

(19)



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(11)

EP 1 001 069 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
12.11.2003 Bulletin 2003/46

(51) Int Cl.7: **D06F 37/42**

(21) Application number: **98110197.5**

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

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

Vorrichtung zum Fernöffnen von Türen insbesondere bei Waschmaschinen

Dispositif pour ouvrir des portes à distance en particulier dans les machines à laver

(84) Designated Contracting States:
AT BE CH DE DK ES FR GB GR IE IT LI NL SE
Designated Extension States:
SI

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

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

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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] An electro-mechanical device is disclosed, for instance, by EP-A-0 600 390.

[0005] 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.

[0006] 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.

[0007] 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.

[0008] 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 blade 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.

[0009] The invention will be more clearly understood through the description of an example of fulfilments 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.

[0010] With reference to figures 1 to 9 both (1) the device according to the invention and (2) the door hook of a washing-machine.

[0011] The device consists of a body (3) which houses various parts making up the device itself.

[0012] (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.

[0013] 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):

- a cursor (5) in the upper section on which a first spring (6) is inserted;
- a first slide (7) positioned behind this cursor (5) which pushes against the rear end of said first spring (6) and has

a first extension (7') in the lower section that fits inside a second slide (8) which carries the hook locking blade (9) in the front section;

- a second spring (10) inserted between the front wall of the second slide (8) and the wall of the first extension (7') of the first slide (7) therefore by exerting pressure on blade (9) of the second slide (8) the said second spring retracts to move subsequently forward after the pressure is released;
- a third slide (11) positioned behind the first slide (7) which moves sideways with respect to the first slide (7) and that pushes against a surface (17) of the first slide (7) with one of its surfaces (18) when in the rest position, making it possible in given conditions to keep the first spring (6) compressed; the two surfaces (17, 18) are small thereby minimising friction during the separation phase;
- a wire (16) with one end connected to the lower part of the third slide (11) and the other end connected to the release push-button, (not shown in the figure);
- a third spring (13) positioned in the rear section of the device, between the rear part of the body (3) and the cursor end (5);
- a fourth spring (12) positioned between one side wall of body (3) and a second extension (19) of the third slide (11).

[0014] 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.

[0015] A first safety device consists of a third 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.

[0016] Another safety device consists of a fourth extension (15) that forms a rear extension of the second blade 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).

[0017] The mechanism operates as follows.

[0018] With the door in the open position (refer to fig. 1, 2 and 3) cursor (5) is in the fully forward position; the first spring (6) is extended and the fourth spring (12) and third spring (13) are also extended.

[0019] The third extension (14) of cursor (5) is positioned under the machine door locking latch (4), acting as a safety mechanism. The second blade holder slide (8) is also in the fully forward position with the corresponding second spring (10) also extended, (refer to fig. 2).

[0020] The third slide (11) is fully inserted inside its seat with its surface (18) resting against surface (17) of the first slide (7).

[0021] When hook (2) is introduced, refer to fig. 4, 5 and 6 the said hook enters with his head and causes the hook locking blade (9) and the front section of cursor (5) to move backwards therefore compressing the first spring (6) and the second spring (10). Once the hook head moves beyond blade (9) the second spring (10) expands carrying blade (9) under the hook edge, while the hook head maintains its pressure against the forward section of cursor (5), maintaining the first spring (6) compressed against the first slide (7) and maintaining the third spring (13) also 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 the third slide (11) thereby securing the third release slide (11) (refer to fig. 4, 5 and 6) and preventing the door from opening during the complete washing cycle.

[0022] It must be noted that with the various components of the device arranged as described above, the first extension (7') of the first slide (7), which as mentioned previously is introduced inside the body of the second blade carrier slide (8), and the corresponding rear wall of the second blade holder slide (8), against which the said first 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.

[0023] 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.

[0024] Pressing the operating push-button located on the machine control panel by means of wire (16) in this condition displaces the third release slide (11), which requires very little force, since only the friction between the parts in contact (17) of the first slide (7) and (18) of the third slide (11) needs to be overcome. The first spring (6) is subsequently able to extend itself at the rear and to pull the first slide (7) backwards, while the first slide (7) will pull, by its first extension (7'), the second blade holder slide (8) and the blade (9), enabling the machine door hook (2) to disengage (refer to fig. 8).

[0025] The small gap between the first extension (7') of the first slide (7) and the corresponding surface of the second blade carrier slide (8) ensures the latter is firstly pushed by the first extension (7'), this serves the purpose of overcoming the initial separation friction between the hook locking blade (9) and the edge of the hook (2) which rests on blade (9).

[0026] Once hook (2) has moved out of its seat, the expansion of the cursor resetting spring (13) returns cursor (5),

second blade holder slide (8) and first slide (7) to their initial position; in addition, the expansion of the fourth spring (12) returns the third slide (11) to its initial position, as shown in fig. 1, 2 and 3.

[0027] The third slide (11) may be connected to the door opening push-button on the control panel also by a small and low-energy electromagnet.

Claims

1. Device to remotely open doors, in particular of washing machines, comprising a body (3) wherein mechanical sliding means for blocking and releasing the machine door closing hook (2) are arranged, **characterized in that** the mechanical sliding means for blocking and releasing the door closing hook (2) comprise a cursor (5) slidably arranged in said body (3), a first slide (7) slidably pushed towards the rear portion of the cursor (5) by a first spring (6) that is pre-compressed by the front portion of the cursor (5) urged by the hook (2) during the door closing phase, a second slide (8) carrying a blade (9) at the front portion thereof for blocking the door closing hook (2), with the first slide (7) having a first extension (7') cooperating with said second slide (8), the device further comprising a third slide (11) having a surface (18) resting against a corresponding surface (17) of the first slide (7) when the door is in the closed position, thus preventing said first slide (7) from being pushed rearwards by the pre-compressed first spring (6), the third slide (11) being operatively connected to a door opening push-button on a control panel of the machine, so that upon exerting a force on the door opening push-button said third slide (11) is actuated to release said surface (17) of the first slide (7) from resting against the corresponding surface (18) of the third slide (11), thus making said first slide (7) free to be pushed rearwards by the pre-compressed first spring (6) and to accompany the blade-carrying second slide (8) rearwards by its first extension (7'), so as to withdraw the blade (9) to a position suitable to release the door closing hook (2).
2. Device according to claim 1, **characterized in that** the second slide (8) and the blade (9) are subjected to the action of a second spring (10), which is compressed upon insertion of the door closing hook (2) by the backward thrust that the blade (9) receives from the hook head, said second spring (10) expanding once the hook head has passed through, so as to cause the blade (9) to engage under the hook edge.
3. Device according to claim 1, **characterized in that** a third spring (13) is arranged between the cursor (5) and the body (3), said third spring (13) being compressed by the hook head upon insertion of the door closing hook (2) and expanded again once the door closing hook (2) has been released, so as to cause the cursor (5) and the first slide (7) and second slide (8) to return to their positions of rest.
4. Device according to claim 1, **characterized in that** the third slide (11) comprises a second extension (19), a fourth spring (12) being arranged between said second extension (19) of the third slide (11) and the body (3), said fourth spring (12) being compressed by displacement of said third slide (11) upon exerting a force on the door opening push-button, once the door closing hook (2) has been released said fourth spring (12) expanding to push the third slide (11) to its reset position.
5. Device according to claim 1, **characterized in that** the body (3) further houses a door locking device suitable to lock the third slide (11) during operation of the machine by means of a latch (4).
6. Device according to claim 5, **characterized in that** the cursor (5) has a third extension (14) on its rear section, which is placed under the latch (4) of the door locking device when the hook (2) is in a door open position to prevent the latch (4) from dropping when the door is open, in the event the machine start control is operated in these conditions.
7. Device according to claim 5, **characterized in that** the blade-carrying second slide (8) has a fourth extension (15) on its rear section, which is placed under the latch (4) of the door locking device when the hook (2) is in a position wherein the door is not securely closed to prevent the latch (4) from dropping when the door is not securely closed.
8. Device according to claim 1, **characterized in that** the first extension (7') of the first slide (7) and a facing wall of the cooperating second slide (8) are spaced by a small gap, so that, upon expansion of the pre-compressed first spring (6) during the releasing phase of the door closing hook (2), the first extension (7'), before accompanying the second slide (8) rearwards, pushes against it to overcome the initial separation friction between the blade (9) and the engaging edge of the hook (2) resting against the blade (9).

9. Device according to claim 1, **characterized in that** the third slide (11) is connected to the door opening push-button on a control panel of the machine by a flexible wire (16).
10. Device according to claim 1, **characterized in that** the third slide (11) is connected to the door opening push-button on a control panel of the machine by a small and low-energy electromagnet.

Patentansprüche

1. Vorrichtung zum Fernöffnen von Türen, insbesondere bei Waschmaschinen, umfassend einen Körper (3), in welchem mechanisch verschiebbare Elemente für das Arretieren und Freigeben des Schließhakens (2) der Maschinentür angeordnet sind, **dadurch gekennzeichnet, dass** die mechanisch verschiebbaren Elemente für das Arretieren und Freigeben des Schließhakens (2) der Tür einen im Körper (3) angeordneten Gleitstein (5), einen ersten Schieber (7), der in Richtung des Hinterbereichs des Gleitsteins (5) durch eine erste Feder (6) gedrückt wird, die durch den Stirnabschnitt des durch den Schließhaken (2) während des Vorganges des Türschließens beanspruchten Gleitsteins (5) vorgespannt ist, einen zweiten Schieber (8), der ein Blatt (9) am dessen Vorderabschnitt für das Arretieren des Türschließhakens (2) trägt, wobei mit dem ersten einen ersten Ansatz (7') besitzenden Schieber (7) der zweite Schieber (8) zusammenwirkt, umfassen, wobei die Vorrichtung weiters einen dritten Schieber (11) mit einer Oberfläche (18) umfasst, die sich auf der entsprechenden Oberfläche (17) des ersten Schiebers (7) abstützt, sobald die Tür sich in der Schließposition befindet, wobei der erste Schieber (7) somit verhindert wird, durch die erste, vorgespannte Feder (6) zurückversetzt zu werden, wobei der dritte Schieber (11) wirksam mit einer Tür öffnenden Drucktaste an einer Schalttafel der Maschine so verbunden ist, so dass die durch Kraftausübung auf die Tür öffnende Drucktaste der dritte Schieber (11) betätigt wird, um die Oberfläche (17) des ersten Schiebers (7) von der abgestützten, entsprechenden Oberfläche (18) des dritten Schiebers (11) freizugeben, wobei der erste Schieber (7) durch die vorgespannte erste Feder (6) freigegeben wird, um zurückgeschoben zu werden und den das Blatt tragenden zweiten Schieber (8) über seinen ersten Ansatz (7') zurück zu begleiten, so wie das Blatt (9) in eine Position zurückgezogen wird, die geeignet ist, um den türschließenden Haken (2) freizulassen.
2. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der zweite Schieber (8) und das Blatt (9) der Wirkung einer zweiten Feder (10) unterliegen, die beim Einbringen des Türschließhakens (2) durch den Rückwärtsschub zusammengedrückt wird, den das Blatt (9) über den Hakenkopf erfährt, wobei die zweite Feder (10) entspannt wird, sobald der Hakenkopf einmal passiert ist, so wie das Blatt (9) dazu gebracht wird, die Hakenecke zu untergreifen.
3. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** eine dritte Feder (13) zwischen dem Gleitstein (5) und dem Körper (3) angeordnet ist, wobei die dritte Feder (13) durch den Hakenkopf beim Einbringen des Türschließhakens (2) gespannt und wieder entspannt wird, sobald der Türschließhaken (2) freigelassen wird, so wie der Gleitstein (5) und der erste Schieber (7) und der zweiten Schieber (8) dazu gebracht werden, in deren Ruhepositionen zurückzubringen.
4. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der dritte Schieber (11) einen zweiten Ansatz (19) umfasst, wobei eine vierte Feder (12) zwischen dem zweiten Ansatz (19) des dritten Schiebers (11) und dem Körper (3) angeordnet ist, die vierte Feder (12) durch die Verschiebung des dritten Schiebers (11) unter Ausübung einer Kraft auf die türöffnende Drucktaste gespannt wird, sobald der Türschließhaken (2) die vierte Feder (12) freigelassen hat, die bei Verschiebung des dritten Schiebers (11) in seine rückgesetzte Position zu entspannt wird.
5. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der Körper (3) ferner eine türverschließende Vorrichtung aufnimmt, die geeignet ist, den dritten Schieber (11) während des Vorgangs der Maschine mittels Riegelmittel (4) zu sperren.
6. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet dass** der Gleitstein (5) einen dritte Ansatz (14) in seinem hinteren Abschnitt aufweist, der unter dem Riegel (4) der türverschließenden Anordnung angeordnet ist, wenn der Haken (2) in einer offenen Position der Tür ist, um das Herunterfallen des Riegels (4) zu vermeiden, wenn die Tür offen ist, im Falle, wo die Maschinenstartkontrolle unter diesen Bedingungen arbeitet.
7. Vorrichtung nach Anspruch 5, **dadurch gekennzeichnet dass** der das Blatt tragende zweite Schieber (8) einen vierten Ansatz (15) in seinem hinteren Abschnitt aufweist, der unter dem Riegel (4) der türverschließenden Anordnung angeordnet ist, wenn der Haken (2) sich in einer Position befindet, in der die Tür nicht sicher geschlossen

ist, um das Herabfallen des Hakens (4) zu vermeiden, wenn die Tür nicht sicher geschlossen ist.

8. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der erste Ansatz (7') des ersten Schiebers (7) und eine Verkleidungswand des mitwirkenden, zweiten Schiebers (8) so unter Belassung einer kleinen Spalte beabstandet sind, dass unter Entspannung der vorgespannten, ersten Feder (6) während des Freigabeschrittes des türschließenden Hakens (2), der erste Ansatz (7'), bevor der zweite Schieber (8) zurückbegleitet wird, diesen entgegen verschiebt, um die anfängliche Trennreibung zwischen dem Blatt (9) und der eingreifenden Ecke des gegen das Blatt (9) abgestützten Hakens (2) zu überwinden.
9. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der dritte Schieber (11) mit der türöffnenden Drucktaste an der Schalttafel der Maschine über einen biegsamen Draht (16) verbunden ist.
10. Vorrichtung nach Anspruch 1, **dadurch gekennzeichnet dass** der dritte Schieber (11) mit der türöffnenden Drucktaste an einer Schalttafel der Maschine mit einem kleinen und niedrige Energie beanspruchenden Elektromagnet verbunden ist.

Revendications

1. Dispositif pour ouvrir des portes à distance en particulier dans les machines à laver comprenant un corps (3) dans lequel sont arrangés des moyens de coulissement mécanique pour bloquer et libérer le crochet (2) de fermeture de la porte, **caractérisé en ce que** les moyens de coulissement mécanique pour bloquer et libérer le crochet (2) de fermeture de la porte comprennent un curseur (5) disposé de manière coulissante dans ledit corps (3), un premier coulisseau (7) poussé de manière coulissante vers la portion arrière du curseur (5) par un premier ressort (6) qui est précontraint par la portion avant du curseur (5) poussé par le crochet (2) pendant la phase de fermeture de la porte, un deuxième coulisseau (8) portant une lame (9) à sa partie avant pour bloquer le crochet (2) de fermeture de la porte, avec le premier coulisseau (7) qui a une première extension (7') coopérant avec ledit deuxième coulisseau (8), le dispositif comprenant en outre un troisième coulisseau (11) ayant une surface (18) prenant appui contre une surface correspondante (17) du premier coulisseau (7) quand la porte se trouve en position fermée, de manière à empêcher que ledit premier coulisseau (7) soit poussé en arrière par le premier ressort précontraint (6), le troisième coulisseau (11) étant relié de manière opérante à un poussoir d'ouverture de la porte sur un tableau de commande de la machine, de sorte que lorsqu'on exerce une force sur le poussoir d'ouverture de la porte il y a l'entraînement dudit troisième coulisseau (11) pour éliminer le contact en appui de ladite surface (17) du premier coulisseau (7) contre la surface correspondante (18) du troisième coulisseau (11), ceci permettant que ledit premier coulisseau (7) puisse être poussé en arrière par le premier ressort précontraint (6) et puisse déplacer en arrière, par sa première extension (7'), ledit deuxième coulisseau (8) portant la lame, de manière à retirer la lame (9) à une position apte à libérer le crochet (2) de fermeture de la porte.
2. Dispositif selon la revendication 1, **caractérisé en ce que** le deuxième coulisseau (8) et la lame (9) sont soumis à l'action d'un deuxième ressort (10) qui est comprimé lors de l'insertion du crochet (2) de fermeture de la porte par la poussée en arrière que la lame (9) reçoit de la part de la tête du crochet, ledit deuxième ressort (10) étant soumis à expansion dès qu'il est traversé par la tête du crochet, de manière à amener la lame (9) à s'engager au-dessous du bord du crochet.
3. Dispositif selon la revendication 1, **caractérisé en ce qu'un** troisième ressort (13) est arrangé entre le curseur (5) et le corps (3), ledit troisième ressort (13) étant comprimé par la tête du crochet lors de l'insertion du crochet (2) de fermeture de la porte et étant soumis de nouveau à expansion dès que le crochet (2) de fermeture de la porte a été libéré, de manière à amener le curseur (5) et le premier coulisseau (7) et le deuxième coulisseau (8) à retourner à leurs positions de repos.
4. Dispositif selon la revendication 1, **caractérisé en ce que** le troisième coulisseau (11) comporte une deuxième extension (19), un quatrième ressort (12) étant arrangé entre ladite deuxième extension (19) du troisième coulisseau (11) et le corps (3), ledit quatrième ressort (12) étant comprimé par le déplacement dudit troisième coulisseau (11) quand on exerce une force sur le poussoir d'ouverture de la porte, dès que le crochet (2) de fermeture de la porte a été libéré ledit quatrième ressort (12) étant soumis à expansion pour pousser le troisième coulisseau (11) à sa position de repos.
5. Dispositif selon la revendication 1, **caractérisé en ce que** le corps (3) loge en outre un dispositif de verrouillage

de la porte apte à verrouiller le troisième coulisseau (11) par un verrou (4) pendant le fonctionnement de la machine.

- 5 6. Dispositif selon la revendication 5, **caractérisé en ce que** le curseur (5) a une troisième extension (14) sur sa section arrière, laquelle est placée au-dessous du verrou (4) du dispositif de verrouillage de la porte quand le crochet (2) est en position d'ouverture de la porte pour empêcher que le verrou puisse tomber quand la porte est ouverte, si l'on actionne dans ces conditions la commande de départ de la machine.
- 10 7. Dispositif selon la revendication 5, **caractérisé en ce que** le deuxième coulisseau (8) portant la lame a une quatrième extension (15) à sa section arrière, laquelle est mise au-dessous du verrou (4) du dispositif de verrouillage de la porte quand le crochet (2) se trouve à une position dans laquelle la porte n'est pas fermée en sécurité pour empêcher la chute du verrou (4) quand la porte n'est pas verrouillée fermement.
- 15 8. Dispositif selon la revendication 1, **caractérisé en ce que** la première extension (7') du premier coulisseau (7) et une paroi en regard du deuxième coulisseau coopérant (8) sont espacées par un petit intervalle de sorte que, lors de l'expansion du premier ressort précontraint (6) pendant la phase de libération du crochet (2) de fermeture de la porte, la première extension (7'), avant d'accompagner le deuxième coulisseau (8) en arrière, exerce une force contre ce dernier pour surmonter le frottement initial de séparation entre la lame (9) et le bord d'engagement du crochet (2) prenant appui contre la lame (9).
- 20 9. Dispositif selon la revendication 1, **caractérisé en ce que** le troisième coulisseau (11) est relié au poussoir d'ouverture de la porte sur un tableau de commande de la machine par un câble flexible (16).
- 25 10. Dispositif selon la revendication 1, **caractérisé en ce que** le troisième coulisseau (11) est relié au poussoir d'ouverture de la porte sur un tableau de commande de la machine par un petit électro-aimant basse énergie.





