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(54) Device for control and correction of the force delivered by a press for working laminar materials

(57) It includes at least one measuring device (2) of pressing force, and it is characterised in that it includes control means (3,4) and means for interaction (5,6) with the user, said control means including a device for processing (3) the recorded signal from the measuring device (2), and a device for data management and processing (4) which, based on specific software, makes a comparison between the recorded signal and some preset regulating parameters, obtaining an automatic correction of the regulation of the pressing force until an optimum force value is achieved.

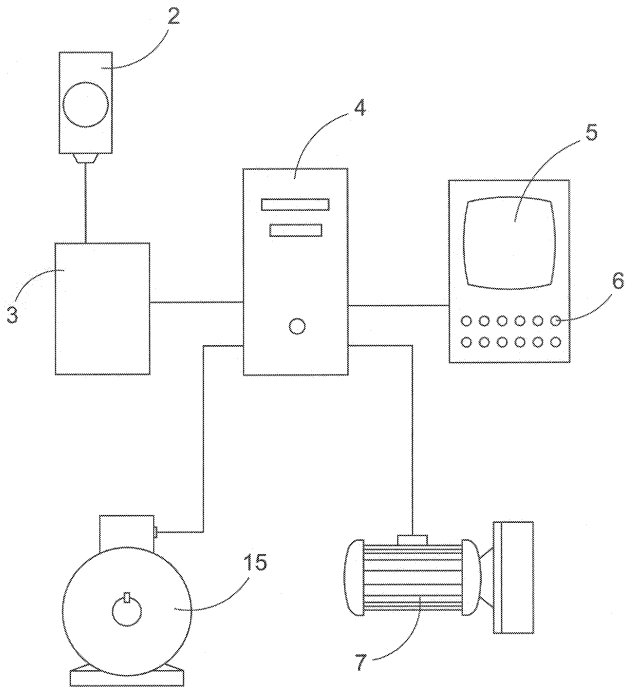

FIG. 1

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Description

[0001] The present invention relates to a device for control and correction of the force delivered by a press for working laminar materials.

BACKGROUND OF THE INVENTION

[0002] Known in the art are machines for working laminar materials, and more specifically presses for cutting, die-cutting, stamping, splitting and/or embossing sheet materials such as paper, compact board, corrugated board, wood, plastic and the like.

[0003] Said machines are mainly made up of a press, in together with other ancillary stations such as a feeder, an offcuts ejector and a reception station for the worked materials, which can be diverse depending up the form of the worked material to be obtained. Moreover, said machines have a conveyor device for the sheets or laminae to be worked, which device normally uses bars provided with clamps mounted on an endless circuit of chains.

[0004] Said press is composed, among other elements, of a table or fixed platen and another moving platen that moves cyclically towards and away from the fixed platen by means inherent to said press. Mounted between the two platens are tools and accessories capable of converting the laminar material to be worked, making use of the pressing action as said platens come together.

[0005] Said presses also have pressing force or pressure graduating devices, usually mounted between the elements that make up and close the dolly-group chain of parts. Said graduating device normally consists in a mechanism of counterposed wedges which, as they are moved in relation to each other, allow the total height of both wedges to be altered, at the same time altering the distance between both platens and, therefore, the pressure as the platens come together.

[0006] The devices for graduating the pressing force or pressure have changed over time, from manual movement of said wedges to movement implemented on some machines by a motor drive or the like.

[0007] Likewise known are various devices for reading the force or pressure that said press brings to bear cyclically. Such devices have also evolved over time, from merely read-only mechanical devices through to the method of providing the press with a micrometric comparator or the like that measures the stretch or cyclic deformation of the material or one or more of the parts that make up the chain of parts that are affected and altered by the pressing force.

[0008] There are currently some models of presses fitted with electronic elements such as extensometers that read the stretch and/or deformation of the material, or load cells that detect and measure the force exercised between two or more of the parts that make up the dolly group described above.

[0009] Such electronic information is used, on the one hand, to inform the operator of the force exercised by the press and, on the other hand, to stop the machine if that force exceeds certain values set by the operator for each job, together with the press manufacturer's preset maximum value.

[0010] However, in spite of the development undergone by the pressure graduating devices, there remain variations or progressive deviations in the pressing force exercised, which occur due to various phenomena such as dilation, oil viscosity variations, etc., and that give rise to machine problems and stoppages.

[0011] Such force variations or deviations normally have the following consequences:

- Excess pressure leads to breakage of the worked sheets and the coming away of layers (valid material) and of cuttings (waste materials), or stoppage of the machine, or to both at once, meaning in both cases the well-known machine down-times, time wastage and decreased output.
- Lack of pressure, on the other hand, leads to poorly cut sheets being obtained and difficulty in separating the valid materials from the waste cuttings, with the attendant machine down-time, reject materials, time wastage and decreased output noted above.

DESCRIPTION OF THE INVENTION

[0012] The object of the device of the present invention for control and correction of the force delivered by a press for working laminar materials is to solve the disadvantages presented by the devices known in the art, while providing a number of advantages that will be described below.

[0013] The device of the present invention for control and correction of the force delivered by a press for working laminar materials is of the type that includes at least one measuring device of pressing force, and is characterised in that it includes control means and means for interaction with the user, said control means including a device for processing the recorded signal from the measuring device, and a device for data management and processing which, based on specific software, makes a comparison between the recorded signal and some preset regulation parameters, obtaining an automatic correction of the regulation of the pressing force until an optimum force value is achieved.

[0014] The device of the invention thereby permits automatic correction during machine operation of progressive deviations of the pressing force, independently of the reason that gives rise to them.

[0015] In accordance with one aspect of the present invention, the preset regulating parameters include a first range of comparison values, a second range of correction values and a maximum safety value of the pressing force.

[0016] Advantageously, when the measured value of the pressing force is equal to or exceeds the first range of comparison values, the data management and

processing device automatically starts to correct the pressing force setting.

[0017] The device of the invention therefore allows the variations of the pressing force that arise in the press to be corrected independently of their source, thus resolving the variations produced by dilation due to the temperature change it undergoes, whether through its work or change of ambient temperature, together with those produced by changes in the fluidity and viscosity of the oil as it heats up, cools down or degenerates, or else due to many other factors that can influence said variations of the pressing force.

[0018] Also advantageously, when the measured value of the pressing force equals or exceeds the second range of correction values, the data management and processing device sends an order to some press driving means to proceed to halt its operation.

[0019] The maximum safety value of the pressing force is a fixed value that is always activated and is capable of stopping the press if that value is exceeded. This safety system protects the press from pressure overload in relation to the values it is designed to withstand.

[0020] Preferably, the press driving means comprise a motor.

[0021] Advantageously, the recorded signal preparing device is an amplifier that amplifies and modulates the signal.

[0022] Preferably, the at least one measuring device of the pressing force can be an extensometer or a load cell.

[0023] Preferably, the data management and processing device can be a personal computer or a PLC.

[0024] Advantageously, the means of interaction with the user include a display screen for presenting information and a plurality of pushbuttons for executing various functions, while it can optionally include a touch screen for display and execution.

[0025] In accordance with one embodiment of the invention, the press includes a fixed platen and a moving platen that moves cyclically towards and away from said fixed platen, between which platens are mounted tools and accessories capable of transforming the laminar material to be worked.

[0026] Advantageously, the press further includes means of traction of the moving platen that include a crankshaft or a camshaft for driving a set of elbowed levers, through connecting rods in the case of a crankshaft.

[0027] Also advantageously, the press further includes means of graduating the pressing force that include at least one pair of counterposed wedges, with each pair of wedges presenting a fixed wedge and a movable wedge, which permits the total height of both to be altered and in turn the distance between the two platens, and therefore the pressure at the moment when the platens come together.

[0028] Preferably, the moving platen and the at least one fixed wedge are associated with one another through the set of elbowed levers.

[0029] According to one embodiment of the invention, the at least one movable wedge is coupled to the at least one feed screw associated with some driving means.

[0030] Preferably, the feed screw driving means comprise a motor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] In order to facilitate the description of the matters set out above some drawings are attached that show, schematically and solely by way of non-restrictive example, a practical case of embodiment of the device of the invention for control and correction of the force delivered by a press for working laminar materials, in which:

Figure 1 is a schematic diagram of the elements that comprise the device of the invention; and
Figure 2 is a section view of a press to which the device of the invention has been applied.

DESCRIPTION OF A PREFERRED EMBODIMENT

[0032] As Figure 1 shows, the device for control and correction of the force delivered by a press 1 for working laminar materials includes, in this example, two extensometers 2 for measuring the pressing or deformation force, suitably mounted on the press 1, an amplifier 3 of the recorded signal coming from the two extensometers 2, a PC or a PLC 4, a display screen 5 for presenting information and a plurality of pushbuttons 6 for executing various functions, with the screen 5 and the pushbuttons 6 being in this case integrated into a single monitor or panel, although a touch screen could optionally be used.

[0033] The amplifier 3 picks up and prepares the signal emitted by the extensometers 2, amplifies it and prepares it to make it controllable.

[0034] The PC or PLC 4 (normally the one fitted to the machine) permits by means of a program the signal to be picked up, the comparison made and the press 1 actuated in order to carry out correction of the pressing force or stoppage of the press, as well as programming and manipulation by the operator and saving of program information and repetitive tasks information.

[0035] The screen 5 and the pushbuttons 6 allow display of the force or pressure exercised and the action to be taken thereupon, as well as allowing programming of the optimum pressure for each job. All of this it does in addition to the functions inherent to the machine.

[0036] As Figure 2 shows, the press 1 includes a fixed platen 8 and a moving platen 9 that moves cyclically towards and away from said fixed platen 8; some traction means of the moving platen 9 that include a crankshaft 13 or a camshaft for driving a set of elbowed levers 14 through some connecting rods 13a; and some graduating means of the pressing force that include a pair of counterposed wedges, one fixed wedge 11 and one movable wedge 10. Moreover, the moving platen 9 and the fixed wedge 11 are associated with each other through the set

of elbowed levers 14.

[0037] Furthermore, the movable wedge 10 is coupled to a feed screw 12 which is driven in this case by means of a motor 7, which receives orders from the above-mentioned PC or PLC 4.

[0038] Similarly, the aforesaid extensometers 2 are provided, being normally coupled to the parts of the press 1 that are liable to undergo most stretching or deformation under the pressing action.

[0039] The functioning of the device of the invention is described below:

> Firstly, the extensometers 2 send the amplifier 3 the recorded signal relating to the deformation found at that time in the pressing action. The amplifier 3 amplifies and modulates said signal so that, when it is received by the PC or PLC 4 by means of a previously installed program, it can determine the value of the force brought to bear in relation to that recorded signal, so that on the one hand said force value is shown on the screen 5, and on the other hand, once the signal has been processed and compared in the PC or PLC 4, the latter transmits the pertinent orders in the light of the signal received and of some pre-established regulating parameters, as described below.

[0040] Said comparison can operate automatically or can be overridden at will, either temporarily or continuously.

[0041] The pre-established regulating parameters include a first range of comparison values for each work cycle, a second range of pre-programmed correction values, and a maximum safety value of the pressing force.

[0042] The operator will first have to select an optimum force value suitable for each job to be carried out, and the program will then automatically establish around that optimum force value a first range of comparison values and a second range of correction values.

[0043] Said program also permits the pressing force parameters selected for each job to be stored, memorised and managed for making ad hoc queries about the parameters and for jobs that are repetitive.

[0044] When the measured value of the pressing force is between the maximum and minimum values of the first range of comparison values, the device of the invention does not carry out any correction.

[0045] When the measured value of the pressing force lies above or below said first range of comparison values, though without reaching the second range of correction values, the program will automatically start to correct the pressing force setting until the selected optimum value is reached.

[0046] If for various reasons the working force lies above or below said second range of correction values, the device of the invention will send an order to stop the press automatically.

[0047] The aforesaid first and second margins can also be used to activate other functions such as warnings, alerts, orders and/or triggering of various actions, and can act directly, in a derived way, timed, etc.

[0048] When the measured value of the pressing force reaches or surpasses the aforesaid maximum safety value, press stoppage will be implemented automatically.

Claims

1. Device for control and correction of the force delivered by a press (1) for working laminar materials, which includes at least one measuring device (2) of pressing force, **characterised in that** it includes control means (3,4) and means for interaction (5,6) with the user, said control means including a device for processing (3) the recorded signal from the measuring device (2), and a device for data management and processing (4) which, based on specific software, makes a comparison between the recorded signal and some preset regulating parameters, obtaining an automatic correction of the regulation of the pressing force until an optimum force value is achieved.

2. Device, according to claim 1, **characterised in that** the preset regulating parameters include a first range of comparison values, a second range of correction values, and a maximum safety value of the pressing force.

3. Device, according to claim 2, **characterised in that** when the measured value of the pressing force is equal to or exceeds the first range of comparison values, the data management and processing device (4) automatically starts to correct the pressing force setting.

4. Device, according to claim 2, **characterised in that** when the measured value of the pressing force equals or exceeds the second range of correction values, the data management and processing device (4) sends an order to some press (1) driving means (15) to proceed to halt its operation.

5. Device, according to claim 4, **characterised in that** the press (1) driving means comprise a motor (15).

6. Device, according to claim 1, **characterised in that** the recorded signal preparing device (3) is an amplifier that amplifies and modulates the signal.

7. Device, according to claim 1, **characterised in that** the at least one measuring device (2) of the pressing force is an extensometer.

8. Device, according to claim 1, **characterised in that** the at least one measuring device (2) of the pressing

force is a load cell.

9. Device, according to claim 1, **characterised in that** the data management and processing device (4) is a personal computer.

10. Device, according to claim 1, **characterised in that** the data management and processing device (4) is a PLC.

11. Device, according to claim 1, **characterised in that** the means of interaction with the user include a display screen (5) for presenting information and a plurality of pushbuttons (6) for executing various functions.

12. Device, according to claim 1, **characterised in that** the means for interaction with the user include a touch screen for display and execution.

13. Device, according to any of the preceding claims, **characterised in that** the press (1) includes a fixed platen (8) and a moving platen (9) that moves cyclically towards and away from said fixed platen (8).

14. Device, according to claim 13, **characterised in that** the press (1) further includes means of traction of the moving platen (9) that include a crankshaft (13) or a camshaft for driving a set of elbowed levers (14), through connecting rods (13a) in the case of use of a crankshaft (13).

15. Device, according to claims 13 or 14, **characterised in that** the press (1) further includes means of graduating the pressing force that include at least one pair of counterposed wedges, with each pair of wedges presenting a fixed wedge (11) and a movable wedge (10).

16. Device, according to claims 13 to 15, **characterised in that** the moving platen (9) and the at least one fixed wedge (11) are associated with one another through the set of elbowed levers (14).

17. Device, according to claims 15 or 16, **characterised in that** the at least one movable wedge (10) is coupled to the at least one feed screw (12) associated with some driving means (7).

18. Device, according to claim 17, **characterised in that** the feed screw (12) driving means comprise a motor (7) .

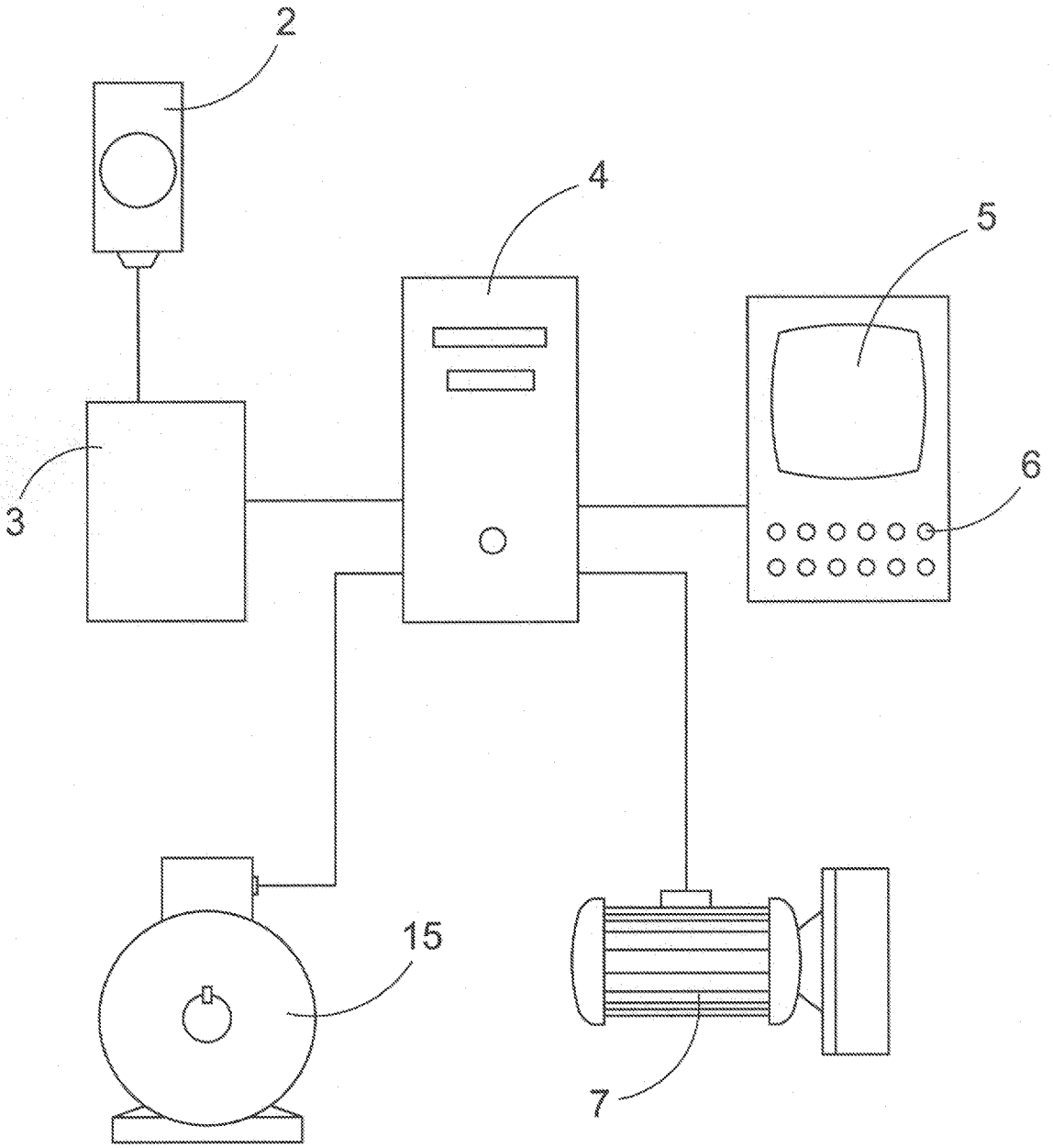

FIG. 1

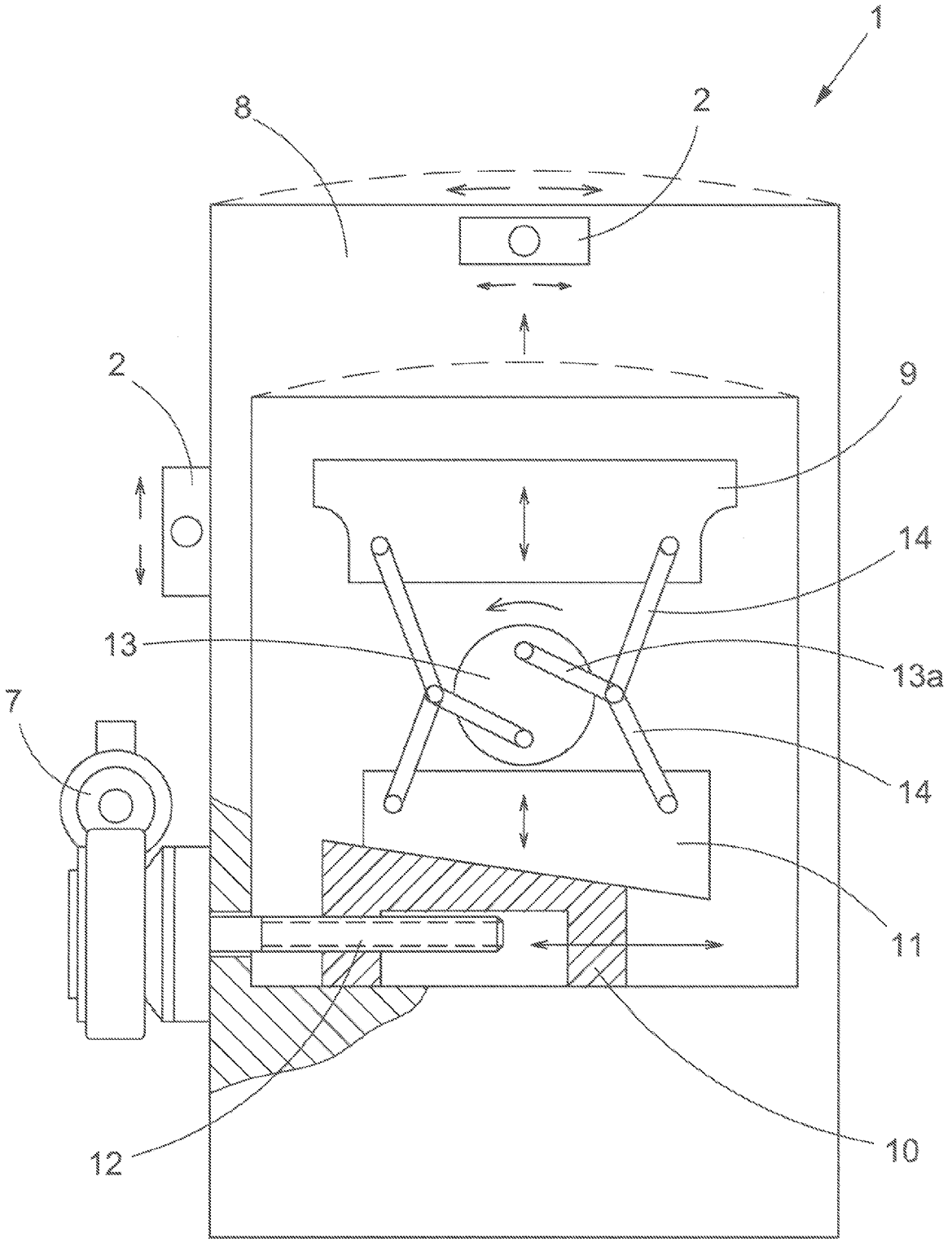

FIG. 2