[0059] Furthermore, the provision of processing and/or

storage capability in the filling units 10 allows to simplify transmission and post-processing of the operating data that are collected during the filling operations.

[0060] In this respect, only a portion of the collected data may be transmitted to the central control unit 40 of the filling machine 1, e.g. only data that are considered relevant for the quality checks, thus saving storage capacity.

[0061] Moreover, historical trends may be easily generated, in order to further improve quality assessment.

[0062] Finally it is clear that modifications and variations may be applied to the solution described and shown, without departing from the scope of the appended claims.

[0063] For example, it is clear that the discussed solution may advantageously be adopted also for different kind of containers, e.g. PET containers, to be filled and/or different kind of filling fluids, e.g. different from food products.

[0064] Moreover, each intelligent filling unit 10 may be configured to control filling of more than one container (e.g. having a corresponding number of flow regulator devices 14 and filling means).

Claims

1. A filling unit (10) of a filling machine (1), designed to engage at least one container (2) to carry out filling thereof with a filling product, including a flow regulator device (14) configured to regulate flow of the product within the container (2) during filling operations,
   characterized by being integrally provided with an electronic control module (30), integrating a computing unit (32), configured to acquire operating data during the filling operations, relating to the filling operations being performed, and a storage memory (34), coupled to the computing unit (32), and configured to store the operating data, during the filling operations.

2. The filling unit according to claim 1, wherein the storage memory (34) is a buffer memory, which is designed to store operating data relating to a number of filling recipes executed in the filling machine (1), a filling recipe including a set of filling operations for filling the container (2) with the filling product.

3. The filling unit according to claim 1 or 2, wherein the operating data include pressure and temperature data associated to pressure and temperature values within the container (2), detected during the filling operations.

4. The filling unit according to any of the preceding claims, wherein the operating data stored in the storage memory (34) are designed to be sent to a central control unit (40), during the filling operations, and/or after the filling operations for further processing thereof.

5. The filling unit according to any of the preceding claims, being integrally provided with a sensor element (17) configured to detect at least one operating parameter related to the filling operations, during the filling operations, the at least one operating parameter being associated to a pressure within the container (2) being filled.

6. The filling unit according to claim 5, wherein the sensor element (17) includes a pressure sensor (17a) arranged within the flow regulator device (14) so as to be fluidically coupled with the internal environment of the container (2) during the filling operations, thereby detecting the pressure within the same container (2).

7. The filling unit according to claim 5 or 6, wherein the sensor element (17) is further configured to detect a temperature within the container (2) being filled, during the filling operations.

8. The filling unit according to any of the preceding claims, wherein the operating data include pressure data associated to pressure values within the container (2), detected during the filling operations, and wherein the computing unit (32) is configured to process the operating data, in order to detect the occurrence of a failure in the filling of the container (2), whenever one of the two following conditions is verified: the pressure within the container (3) is found to exceed a first pressure threshold (Th_1); the differential pressure between the container (3) and a tank supplying the filling fluid is found to exceed a second pressure threshold (Th_2).

9. The filling unit according to any of the preceding claims, wherein the control module (30) includes a communication interface (38), configured to be coupled to a digital communication bus (42) for communication with a central control unit (40).

10. The filling unit according to any of the preceding claims, defining at least a filling conduit (15) for the filling fluid to flow within the container (2) during the filling operations; further including actuator elements operable to modify a section of flow of the filling fluid through the filling conduit (15), according to the filling operations to be performed.

11. A filling machine (1), including a number of filling units (10), according to any of the preceding claims.

12. The machine according to claim 11, including a central control unit (40), configured to acquire the operating data stored in the storage memory (34), during

the filling operations, and/or after the filling operations for further processing thereof.

13. The machine according to claim 12, wherein the operating data include pressure data associated to pressure values within the container (2), detected during the filling operations, and wherein the central control unit (40) is configured to generate pressure plots based on the detected pressure values for displaying to an operator.

14. The machine according to any of claims 11-13, including a conveyor element (4), which is mounted to rotate about a longitudinal axis (A), and carries the filling units (10) at its periphery, the filling units (10) being designed to be moved along a path (P) by the rotation of the conveyor element (4).

15. The machine according to any of claims 11-14, configured to fill one or more containers (2) with a carbonated liquid, the carbonated liquid being a food product.

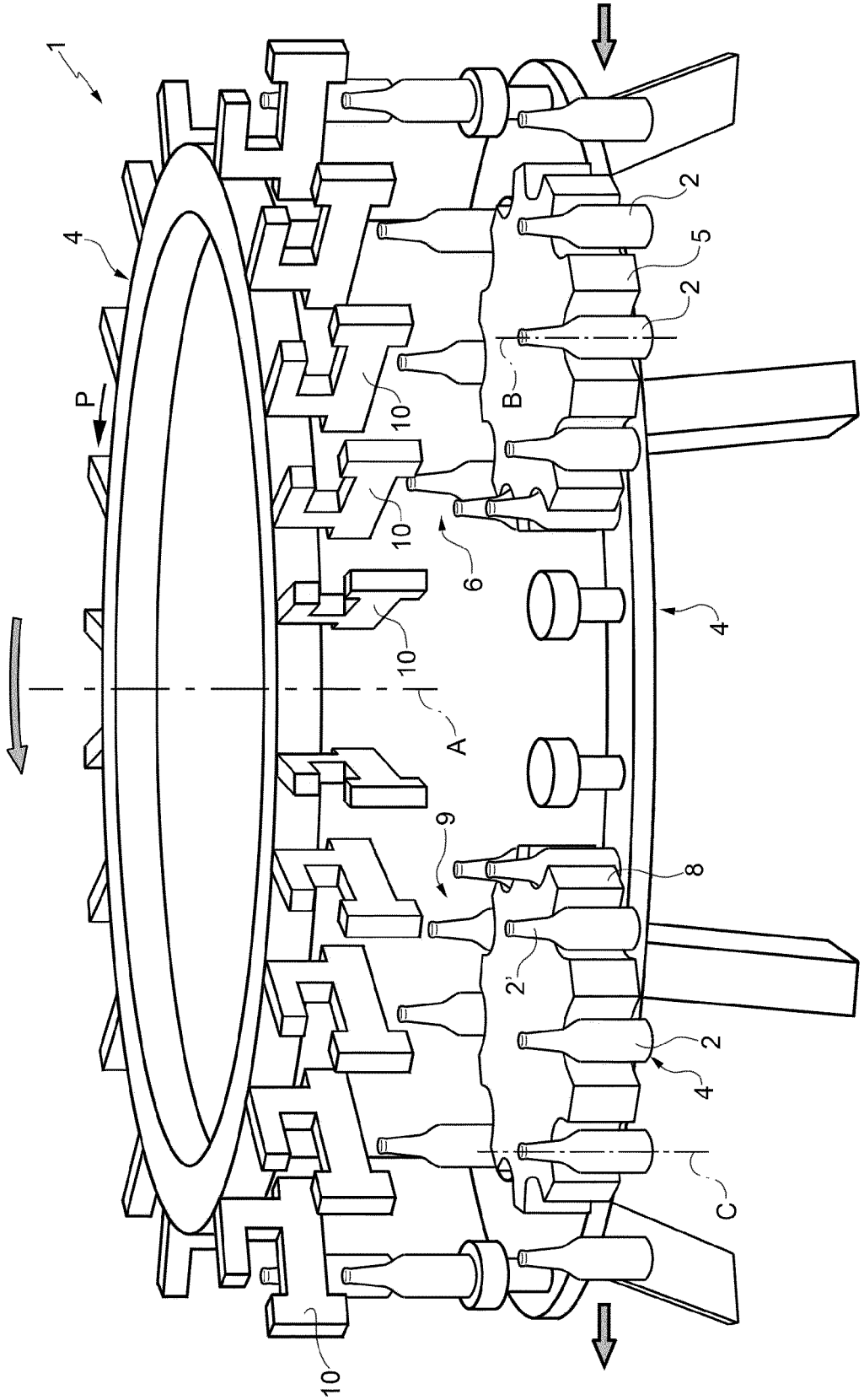


FIG. 1

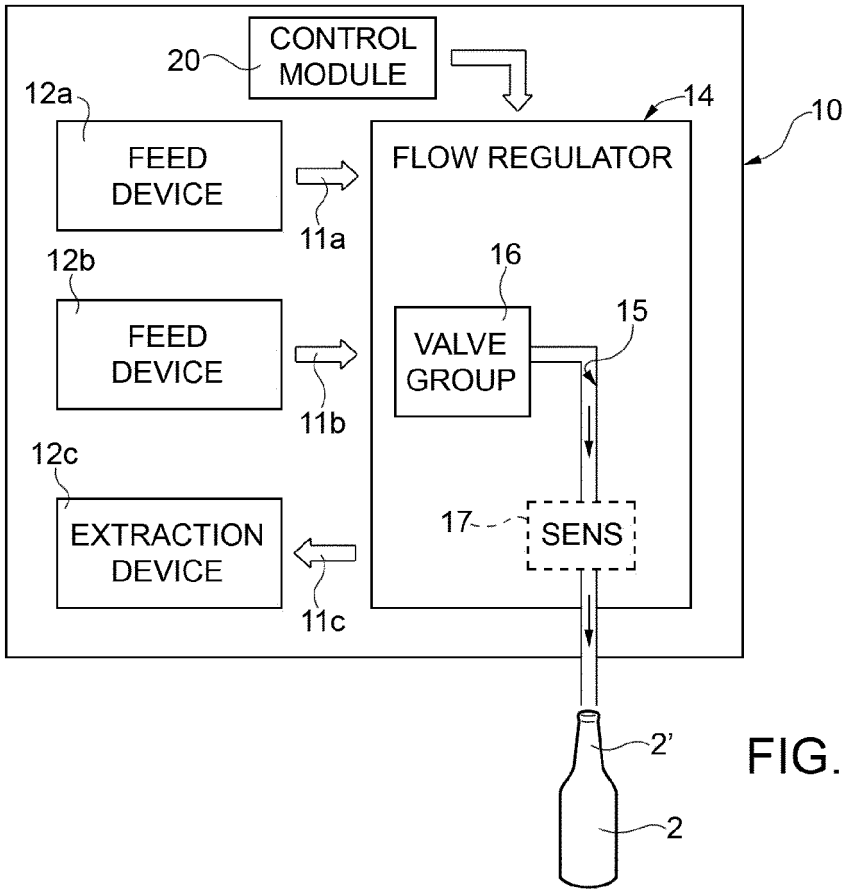
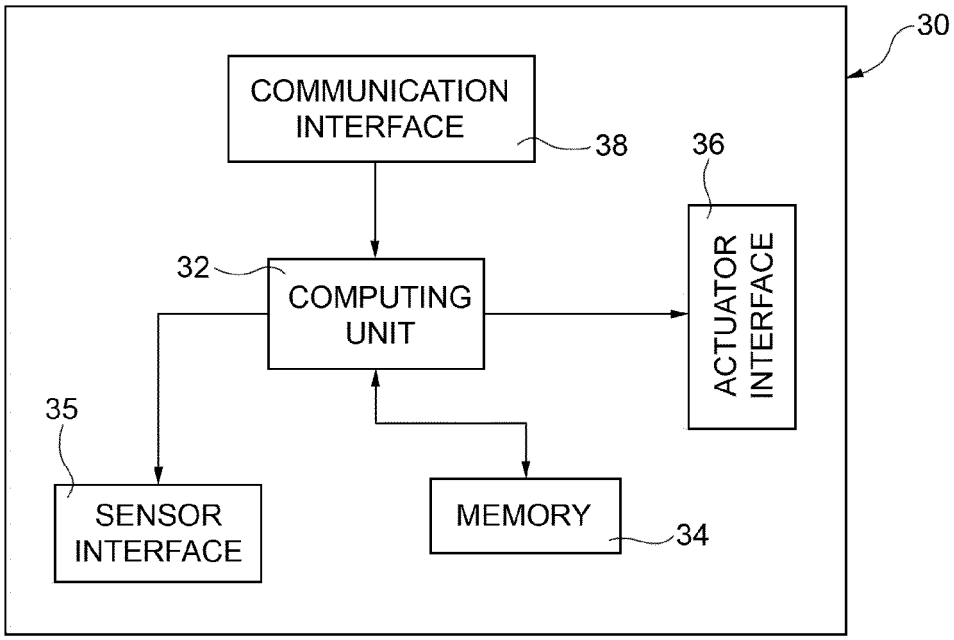

CONTROL MODULE
20
12a
FEED DEVICE
11a
14
10
FLOW REGULATOR
12b
FEED DEVICE
11b
16
VALVE GROUP
15
12c
EXTRACTION DEVICE
11c
17
SENS
2'
2

FIG. 2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36
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COMPUTING UNIT
ACTUATOR INTERFACE
35
SENSOR INTERFACE
MEMORY
34

FIG. 6

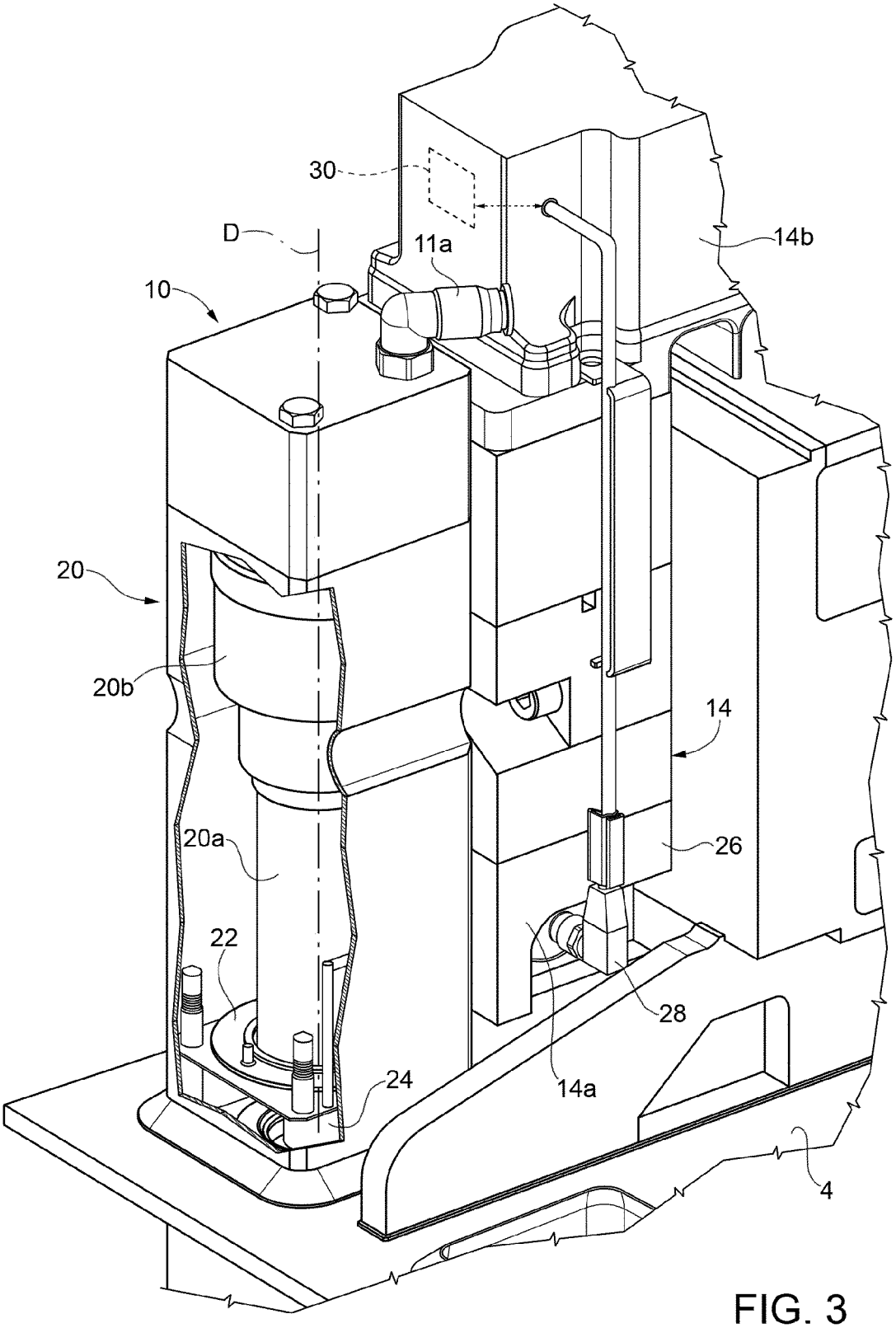
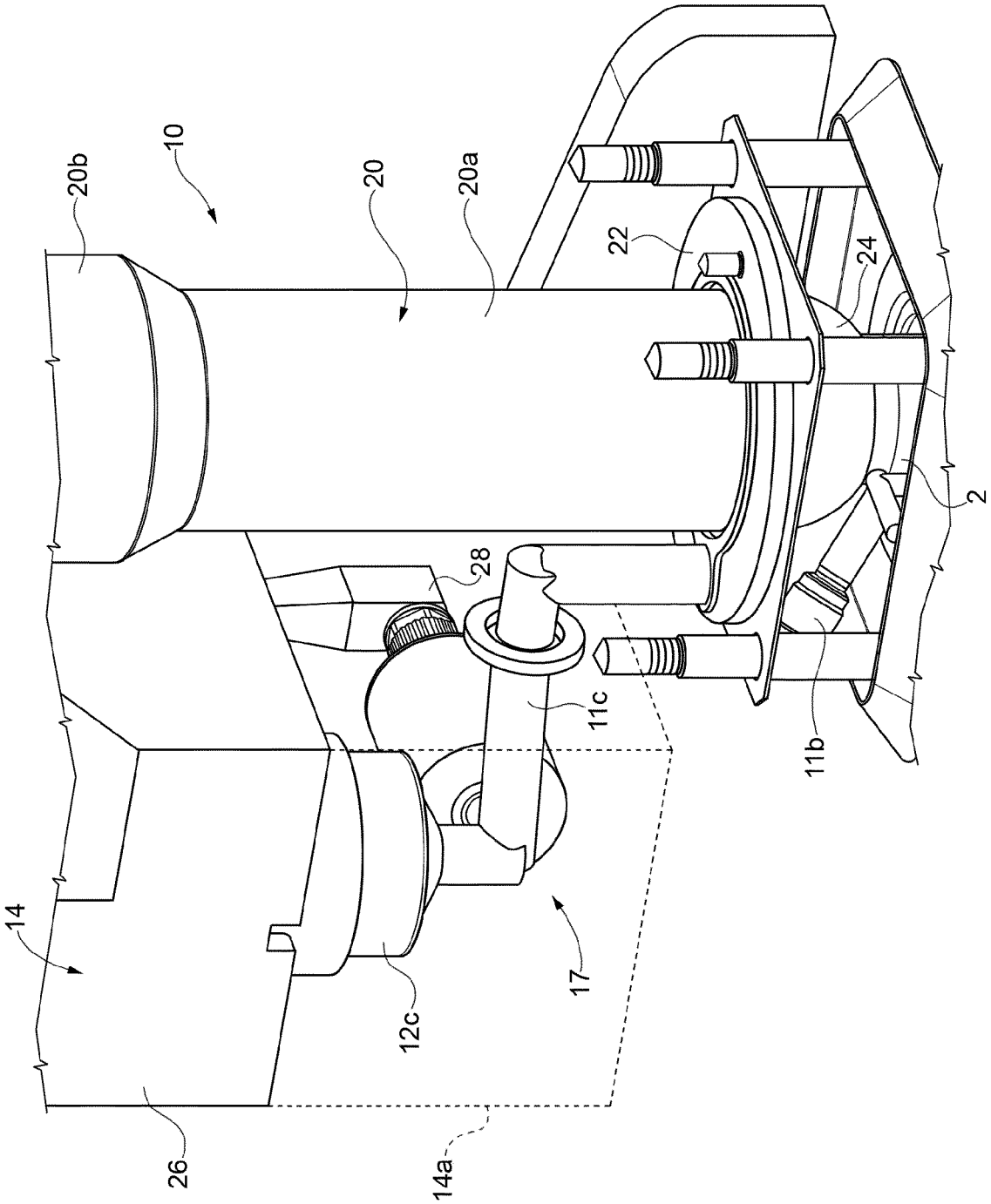


FIG. 3

FIG. 4



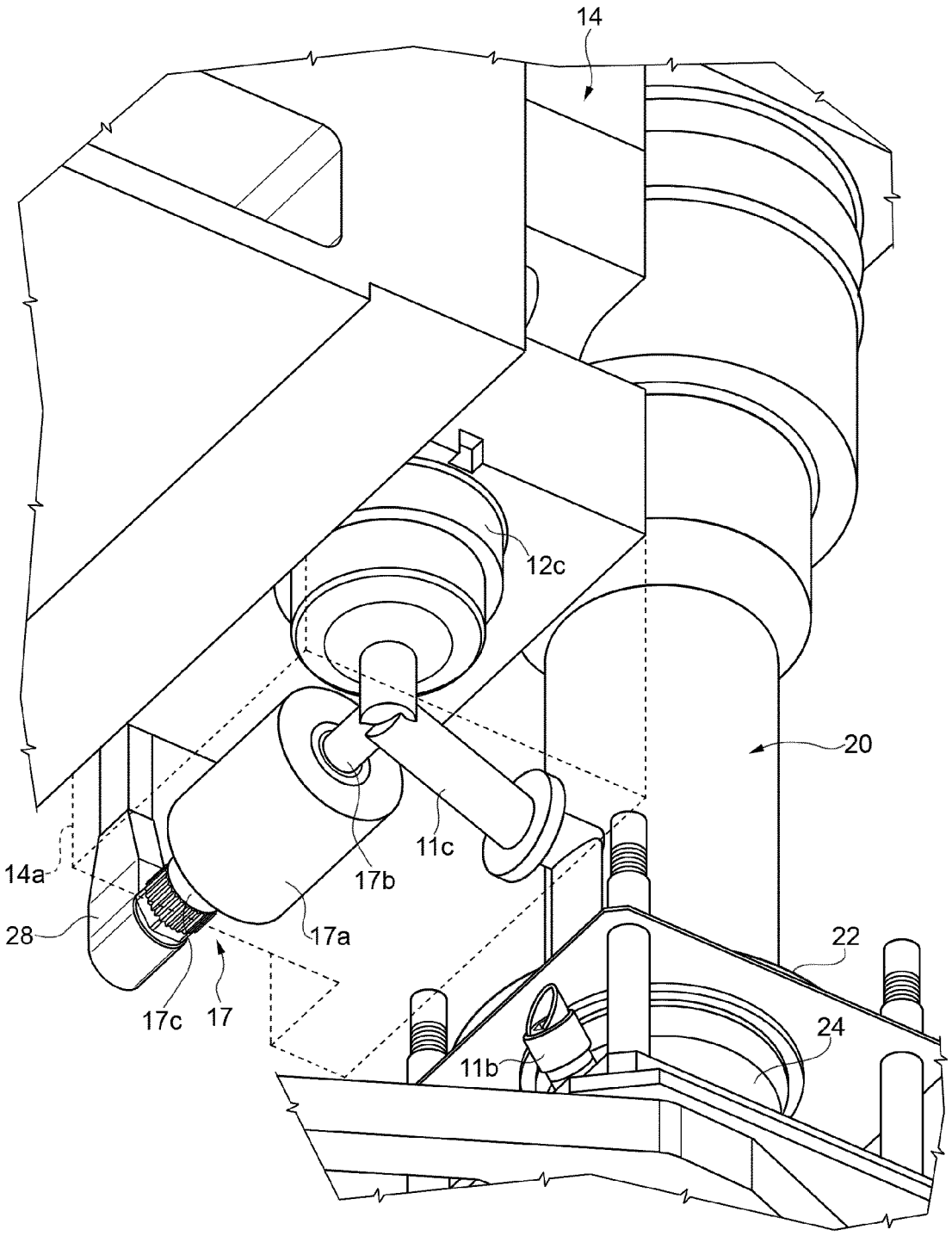
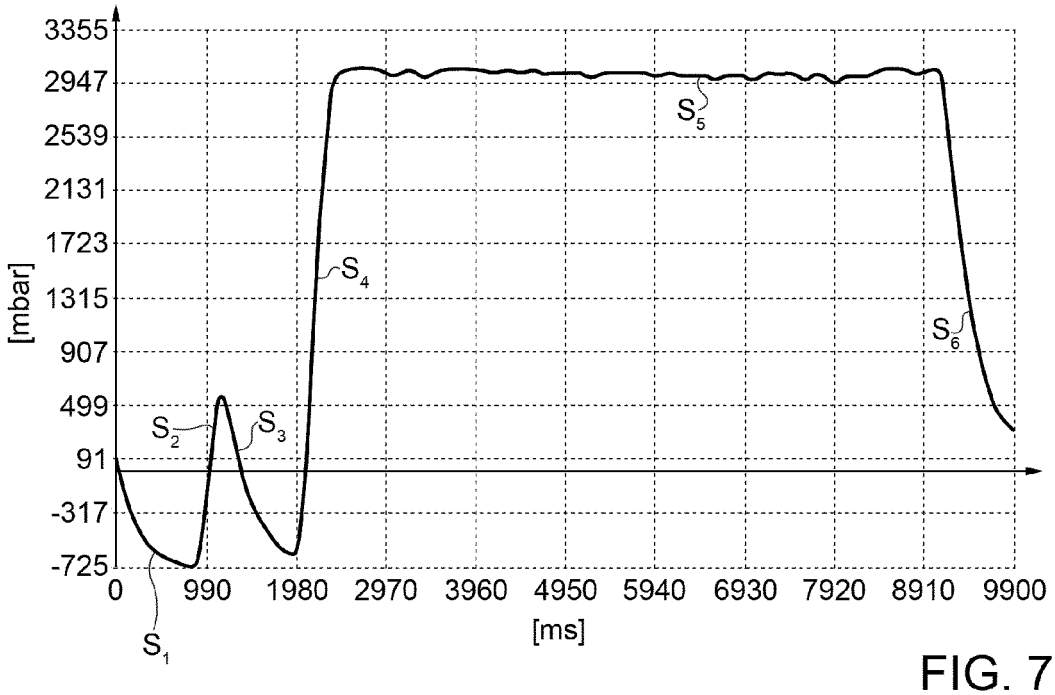


FIG. 5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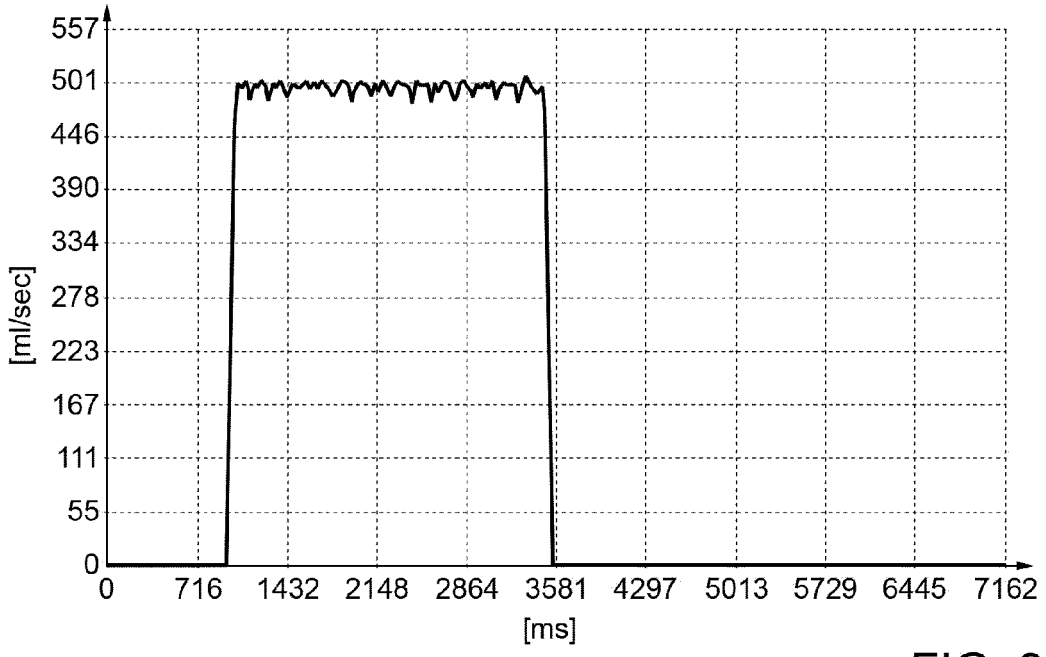
S4
S5
S6

FIG. 7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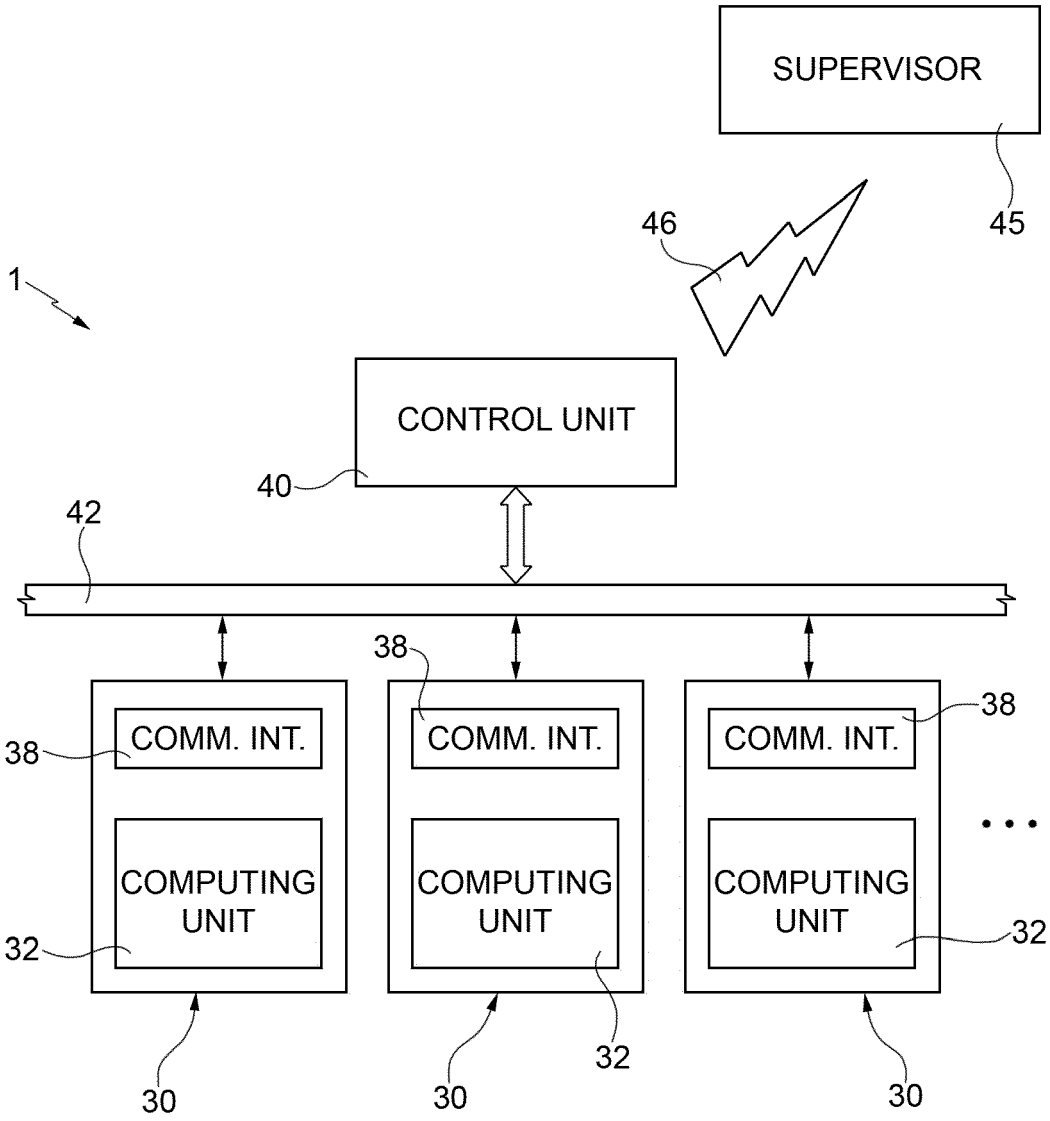
5729
6445
7162
[ms]

FIG. 9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46
1
CONTROL UNIT
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42
38
38
COMM. INT.
COMPUTING UNIT
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COMM. INT.
COMPUTING UNIT
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COMM. INT.
COMPUTING UNIT
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FIG. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 14 00 1723

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 Y	WO 02/068266 A1 (AZIONARIA COSTRUZIONI ACMA SPA [IT]; CRIVELLARO CLAUDIO [IT]; CAVALLAR) 6 September 2002 (2002-09-06) * the whole document *	1,2,4, 9-12,14 3,5-8, 13,15	INV. B67C3/00 B67C3/28
Y	GB 2 072 380 A (SEITZ WERKE GMBH) 30 September 1981 (1981-09-30) * abstract; figures 1-4 *	3	
Y	EP 1 127 835 A1 (KHS MASCH & ANLAGENBAU AG [DE]) 29 August 2001 (2001-08-29) * the whole document *	5-8,13, 15	
Y	WO 2006/013746 A1 (NIHON YAMAMURA GLASS CO LTD [JP]; NAKANO MINORU [JP]; TANAKA NAOHIRO [ ]) 9 February 2006 (2006-02-09) * abstract *	7	
A	WO 2011/091956 A1 (KHS GMBH [DE]; CLUESSERATH LUGWIG [DE]) 4 August 2011 (2011-08-04) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) B67C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	11 September 2014	Wartenhorst, Frank

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 00 1723

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11-09-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02068266 A1	06-09-2002	AT 325036 T	15-06-2006
		DE 60211123 T2	23-11-2006
		EP 1363835 A1	26-11-2003
		ES 2261634 T3	16-11-2006
		IT BO20010108 A1	28-08-2002
		US 2004123917 A1	01-07-2004
		WO 02068266 A1	06-09-2002
GB 2072380 A	30-09-1981	BE 887772 A1	01-07-1981
		BR 8101436 A	15-09-1981
		DD 158764 A5	02-02-1983
		DE 3009405 A1	17-09-1981
		DK 73881 A	13-09-1981
		FR 2478059 A1	18-09-1981
		GB 2072380 A	30-09-1981
		IT 1170782 B	03-06-1987
		JP H0462955 B2	08-10-1992
		JP S56142187 A	06-11-1981
		NL 8100561 A	01-10-1981
		US 4386635 A	07-06-1983
EP 1127835 A1	29-08-2001	BR 0100648 A	09-10-2001
		DE 10008426 A1	30-08-2001
		EP 1127835 A1	29-08-2001
		ES 2190937 T3	01-09-2003
		JP 2001261096 A	26-09-2001
		US 2001045242 A1	29-11-2001
WO 2006013746 A1	09-02-2006	JP 3872486 B2	24-01-2007
		JP 2006047103 A	16-02-2006
		WO 2006013746 A1	09-02-2006
WO 2011091956 A1	04-08-2011	DE 102010006028 A1	28-07-2011
		EP 2528850 A1	05-12-2012
		US 2012255644 A1	11-10-2012
		WO 2011091956 A1	04-08-2011

EPO FORM P0459

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