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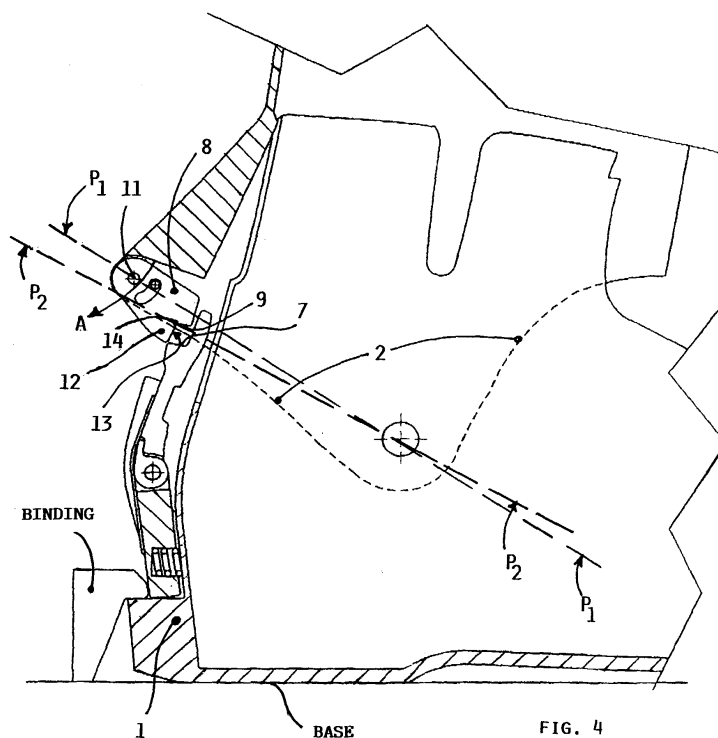
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(54) **Ski boots and similar footwear with safety arrangement**

(57) Ski boot with a lower shell (1) and an upper shell (2) hinged thereon, as well as a vertical locking lever (4) which is provided at the back of the lower shell, on the lower portion thereof, and which is capable of pivotally oscillating about a horizontal, protruding pin (5). A locking member (8) is capable of pivoting about a third pin (11) that is firmly joined to the upper shell, which in turn is capable of pivoting about a pin that is hinged on the lower shell, this member being provided with a lower

surface abutting against the upper surface of the lever when the boot is mounted on the ski binding. This locking member (8) has a working surface that is constituted by two surface portions arranged at an inwardly directed angle with respect to each other. Elastic means are provided to act on the locking member so as to bias it outwardly from below.

Said third pin is mounted on an appropriate support member that is rigidly attached to the upper shell.



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Description

[0001] The present invention refers to an improved safety arrangement for ski boots and similar sports footwear, adapted to ensure the possibility for an upper shell hinged on the lower shell of the boot to pivot backwards in the case of violent backward stresses being imposed to the leg and, therefore, the upper shell that contains and closes it in.

[0002] A boot of this kind usually comprises, on the upper shell, two hem portions or flaps that open apart to allow for the foot to be introduced in the boot and removed therefrom. In order to be protected in an adequate manner, the foot must be fittingly and tightly closed in, especially by the upper shell when said hem portions or flaps thereof are closed.

[0003] The upper shells are usually rather high, since this is how the twofold advantage is obtained of both protecting the articulation of the ankle from any excessive stress that might be imposed thereon and, at the same time, facilitating an effective control of the lateral inclination of the boot, and therefore the ski, by only inclining the leg with respect to the ground, and no longer having to also incline the foot with respect to the leg.

[0004] However, an upper shell that is too rigid unavoidably gives rise to a number of well-known disadvantages both when the knee has to be inclined forwards with respect to the foot, this by the way being a basic movement that is performed repeatedly during skiing and does not admit any sensible resistance thereto, and in connection with the fact that, when the ski is removed upon concluding a downhill race, a too rigid upper shell would be of hindrance in walking.

[0005] In view of doing away with such drawbacks, it is a largely known practice to provide upper shells that are separated from the respective lower shell and to make them capable of partially rotating, i.e. pivoting about two horizontal pins that are provided at the two sides of the boot and connect respective corresponding points between lower shell and upper shell.

[0006] This solution is effective in doing away with the above-cited drawbacks; however, it has been observed that, owing to the position of the leg especially during rather demanding ski runs (the posture is almost constantly inclined forwards, with bent knees, when skiing), the possibility that is thereby created for the upper shell to pivot backwards increases the possibility of a loss of control on the ski.

[0007] In view of solving this problem, while however continuing to have the upper shell being capable of moving in an articulated manner with respect to the lower shell when walking, it is a largely known practice to provide a locking member with an oscillating lever arranged vertically and with a central pin (first class lever) on the backside of the lower shell, in which the lower portion thereof is protruding. When the boot is fastened on the ski, the heel-piece of the binding thereof comes to press against said lever member, thereby pushing it inwards

and, therefore, causing the upper arm of the lever to move outwards, i.e. protrude so as to abut against and engage an appropriate stop arrangement that is provided on the upper shell, firmly joined thereto.

[0008] In this manner, during skiing the upper shell is free to pivot forwards as before, while a turning movement backwards beyond a pre-established extent is however prevented by the resistance of said lever against the pressure of said stop provision, which would otherwise tend to freely move backwards with the entire upper shell.

[0009] When the ski is removed, the lever, which is no longer actuated by the heel-piece of the binding, moves automatically back into its resting position, thereby allowing again the upper shell to freely pivot backwards.

[0010] However, it has been noticed that, under particularly severe and demanding skiing conditions, the above-described constraint to the backward pivotal movement of the leg may quite frequently lead to serious harms involving both the tibia/fibula and the articulation of the knee.

[0011] In substance, in the presence of severe backward stresses, there is actually no provision of any safety arrangement similar to the one that is being implemented since many years now in ski bindings and is generally known under the term of "safety binding".

[0012] In order to fill this gap, the publication WO 97/22271 discloses a toggle-type arrangement that is adapted to enable the upper shell to change from a forward-inclined working position to a resting position in which the upper shell is capable of pivoting backwards.

[0013] However, this solution does not prove effective in enabling the posture of the upper shell to adapt automatically when the skis are put on or removed. Quite on the contrary, this rather requires a quite awkward manoeuvre to be performed. In addition, the above-mentioned arrangement appears to be complicated, easily jammed by snow or ice, as well as particularly expensive.

[0014] It would therefore be desirable, and is actually a main object of the present invention to provide a safety arrangement which, while retaining all of the peculiar advantages of the above-described locking lever, is capable of enabling the same lever to be automatically released when the backward effort of the leg exceeds a certain pre-established level.

[0015] Within the above general object, another important purpose of the present invention is to provide a safety arrangement of the above-indicated kind which is adapted to enable the locking lever to automatically resume its working position when the leg moves back into its normal forward-inclined posture.

[0016] This safety arrangement shall furthermore be capable of being easily manufactured and operated at reasonably low costs with the use of readily available, largely known tools, materials and component parts.

[0017] According to the present invention, these aims, along with further ones that will be apparent in the fol-

lowing description, are reached in a safety arrangement associated to and operating in combination with said backside locking lever, incorporating the characteristics as recited in the appended claims.

[0018] The invention may be implemented in the form of a preferred, although not sole embodiment that is described in detail below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figures 1, 2 and 3 are schematic views of three working positions of a locking arrangement according to the prior art for preventing the upper shell of a ski boot from pivoting backwards;
- Figure 4 is a side view of an arrangement according to the present invention illustrating symbolically the basic component parts thereof;
- Figures 5, 6, 7, 8 and 9 are views of corresponding dispositions of an arrangement according to the present invention in respective positions of the upper shell with respect of the lower shell;
- Figures 10 and 11 are two partially see-through and partially cross-sectional side views of two alternative embodiments of an arrangement according to the present invention; and
- Figure 12 is a schematic, perspective rear view of the arrangement illustrated in Figures 10 and 11 as seen from behind.

[0019] For reasons of greater clarity, it is specially pointed out that the terms horizontal, vertical, above, below, under and the like, as used in the following description and the appended claims, are to be understood as being referred to with respect to the boot as correctly resting on a flat ground.

[0020] With reference to Figures 1, 2 and 3, these can be noticed to illustrate a ski boot provided with a lower shell 1 and an upper shell 2, the latter being capable of pivoting with respect to said lower shell about a pin 3.

[0021] On the rear, lower portion of the lower shell there is applied an oscillating locking member, or vertical lever, 4. This member is joined in an articulated manner onto said lower shell by means of a second pin 5, which is provided in an intermediate position of said lever, and is oriented horizontally so as to enable said lever to protrude from the lower shell with either the upper arm 6 thereof or, alternatively, the lower portion 10 thereof. This lever is biased by elastic means (not shown) into protruding with said portion 10 thereof from the body of the lower shell under resting conditions, i.e. when at rest (see Figure 1).

[0022] The upper edge of said lever 4 is constituted by an upper surface 7, which is arranged in a sensibly horizontal position when said lower portion 10 of the lever is retracted into said lower shell.

[0023] According to the prior art, a locking member 8 is applied on said upper shell, above said vertical lever 4, and is provided with a lower surface 9 arranged preferably in a horizontal position.

[0024] If the boot is not mounted in the ski binding, and the upper shell is stressed to pivot backwards, owing to the lever 4 not engaging the locking member 8 in any way, the upper shell is actually able to turn backwards, as this is best illustrated in Figure 2.

[0025] When the boot is on the contrary mounted and fastened in the ski binding, as shown schematically in Figure 3, said lower portion 10 is pressed inwards and this causes the upper arm 6 of the lever 4 to move outwards and protrude in such a manner that the upper surface 7 thereof comes to face the lower surface 9 of said locking member 8, exactly therebelow, thereby preventing it, and therefore also the upper shell, from lowering.

[0026] The prior art provides for said locking member 8 to be attached firmly to the upper shell; according to the present invention, on the contrary, said locking member 8 is assigned an elongated shape, is arranged obliquely, i.e. sloping downwards, is adapted to pivotally turn about a third horizontal pin 11 and features an outer portion 12 that does not comprise said lower surface 9 that is located beneath the upper surface 7 (see Figure 4).

[0027] Said third pin is supported by an appropriate support means 15 which is firmly attached to said upper shell and shall be described in greater detail further on. In addition, said locking member is provided with a working surface 13 that delimitates said portion 12 inwardly and that, therefore, extends with an angle downwards with respect to said lower surface 9, wherein the common corner 14 is located outwards (i.e. backwards) with respect to said lower surface 9.

[0028] At this point, in order to enable the invention to be more clearly and effectively understood in its peculiarities, it appears suitable to right away emphasize the fact that the locking member is subject to an elastic action tending to bias it into the normal position thereof through a pivoting motion in a direction as indicated by the arrow A in Figure 4. Anyway, this point shall be dealt with in greater detail further on.

[0029] The way in which the arrangement according to the present invention works is as follows:

1) - When the boot is applied and fastened on to the ski binding, and when the upper shell is inclined forwards in its normal posture, the position of said locking member 8 is as schematically illustrated in Figure 5.

2) - When the upper shell is then gradually displaced backwards, under exertion of a certain effort in order to overcome the elastic action on said locking member 8, the third pin 11 follows the turning or pivoting motion thereof with respect to the first pin 3, up to the moment at which the lower surface 9 of

said locking member 8 comes into contact with the upper surface 7 of the lever provided therebelow, as this is best illustrated in Figure 6.

3) As the upper shell continues being displaced backwards, said third pin 11 goes on turning downwards and backwards; however, the resistance opposed by the lever 4 causes at this point also the locking member 8 to turn with respect to said third pin, as this is best shown in Figures 7 and 8. In substance, the locking member 8 turns about the pin 11 which in turn turns with a radius r about said first pin 3, so that said locking member 8 moves with a combined rotary motion.

However, and this for the matter is the actual effect of the present invention, the locking member 8 turning in this way on the pin 11 practically causes the lower corner 24 of the working surface 13 to first come into contact with the outer side of the upper arm 6 of the lever 4 and then, as said locking member 8 goes on turning, to push said outer side of the upper arm 6 of the lever 4 inwards. Figures 7 and 8 respectively illustrate two successive moments of such a pushing action being performed, inwards with respect to the boot, on said upper arm 6 of the lever 4 by the pressure exerted by said lower corner 24 owing to the turning motion imposed to the locking member 8 by the pushing action exerted by said lower surface 9 as a result of the contrast opposed by the upper surface 7 of the lever 4.

The ultimate effect is that the upper surface 7 of the lever 4 moves, sliding thereunder, with respect to said lower surface 9, thereby creating a contact and contrast zone 25.

4) - As the upper shell continues to move further backwards, as this is best shown in Figure 9, said third pin 11 goes on turning downwards and backwards; but the persisting resistance opposed by the lever 4 causes at the same time also the locking member 8 to go on turning until the moment is reached in which said lower corner 24 of the working surface causes said surface 7, or better said contrast zone 25, to reach and move beyond the inner edge 26 of said lower surface 9; the first, direct consequence of this is that said lower surface 9 is no longer contrasted by the lever 4 and, as a result, said locking member 8, and the upper shell with it, snaps into a condition in which it is able to turn fully unimpeded backwards, exactly as if said lever 4 would suddenly be no longer there.

[0030] A question may well arise at this point concerning the fact that, owing to the upper surface 7 being pressed with an increasing force against the lower surface 9 of the locking member 8 in correspondence of said contrast zone 25, this should in fact prove of hindrance to such surfaces in being able to slide with re-

spect to each other. However, suffice it to consider that such an action, as this has for the matter been able to be punctually found and demonstrated experimentally, brings merely about a friction between two preferably metal surfaces and that, therefore, such a friction turns out to be of very little extent as compared with the pushing action that acts tangentially on one of these same surfaces; in other words, such a friction proves practically unable to bring about any jamming or any other problem or failure in the operation of the arrangement of the invention.

[0031] It will of course be appreciated that the afore described phases of operation of the arrangement of the invention are carried out almost instantly, i.e. they take place in just a fraction of a second, as this is actually required for them to prove useful and effective. Therefore, the desired result of a safety arrangement that is capable of tripping, i.e. becoming activated by a pre-determined stress or load applied backwards to the upper shell is thereby fully reached.

[0032] Attention is at this point drawn to a particular advantage offered by the above-described embodiment of the arrangement according to the present invention; in fact, as soon as the backward load or stress applied to the upper shell is terminated and the upper shell itself is moved again forwards, a condition is created whereby the above-described sequence is automatically and instantaneously started and carried out in the reverse order, and the lever 4 is able to snap back into the normal working position thereof, thereby moving into abutting against the locking member 8 that will have in the meantime resumed its normal posture.

[0033] As far as the support means 15 is concerned, this is most clearly illustrated in Figures 10 and 11, so that it does not need any further description or explanation, actually. In this connection, suffice it to say that such a support means may be constituted by any means which, being firmly joined to the upper shell, is adapted to sustain said third pin 11 in the afore described position thereof. In a particularly useful manner, in order to limit the turning extent of the locking member 8, a stop means is provided that is effective in limiting, at a pre-determined extreme position, the capability of said locking member 8 to turn under resting conditions thereof, i.e. when the upper shell is inclined forwards and, therefore, only the lower surface 9, and sometimes not even such a surface, is engaged against the upper surface 7 of the lever 4.

[0034] In an advantageous manner, said stop means comprises a peg 17 adapted to engage appropriate perforations provided in said support means 15 and passing through an appropriate through-slot 18 provided in the locking member 8, as this is best illustrated in Figure 11.

[0035] As far as the elastic action acting on said locking member 8 is concerned, this can be most effectively brought about by a spiral spring 19 that works as a compression spring and is provided in a position between

the lower portion 20 (containing the working surface 13) of the locking member 8 and a suitable wall 21, which is provided on the front side and above said locking member and preferably is an integral part of the structure of the support means 15, as shown in the Figures. 5

[0036] Advantageously, in order to allow for the intensity of the resisting stress or effort during the backward turning motion of the upper shell to be adjusted, i.e. in order to adjust the magnitude of the stress or effort at which the afore described safety arrangement is due to trip (i.e. the release of the lever 4), the arrangement itself is also provided with the possibility for said spring to be preloaded by means of an adjustable setting screw or bolt 22 rotating with an extreme thereof in an appropriate threaded hole provided in said wall 21, and with the other extreme thereof attached to the upper portion 29 of said spring 19 (see Figure 11). 10 15

[0037] It has been further found that, in view of obtaining an optimum response of the arrangement of the invention, the angle between the lower surface 7 and the working surface 13 of the locking member 8 should preferably be of approx. 90°. In this case, it has also been found that a safe, reliable and convenient operation of the arrangement is obtained when the plane P1 that contains said pin 3 and said third pin 11 is sensibly close to the plane P2 that contains said pin 3 and said corner 14 between said lower surface 7 and said working surface 13 of the locking member 8. 20 25

Claims

1. Ski boot or similar sports footwear, provided with:

- a lower shell (1),
- an upper shell (2) arranged on said lower shell and connected thereto so as to be capable of partially turning with respect to said lower shell by means of at least a pin (3) engaging both said lower shell and said upper shell,
- an oscillating member or locking lever (4) provided on the backside in the lower portion of said lower shell,
- a second pin (5), arranged in a substantially horizontal position, engaging said lower shell and an intermediate portion of said oscillating locking member (4), and adapted to allow for the latter to oscillate with respect to said lower shell,
- first elastic means adapted to act on said locking member (4) in such a manner that the upper portion (6) thereof is stressed into pushing inwards with respect to said lower shell, said oscillating member being provided with an upper surface (7) and a lower portion (10) which, when at rest, protrudes from the body of said lower shell,
- a locking member (8) connected, even with the

aid of intermediate connecting means, to said upper shell and provided with a respective lower surface (9) that is adapted to move into abutting against said upper surface (7) of said oscillating member when the related lower portion (10) is in a position in which it is even partially retracted into said lower shell,

characterized in that:

- said upper shell is provided with a third pin (11) that is in a substantial manner firmly joined thereto and is arranged in a substantially horizontal position,
- said locking member (8) is pivotally hinged on said third pin (11) with the outer portion (12) thereof opposing said lower surface (9), and
- it is further provided with a working surface (13) which is angled with respect to said lower surface (9) and contiguous thereto via a common corner (14) provided on the outward side of said lower surface (9),
- there are provided second elastic means adapted to act (A) on said locking member (8) so as to stress said working surface (13) and said contiguous lower surface into turning, jointly with said locking member (8), outwardly below said third pin (11)

2. Ski boot according to claim 1, **characterized in that** there is provided a support means (15), which is attached to said upper shell (2) and is adapted to support said third pin (11). 30

3. Ski boot according to claim 1 or 2, **characterized in that** there are provided stop means which are adapted to limit, at a pre-determined extreme position, the extent to which said locking member (8) is capable of turning under resting conditions thereof, i.e. when it is not engaged against said oscillating member or lever (4). 35 40

4. Ski boot according to claim 3, **characterized in that** said stop means comprise a peg (17) capable of engaging said support means (15) and a corresponding appropriate through-slot (18) in said locking member (8). 45

5. Ski boot according to claim 3, **characterized in that** said second elastic means comprise a spiral spring (19) that works as a compression spring and is provided in a position between the lower portion (20) of said locking member (8), containing said lower and working surfaces (10, 13), and a suitable wall (21), which is preferably provided on the front side, above said locking member, and is firmly joined to said upper shell. 50 55

6. Ski boot according to claim 5, **characterized in that** said suitable wall (21) is comprised of and formed by the structure of said support means (15).
7. Ski boot according to claim 5 or 6, **characterized in that** there are provided means for adjusting the preloading of said spiral screw, said means comprising at least a setting screw or bolt (22) adapted to act between said suitable wall (21) and that end portion (29) of said spring (19) which is not engaged against said locking member (8). 5 10
8. Ski boot according to any of the preceding claims, **characterized in that** said lower and working surfaces (10, 13) are at an angle of approx. 90° with respect to each other. 15
9. Ski boot according to any of the preceding claims, **characterized in that** the plane passing through said first and said third pin (3, 11) is sensibly close to or coinciding with the plane passing through said first pin (3) and said common corner (14). 20

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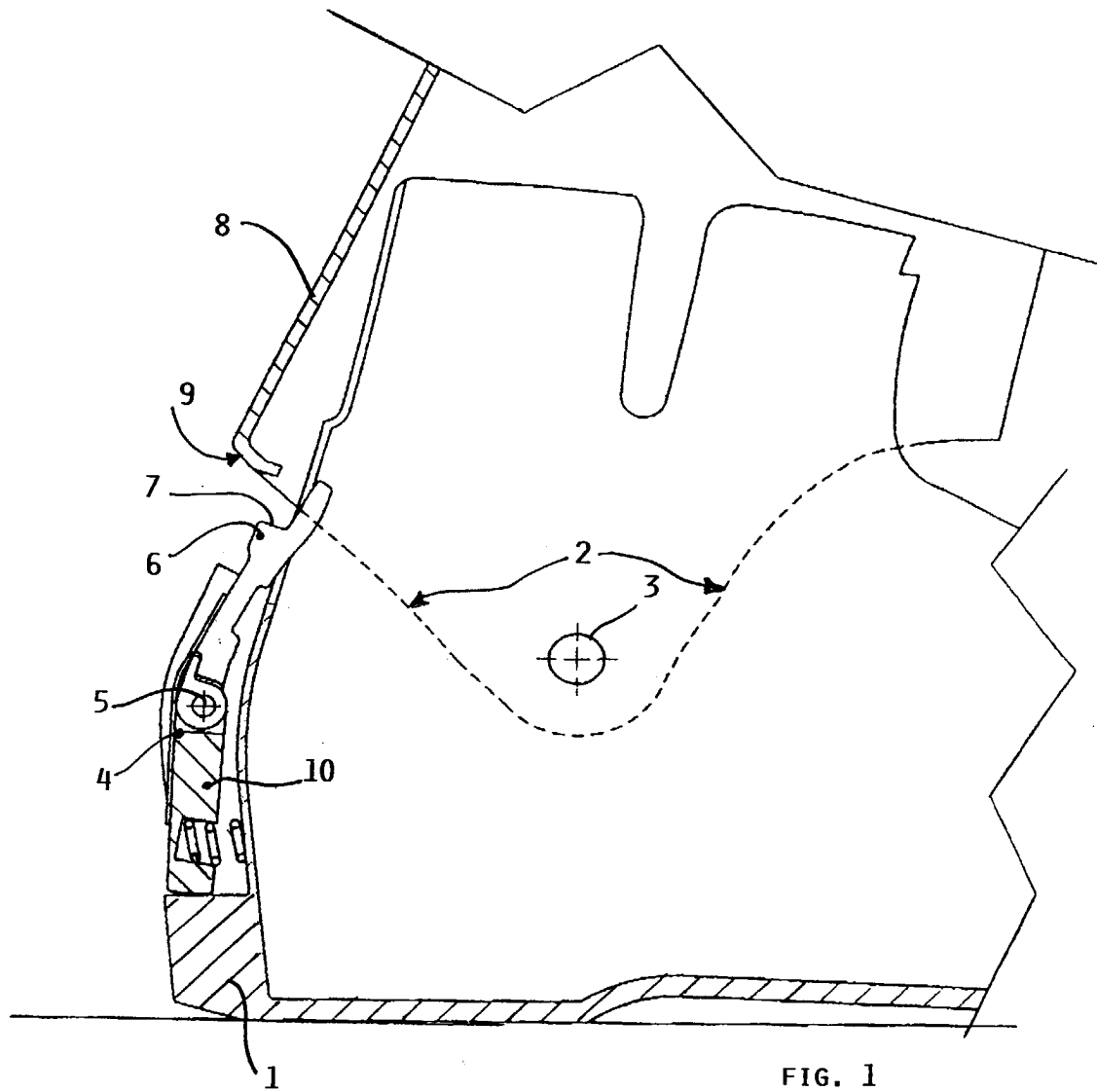
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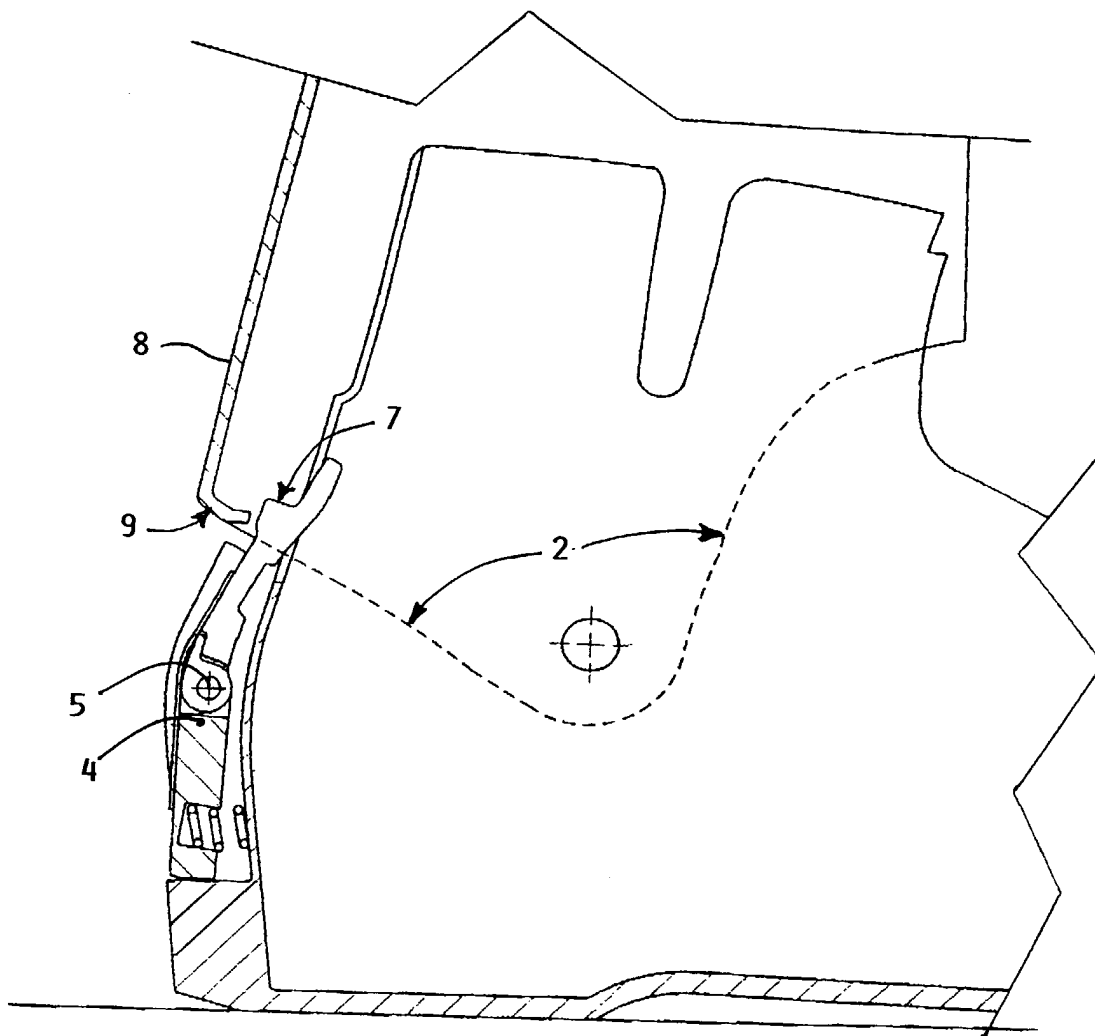


FIG. 2

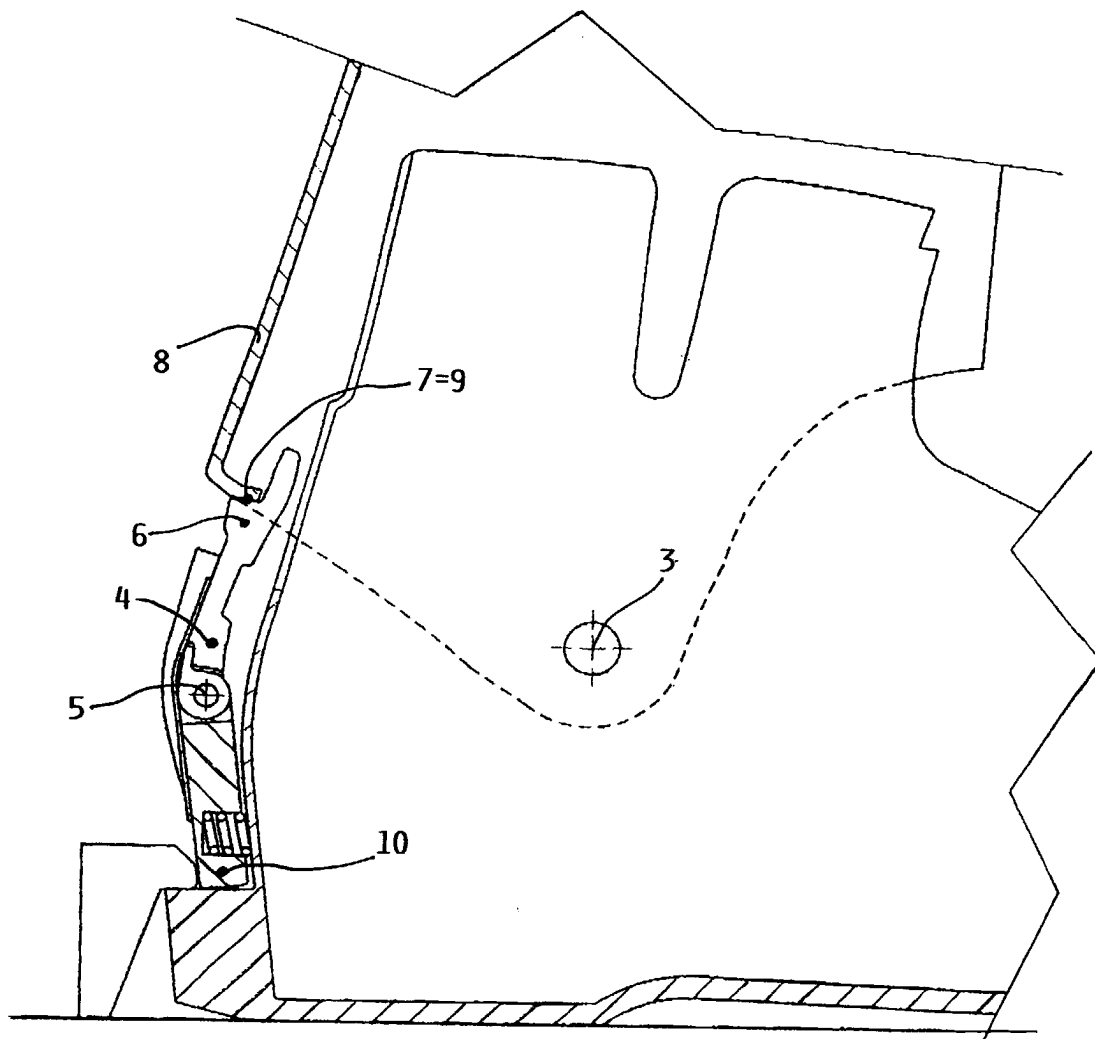
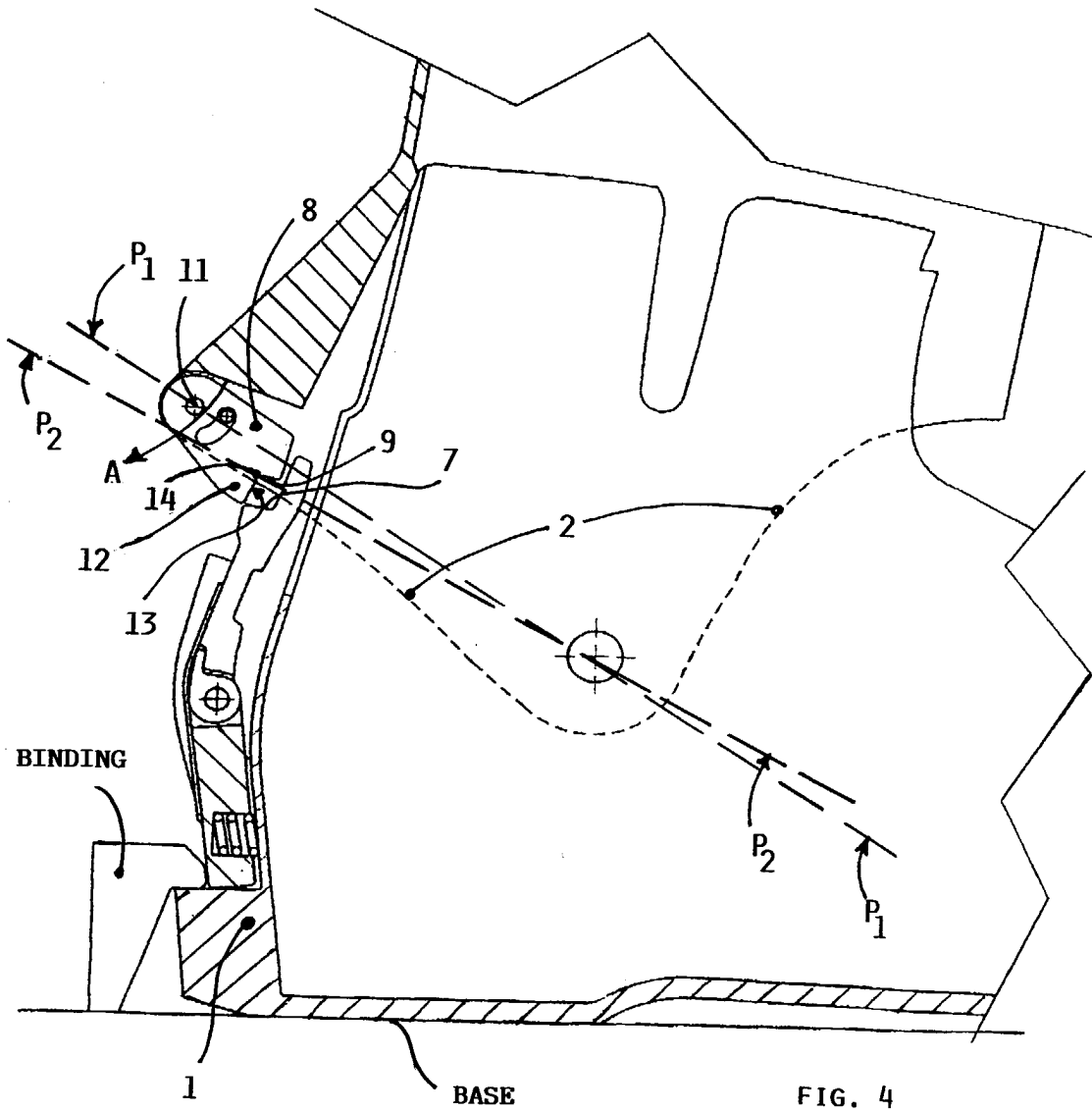


FIG. 3



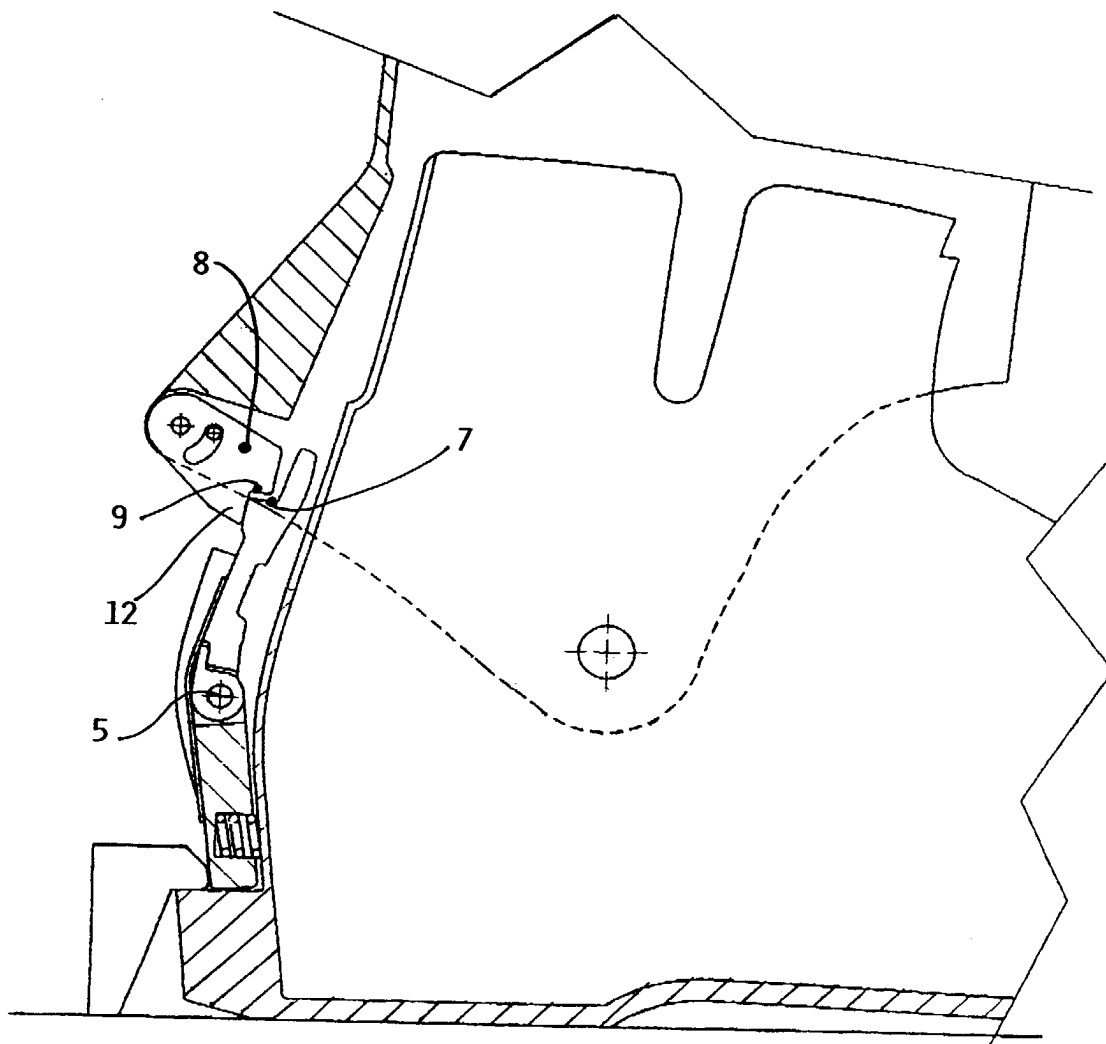


FIG. 5

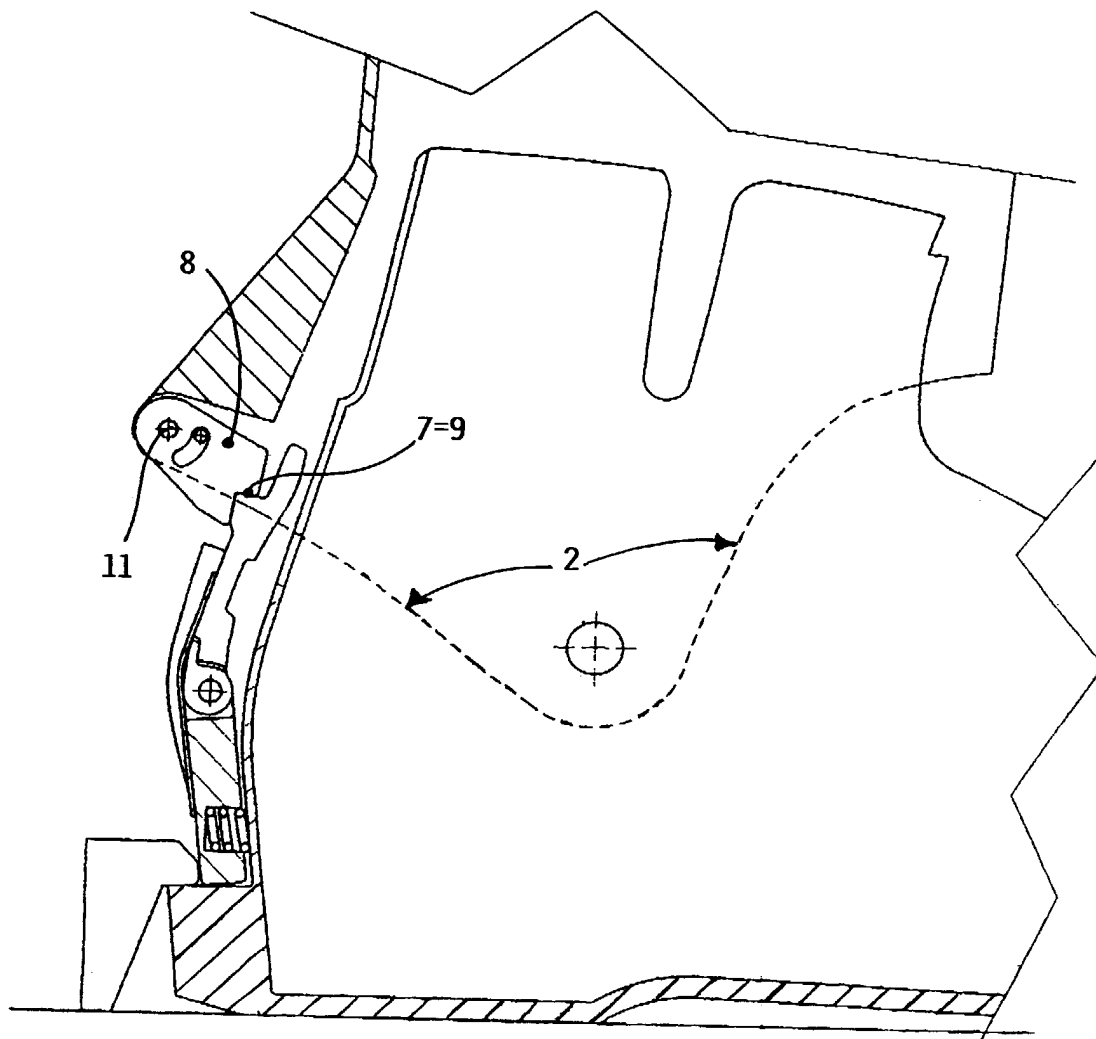


FIG. 6

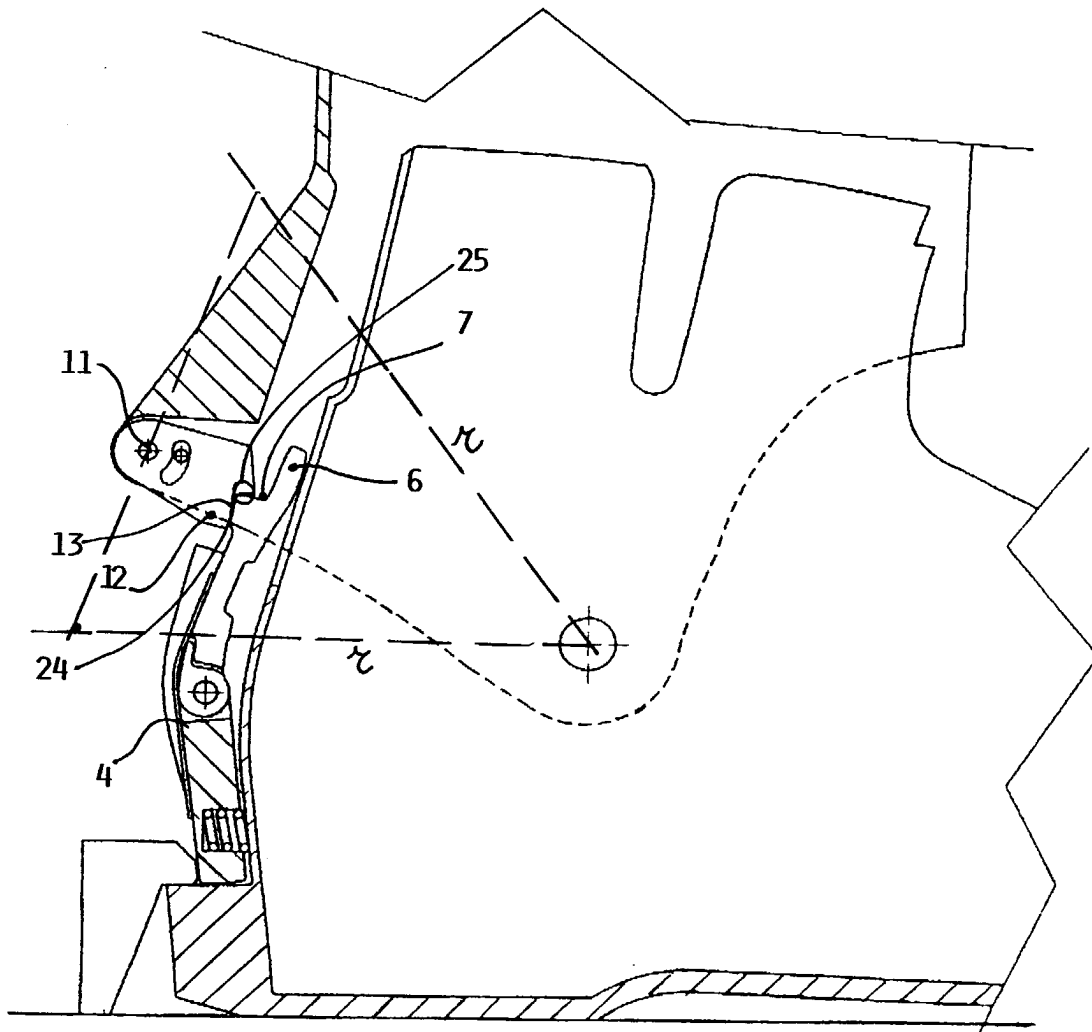


FIG. 7

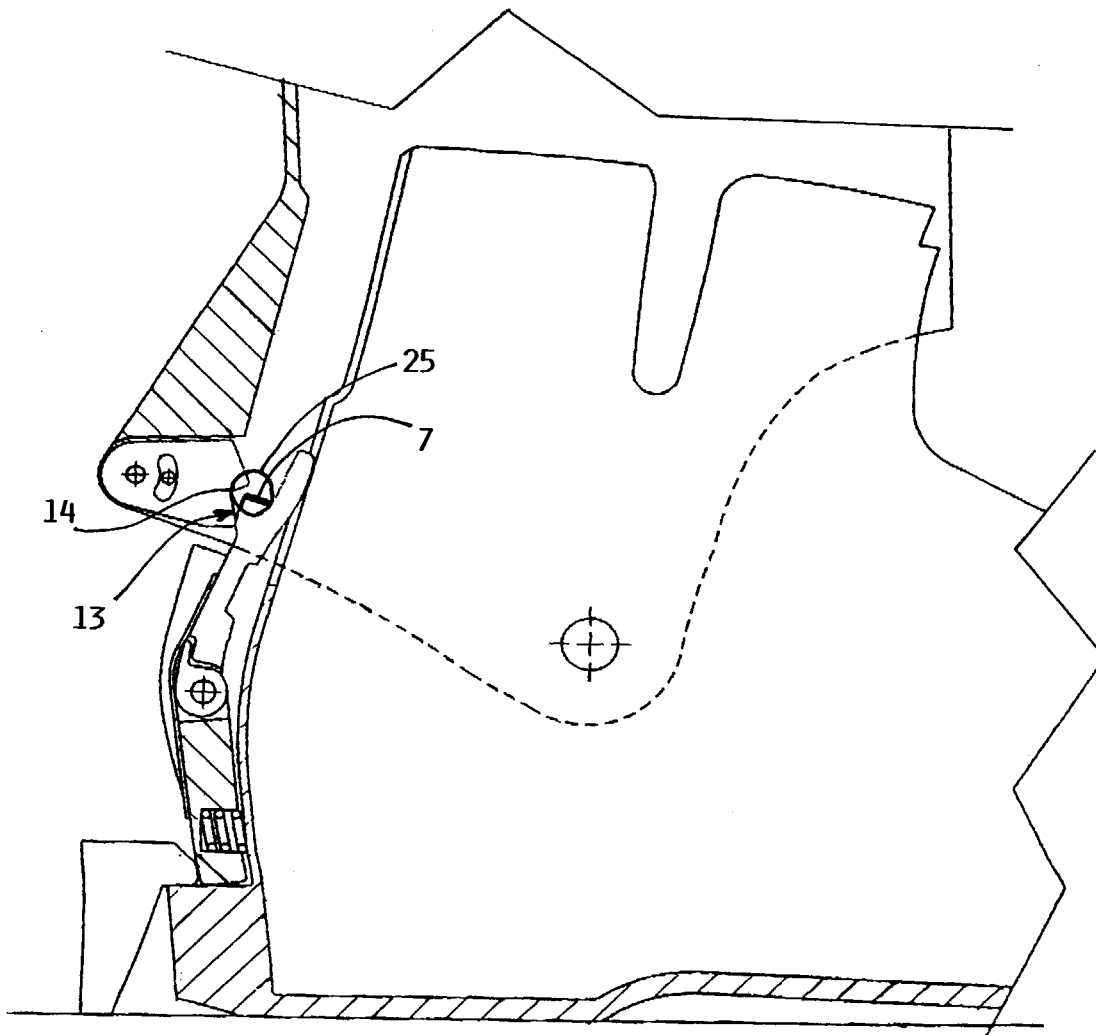


FIG. 8

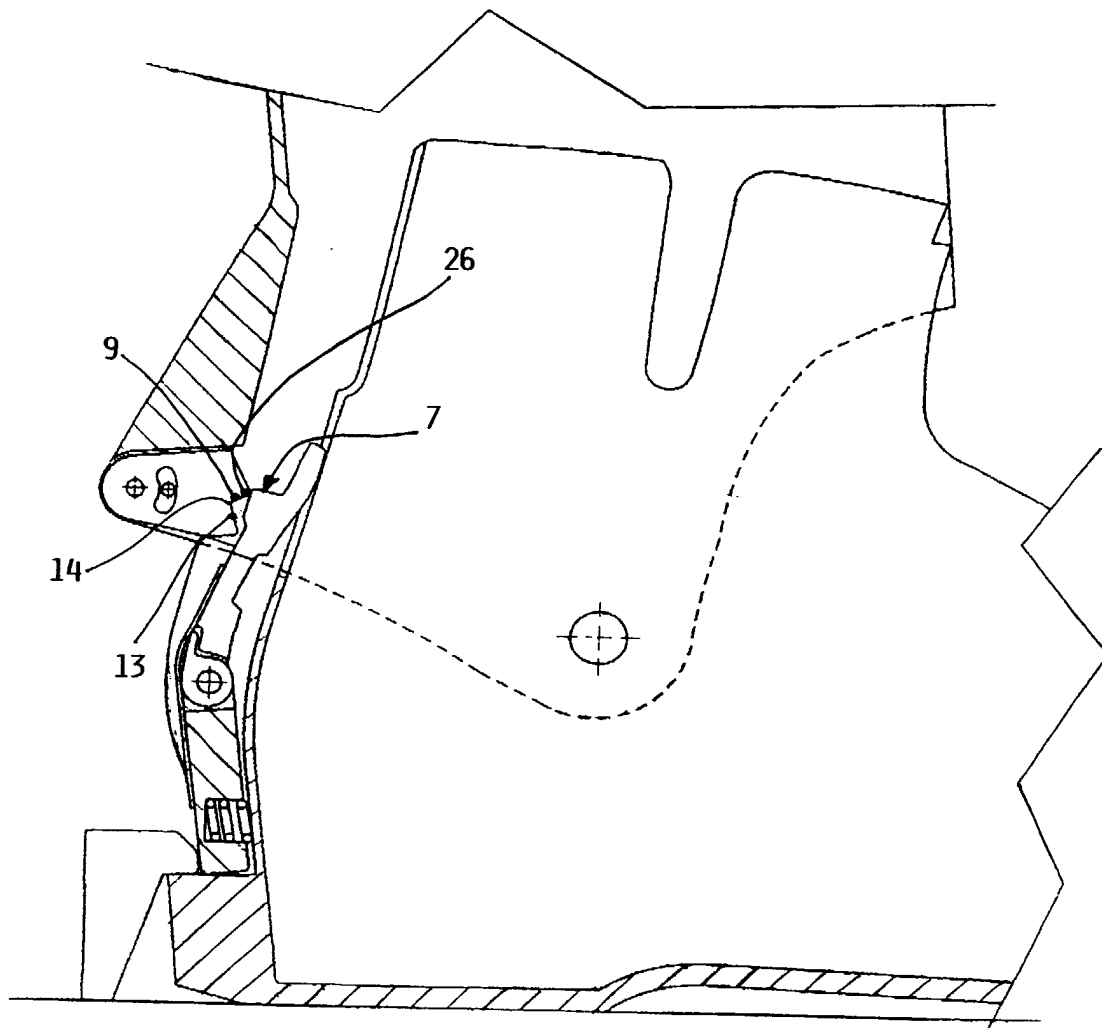


FIG. 9

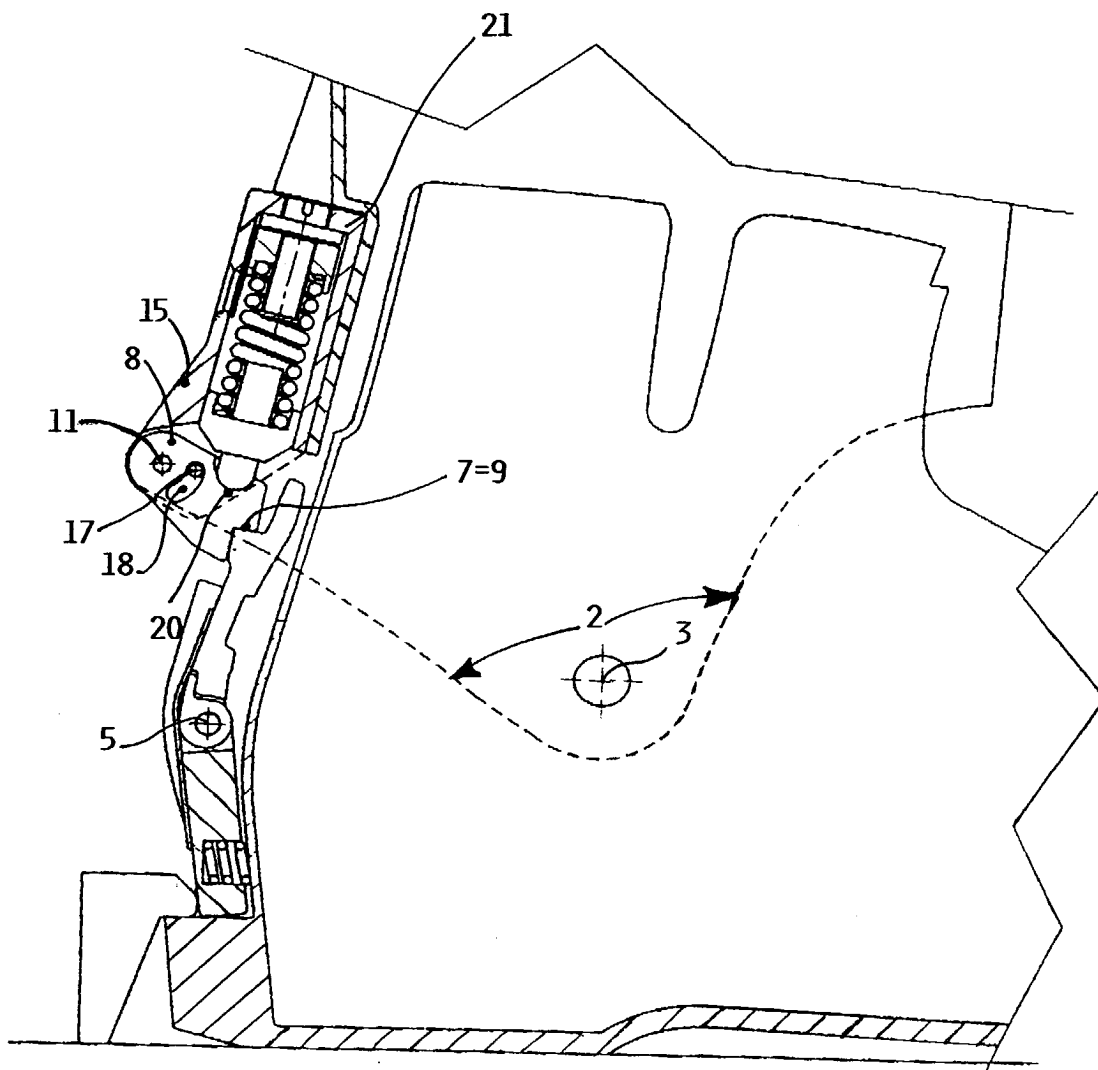


FIG. 10

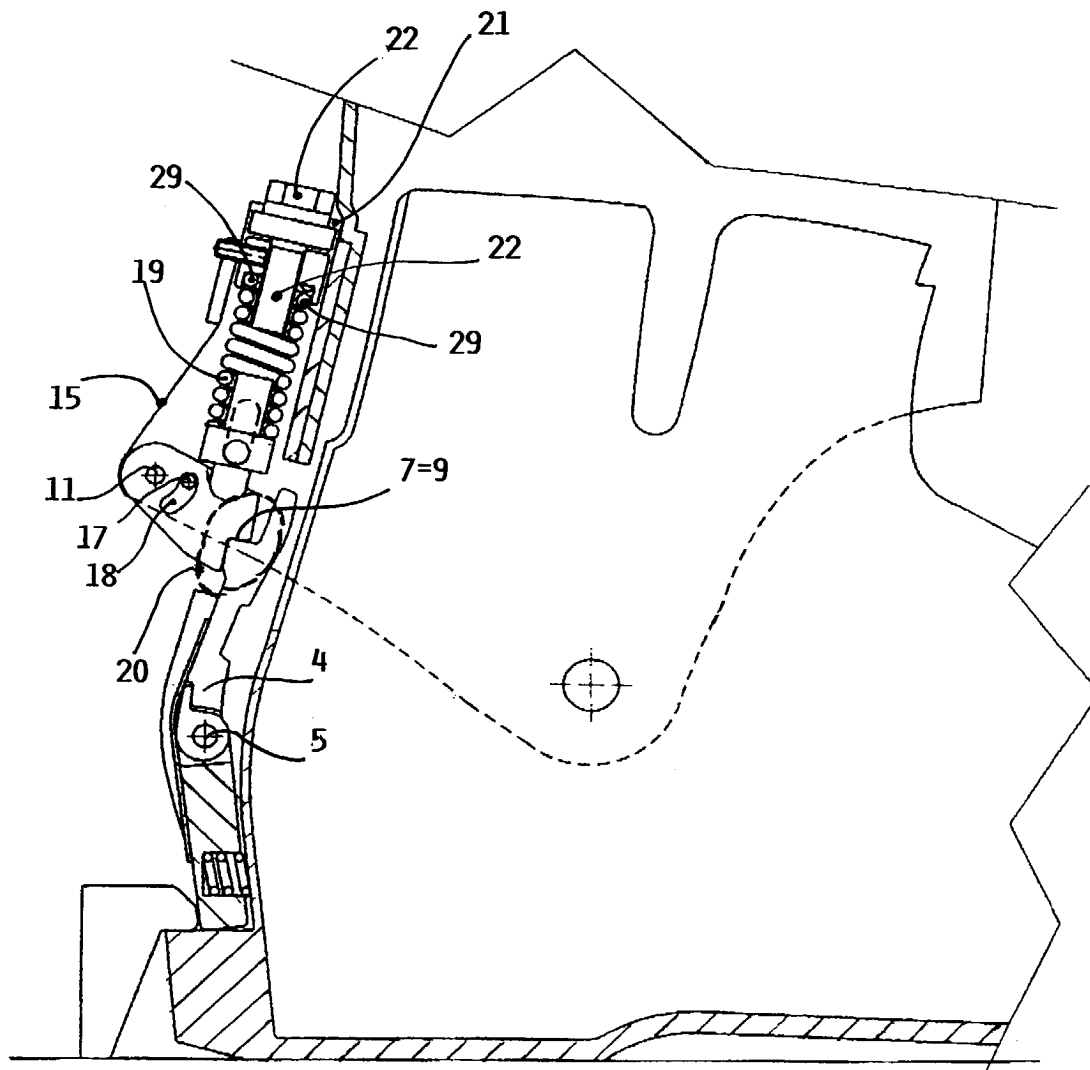


FIG. 11

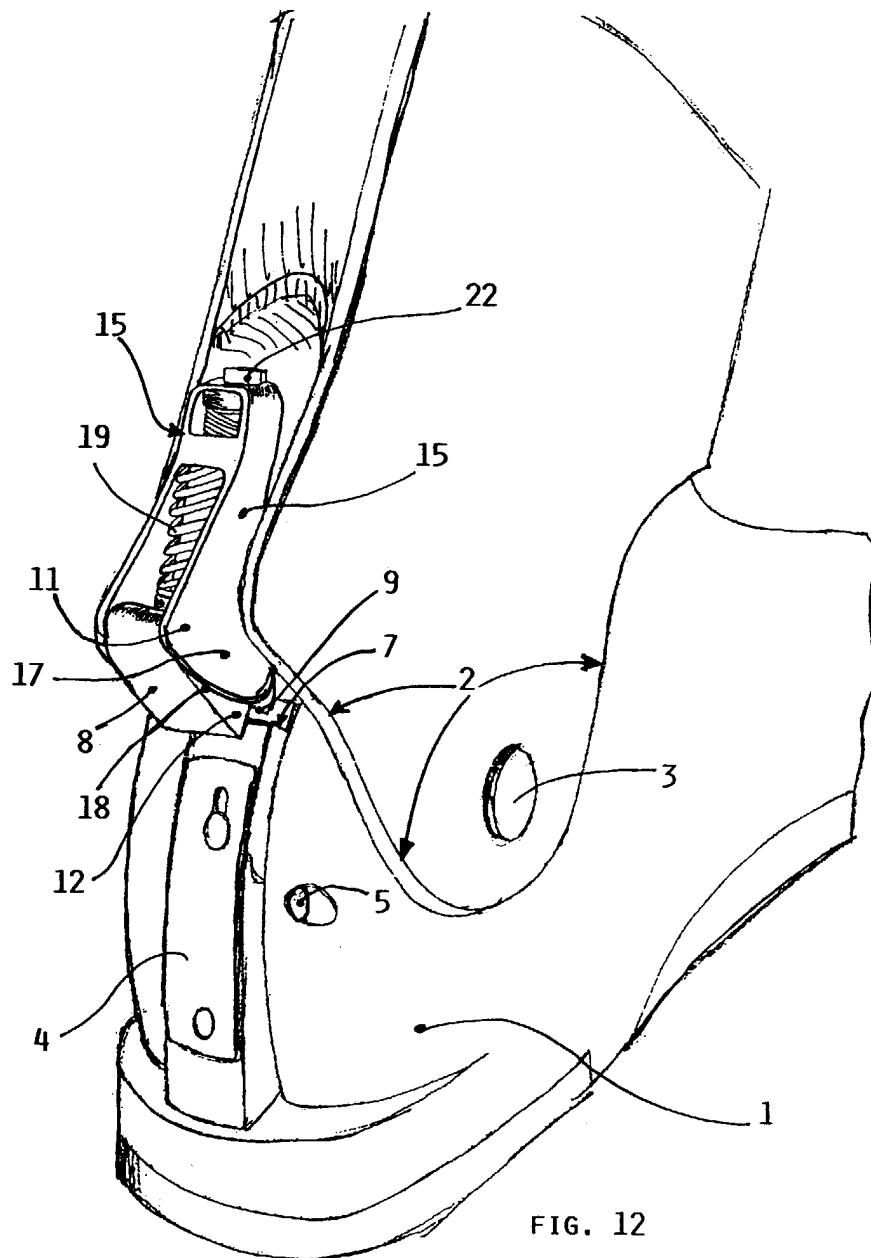


FIG. 12



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EUROPEAN SEARCH REPORT

Application Number
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