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(11) **EP 1 001 069 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.05.2000 Bulletin 2000/20

(51) Int. Cl.⁷: **D06F 37/42**

(21) Application number: **98110197.5**

(22) Date of filing: **04.06.1998**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **23.12.1997 IT MI972852**

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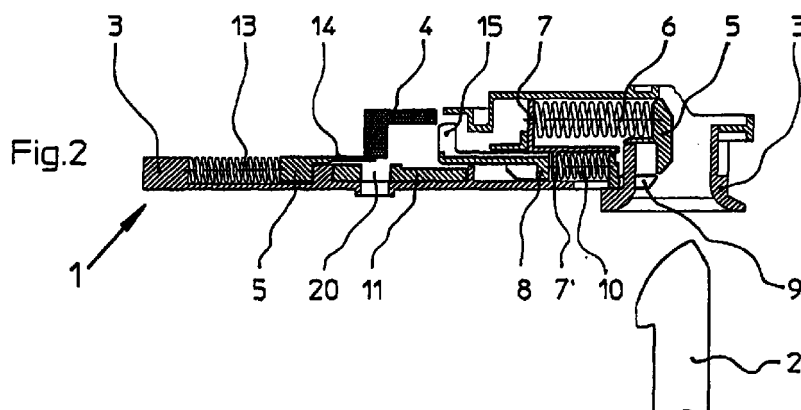
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(54) **Device to remotely open doors, in particular of washing-machines**

(57) The invention refers to a device designed to open doors at a distance, washing machine doors in particular, and is characterised by the fact that the force necessary to release the door hook is exerted by a spring (6) inserted between a cursor (5) and a slide (7), the latter is connected by an extension (7') to a slide (8)

which carries a blade (9) that locks the door hook, the hook is released by the action of a slide (11) connected to a push-button which operates the device and when the door is in the closed position its surface (18) presses against surface (17) of slide (7).



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Description

[0001] This invention refers to a device, in particular for washing-machines, the purpose of which is to open the machine door from a distance by means of the push-button positioned on the control panel, the said device also houses the instantaneous locking device and delayed door release device, usually known as door lock.

[0002] Both electromagnetic and mechanical devices of this kind already exist and are well known, the latter designs usually operate on the swinging type closure hook causing the engaging tooth of the hook itself to retract.

[0003] Moreover, electro-mechanical devices are considerably more expensive, due to the fact that as has been mentioned mechanical devices operate by displacing the closure hook, require a considerable excursion of the push-button during the opening phase, hence a high degree of precision is required in the working dimensional tolerances of the cable, and requiring considerable force to be exerted on the push-button.

[0004] The device subject of the invention is based on a mechanical design and its fundamental advantage is that of releasing the machine door hook and therefore the subsequent opening of the machine door by exerting a limited force on the control push-button and requiring a short excursion of the push-button as in electro-mechanical devices.

[0005] An additional advantage of the invention is that it can also operate with a fixed machine door hook design, though its application and correct operation continue to be possible on swinging machine door hook designs.

[0006] A further advantage is that of allowing the conversion from a mechanical device to an electro-mechanical device by replacing the wire actuated device that operates the release mechanism with an electromagnet. However, the said electromagnet has a much smaller size compared with the size required for known electro-mechanical devices and this is made possible since only a small force is required resulting from the device features that shall be described below.

[0007] The invention is characterised by the fact that whereas for known mechanical devices all the work to release the machine door closure hook is performed by the force exerted on the release push-button and therefore a significant force is required to adjust the hook and an extended excursion of the push-button is necessary, for the device subject of the invention the hook is engaged by means of a swinging knife positioned under the hook and the force required to release the machine door closure is exerted by a spring that is pre-compressed by the hook itself during the door closure phase and consequently the force exerted on the machine door opening push-button is limited to the force required to overcome the friction between two small surfaces in contact, therefore the movement of one of the

two surfaces causes the previously pre-compressed spring to expand as specified in claim 1.

[0008] The invention will be more clearly understood through the description of an example of fulfillments provided solely for the purposes of illustration and is not exhaustive, as detailed by the three attached drawings which represent:

figs. 1 - 2 - 3 - the device in the rest position and namely with the door open: fig. 1 viewed from below without the bottom cover of the body housing the various parts of the device; fig. 2 in cross-section; fig. 3 viewed from above without the cover, respectively;

figs. 4 - 5 - 6 - the device with the door closed: fig. 4 viewed from below without the bottom cover of the body housing the various parts of the device; and fig. 5 in cross-section; and fig. 6 viewed from above, without the cover, respectively;

figs. 7 - 8 - 9 - the device in the opening phase: fig. 7 viewed from below without the bottom cover of the body housing the various parts of the device; fig. 8 in cross-section; fig. 9 viewed from above without the cover, respectively.

[0009] With reference to figures 1 to 9 both (1) the device according to the invention and (2) the door hook of a washing-machine.

[0010] The device consists of a body (3) which houses various parts making up the device itself.

[0011] (4) indicates the machine door locking latch the function of which, once the washing-machine door has been closed and the operating command has been activated, is to instantly operate the door locking mechanism and at the end of the washing cycle to impart the delayed action to the door release mechanism.

[0012] The machine door locking device is not shown in the drawings, but is part of a separate body housed inside body (3) of the device as foreseen in the invention, behind the components that impart the locking and release action to the machine door hook. The various device components are housed inside body (3):

- cursor (5) in the upper section on which spring (6) is inserted;
- slide (7) positioned behind this cursor (5) which pushes against the rear end of spring (6) which has a fin in the lower section (7') that fits inside a second slide (8) which carries the hook locking knife (9) in the front section;
- spring (10) inserted between the front wall of slide (8) and the extension wall (7') of slide (7) therefore

by exerting pressure on knife (9) of slide (8) the said spring retracts to move subsequently forward after the pressure is released;

- slide (11) positioned behind slide (7) which moves sideways with respect to slide (7) and that pushes against surface (17) of slide (7) with one of its surfaces (18) when in the rest position, making it possible in given conditions to keep the spring compressed (6); the two surfaces are small thereby minimising friction during the separation phase;
- wire (16) with one end connected to the lower part of slide (11) and the other end connected to the release push-button, (not shown in the figure);
- spring (13) positioned in the rear section of the device, between the rear part of the body (3) and the cursor end (5);
- spring (12) positioned between one side wall of body (3) and an extension (19) of slide (11).

[0013] These are the main components of the device which serve to operate the remote locking and release mechanisms of the machine door hook, but the said device includes other components which have a safety function, to prevent machine operation with the door open, or when the door is not closed securely.

[0014] A first safety device consists of an extension (14) positioned in relation to the cursor rear section (5) which, when the machine door is in the open position, lies under latch (4) of the door locking device preventing it from completing the closure phase should the machine be operated with the door in the open position.

[0015] Another safety device consists of extension (15) that forms a rear extension of the knife holder slide (8) which in the event the hook is not securely closed, positions itself under the machine door locking latch (4) preventing it from completing the closure phase and consequently inhibiting operation of the machine, (refer to fig. 8 which represents one of the hook positions during the opening phase, but can correspond to a hook position when the door is in a partially closed condition).

[0016] The mechanism operates as follows.

[0017] With the door in the open position (refer to fig. 1, 2 and 3) cursor (5) is in the fully forward position; spring (6) is extended and springs (12) and (13) are also extended.

[0018] Extension (14) of cursor (5) is positioned under the machine door locking latch (4), acting as a safety mechanism. The knife holder slide (8) is also in the fully forward position with the corresponding spring (10) also extended, (refer to fig. 2).

[0019] Slide (11) is fully inserted inside its seat with its surface (18) resting against surface (17) of slide (7).

[0020] When hook (2) is introduced, refer to fig. 4, 5 and 6 the said hook enters with his head and causes the hook locking knife (9) and the front section of cursor (5) to move backwards therefore compressing spring (6) and spring (10). Once the hook head moves beyond knife (9) spring (10) expands carrying knife (9) under the

hook edge, while the hook head maintains its pressure against the forward section of cursor (5), maintaining spring (6) compressed against slide (7) and maintaining spring (13) compressed. By this arrangement of the various device components, according to the invention, when the machine is operated, the door closing latch (4) can move into its seat (20) in slide (11) thereby securing the release slide (11): (refer to fig. 4, 5 and 6) and preventing the door from opening during the complete washing cycle.

[0021] It must be noted that with the various components of the device arranged as described above, extension (7') of slide (7), which as mentioned previously, is introduced inside the knife carrier slide body (8), and the corresponding rear wall of knife holder slide (8), against which the said extension (7') pushes during the release phase, are not in contact with one other but an empty gap of a few tenths of a millimetre exists between the two parts.

[0022] The machine door locking latch (4) returns to its retracted position with the appropriate delay leaving seat (20) vacant on completion of the washing operation, refer to figures 7, 8 and 9.

[0023] Pressing the operating push-button located on the machine control panel by means of wire (16) in this condition displaces release slide (11), which requires very little force, since only the friction between the parts in contact (17) of slide (7) and (18) of slide (11) needs to be overcome. Spring (6) is subsequently able to extend itself at the rear and to pull slide (7) backwards together with extension (7'), knife holder slide (8) and knife (9), enabling the machine door hook to disengage; (refer to fig. 8).

[0024] The small gap between slide (7) and the corresponding surface of knife carrier slide (8) ensures the latter is pushed by extension (7'), this serves the purpose of overcoming the initial separation friction between the hook locking knife (9) and hook edge (2) which rests on knife (9).

[0025] Once hook (2) has moved out of its seat, the expansion of the cursor (5) resetting spring (13) returns cursor (5), knife holder slide (8) and slide (7) to their initial position; in addition, the expansion of spring (12) returns slide (11) to its initial position, as shown in fig. 1, 2 and 3.

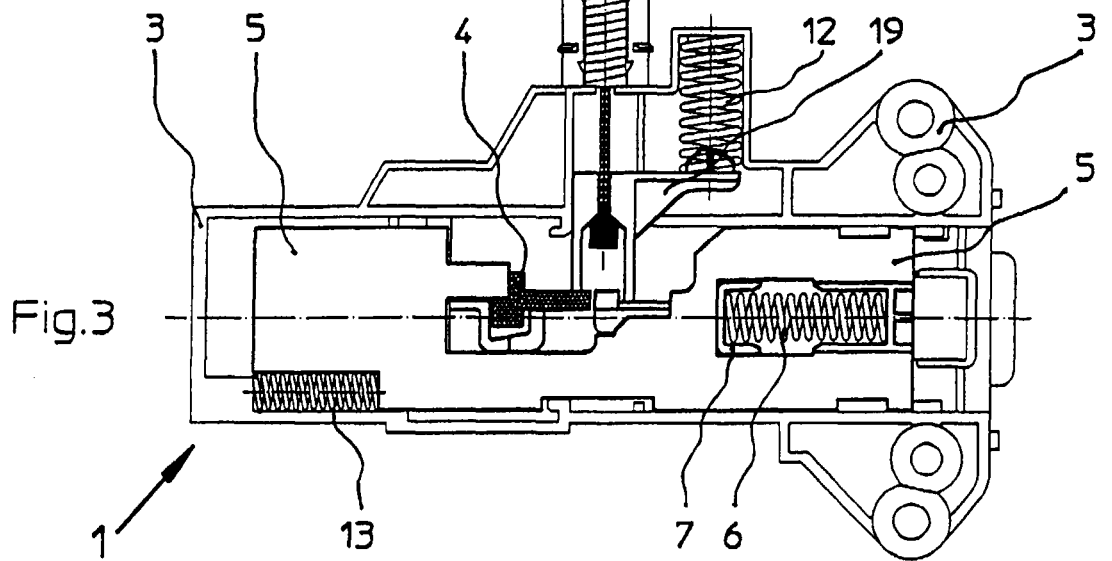
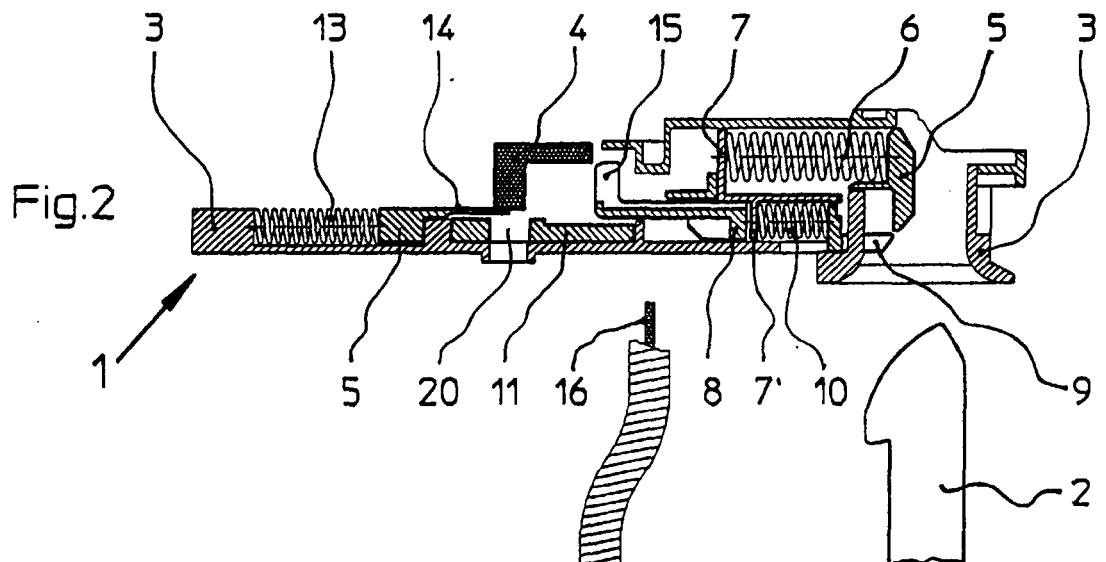
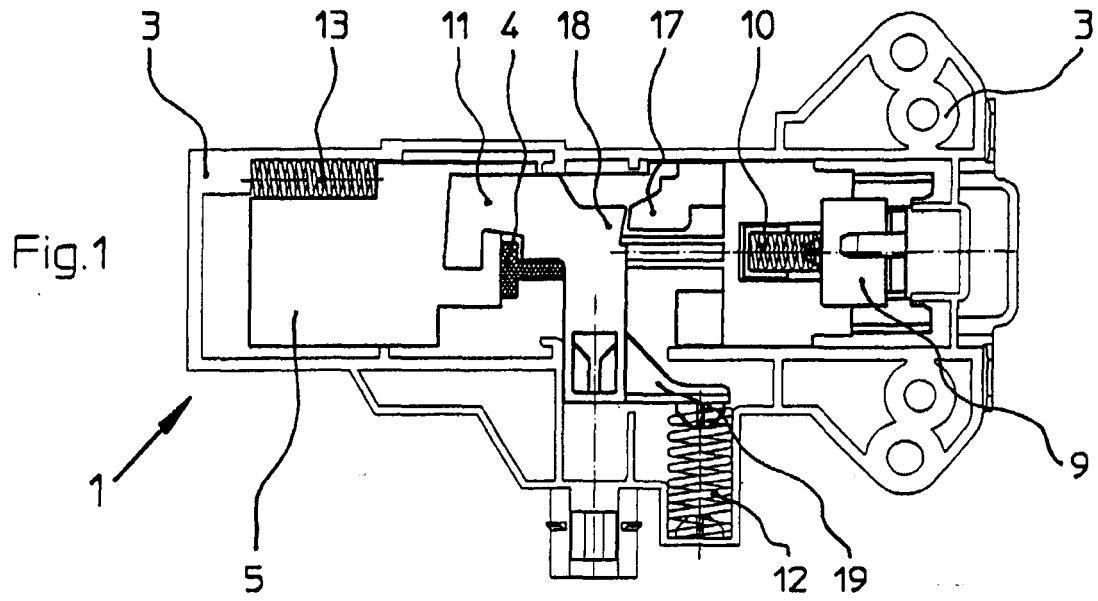
Claims

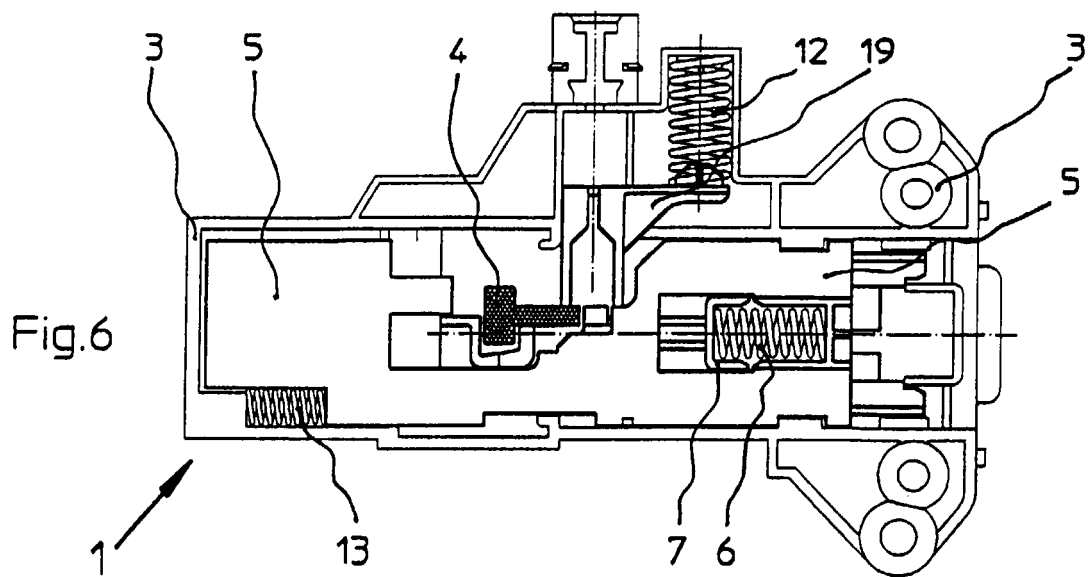
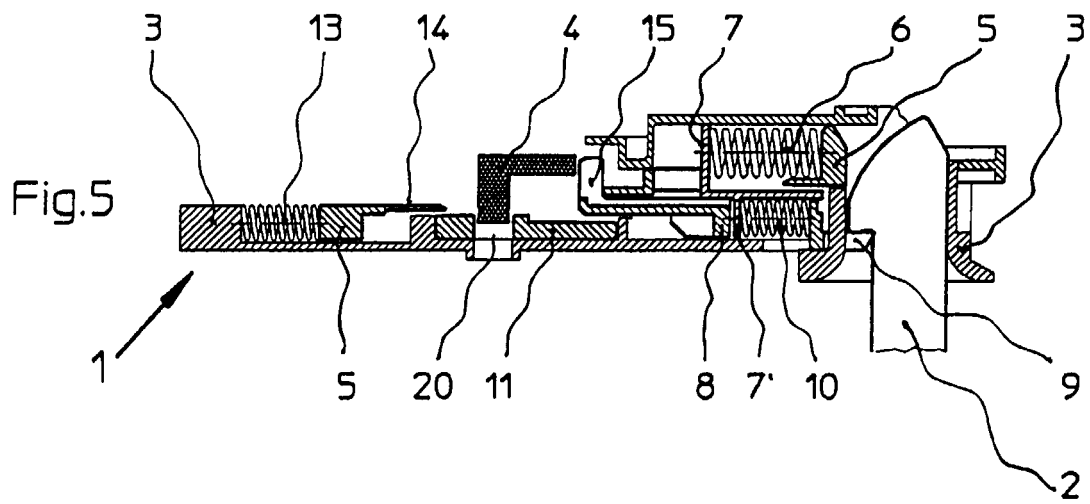
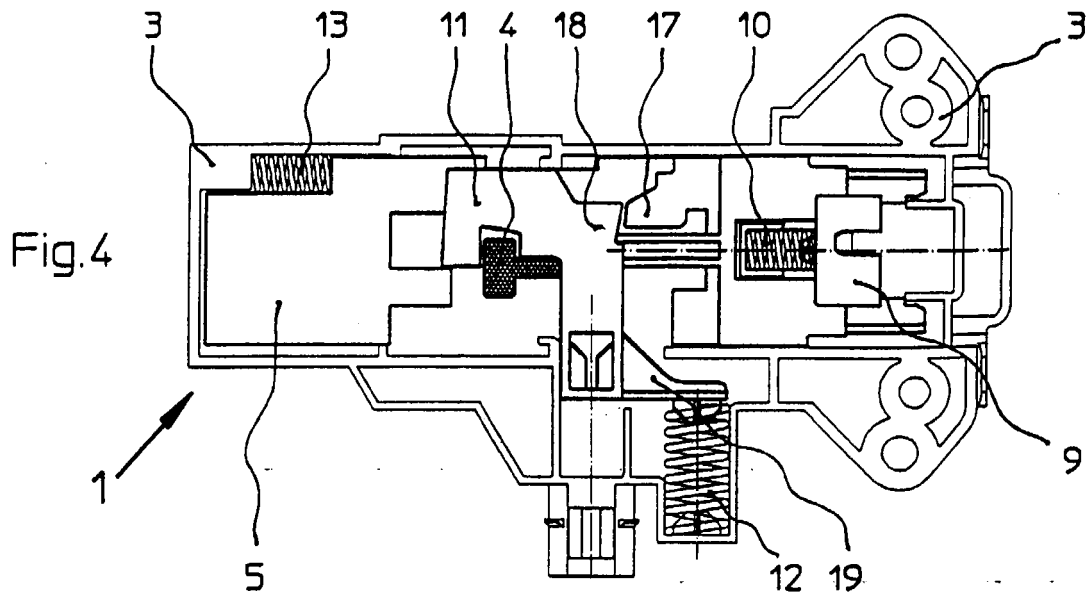
1. Device to remotely open doors, in particular of washing-machines, characterised by the fact that the force necessary to release the machine door closing hook (2) is exerted by spring (6) inserted between cursor (5) and slide (7), the said spring is pre-compressed from the front by hook head (2) during the door closing phase, slide (7) being connected through extension (7'), to slide (8) that carries the machine door hook closing knife (9), the release operation is achieved by slide (11) which is

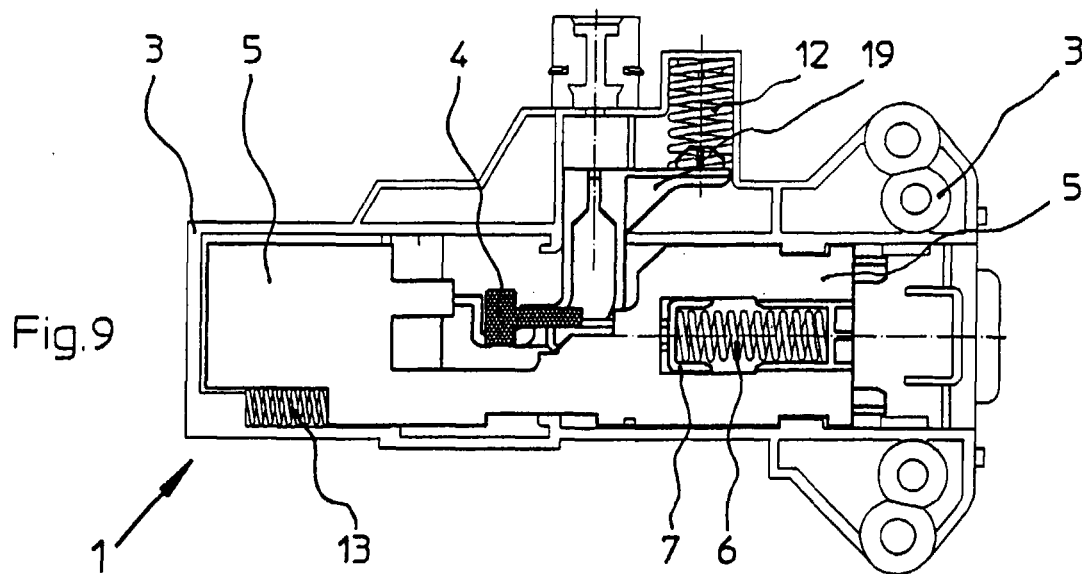
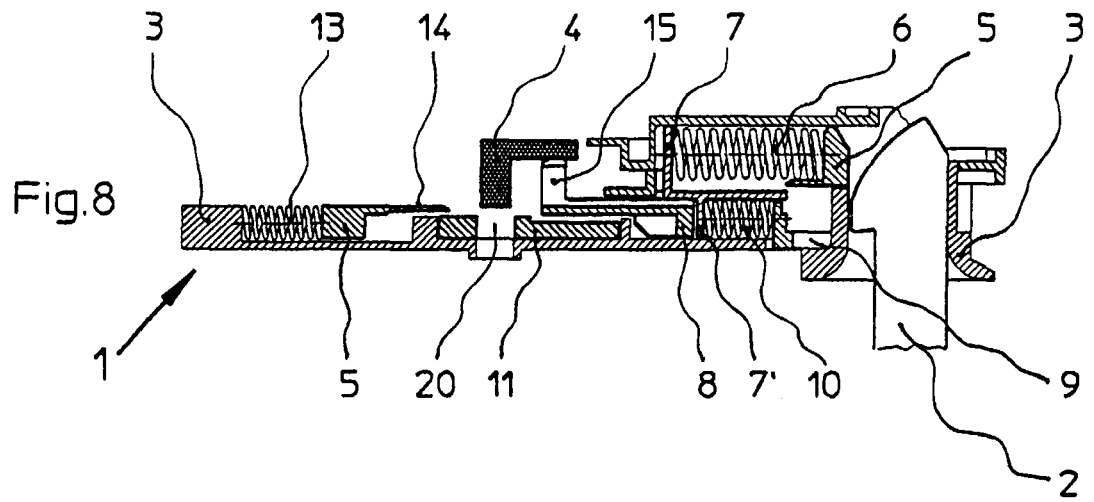
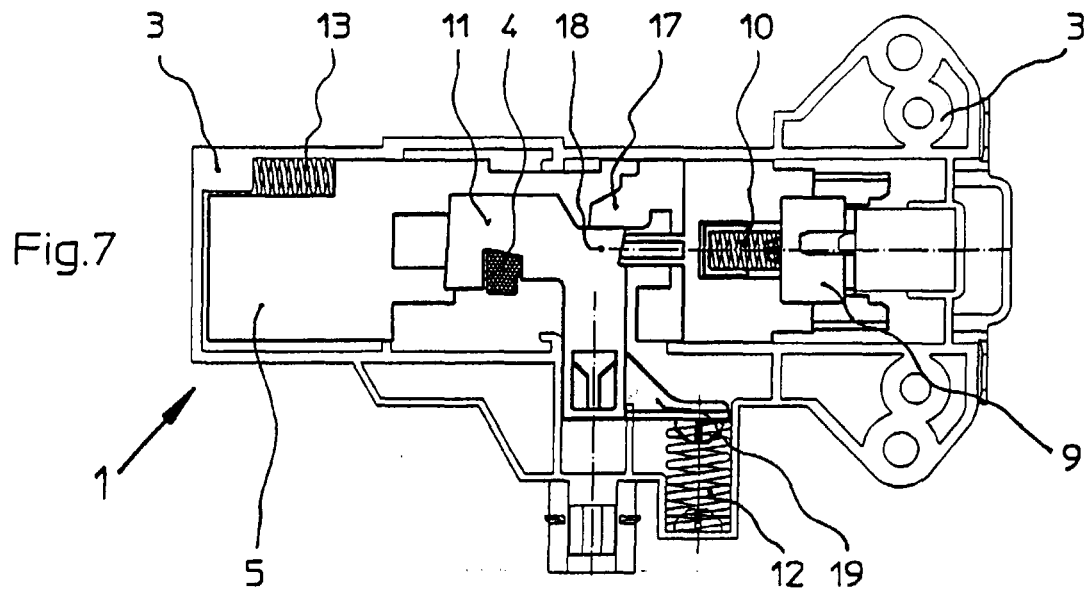
connected by flexible wire (16) to a control push-button at a distance on the control panel that houses the operating controls of the machine and when the machine door is in the closed position one of its surfaces (18) pushes against a surface (17) of slide (7), surface (17) which, once distanced from pushing against surface (18) of slide (11) allows spring (6) and slide (7) to extend backwards and knife carrier slide (8), with the consequent withdrawal of blade (9) and the release of hook (2).

2. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that slide (8) and the corresponding knife (9) are subjected to the action of spring (10), that is compressed when hook (2) is inserted, by the effect of the backward thrust that knife (9) receives from the hook head, once the hook head has passed through, the said spring then expands carrying knife (9) under the hook engaging edge.
3. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that the cursor body (5) is also connected to spring (13) which is also compressed by the hook head when it is inserted and that once engagement has been completed the spring expands returning cursor (5) and slides (7) and (8) to their position of rest.
4. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that slide (11) by which the release of machine door hook (2) is controlled, is connected to extension (19) coupled to spring (12), which is subjected to compression, so that pressing the push-button causes slide (11) to be displaced and the hook to be disengaged, after completion of the release operation, spring (12) expands returning slide (11) to the reset position.
5. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that the body (3) is capable of housing the complete body of a suitable door locking device which during the machine's operation, is capable of locking slide (11) by means of its latch (4).
6. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that an extension (14) has been made on the rear section of cursor (5), which, positions itself under the door locking latch (4) in the door opening phase to prevent the latch (4) from dropping when the door is in the open position, in the event the machine start control is operated in these conditions.

7. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that the knife carrier slide (8) is equipped with a rear extension (15) which positions itself under the door locking latch (4) in the phase when the door is not securely closed, to prevent the latch from dropping when the door is not securely closed.
8. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that a small empty gap remains between extension (7') and the adjoining slide wall (8), hence, before pulling slide (8) backwards during the release phase extension (7') pushes against it to overcome the initial separation friction between knife (9) and the hook engaging edge (2) that rests against knife (9).
9. Device to remotely open doors, in particular of washing-machines, as in claim 1, characterised by the fact that, alternatively, slide (11) may be actuated by a small and low energy electro-magnet, instead of by means of wire (16), since its task is limited to overcoming the friction between the two surfaces: (17) and (18).









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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 0197

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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