Clamping device for the doors of industrial machines

Clamping device (10) for an openable door (13) of an industrial machine equipped with a frame (12), and comprising first mating connecting means (20, 21) for a first clamping of the door (13) to the frame (12), and second mechanical closing means (30) including a selectively movable fastening element (31) associated with the frame (12) and able to be inserted in a mating seating (23) provided on the door (13). The fastening element (31) is associated with an actuator element (35) able to move it from an inactive position to an active clamping position wherein one operative end (32) thereof cooperates with the seating (23). The actuator element (35) is arranged offset with respect to the axis of movement of the fastening element (31) and at a distance from the operative end (32) such that it can be located in a position not directly interfering with the front edge of the frame (12).
Description

FIELD OF THE INVENTION

[0001] The present invention concerns a clamping device for the doors of industrial machines of the type which, during the operating cycle, generate toxic and polluting vapors, fumes or hot and/or pressurized liquids. The invention is applied preferentially to washing machines, for example small size industrial or hospital washing machines employed for washing and disinfecting medical and surgical instruments and equipment. The clamping device according to the invention comprises first temporary connecting means to connect the door to the body of the machine, and second fastening means including at least a movable element cooperating with a part of the door to ensure a stable and airtight mechanical closure thereof.

[0002] To be more exact, the second fastening means guarantee a high closing pressure on the seals, so as to guarantee over time that the door is sealed against leakages of fumes, liquids or vapors, even when there are strong vibrations or stresses of other type on the door.

[0003] The characteristic of the invention is that it includes a high capacity actuator element able to move the movable element of said second fastening means to make it cooperate with a mating female part of the door.

[0004] This actuator element is arranged at a distance from the operative end of said movable element and offset with respect to said end so that it can be located in a zone of the machine where it does not directly interfere with the body of the machine.

[0005] Apart from the washing machines cited above, the clamping device according to the invention can be applied to small ovens, small painting or coloring machines or similar applications.

BACKGROUND OF THE INVENTION

[0006] There are known clamping devices for machines of an industrial type, for example washing machines, used to close a door, which can normally be opened at the front, with respect to the frame or body of the machine, wherein first connecting means, for example with a spring latch, include first elements associated with the frame and corresponding second elements associated with the door to cause it to close.

[0007] The first elements can consist for example of a protruding block equipped with a hook or one or more grooves or similar, while the second elements on the door can comprise a cavity inside which the hook is inserted. This block with the hook can be associated with elastic means which facilitate the rapid coupling or uncoupling of the door and body of the machine.

[0008] These connecting means, however, do not guarantee the mechanical stability and security of the closure, since, especially in those cases where the washing machine is carrying out spin cycles with a high level of vibrations, it cannot be guaranteed that the door will be kept closed and therefore there might be an unwanted opening of the door while the machine is operating. Moreover, conventional connecting means do not guarantee sufficient and secure mechanical pressure so as to ensure over time that the seals arranged around the door remain airtight.

[0009] Also, due to the high temperatures reached inside such machines, it is necessary that the mechanical stability of the closure be guaranteed, so as to prevent liquids, fumes and vapors from leaking, which might cause risks of accidents to the workers and/or environmental contamination and pollution.

[0010] This disadvantage has been overcome in the state of the art by using other stable mechanical closure means normally consisting of a fastening element, for example a rod or bar, arranged in proximity with the front edge of the frame. When the door is closed and held in position by the first connecting means, this mechanical fastening element is moved by an actuator, for example a solenoid, from an inactive position to an active position whereinafter it is inserted into a mating seating made on the door and mechanically clamps the latter.

[0011] The cooperation between the fastening element and the relative seating guarantees a secure closure of the door even when the machine is subject to strong vibration stresses.

[0012] This conventional solution however has the disadvantage that it has slow response times and little closing power. In fact, when industrial machines, for example washing machines of the hospital type, are very small in size, it is necessary to use components, particularly the actuator which moves the movable fastening element, which are small in size and hence have low power. This is because traditional solutions provide that this actuator is located in a seating prepared on the front edge of the body of the machine.

[0013] In this way, due to the limited power of the actuator, there is no guarantee that the door will remain closed stably and securely with respect to the body of the machine, and the desired closing pressure on the seals is not guaranteed either, with the risk that in any case fumes, vapors and liquids might leak from the machine.

[0014] The Applicant has designed and embodied the present invention to overcome these shortcomings of the state of the art, and to obtain further advantages.

SUMMARY OF THE INVENTION

[0015] The present invention is set forth and characterized essentially in the main claim, while the dependent claims describe other innovative characteristics of the invention.

[0016] The purpose of the invention is to achieve a clamping device for an openable door of an industrial
machine which will guarantee stability and security to the mechanical and air-tight closure of the door with respect to the body of the machine, even when the machine is carrying out operating cycles with great vibration stresses or when high temperatures develop inside, with a great production of fumes, vapors or liquids under pressure.

[0017] The clamping device according to the present invention comprises, in traditional manner, first connecting means including first holding elements associated with the door and mating second holding elements associated with the fixed body of the machine.

[0018] The device also comprises second stable mechanical fastening means which comprise a movable fastening element, with a rod or bar, associated with the body of the machine, which is able to be selectively inserted into a mating seating arranged on the door, when said door is closed and held in the correct position by the first connecting means. This fastening element is associated with at least an actuator element able to move it from a first inactive position to a second active clamping position, wherein an operative end of the fastening element cooperates with the seating on the door.

[0019] According to a characteristic feature of the present invention, the actuator element is distanced from said operative end and is offset horizontally on the transverse plane with respect to the axis on which the fastening element is inserted into the seating.

[0020] To be more exact, the fact that the actuator element is distanced and offset allows to locate the actuator element in a position not directly interfering with the front edge of the machine body, in correspondence with which problems of space prevent the retracted positioning of components of a certain size. On the contrary, thanks to the arrangement according to the invention it is possible to use an actuator element of greater size and power, since it can be arranged inside a lateral compartment normally provided at the side of the machine body, where the operating units and devices of the machine are accommodated, such as electric cards, hydraulic devices, electric feeders or transformers, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] These and other characteristics of the present invention will be apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional view of a washing machine on which a clamping device according to the present invention is mounted;
- fig. 2 is an exploded three-dimensional view of a device according to the invention;
- fig. 3 is a view from above, partly in section, of a detail from fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT OF THE INVENTION

[0022] With reference to the attached drawings, a clamping device 10 for washing machines of the industrial or hospital type, in this case a dishwasher for surgical instruments and surgical or hospital tools, according to the present invention comprises mating first connecting means and second mechanical closing means 30.

[0023] Although the invention is described with reference to a hospital washing machine, it is clear that its teaching can be transferred directly to other types of industrial machine with analogous or similar characteristics.

[0024] The washing machine on which the device 10 according to the present invention is mounted consists substantially of a frame, or machine body, 12 and a door 13 which can be opened at the front. In this case, the frame 12 is substantially parallelepiped in shape and at the front has an aperture 12a which allows to load the material to be washed. Below the aperture 12a the door 13 is hinged, in such a manner that it can be selectively positioned between a completely open position, substantially horizontal, shown in fig. 1, which allows to load the material to be washed, and a substantially vertical closed position, where in it is not possible to access the inside of the machine.

[0025] The first connecting means comprise first elements 20 mounted on the frame 12 of the machine, in a central zone of the upper edge of the aperture 12a, which consist of a metal plate 14 on which a groove 15 is made centrally (figs. 1-3).

[0026] From the sides of the groove 15 two spheres 16 partly protrude towards the inside, and are held elastically in a position thrust outward by respective helical springs 17. Both the spheres 16 and the respective springs 17 are housed inside corresponding seatings 19 made laterally on the plate 14 and open on the groove 15.

[0027] The springs 17 are kept stressed by corresponding pins 18 arranged transversely to the seatings 19.

[0028] The first connecting means also comprise second elements 21 mounted on the door 13 in a position such that, when the door 13 is progressively taken to the closed position, these second elements 21 cooperate with said first elements 20 to determine a temporary connection and centering condition of an elastic type.

[0029] These second elements 21 mounted on the door 13 comprise a block 22, of a size mating with that of said groove 15, on whose sides there are two semi-spherical hollows 26 able to house, when the door 13 is in the closed position, the protruding parts of the spheres 16 (fig. 3) thrust elastically.

[0030] On one of the two sides of the block 22 there is also a seating 23 able, during use, to host a fastening element consisting of a rod 31, which will be described...
The present invention relates to a device for an openable door of a washing machine, all of which shall come within the field of protection of the present invention.

Claims

1. Clamping device for an openable door (13) of an industrial machine equipped with a frame (12), said device comprising first mating connecting means (20, 21) for a first clamping of said door (13) to said frame (12), and second mechanical closing means (30) including a selectively movable fastening element (31) associated with said frame (12) and able to be inserted in a mating seating (23) provided on said door (13), said fastening element (31) being associated with an actuator element (35) able to move it from an inactive position to an active clamping position wherein one operative end (32) thereof cooperates with said seating (23), characterized in that said actuator element (35) is arranged offset with respect to said incision of movement of said fastening element (31) and at a distance from said operative end (32) such that it can be located in a position not directly interfering with the front edge of said frame (12).

2. Device as in claim 1, wherein a compartment (36) to house operative units is arranged adjacent to said frame (12), characterized in that said actuator element (35) is arranged retracted inside said compartment (36).

3. Device as in any claim hereinbefore, characterized in that said fastening element comprises an L-shaped rod (31) including a first operative end (32) conformed as a tooth able to be inserted into said seating (23), and a second end (37) opposite the first (32) and offset with respect thereto, able to be associated with said actuator element (35).

4. Device as in any claim hereinbefore, wherein said seating (23) is made in a protruding block (22) able to be inserted in a mating groove (15) made in a plate (14) associated with the front edge of said frame (12), characterized in that said fastening element (31) has an abutment side (33) able to rest on a mating side of said plate (14) to determine the depth to which said operative end (32) is inserted into said seating (23).

5. Device as in any claim hereinbefore, characterized in that said fastening element (31) comprises at the rear a bent segment (34) able to drive a micro-switch, not shown in the drawings, arranged in proximity with the actuator (35) which signals to the user the state of activation of the mechanical closing means (30).

6. Device as in any claim hereinbefore, characterized
in that said actuator element (35) is a solenoid of great size and power.