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(54) Top-loading clothes washing machine with two drum door flaps

(57) A top-loading clothes washing machine comprises a drum (18) with a peripheral wall formed with an opening (19) for loading and unloading cloth items, said opening being provided with two oppositely located and partially overlapping door flaps (20,22) hingedly connected to opposite edges of said opening and provided with spring means (S) biasing them towards their open positions. The door flaps (20,22) are provided with hook and slot means (23,50) for keeping the door flaps in their closed positions, such means presenting at least one hook (23) placed on the inner surface (K) of one of said door flaps (20,22).

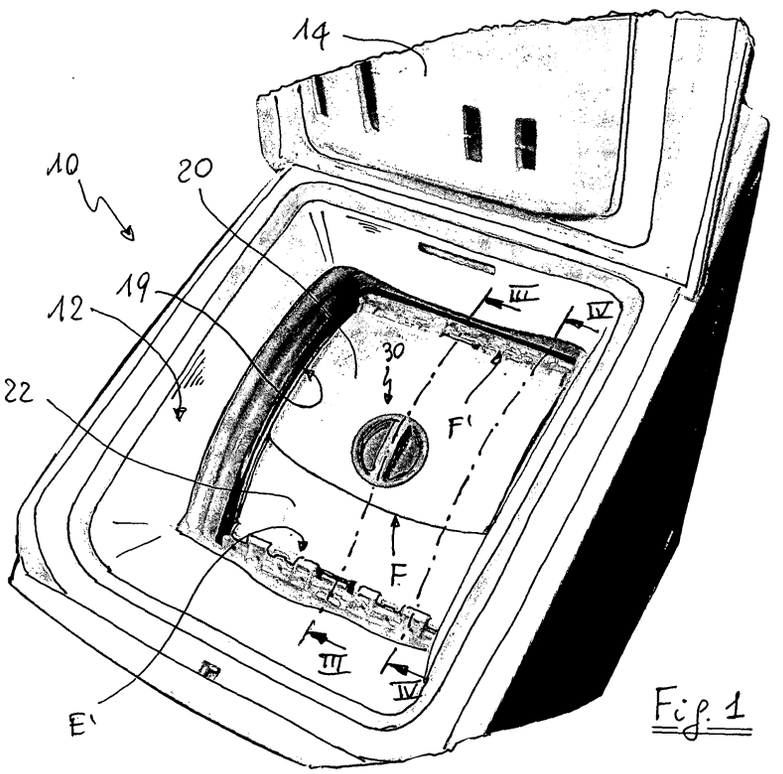

Fig. 1

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Description

[0001] The present invention relates to a top-loading clothes washing machine comprising a drum with a pheripheral wall formed with an opening for loading and unloading cloth items, said opening being provided with two oppositely located and partially overlapping door flaps hingedly connected to opposite edges of said opening and provided with springs means biasing them towards their open positions, said door flaps being provided with hook and slot means for keeping the door flaps in their closed positions.

[0002] In the known top-loading washing machines, as shown for instance in FR-A-2793265, one of the door flaps comprises one or more hooks on the outer surface of the flap, which are adapted to cooperate with slots provided in the other door flap. The two door flaps are urged by torsion or coil springs towards an open configuration, i.e. a configuration in which both door flaps are turned outside. Even if such system is simple, nevertheless the presence of the hooks on the outer surface of one of the flaps implies a risk of hurting the hands of the user, especially during the opening of the door, due to the acceleration impressed by the springs. Another disadvantage of the known systems is the noise that is made if the door flaps are opened with one hand. These reasons lead the user to handle the opening and closing of the door flaps always with both hands. This is not always practical, especially when the user has to open the door flaps for loading laundry into the drum, since one hand is often used for supporting a container with laundry.

[0003] According to the present invention, the above disadvantages are overcome thanks to the features listed in the appended claims.

[0004] According to a preferred embodiment of the invention, the two door flaps comprise an unlocking device adapted to be driven by the user and comprising a movable element for urging the door towards an open configuration by disengaging said hook means. Thanks to this further feature, the user can act on the movable element, which is preferably placed on the door flap having bigger dimension, with one hand only.

[0005] According to another preferred feature of the invention, the two door flaps comprise a safety device having a movable element for preventing accidental opening of the door flaps caused by laundry that could eventually pulls the door flaps inside. Such safety device is adapted to be unlocked by the user together with said unlocking device.

[0006] According to a further feature of the invention, both door flaps present a metal structure co-moulded (and therefore over-moulded) with a polymeric material. This co-moulding process for producing the two door flaps assures a very smooth surface of the door flaps, and it allows to have a predetermined thickness of the door flaps, particularly of the door flap provided with slots for the hooks, so that such hooks do not protrude from the slot inside the drum, avoiding any risk of damaging laundry.

[0007] The invention will be explained in the following description on the basis of an example of embodiments shown in the drawings in which:

- Figure 1 shows a perspective view of a partially sectioned washing machine according to the present invention,
- Figure 2 is a perspective enlarged view of a door flap of the machine of figure 1,
- Figure 3 is a section taken along line III - III of figure 1,
- Figure 4 is a section taken along line IV - IV of figure 1,
- Figure 5 is a perspective enlarged view of the other door flap of the washing machine of figure 1, from which a knob component has been removed,
- Figure 6 is a perspective view of the knob component removed from figure 5,
- Figure 7 is a perspective bottom view of the component of figure 6,
- Figure 8 is a perspective view of the inner face of the door flap of figure 5, from which the knob component and a safety locking device has been removed,
- Figure 9 is a partial view similar to figure 8, in which both the knob component and the safety locking device are present,
- Figure 10 is a perspective enlarged view of the safety locking device shown in figure 9,
- Figure 11 is a perspective view of the sliding element used in the safety locking device of figure 10,
- Figure 12 is a top view (from the outside of the drum) of the two door flaps, in a closed configuration thereof, and in which one of the door flaps is shown without the covering of polymeric material,
- Figure 13 is a perspective view of the washing machine during the closure of the door flaps, and
- Figure 14 is a perspective view of the washing machine during the opening of the door flaps.

[0008] With reference to the drawings, a top-loading clothes washing machine comprises a structural frame 10, an opening 12 closed by a lid 14, a tub (not shown) suspended in the frame 10 and a drum 18 having an horizontal axis rotatably mounted in the tub and provided with a peripheral wall formed with an opening 19 for the introduction and discharge of the laundry.

[0009] Hingedly connected to opposite transverse edges of opening 19 is a pair of door flaps 20 and 22, respectively, adapted to be brought to a partially overlapping relationship in their closed positions, as shown in figure 1. Door flaps 20, 22 are of arched configuration so as to conform to the circular profile of the drum in their closed positions.

[0010] Adjacent their respective hinged connections, door flaps 20 and 22 are each provided with at least one

coil spring S (figure 12) adapted to bias the respective door flap towards its upright open position. Each of the door flap 20 and 22 presents a metal structure 20a and 22a respectively (figures 3, 4 and 12) which is over-moulded with a polymeric material P.

[0011] A first door flap 20, called also "back door" and more distant from the front face of the washer 10 (i.e. closer to the hinge of the lid 14 than a second door flap 22) has preferably a bigger dimension than the second door flap 22, this latter called also "front door". The back door 20 presents, on its inner surface K (i.e. on its surface facing the inside of the drum) a couple of hooks 23 which are part of the metal frame 20a of the door flap (figure 12). The hooks 23 are placed at a predetermined distance L from an edge F of the back door 20 opposite to the transverse edge F' hinged to the opening 19. The back door 20 has also a circular seat 24, placed substantially adjacent the edge F. The circular seat 24 has a bottom wall 24a with two openings: a first central butterfly-shaped opening 26 and a second offset segment-shaped opening 28. The circular seat 24 is formed in a zone of the back door 20 where the metal structure 20a is lacking, i.e. it is shaped in the co-moulded polymeric material P, as it is clearly shown in figure 12. In the circular seat 24 it is rotatably mounted a cylindrical knob 30 having an upper face with a grip portion 30a and a lower face with an axle 30b with two opposite radial fins 32. The knob 30 presents a sidewall 30c with a downwardly oriented tooth-shaped cam 34. In the installed configuration of the knob 30, the cam 34 can move in the opening 28 of the seat 24, when the knob is rotated by the user, while at the same time the radial fins 32 can rotate in the opening 26. This latter is also the stop for the rotation of the knob 30.

[0012] The knob 30 is rotatably mounted by means of a central screw 36 (figure 3) cooperating with a shell 38a of a safety locking device 38 installed, by means of a screw 40, on the inner face K of the back door 20. In the shell 38a is slidably mounted a slider 42 having a tooth shaped end 42a and a second end 42b on which a spring 44 is acting. The spring 44 is interposed between the slider 42 and the shell 38a. The slider 42 is further provided with a shaped opening 42c through which the screw 36 is mounted, and having two surfaces 46a and 46b where the fins 32 of the knob 30 can act, upon rotation (in whatever direction) of the knob 30, against the force exerted by the spring 44. When the user does not rotate the knob, the force of the spring 44 urges the end 42a of the slider 42 to protrude from an opening H of the shell 38a, as shown in figures 3, 10 and 9, and it keeps also the cam 34 in its central position in the opening 28 of the back door 20, as shown in figures 3 and 9.

[0013] The second door flap 22, or front door, is smaller that the back door 20 and presents, adjacent its edge E opposite its transverse edge E' hinged to the opening 19, two slots 50 and a circular small groove 52 with slanted ends 52a and 52b respectively and adapted to cooperate with the tooth shaped cam 34 of the knob 30.

[0014] The closing of the two door flaps 20 and 22 is similar to the closing of the known washing machines. As shown in figure 13, the user with one hand pushes down the front door 22 and with his second hand pushes down the back door 22 so that the hooks 23 can engage the slots 50. At the same time, the end 42a of the slider 42 glides against the edge E of the front door 22, and it snap-engages on such edge. In the closed configuration of the drum, shown in figures 3 and 4, the end 42a of the slider 42 overlaps the inner surface of the edge E, while the hooks 23 are inside the corresponding slots 50. In such configuration, the cam 34 of the knob 30 is within the groove 52, in the central portion thereof. The shape of the hooks 23 and the force exerted by the springs S of the door flaps prevent the door flaps 20 and 22 from opening, even in presence of forces exerted by cloth items inside the drum. The slider 42, with its end portion 42a, has the function of a safety lock for avoiding any accidental aperture of the door flaps during the washing cycle of the machine.

[0015] When the user wants to open the door of the drum, he has only to rotate with one hand the knob 30 (figure 14) in a clockwise or anti-clockwise direction. During such rotation, one of the two fins 32 acts on one of the surfaces 46a and 46b of the slider 42, causing its movement against the spring 44 and disengaging the end 42a from the edge E of the front door 22. At the same time the cam 34 glides on the bottom surface of the groove 52, particularly on one of the slanted ends 52a thereof, therefore exerting a force which moves the door flaps 20 and 22 one from the other. During such movement, the hooks 23 disengage from the slots 50. In this condition it is only the hand of the user, which still grips the knob 30, that keeps the front door 22 still under the back door 20. When the edge F of the back door 20 is no longer overlapping the edge E of the front door 22, i.e. when the edge E of the front door 22 steps over the edge F of the back door 20, the front door 22 does continue to rotate thanks to its spring S. Even if such movement is not controlled by the user, the reduced dimension of the front door 22, combined with the smoothness of its front edge E (co-moulded) and the absence of hooks, does not create any harm for the user. On the other hand, since the user has still his hand on the knob 30, it is perfectly natural for him to "guide" the back door 20 up to its final upright position. In this configuration, the small dimension of the hooks 23 and their distance from the edge F' of the back door 20 hinged to the drum (due to the higher dimension of the back door 20 compared to the dimension of the front door 22) prevent the cloth items from getting caught on such hooks during loading and unloading of laundry.

[0016] In the close configuration of the door flaps, as it is clearly shown in figure 4, the hooks does not protrude from the respective slots 50, also thanks to the high thickness of the front door 22 assured by the co-moulding process. This prevents the cloth items from being damaged by such hooks 23 during the washing

cycle. Moreover the use of the safety-locking device 38 does allow having hooks 23 of very limited height.

[0017] The invention has only been described by means of the above example and it is therefore pointed out that it can be realised in many ways within the scope of the inventive concept and the enclosed claims. For instance, the hooks can be also placed on the front door, and the movable element driving the opening of the door flaps can be different from a knob or lever.

Claims

1. A top-loading clothes washing machine comprising a drum (18) with a peripheral wall formed with an opening (19) for loading and unloading cloth items, said opening being provided with two oppositely located and partially overlapping door flaps (20, 22) hingedly connected to opposite edges of said opening and provided with spring means (S) biasing them towards their open positions, said door flaps being provided with hook and slot means (23, 50) for keeping the door flaps in their closed positions, **characterised in that** said hook and slot means (23, 50) present at least one hook (23) placed on the inner surface (K) of one (20) of said door flaps (20, 22).

2. A top-loading washing machine according to claim 1, **characterised in that** it comprises an unlocking device adapted to be driven by the user and comprising a movable element (30, 34) for urging the door flaps (20, 22) towards an open configuration by disengaging said hook means (23, 50).

3. A top-loading washing machine according to claim 2, **characterised in that** the movable element is a rotating element (30) placed on a first door flap (20) and having a cam portion (34) capable of cooperating with a corresponding guide portion (52, 52a) on a second door flap (22).

4. A top-loading washing machine according to claim 2 or 3, **characterised in that** the unlocking device (30, 34, 52, 52a) comprises a safety locking movable element (42, 42a) for assuring that the hook means (23, 50) are kept engaged when the door flaps are in their closed configuration, such safety locking element (42, 42a) being adapted to be driven by the user together with said movable element (30, 34) for unlocking purposes.

5. A top-loading washing machine according to claims 3 and 4, **characterised in that** the rotating element (30) has a cylindrical shape and presents a first face with a knob portion (30a) and a second face provided with said cam portion (34), the rotating element (30) being rotatably mounted in a seat (24) of the first door flap (20), such seat being provided with an opening (28) for allowing the cam portion (34) to act on the guide portion (52, 52a) of the second door flap (22) when the rotating element (30) is driven by the user, in order to exert a force for disengaging the hook and slot means (23, 50).

6. A top-loading washing machine according to claim 5, **characterised in that**, on an inner face (K) of the first door flap (20) there is provided a sliding element (42) which is adapted to be driven by the rotation of the rotating element (30, 32) and presents an end portion (42a) adapted to engage an edge (E) of the second door flap (22), such sliding element (42) being urged towards its engagement configuration by a spring (44), such end portion (42a) being shaped so as to assure a snap-engagement of the sliding element (42) when the door flaps (20, 22) are closed.

7. A top-loading washing machine according to claim 6, **characterised in that** the rotating element (30) has an axle (30b) with two opposite fins (32) adapted to cooperate with corresponding surfaces (46a, 46b) of the sliding element (42) against the force of said spring (44) in order to retract the sliding element (42) independently on rotation direction of the rotating element (30).

8. A top-loading washing machine according to any of the preceding claims, **characterised in that** between an edge (F) of a first door flap (20) and the hook (23) there being provided a predetermined distance (L).

9. A top-loading washing machine according to claim 8, in which the washing machine (10) is provided with a lid (14) hinged to the machine along an axis substantially parallel to the axis of the drum, **characterised in that** the first door flap (20) is nearer to the hinge of the lid (14) than the second door flap (22).

10. A top-loading washing machine according to claim 8 or 9, **characterised in that** the first door flap (20) is bigger than a second door flap (22).

11. A top-loading washing machine according to any of the preceding claims, **characterised in that** at least one of the door flaps (20, 22) presents a metal structure (20a, 22a) embedded in a polymeric material (P).

12. A top-loading washing machine according to claim 11, **characterised in that** the metal structure (20a) of a first door flap (20) includes the at least one hook (23), while the metal structure (22a) of a second door flap (22) includes the at least one slot (50).

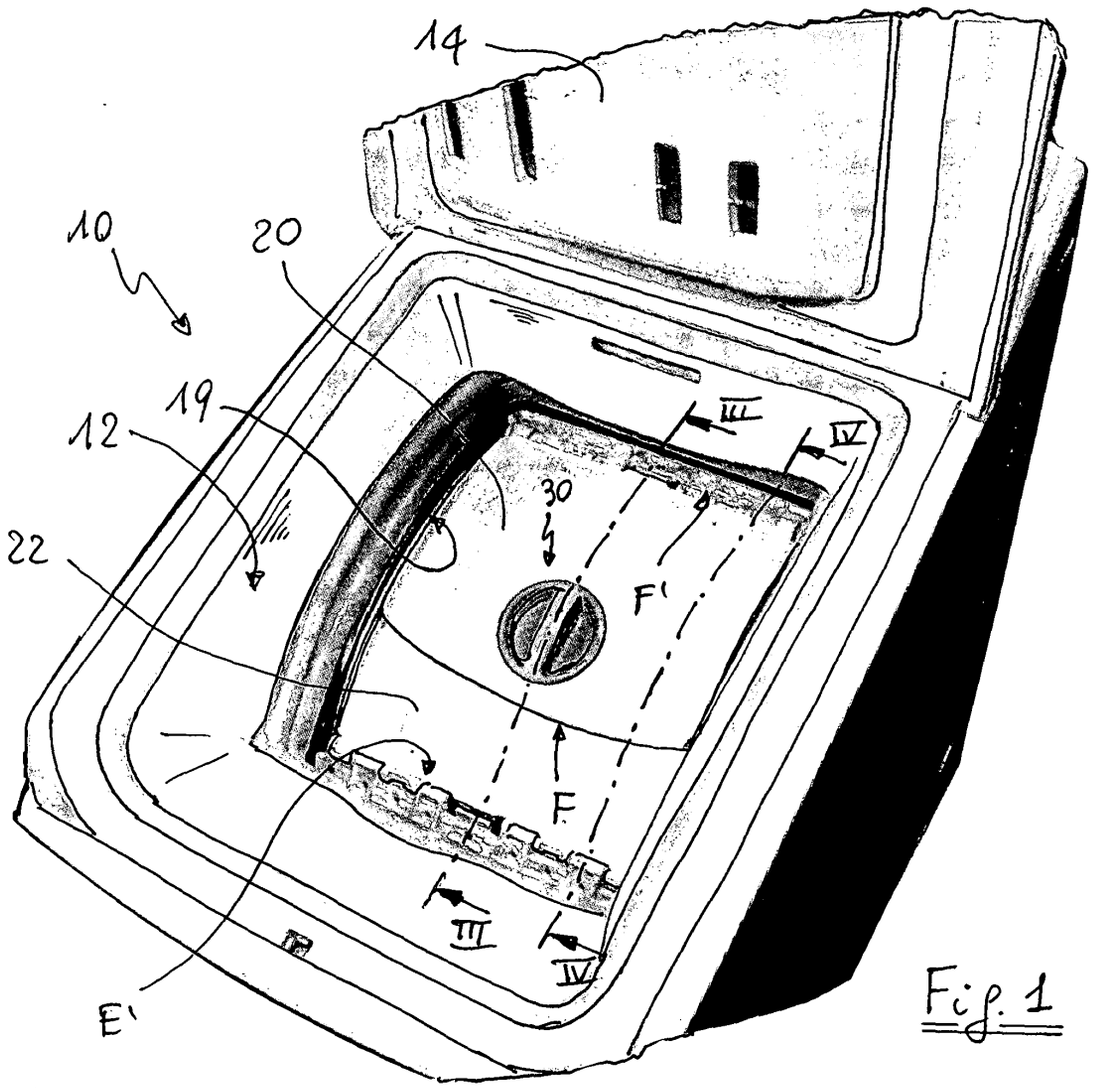

Fig. 1

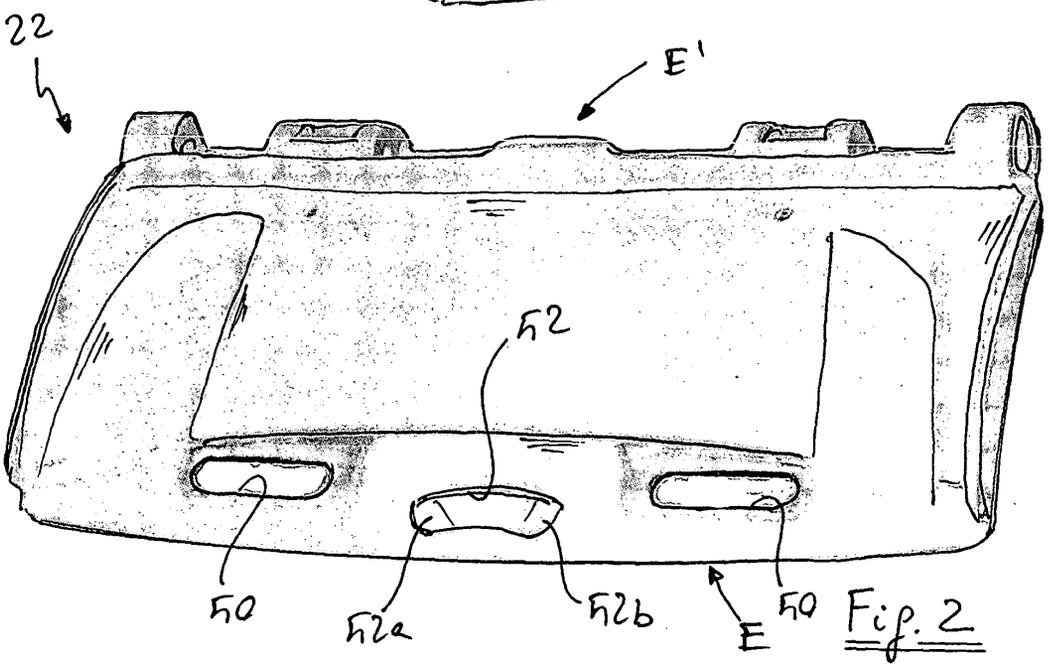

Fig. 2

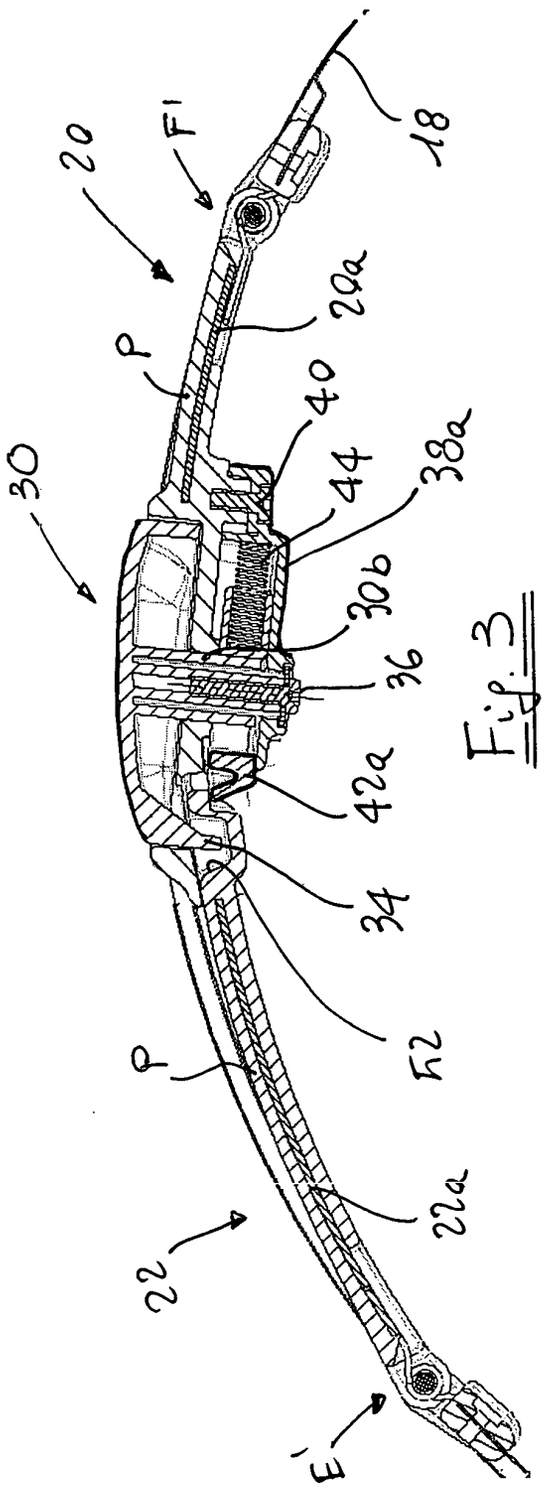
20
F'
18
P
20a
40
44
38a
30
30b
36
42a
34
42
P
22a
22
E'

Fig. 3

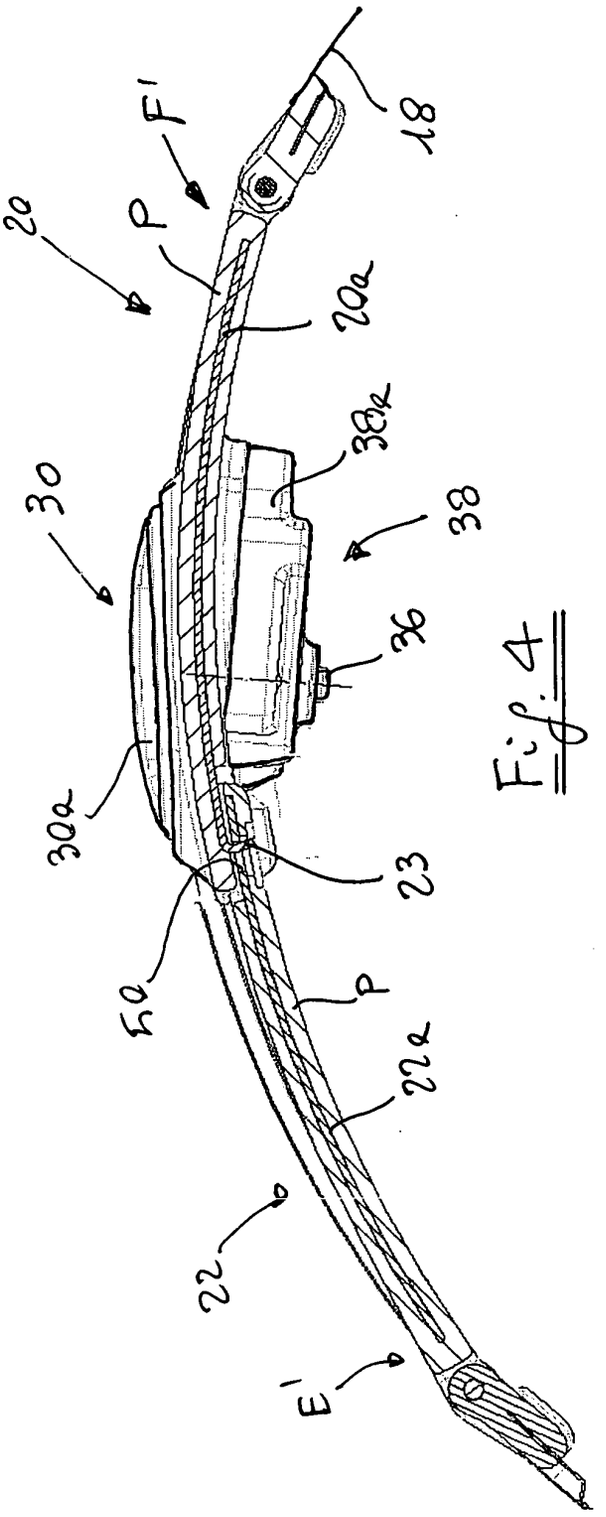
20
F'
18
P
20a
38a
30
38
36
30a
23
50
P
22a
22
E'

Fig. 4

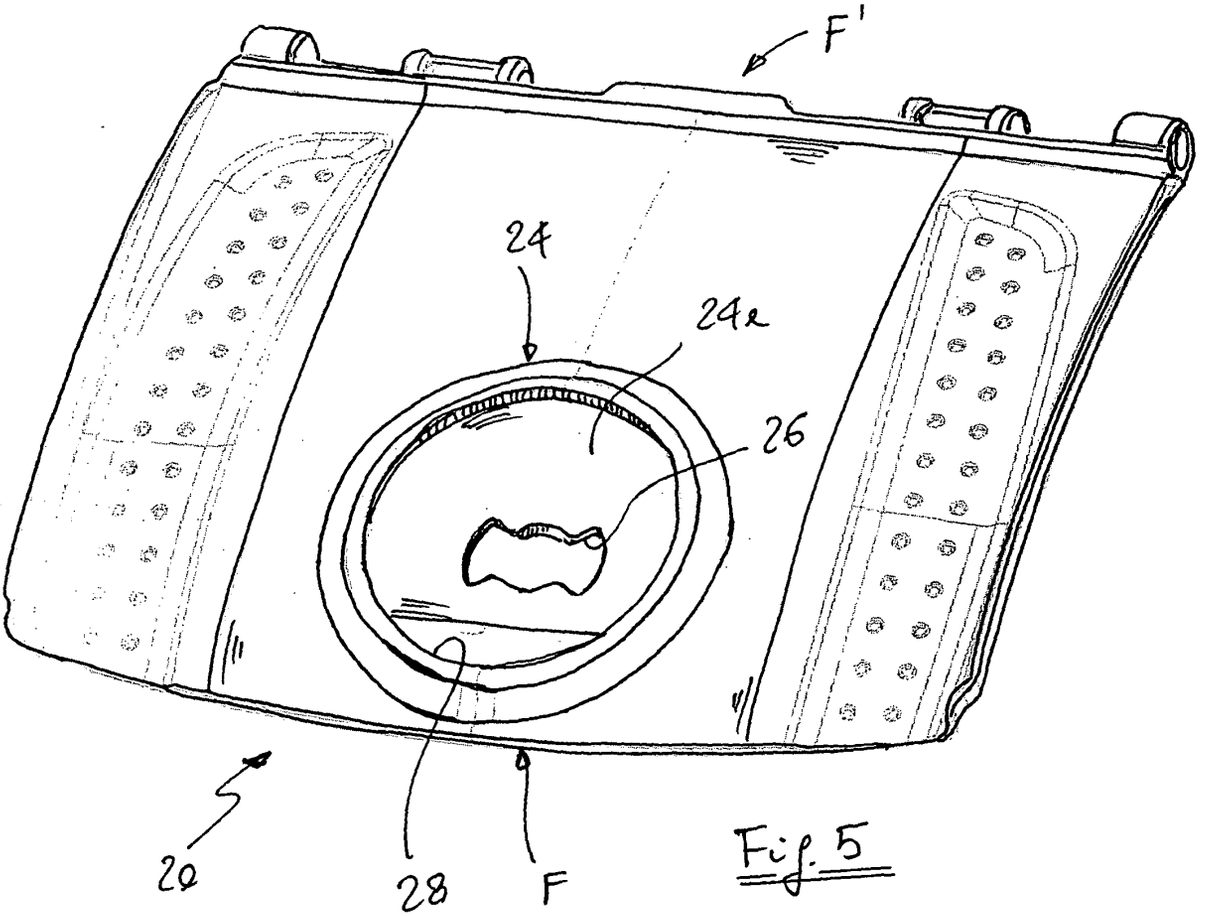

Fig. 5

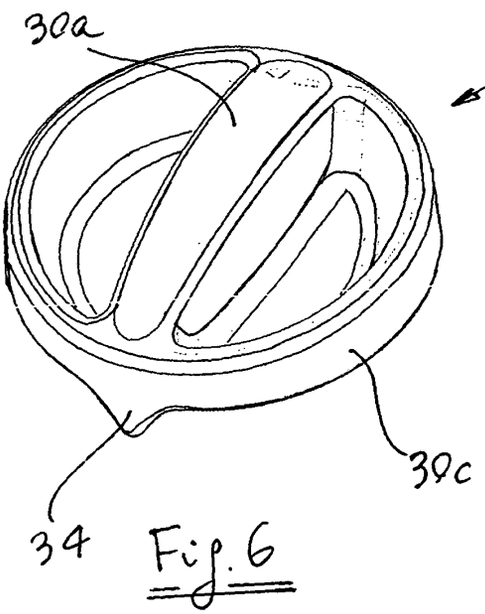

Fig. 6

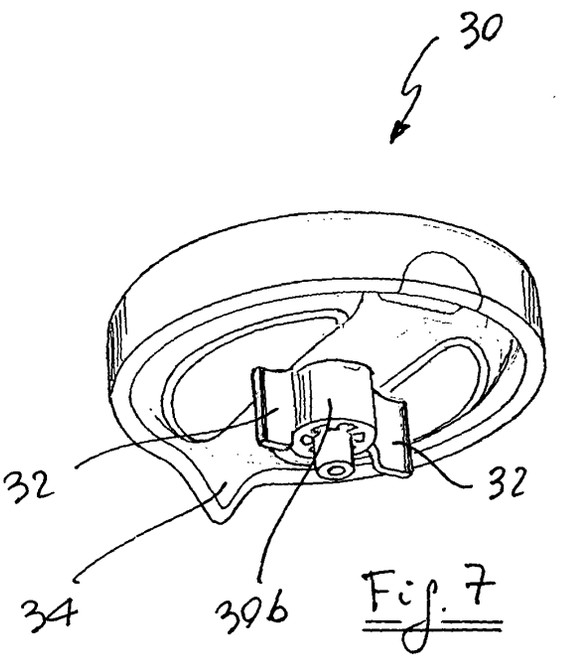

Fig. 7

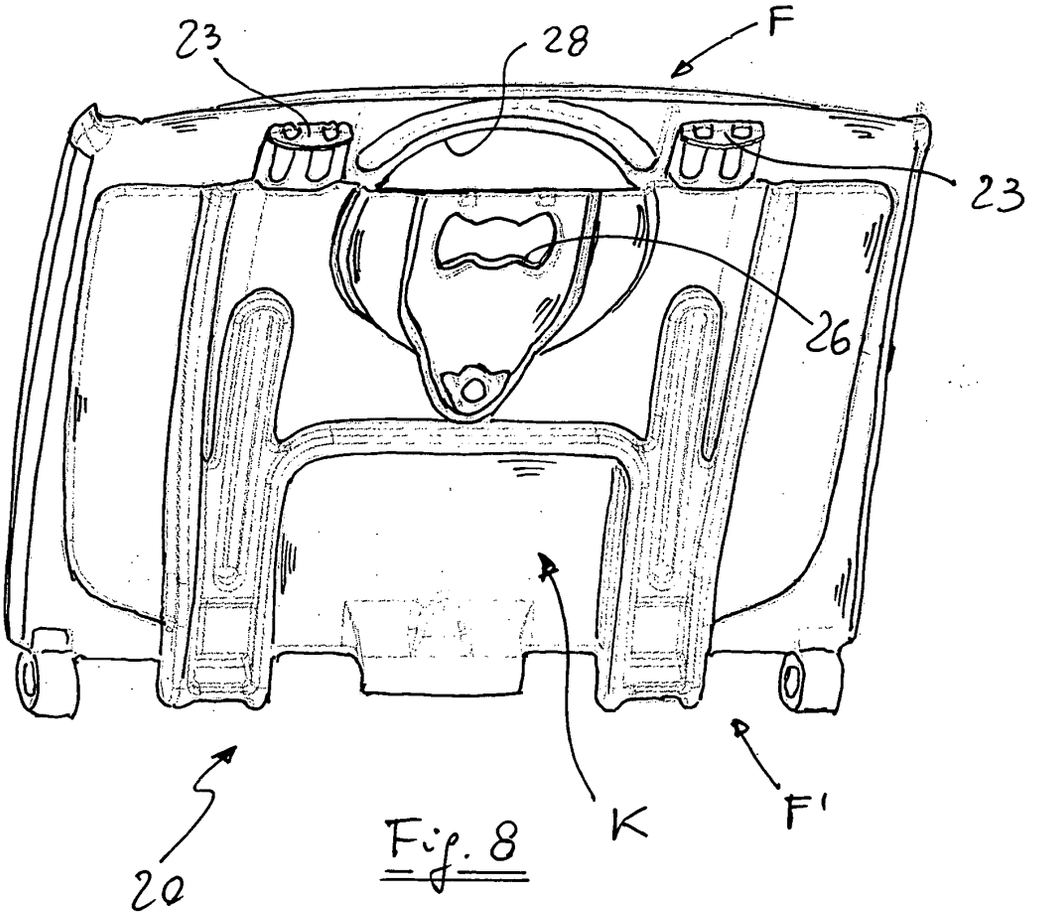

Fig. 8

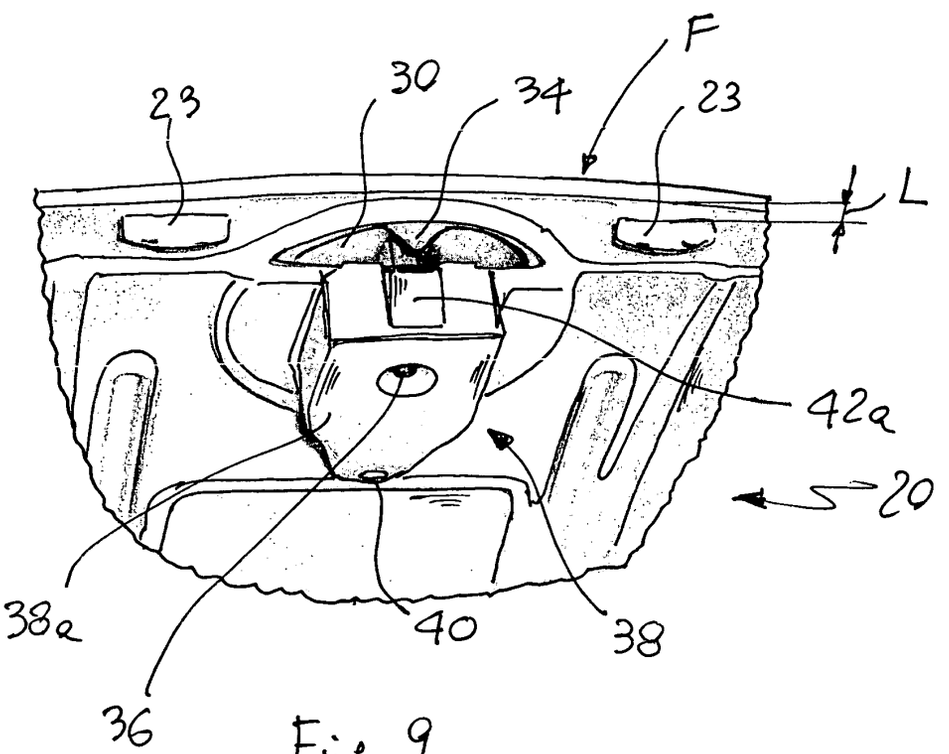

Fig. 9

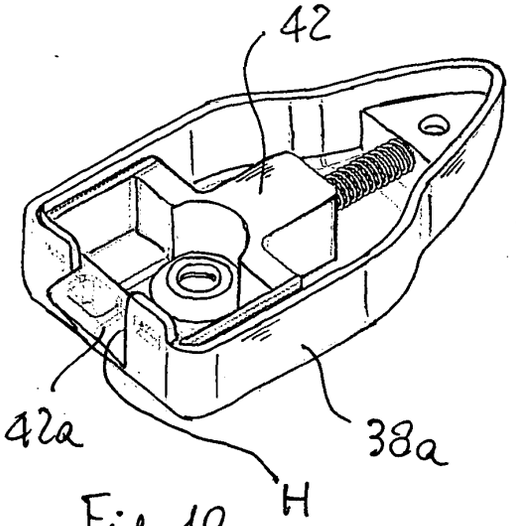

Fig. 10

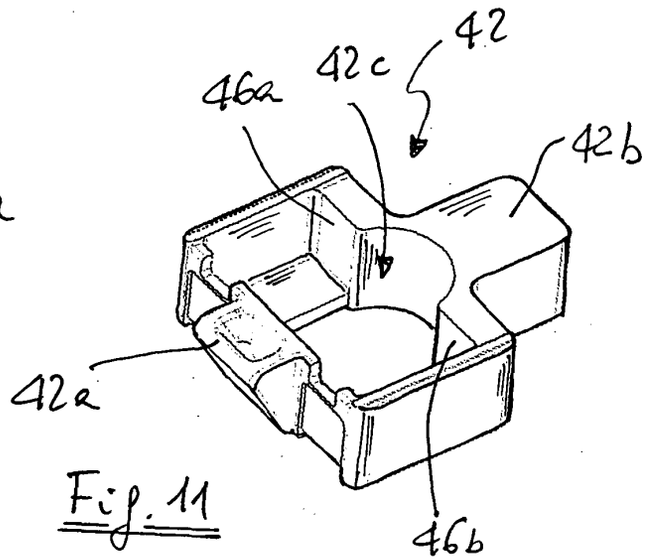

Fig. 11

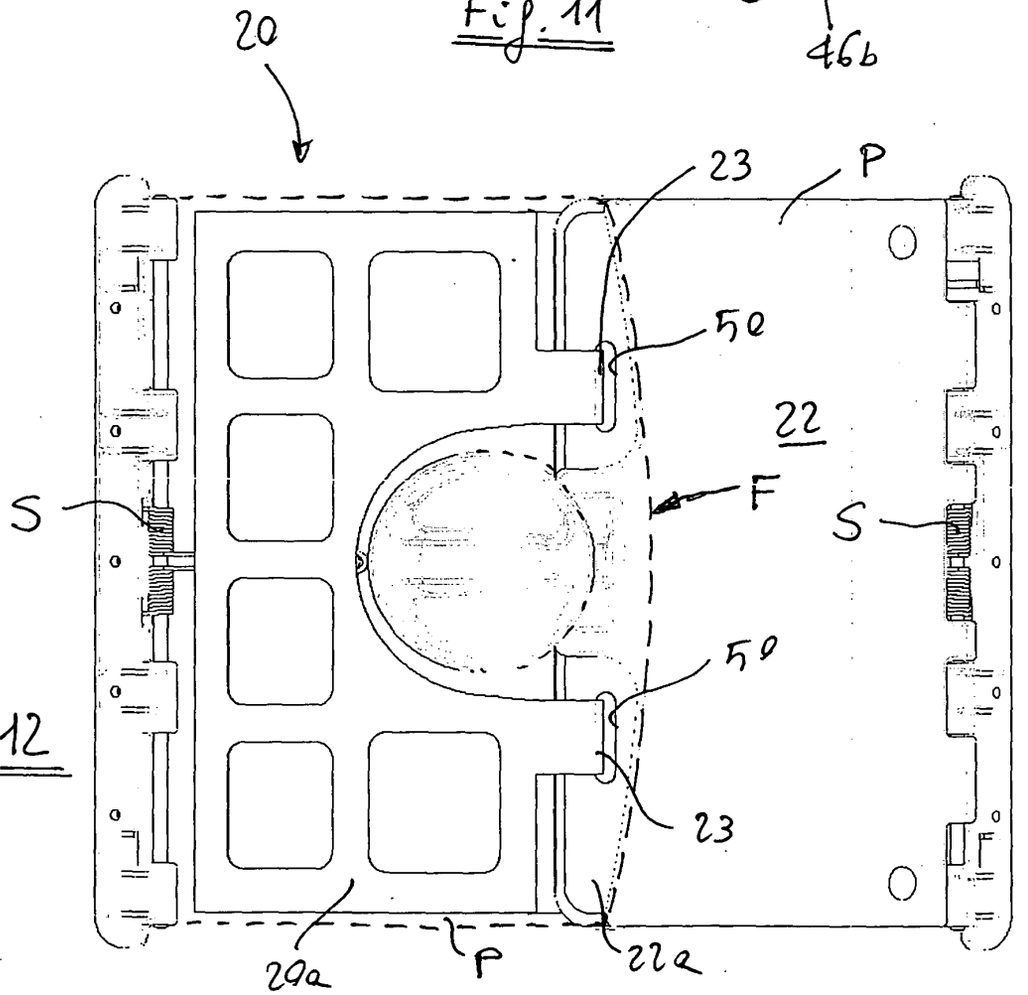

Fig. 12

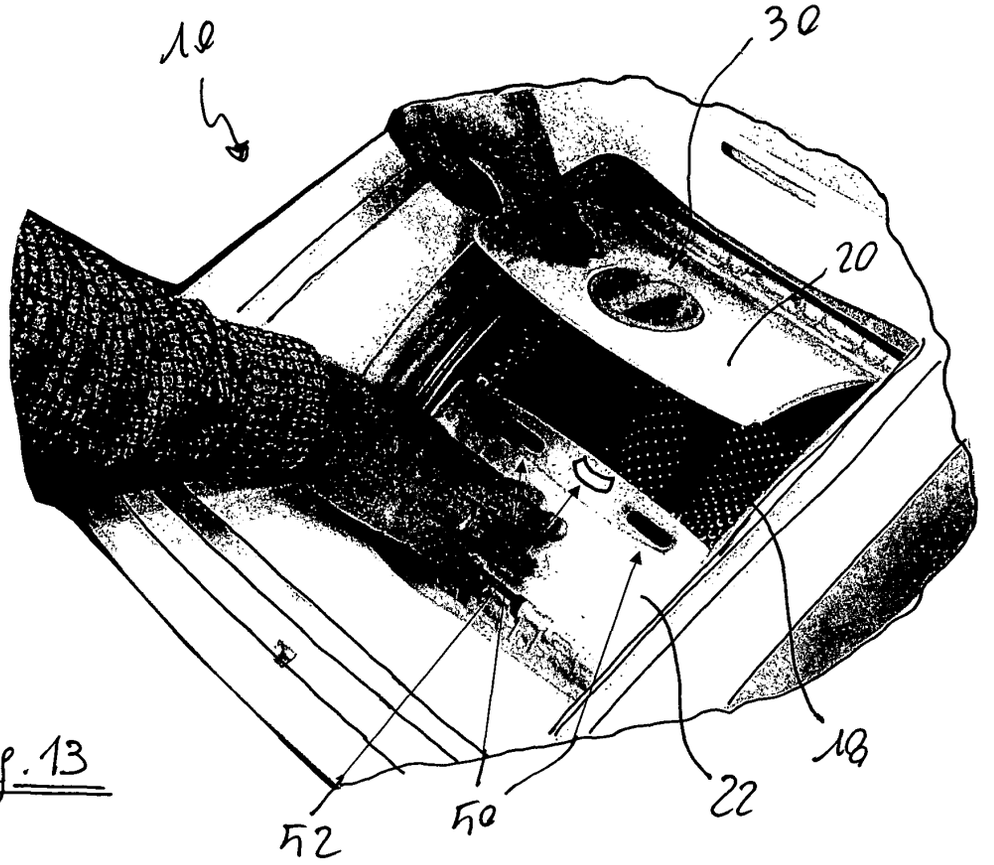

Fig. 13

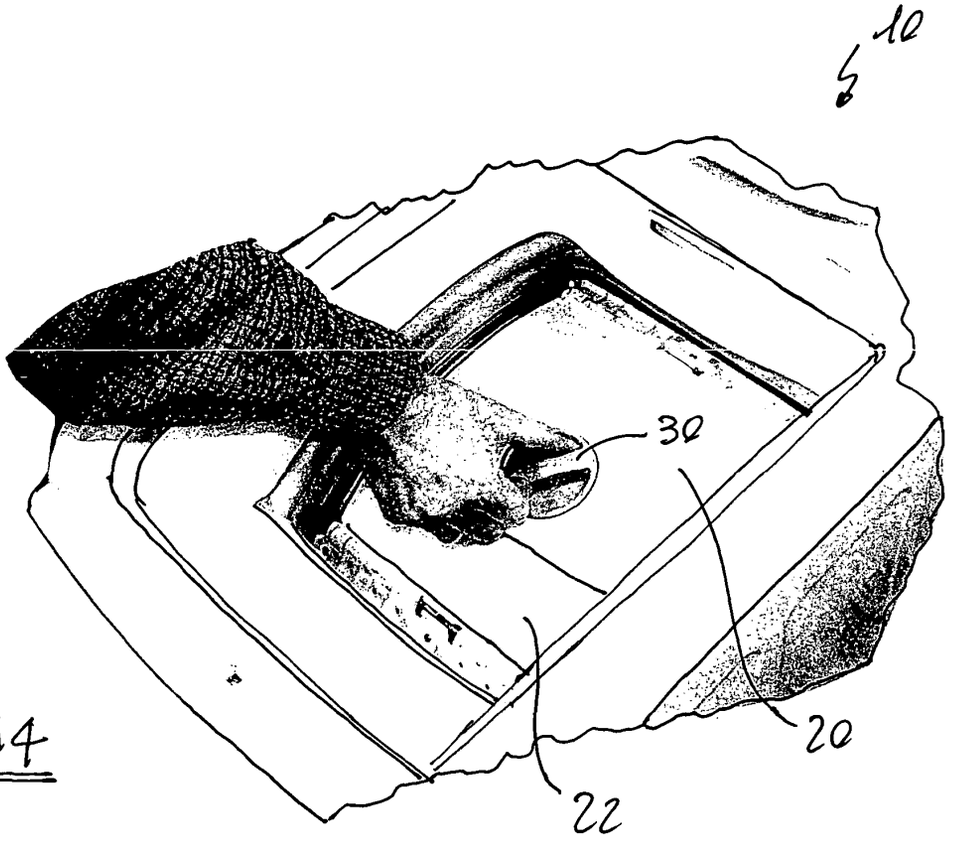

Fig. 14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
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			D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 August 2004	Falkentoft, C

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