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(54) MOLD WITH HIGH CONTROLLABILITY

(57) A mold comprising:
at least one mold part (4, 5) comprising hydraulic cylinders (24e, 24f, 24g, 24h) which support at least one female mold portion (6a, 6b), which rests at least on one isostatic base (8b) and comprises at least one receptacle (7a, 7b, 7c);
characterized in that it comprises:
- means for detecting one or more operating parameters of the mold during the active step;
- one or more data collection controllers (15) adapted to collect the data detected by the detection means;
- a display device (29) connected to the controller (15), adapted to process and display the collected data.

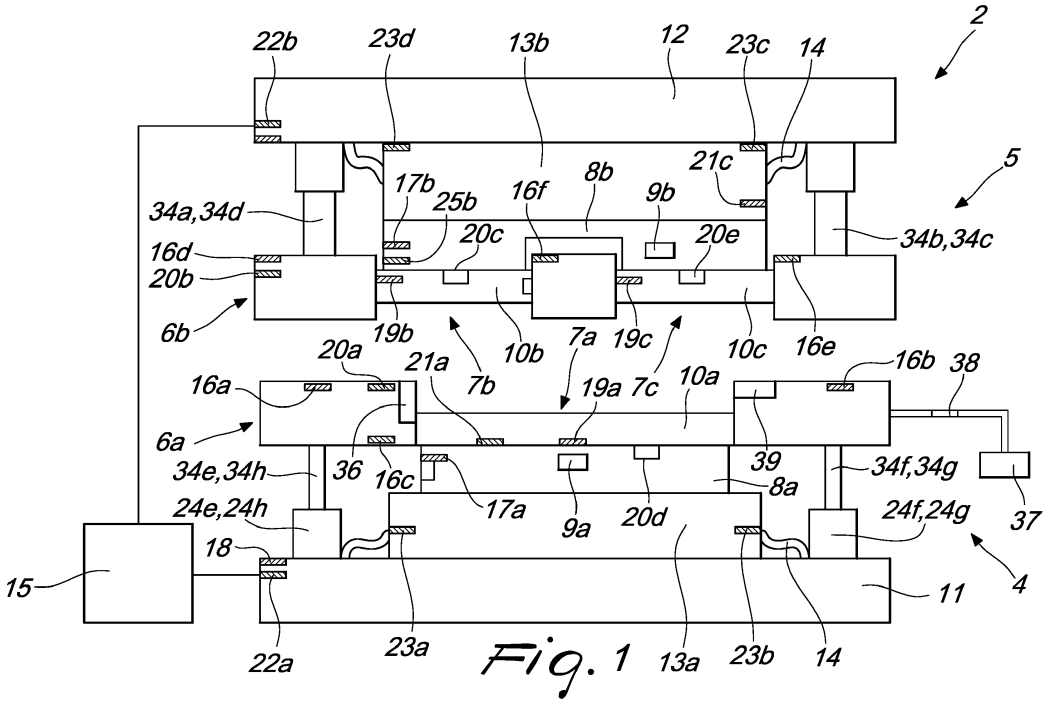

Fig. 1

EP 3 401 068 A2

Description

[0001] The present invention relates to a mold, particularly but not exclusively useful and practical in the field of the ceramics industry.

[0002] Various types of mold for the production and processing of various products are currently in use. In particular, in the ceramics industry, molds are widespread for the manufacture of blanks, tiles or the like starting from ductile materials, such as for example clay. The most recent and most widespread molds in use in the ceramics industry are constituted by two mold parts which are adapted to be pushed against each other by a press.

[0003] Each mold part commonly comprises a hydraulic plate on which a female mold portion is fixed by means of hydraulic cylinders. Each female mold portion normally comprises one or more receptacles. Plugs which act as male mold parts are fixed, generally by means of magnetic anchorings, inside the receptacles. The most recent and effective plugs currently in use are isostatic plugs, i.e., particular male mold parts provided with an oil-pressure controlled circuit in which pressurized oil is introduced which is capable of compensating for any regions that would be poorly pressed.

[0004] Normally the molds also comprise an electronic heating circuit adapted to ensure the correct working temperature. The work environment is commonly isolated from the outside by bellows.

[0005] Some of the molds currently in use are also provided with sensors for monitoring certain parameters. More precisely, in the molds of the background art it is possible to find: a general circuit current control system; a temperature sensor for spot temperature detection in a single point of a female mold portion; a sensor which detects the maximum pressure and the minimum pressure in the oil-pressure controlled circuit of the isostatic plugs.

[0006] However, these molds of the known type are not free from drawbacks, which include the fact that if a failure or malfunction of an electromagnet occurs, the control system detects a variation of the current of the general power supply circuit and sends an alarm to block the system without it being possible to detect which electromagnet is subject to malfunction or the extent of this malfunction. In this case one is therefore forced to halt production and send the entire mold to maintenance, even if the magnetic field is in any case sufficient to ensure the anchoring of the plug.

[0007] Another drawback of molds of the known type is constituted by the fact that in operation the molds do not heat up uniformly, and this entails thermal expansions, which are characterized by a greater deformation in the direction of the longer side of the mold, causing significant variations of the tolerances, with the consequent release of products with imperfections.

[0008] Another drawback of molds of the known type is constituted by the fact that they do not allow to detect leaks of oil from the individual isostatic plugs.

[0009] A further drawback of molds of the known type consists in that they are subject to the phenomenon known as "double pressing": the material, after having undergone the pressing process, is not expelled correctly from its receptacle, for example due to surface adhesion phenomena, and therefore the subsequent loading of material overloads that receptacle and, when the upper mold part is about to perform the pressing cycle, the abnormal presence of material entails structural misalignments of the system which have a negative effect on the subsequent cycles.

[0010] Another drawback of molds of the known type resides in that any phenomena of misalignment of the two mold parts, which have occurred for example due to "double pressing" phenomena, cannot be detected directly and in a timely manner but can only be deduced following the occurrence of a performance drop of the pressing or following failures.

[0011] Another drawback of molds of the known type is constituted by the fact that they are subject to malfunctions caused by the infiltration of elements, such as for example dust or clay, following damage to the insulation bellows of the mold.

[0012] A further drawback of molds of the known type resides in that they are subject to deformation and failure caused by the accumulation of materials, such as for example soil and dust, inside them; this accumulation is mostly caused by pressure drops in the pneumatic cleaning circuit.

[0013] Another drawback of molds of the known type is constituted by the fact that they are subject to variations of the pressure of the hydraulic cylinders which are potentially damaging for the durability of the cylinders themselves.

[0014] Another drawback of known molds resides in that any defects of the pressed material, such as for example shape defects, cracks or chipping, cannot be detected in the post-pressing step but only in the subsequent steps of the production process.

[0015] A further drawback of molds of the known type resides in that they do not provide data, such as for example the actual number of strikes performed by the plugs, sufficient to be able to plan effectively maintenance and part replacement.

[0016] The aim of the present invention is to overcome the limitations of the background art described above by devising a mold that allows the operator to monitor the operating parameters during the active step, supervising the correct execution of pressing and minimizing the risks of malfunction or failure.

[0017] Within this aim, an object of the present invention is to provide a mold that is capable of identifying and signaling the malfunction of an individual electromagnet as well as the extent of this malfunction.

[0018] Another object of the present invention is to devise a mold that is capable of detecting thermal differences within the individual mold parts.

[0019] Another object of the present invention is to provide a mold that allows to correct said thermal differences.

[0020] A further object of the present invention is to devise a mold that allows to detect leaks of oil from the isostatic plugs.

[0021] Another object of the present invention is to devise a mold that prevents the "double pressing" phenomena.

[0022] Another object of the present invention is to devise a mold that allows to identify in a timely manner phenomena of misalignment between the two mold parts.

[0023] A further object of the present invention is to devise a mold that avoids as much as possible the infiltration, within the work area between the two mold parts, of elements such as for example dust or clay.

[0024] Another object of the present invention is to devise a mold that prevents the accumulation of materials, such as for example soil or dust, within the mold.

[0025] Another object of the present invention is to devise a mold that allows to detect variations of the pressure of the hydraulic cylinders.

[0026] A further object of the present invention is to devise a mold that allows to identify any defects of the pressed material, such as for example shape defects, cracks or chipping, already in the post-pressing step.

[0027] Another object of the present invention is to devise a mold that provides data, such as for example the actual number of strikes performed by the plugs, that are sufficient to be able to plan effectively maintenance and part replacement.

[0028] A still further object of the present invention is to devise a system for collecting, processing, transmitting and displaying the data produced by the mold which is useful to monitor the correct execution of pressing, to minimize the risks of failure and to plan maintenance steps strategically and proactively.

[0029] This aim, and these and other objects which will become better apparent hereinafter, are achieved by a mold comprising:

- at least one mold part comprising hydraulic cylinders which support at least one female mold portion, which rests at least on one isostatic base and comprises at least one receptacle;

characterized in that it comprises:

- means for detecting one or more operating parameters of the mold during an active step;
- one or more data collection controllers adapted to collect the data detected by said detection means;
- a display device connected to said controller, adapted to process and display the collected data.

[0030] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of the mold and of the corresponding monitoring system according to the invention, illustrated by way of nonlimiting example with the aid of the accompanying drawings, wherein:

Figure 1 is a schematic overall view of the mold;
Figure 2 is a schematic perspective view of a female mold portion and of the heating system;
Figures 3 and 4 are schematic views of some possible configurations of the electromagnetic signature means applied to the plugs;
Figure 5 is a schematic view of a possible configuration of the monitoring system.

[0031] With reference to the cited figures, the mold according to the invention, designated generally by the reference numeral 2, comprises at least one mold part and preferably a lower mold part 4 and an upper mold part 5.

[0032] The lower mold part 4 comprises a female mold portion 6a, which rests on a base 8a and is provided with at least one receptacle 7a. In the same way, the upper mold part 5 comprises a female mold portion 6b, which rests on an isostatic base 8b and is provided with one or more receptacles 7b and 7c.

[0033] Isostatic plugs 10a and non-isostatic plugs 10b, 10c, which are replaceable, are fixed inside each receptacle 7a, 7b and 7c by means of electromagnets 9a, 9b contained in the base 8a and in the isostatic base 8b.

[0034] The mold according to the invention comprises an upper hydraulic plate 12 and a lower hydraulic plate 11.

[0035] The mold according to the invention comprises support means 34a, 34b, 34c, 34d, which are fixed to the upper hydraulic plate 12 and are adapted to support the upper female mold portion 6b. The mold according to the invention comprises other cylinders 24e, 24f, 24g and 24h to support the lower female mold portion 6a by means of the support means 34e, 34f, 34g, 34h.

[0036] The mold according to the invention comprises two expulsion blocks 13a and 13b, which are arranged one in the lower mold part 4, between the base 8a and the hydraulic plate 11, and the other one in the upper mold part 5, between the isostatic base 8b and the hydraulic plate 12.

[0037] The mold according to the invention comprises an insulation bellows 14 which is adapted to protect the workspace.

[0038] Advantageously, the mold according to the invention comprises at least one pneumatic cleaning circuit 37.

[0039] Advantageously, the mold according to the invention comprises at least three temperature detection means 16a, 16b, 16c, 16d, 16e, 16f, which are arranged in at least three different points of each female mold portion 6a, 6b. In another possible embodiment, the temperature sensors 16a, 16b, 16c, 16d, 16e, 16f are replaced with one or more thermal cameras.

[0040] Advantageously, the mold according to the in-

vention comprises two or more proximity detection means 17a and 17b adapted to detect the alignment of the plugs 10a, 10b, 10c.

[0041] Advantageously, the mold according to the invention comprises at least one strike detection means 18, which is arranged on the lower hydraulic plate 11 and is adapted to count the number of strikes performed by the mold, such as for example a cycle counting sensor.

[0042] Advantageously, the mold according to the invention comprises at least one electromagnetic signature means 19a, 19b, 19c for each isostatic plug 10a and for each non-isostatic plug 10b, 10c. The mold according to the invention comprises furthermore electromagnetic receivers 20c, 20d, 20e which are arranged on the lower base 8a and on the upper isostatic base 8b and are adapted to detect the presence of the isostatic plugs 10a, and of the non-isostatic plugs 10b, 10c by means of the electromagnetic signal that arrives from the signature means 19a, 19b, 19c.

[0043] The mold according to the invention comprises two electromagnetic signature means, respectively for the lower female mold portion 6a and for the upper female mold portion 6b, and comprises furthermore two electromagnetic receivers 20a and 20b which are arranged respectively in the upper female mold portion 6a and in the lower female mold portion 6b and are adapted to detect the identifier of the female mold portion by means of the electromagnetic signal that originates from the electromagnetic signature means.

[0044] In one possible embodiment, the electromagnetic signature means 19a, 19b, 19c and the electromagnetic receivers 20c, 20d, 20e are capable of communicating via radiofrequency by means of RFID or NFC technology.

[0045] Advantageously, the mold according to the invention comprises one or more pressure detection means 21a, which are adapted to measure the pressure of the oil inside each isostatic plug 10a, and at least one pressure detection means 21c, which is adapted to measure the pressure of the oil within the isostatic base 8b.

[0046] Advantageously, the mold according to the invention comprises pressure detection means 22a and 22b which are arranged in the lower hydraulic plate 11 and optionally in the upper hydraulic plate 12 and are adapted to measure the pressure in the hydraulic cylinders 24e, 24f, 24g, 24h.

[0047] Advantageously, the mold according to the invention comprises one or more pressure detection means 23a, 23b, 23c and 23d which are adapted to measure the pressure within the space isolated by the insulation bellows 14.

[0048] In another possible embodiment, the pressure detection means 23a, 23b, 23c, 23d are replaced by a dust detection means which is adapted to detect the presence of dust within the space isolated by the insulation bellows 14.

[0049] Advantageously, the mold according to the invention comprises one or more magnetic field detection means 25b which are adapted to measure the magnetic field proximate to at least one base 8b.

[0050] In another possible embodiment, the magnetic field detection means 25b are replaced with current detection means adapted to measure the magnetization current of the electromagnets 9a, 9b.

[0051] In one possible embodiment, the mold according to the invention also comprises one or more multisensor cards which are adapted to group or collect data from multiple detection means.

[0052] The mold according to the invention comprises an electric heating circuit 26, constituted by electric propagation means 27 and electric heating means 28 arranged in various points within the female mold portions 6a, 6b.

[0053] In one possible embodiment, the electric heating circuit 26 is designed so that it can be adjusted and therefore it can heat different portions of the mold 2 in a different manner; said adjustable heating circuit 26 and the temperature detection means 16a, 16b, 16c, 16d, 16e, 16f are advantageously connected to an electronic control device 35 which is adapted to adjust the operation of the adjustable heating circuit 26 as a function of the temperatures measured by the temperature detection means 16a, 16b, 16c, 16d, 16e, 16f.

[0054] In one possible embodiment, the mold according to the invention also comprises a system 36 for detecting the quantity of material that is present within the receptacles 7a, 7b, 7c which is adapted to block the pressing process if excessive material is present; this system 36 for detecting the quantity of material can be constituted for example by a load cell.

[0055] In one possible embodiment, the mold according to the invention also comprises an optical detection means 39 which is adapted to detect the geometric and surface nonconformities of the pressed material, such as for example defects in shape, cracks or chipping.

[0056] In one possible embodiment, the mold according to the invention also comprises a means 38 for detecting air pressure, which is adapted to detect the pressure of the air in the pneumatic cleaning circuit 37.

[0057] In one possible embodiment, the mold according to the invention also comprises a system for venting by means of a pressurized filtered air jet (not shown), which is adapted to clean from dust the environment inside the insulation bellows 14.

[0058] The mold according to the invention comprises at least one data collection controller 15 which is adapted to collect the data that arrive from the temperature detection means 16a, 16b, 16c, 16d, 16e, 16f, from the air pressure detection means 38, from the proximity detection means 17a and 17b, from the strike detection means 18, from the electromagnetic receivers 20a, 20b, 20c, 20d, 20e, from the pressure detection means 21a, 21c, 22a, 22b, 23a, 23b, 23c and 23d, from the magnetic field detection means 25b and from the optical detection means 39.

[0059] The mold according to the invention also comprises at least one device 29, connected to said controller 15, which is adapted to process and display the data collected therein.

[0060] In particular with reference to Figure 5, the monitoring system 40 adapted to process and transmit the data arriving from the mold according to the invention comprises a data storage means 30 adapted to store data useful for the operation of a program and a private data storage means 31 adapted to store securely the personal data of the users.

[0061] The monitoring system 40 adapted to process and transmit the data that arrives from the mold according to the invention comprises a server 32 which is adapted to exchange, by virtue of transmission means, data with the data storage means 30, with the private data storage means 31, with the data collection controller 15 and with information technology devices such as computers, tablets and smartphones, and to integrate these data.

[0062] The monitoring system adapted to process and transmit the data that arrive from the mold according to the invention comprises a program 33 which is adapted to be run on information technology devices, such as for example computers, tablets, smartphones, and is adapted to organize, process and display the data that arrive from the server 32.

[0063] The operation of the mold and of the corresponding monitoring system according to the invention is briefly described hereinafter.

[0064] During the active step, the detection means detect one or more operating parameters and transmit the collected data to the data collection controller 15. These data are then sent to the display device 29, which processes them and displays them in such a form as to allow an operator to monitor the correct execution of pressing and to minimize the risks of malfunction or failure.

[0065] In particular, advantageously, the temperature detection means 16a, 16b, 16c, 16d, 16e, 16f measure the temperature in various points of the receptacles 7a, 7b, 7c and transmit these measurements to the data collection controller 15 and to the electronic control device 35. Advantageously, the electronic control device 35 adjusts the operation of the adjustable heating circuit 26 as a function of the temperatures measured by the temperature detection means 16a, 16b, 16c, 16d, 16e, 16f in order to compensate for the thermal differences among the various points of the receptacles 7a, 7b, 7c and ensure a temperature that is as much as possible uniform within the mold parts 4 and 5.

[0066] In particular, advantageously, the magnetic field detection means 25b measure the magnetic field proximate to least one base 8b and send the results of these measurements to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any drops in the magnetic field proximate to a given base 8b, as well as the extent of this magnetic field drop, and is therefore able to decide whether and which base requires maintenance.

[0067] In particular, advantageously, the pressure detection means 21a, 21c measure the pressure of the oil respectively within each single individual isostatic plug 10a and within each isostatic base 8b, send the results of these measurements to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any drops in pressure within an isostatic plug 10a and within each isostatic base 8b and to intervene in a timely manner.

[0068] In particular, advantageously, the proximity detection means 17a, 17b measure the alignment of the plugs 10a, 10b, 10c and send the results of these measurements to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any misalignments of the two mold parts 4 and 5 and to intervene in a timely manner.

[0069] In particular, advantageously, the system 36 for detecting the quantity of material measures the quantity of material that is present in the receptacles 7a, 7b and 7c and, in the case of the presence of excessive material, blocks the pressing process, thus avoiding the occurrence of the "double pressing" phenomenon.

[0070] In particular, advantageously, the pressure detection means 22a, 22b measure the pressure of the oil inside the hydraulic cylinders 24e, 24f, 24g, 24h and send the results of these measurements to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any pressure variations inside the hydraulic cylinders 24e, 24f, 24g, 24h and to intervene in a timely manner.

[0071] In particular, advantageously, the pressure detection means 23a 23b, 23c, 23d measure the minimum pressure that is present within the insulation bellows 14 and send the results of these measurements to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any increases in the minimum pressure that is present inside the insulation bellows 14, which indicate damage thereof, and to intervene in a timely manner.

[0072] In particular, advantageously, in one embodiment the pressure detection means 23a, 23b, 23c, 23d are replaced by a dust detection means, which detects the presence of dust within the insulation bellows 14 and sends the results of this detection to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any presence of dust within the insulation bellows 14, which indicates damage thereof, and to intervene in a timely manner.

[0073] In particular, advantageously, the air pressure detection means 38 measure the pressure of the air inside the pneumatic cleaning circuit 37 and send the results of these measurements to the data collection con-

troller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any pressure drops within the pneumatic cleaning circuit 37 and to intervene in a timely manner.

[0074] In particular, advantageously, the strike detection means 18 counts the number of strikes performed by the mold 2 and sends this count to the data collection controller 15, which in turn sends it to the display device 29. In this manner, the user of the mold is enabled to know in real time the number of strikes performed by the mold 2 and therefore to plan maintenance interventions in a timely manner.

[0075] In particular, advantageously, the electromagnetic signature means 19a, 19b, 19c arranged on each isostatic plug 10a and on each non-isostatic plug 10b, 10c signal the presence of the isostatic plugs 10a and of the non-isostatic plugs 10b, 10c to the electromagnetic receivers located on the bases 8a and 8b, which send this information related to the presence of the isostatic plugs 10a and of the non-isostatic plugs 10b, 10c to the data collection controller 15.

[0076] In turn, the data collection controller 15 sends to the display device 29 the information related to the presence of the isostatic plugs 10a and of the non-isostatic plugs 10b, 10c within the mold 2. In this manner, the user of the mold is enabled to know in real time which isostatic plugs 10a and non-isostatic plugs 10b, 10c are present inside the mold and the actual number of strikes performed by them.

[0077] In particular, advantageously, the optical detection means 39 records the geometric and surface characteristics of the pressed material and sends the results of this recording to the data collection controller 15, which in turn sends them to the display device 29. In this manner, the user of the mold is enabled to identify any geometric and surface nonconformities of the pressed material, such as for example defects in shape, cracks and chipping, and to intervene in a timely manner.

[0078] Advantageously, the system for venting by means of a pressurized filtered air jet releases into the environment inside the insulation bellows 14 a jet of pressurized filtered air once every certain number of cycles, cleaning this environment of the dust that has penetrated.

[0079] All the data gathered by the data collection controller 15 can also be sent to the monitoring system 40. The server 32 gathers the data that arrive from the data collection controller 15 and integrates them with the data present in the data storage device of the application 30 and in the private data storage device 31. The data are then exchanged, by virtue of transmission means, such as for example an Internet connection, between the server and one or more mobile information technology devices, such as for example computers, tablets or smartphones, on which the program 33 has been installed.

[0080] The users of the monitoring system 40 can thus monitor, by means of a mobile information technology device, the operating parameters of the mold according to the invention even from a remote location. Advantageously, these parameters can also be used by the company that supplies the mold, which will be able to provide the user of the mold according to the invention with indications that are useful for planning maintenance and part replacements.

[0081] In practice it has been found that the invention fully achieves the intended aim and objects. In particular, it has been shown that the mold thus conceived allows to overcome the qualitative limitations of the background art, since it allows the operator to monitor the operating parameters during the operation step, supervising the correct execution of pressing and minimizing the risks of malfunction or failure.

[0082] An advantage of the mold according to the invention resides in that it is capable of identifying and signaling the malfunction of an individual electromagnet as well as the extent of this malfunction. In this manner, the operator is able to decide whether and which electromagnet requires maintenance.

[0083] Another advantage of the mold according to the invention resides in that it is capable of detecting the thermal differences that are present inside the mold, of compensating for these thermal differences and of ensuring a working temperature that is as uniform as possible. In this manner, the mold according to the invention is capable of preventing significant variations of the tolerances and the consequent release of products with imperfections.

[0084] Another advantage of the mold according to the invention resides in that it allows to detect leaks of oil from a single isostatic plug, allowing the operator to intervene in a timely manner.

[0085] Another advantage of the mold according to the invention resides in that it is capable of preventing the "double pressing" phenomenon.

[0086] A further advantage of the mold according to the invention resides in that it allows to identify in a timely manner phenomena of misalignment between the two mold parts.

[0087] Another advantage of the mold according to the invention resides in that it allows to identify in a timely manner any damage to the insulation bellows and thus prevent the infiltration, within the work area, of elements such as for example dust or clay. Furthermore, the mold according to the invention is capable, by virtue of the system for venting by means of a pressurized filtered air jet, of contrasting the presence of these elements.

[0088] Another advantage of the mold according to the invention resides in that it is capable of preventing the accumulation of materials, such as for example soil and dust, within the mold, allowing to identify in real time any pressure drops within the pneumatic cleaning circuit, thus allowing the operator to intervene in a timely manner.

[0089] Another advantage of the mold according to the invention resides in that it allows to detect in a timely manner variations in the pressure of the hydraulic cylinders.

[0090] A further advantage of the mold according to

the invention resides in that it allows to identify any defects of the pressed material, such as shape defects, cracks or chipping, already in the post-pressing step.

[0091] A still further advantage of the mold according to the invention resides in that it provides data, such as for example the actual number of strikes performed by the plugs, sufficient to be able to plan effectively maintenance and parts replacement.

[0092] Furthermore, the monitoring system adapted to process and transmit the data that arrive from the mold according to the invention allows one or more users to use these data and operating parameters even from a remote location. These parameters can be used, for example, also by the company that supplies the mold, which will be able to provide the user of the mold according to the invention with indications that are useful for planning maintenance and parts replacement.

[0093] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Furthermore all the details may be replaced with other technically equivalent elements.

[0094] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to the requirements and the state of the art.

[0095] The disclosures in Italian Patent Application No. 102017000050342 from which this application claims priority are incorporated herein by reference.

[0096] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A mold comprising:

at least one mold part (4, 5) comprising hydraulic cylinders (24e, 24f, 24g, 24h) which support at least one female mold portion (6a, 6b), which rests at least on one isostatic base (8b) and comprises at least one receptacle (7a, 7b, 7c);
characterized in that it comprises:

- means for detecting one or more operating parameters of the mold during an active step;
- one or more data collection controllers (15) adapted to collect the data detected by said detection means;
- a display device (29) connected to said controller (15), adapted to process and display the collected data.

2. The mold according to claim 1, **characterized in that** it comprises at least one adjustable electric heating circuit (26) and an electronic control device (35) that is adapted to adjust the operation of said adjustable electric heating circuit (26), said detection means comprising at least three temperature detection means (16a, 16b, 16c, 16d, 16e, 16f) which are arranged in at least three different points of said at least one female mold portion (6a, 6b) and are adapted to measure the temperature in at least three different points of said at least one mold part (4, 5);
said electronic control device (35) being adapted to adjust the operation of said adjustable electric heating circuit (26) as a function of the temperatures measured by said temperature detection means (16a, 16b, 16c, 16d, 16e, 16f).

3. The mold according to one or more of the preceding claims, **characterized in that** it further comprises:

- at least one isostatic plug (10a) and non-isostatic plugs (10b, 10c) adapted to imprint their surface geometry on the pressed material;
- at least one electromagnet (9a, 9b) adapted to fix said at least one isostatic plug (10a) and said non-isostatic plugs (10b, 10c);

said detection means comprising at least one from:

- at least one pressure detection means (21a) adapted to measure the pressure of the oil inside said at least one isostatic plug (10a);
- at least one pressure detection means (21c) adapted to measure the pressure of the oil inside said isostatic base (8b);
- at least one magnetic field detection device (25b) adapted to detect the magnetic field generated by said at least one electromagnet (9a, 9b).

4. The mold according to one or more of the preceding claims, **characterized in that** said detection means comprise at least two proximity detection means (17a, 17b) which are adapted to monitor the alignment of the plugs.

5. The mold according to one or more of the preceding claims, **characterized in that** said detection means comprise at least one material quantity detection system (36), which is adapted to measure the quantity of material that is present within said at least one receptacle (7a, 7b, 7c).

6. The mold according to one or more of the preceding claims, **characterized in that** it further comprises at least one insulation bellows (14) adapted to isolate the work environment;
said detection means comprising at least one pres-

sure detection means (23a, 23b, 23c, 23d) which is adapted to detect the minimum pressure that is present within said insulation bellows (14).

7. The mold according to one or more of the preceding claims, **characterized in that** it further comprises:

- at least one pneumatic cleaning circuit (37);

said detection means comprising:

- at least one air pressure detection means (38) adapted to measure the pressure of the air in said pneumatic cleaning circuit (37).

8. The mold according to one or more of the preceding claims, **characterized in that** said detection means comprise at least one pressure detection means (22a, 22b) adapted to measure the pressure of the oil in said hydraulic cylinders (24e, 24f, 24g, 24h).

9. The mold according to one or more of the preceding claims, **characterized in that** said detection means comprise at least one strike detection means (18) that is adapted to count the number of strikes performed by the mold (2).

10. The mold according to claim 3, **characterized in that** said detection means comprise:

- at least one electromagnetic signature means (19a, 19b, 19c), which is applied on said at least one isostatic plug (10a) and on said non-isostatic plugs (10b, 10c);
- at least one electromagnetic receiver (20c, 20d, 20e) adapted to detect the presence of said at least one isostatic plug (10a) and of said non-isostatic plugs (10b, 10c) by means of the electromagnetic signal that originates from said at least one signature means (19a, 19b, 19c).

11. The mold according to one or more of the preceding claims, **characterized in that** said detection means comprise at least one optical detection means (39) adapted to detect the geometric and surface non-conformities of the pressed material.

12. A monitoring system (40) adapted to process and transmit data that arrive from a mold according to one or more of the preceding claims, **characterized in that** it comprises:

- at least one data storage means (30), adapted to store data useful for the operation of a program;
- at least one means (31) for storing private data, adapted to store securely the personal data of users;
- a server (32) adapted to exchange, by virtue of transmission means, data with said data storage means (30), with said private data storage means (31), with said data collection controller (15), and with information technology devices, and adapted to integrate said data;
- a program (33) capable of being run on information technology devices, adapted to organize, process and display the data that arrive from said server (32).

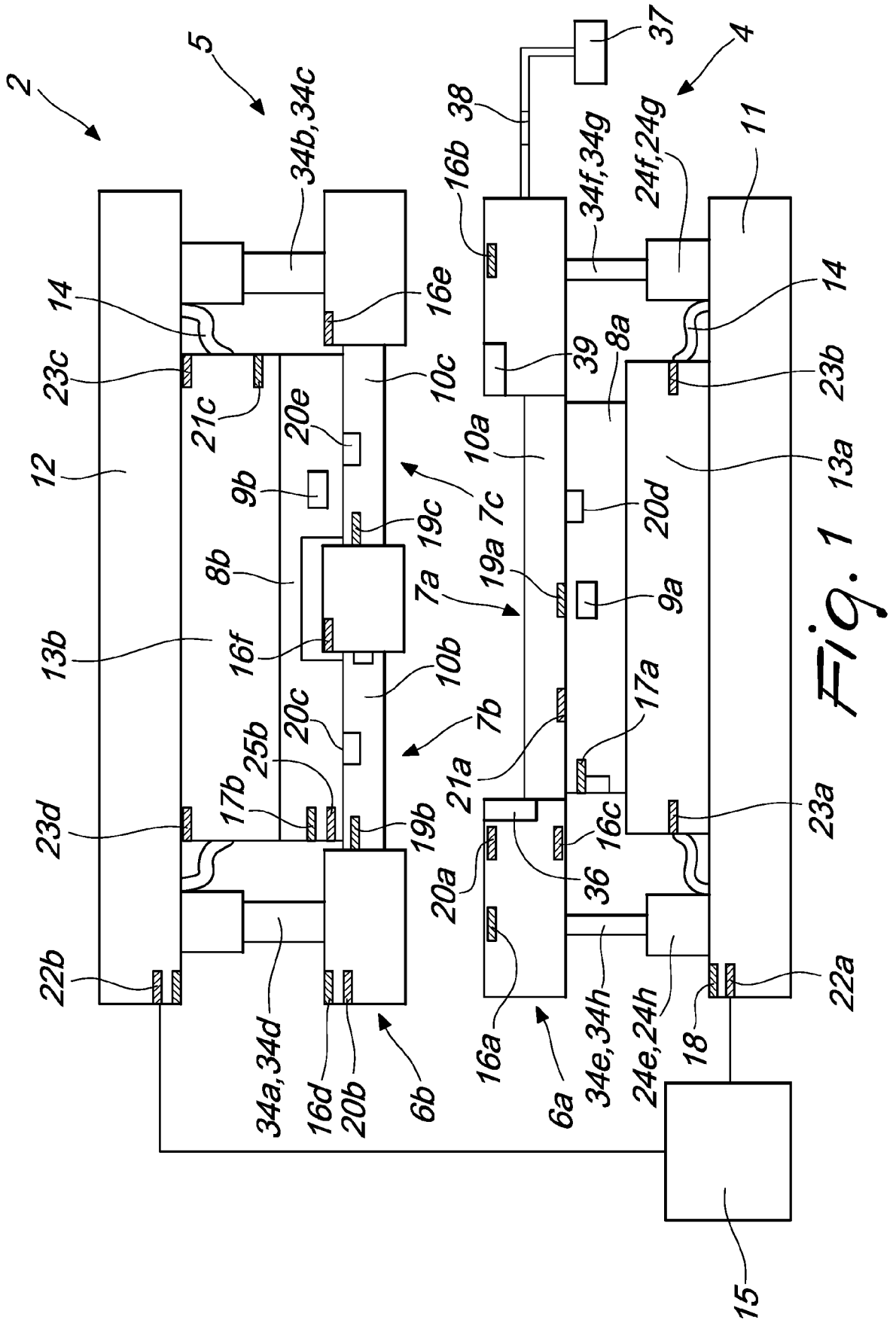
2
5
4
34b,34c
37
38
16b
34f,34g
24f,24g
11
14
16e
39
8a
23c
10c
23b
21c
20e
10a
13a
12
9b
19c
7c
20d
8b
7a
19a
9a
13b
16f
10b
17a
20c
7b
25b
21a
17b
23a
23d
19b
16c
20a
36
22b
16a
34e,34h
24e,24h
18
22a
34a,34d
16d
20b
6b
6a
15

Fig. 1

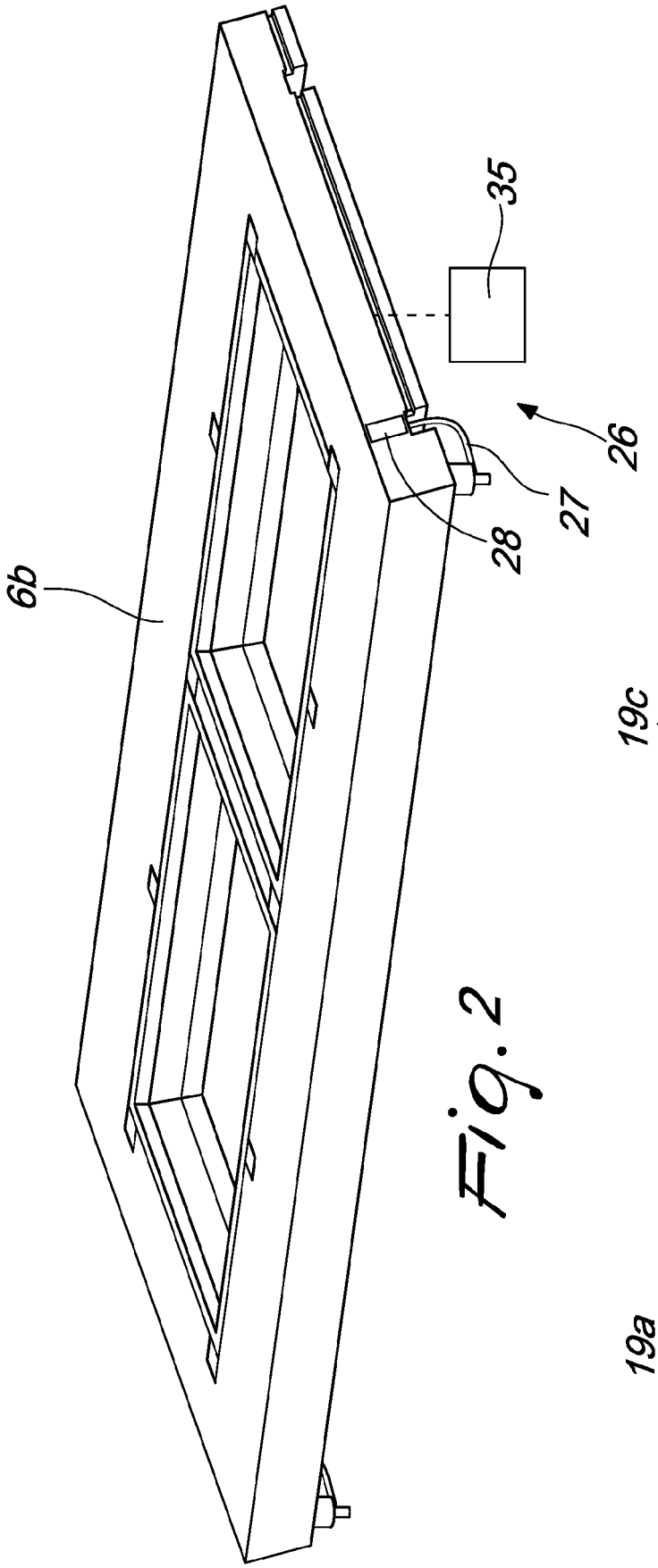

Fig. 2

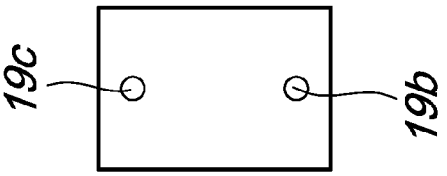

Fig. 4

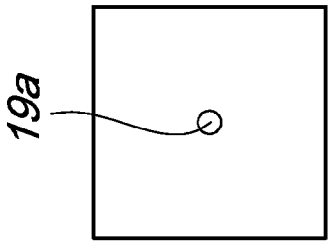

Fig. 3

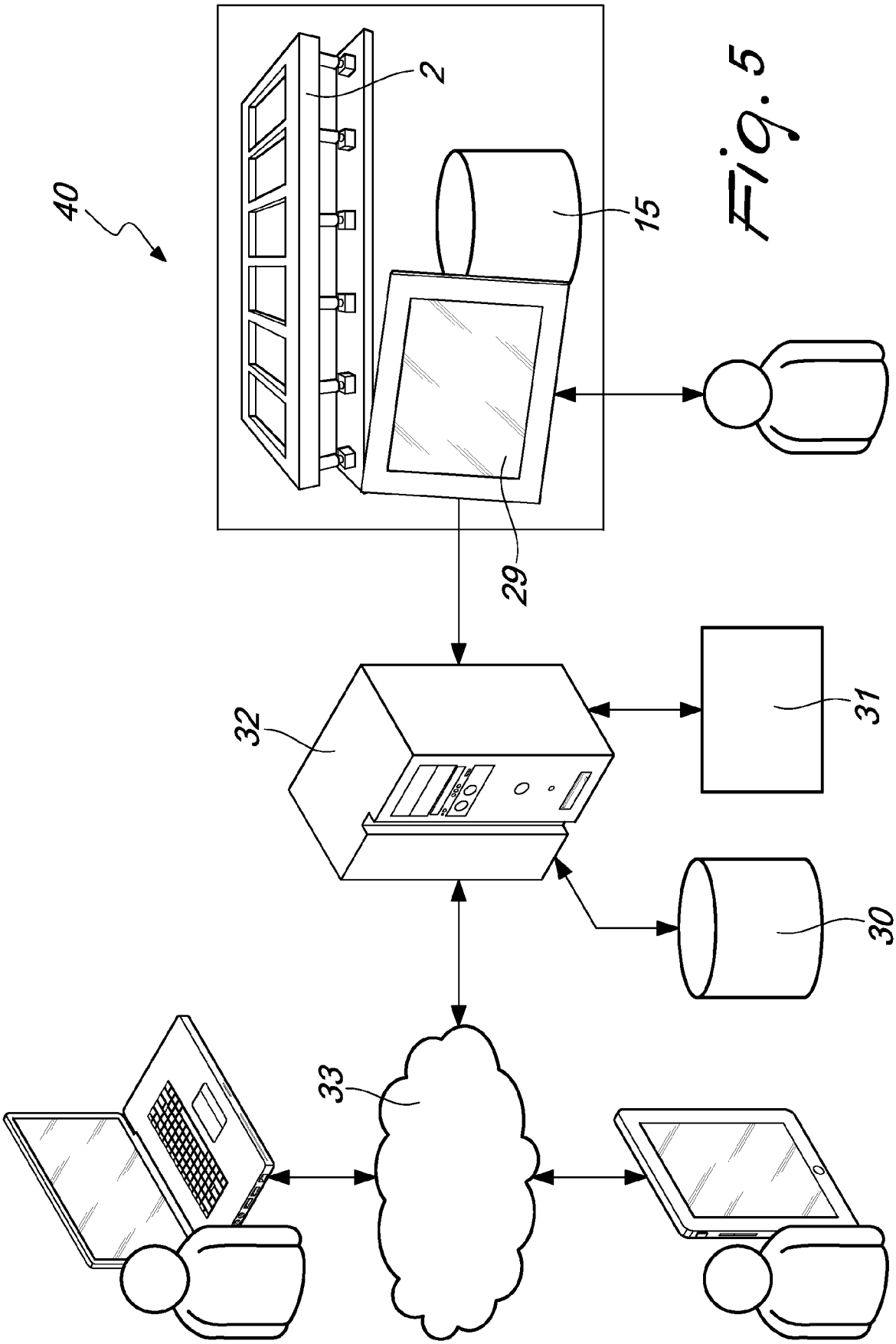

Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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