United States Patent

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[54] **DEVICE FOR RELEASABLY ATTACHING SKI BOOTS TO SKIS**

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[52] **U.S. Cl.** ..... **280/11.35 T**

[51] **Int. Cl.** **A63c 9/00**

[58] **Field of Search** ..... 280/11.35 T

[56] **References Cited**

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[57] **ABSTRACT**

A ski safety device for releasably attaching ski boots to skis comprises boot heel gripping means on one end of a lever mounted for both vertical and horizontal pivotal movement in relation to the plane of the ski. A continuous pressure is applied against the other end of the lever so that the gripping means is normally maintained in a boot gripping position but can be knocked horizontally or vertically to a boot freeing position.

15 Claims, 5 Drawing Figures

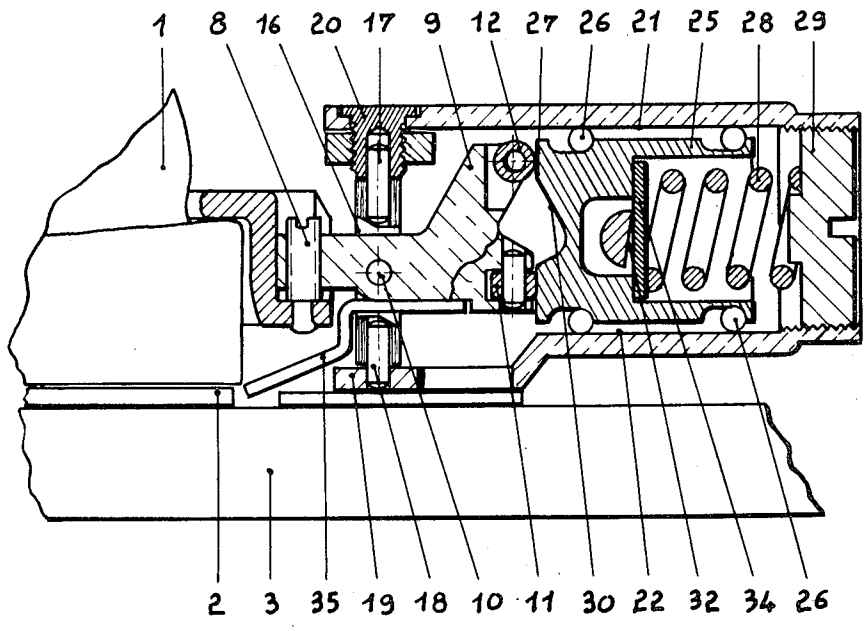


Fig. 1

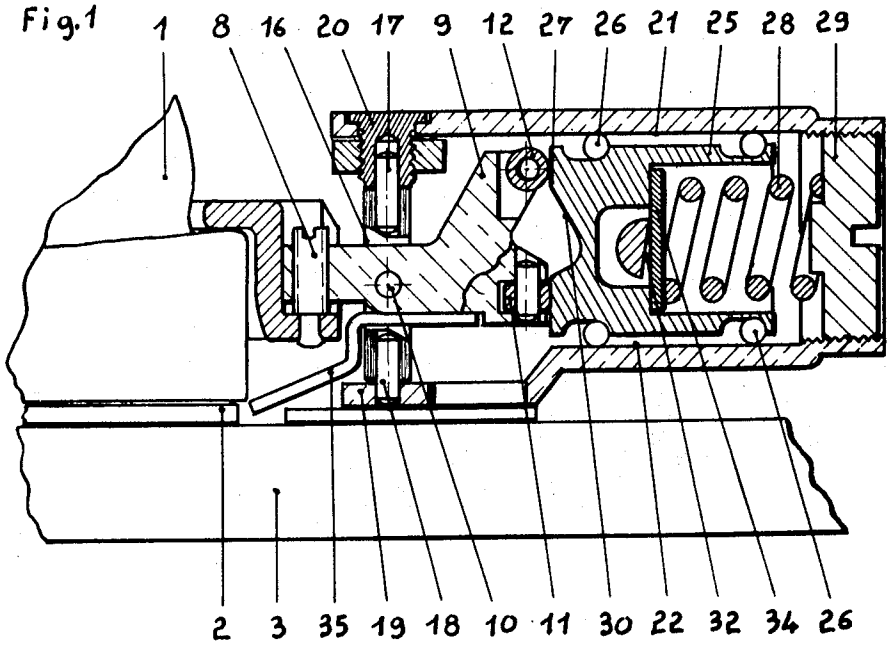

1 8 16 20 17 9 12 27 26 21 25 28 29
2 3 35 19 18 10 11 30 22 32 34 26

Fig. 2

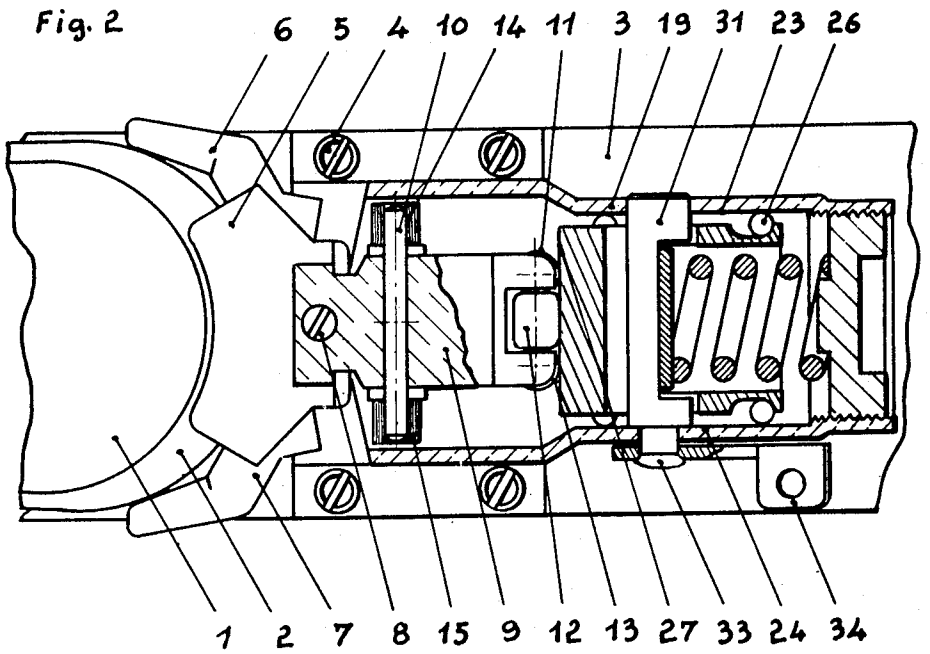

6 5 4 10 14 11 3 19 31 23 26
1 2 7 8 15 9 12 13 27 33 24 34

Fig. 3

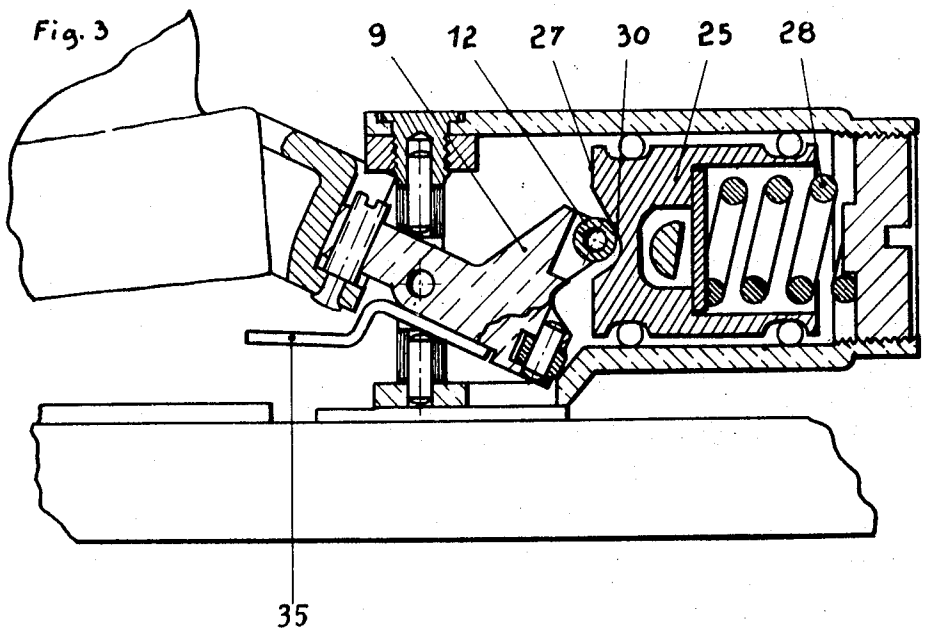


Fig. 4

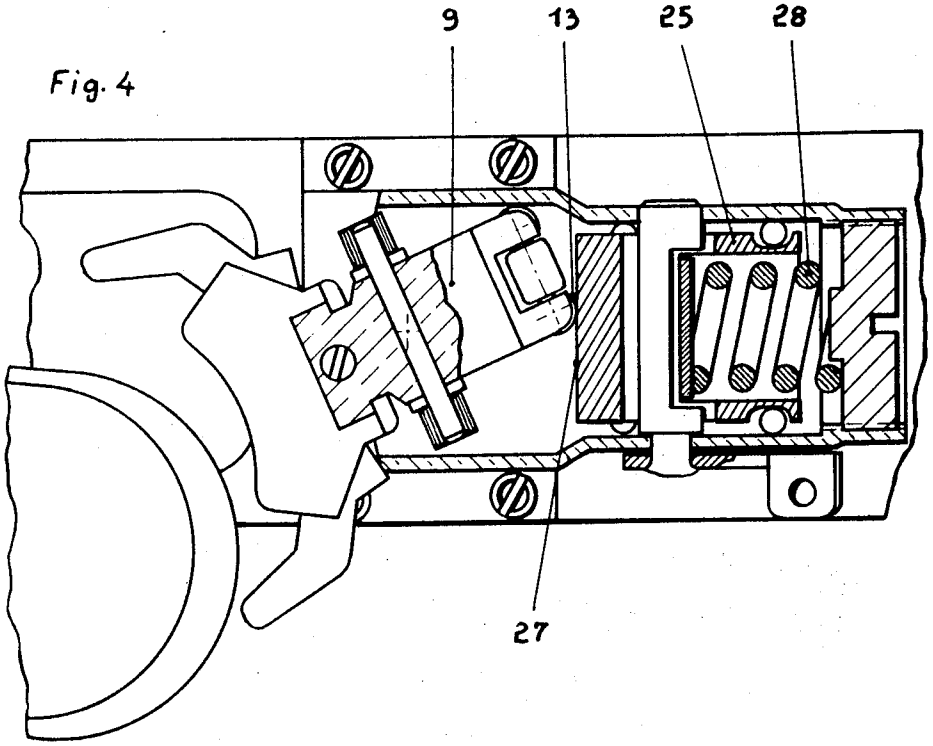
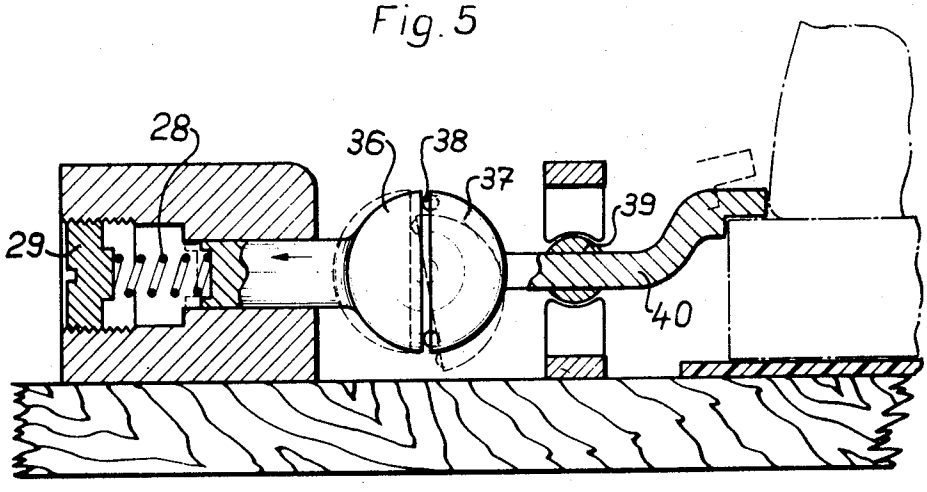


Fig. 5



DEVICE FOR RELEASABLY ATTACHING SKI BOOTS TO SKIS

The present invention relates to devices for releasably attaching skis to ski boots while allowing these two components to separate in the case of a fall, shock, or abnormal pressure.

Numerous such devices already exist, attachment of the boot to the ski being effected by mechanical locking means similar to the sear of a firearm, so that when subjected to a force of a minimum value, one or more spring studs fixed to the ski instantly free the boot.

The most frequent causes of skiing accidents being by frontal or lateral forces or shocks, most known safety devices comprise one safety device called the "toe clip" placed on a ski in front of the boot and another safety device called the "heel clip" behind the boot.

These devices are often complicated and adjustment and maintenance thereof is difficult.

It is an object of the invention to provide a device which assembles all the safety fixation components in one place near the heel of the boot. In other words, the device according to the invention is a heel clip offering the same degree of safety in case of accident as the known "toe clip" and "heel clip" combinations. There is thus obtained a reasonably priced fixation in a compact and strong unit, and which can be simply maintained.

To achieve such a result, the anatomy and the behavior of the organs of skier's legs while skiing have been studied and the following three facts have been particularly noted:

1. In the case of a frontal shock, the body of the skier suddenly moves forward by inertia. Since the toe presses against a stop, the principal force present causes lifting of the heel.

2. In the case of a lateral shock or the skier falling sideways while moving, the forces on the ski from the weight and inertia of the skier are translated by the composition of a frontal or axial force and a side force. The resultant is once more applied especially to the heel which tends to lift up and to move out of the longitudinal axis of the ski at the same time, while the toe can remain fixed at the front stop.

3. In every case, (with the exception of the very rare case of a shock from behind), the weight of the skier combined with his inertia tend to increase the pressure of the sole on the ski, especially at the toe end while, conversely, this pressure tends to diminish in the vicinity of the heel. This known phenomenon has lead certain makers of skis having a frontal safety fixation to insert a piece of material with a low coefficient of friction between the sole and the ski with the aim of facilitating the boot to slide forward and, consequently, to unlock the frontal safety device. But because the sliding properties of the materials in contact are variable according to such conditions as temperature, melted or frozen snow getting therebetween, the state of the sole of the boot and so on, the effects of this measure are doubtful.

The attachment device according to the invention resolves this problem by eliminating slipping of the boot on the ski in case of accidents, and taking the maximum advantage of the decrease in the skier's pressure on the heel. In its broadest concept, the invention provides a safety heel clip in which upward vertical forces on the heel and forces on the heel horizontally in both directions and in all oblique directions are opposed by means providing one or more opposing forces which can be exerted up to certain values, above which sudden and total freeing of the boot is caused.

The result is obtained by means of a "Cardan" type of device which opposes the forces from the heel of the boot to an opposing force which can be supplied by a spring, an elastomer, pneumatic or hydraulic pressure, and by simple means employed to ensure the complete freeing of the boot at a predetermined value. Thus, the combination of the safety devices and their adjusting components as well as the devices for locking and unlocking the boot of the ski can be concentrated in the same place, namely, in the proximity of the heel of the heel of the boot, the front fixation being simplified to a simple stop member, only used to support the toe of the boot.

An embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a side view, partly in cross section of a heel clip according to the invention with a boot placed on a ski in the normal position.

FIG. 2 is a plan view of the same heel clip in the normal position.

FIG. 3 is a view similar to FIG. 1 but with the heel of the boot subjected to a lifting force.

FIG. 4 is a view similar to FIG. 2 but with the heel of the boot subjected to a lateral force.

FIG. 5 is a side view, partly in cross section of another embodiment of the heel clip according to the invention.

In FIGS. 1 and 2, only the heel end 1 of the ski boot is shown. The entire length of the boot rests on a metal plate 2 permanently fixed on ski 3. The heel clip fixation device according to the invention is connected to a support member which is releasably attached to the ski by means of four screws 4. The safety device comprises a unit composed of parts 5, 6, and 7 pivotally fixed to one another in order to be able to tightly grip the heel of the boot according to the shape thereof, and to be firmly fixed together to prevent any subsequent free play. Details of this pivotal fixation are well known and have not been shown.

All three parts 5, 6, and 7 are connected by a screw 8 to a crank lever 9 bearing a cylindrical pin 10 around which it is able to pivot, and to a group of antifriction members comprising three freely rotating rollers 11, 12, and 13. Bearings 14 and 15, on which the ends of pin 10 pivot, join a part 16 around the crank lever 9 and bearing two pivotally mounted shafts 17 and 18, at right angles to the pin 10, freely pivoting at one end in a hole of a body 19 fixed to the ski and at its other end in a bearing 20 fixed to the same body 19 but on the opposite side thereof. The part 16 constitutes the component commonly called the "Cardan joint." In fact, the lever 9 is free to rotate in any direction, both around the pin 10 and around the shafts 17 and 18, thus forming a "Cardan" transmission. Screw 8 serves to adjust the rest position of the lever 9, in relation to the thickness of the heel of the boot, as is well known.

The body 19 consists of a substantially tubular prismatic part the inside faces 21, 22, 23, and 24 of which form planar bearing surfaces. In the interior space defined between these walls a part 25 can freely move by means of a suitable number of ball bearings or rollers 26.

Part 25 has a bearing surface 27 against which rollers 11, 12, and 13 of the crank lever 9 always press as the part 25 is pushed against these rollers by an opposing force supplied, for example, by a compression spring 28 compressed as desired by a threaded stopper 29, which can be screwed into a cylindrical tail part of the body 19.

Thus, the force or pressure of spring 28, by means of the rollers 11, 12, and 13 on lever 9, and by the set of parts 5, 6, and 7, firmly pushes the boot 1 forward, against a frontal stop (not shown) on the ski. In addition, the roller 12 tends to pivot the lever 9 about its pin 10 in the counterclockwise direction looking at FIG. 1, thus pressing the heel of the boot against plate 2 and ski 3 by reason of the upper edge of part 5 which engages the upper rim of the heel of the boot, as shown in FIG. 1. In the described position, the lever is in its lacking position and the device is ready for normal use.

The system works in the case of shocks, falls or abnormal pressures, as is shown in FIGS. 3 and 4. In FIG. 3, the heel tends to lift up following a frontal shock, for example. The force of inertia added to the weight of the skier must be sufficient to be able to overcome the resistance offered by the opposing force of the spring 28 on the part 25 and hence roller 12. The heel of the skier raises, pivoting the lever 9 in a clockwise direction in a vertical plane (looking at FIG. 1) and the roller 12 runs over surface 27 which is inwardly curved at 30 and facilitates the pivotal movement of the lever. The lever 9 is then immobilized in an unlocking position shown in FIG. 3, thus totally freeing the heel and the boot.

In FIG. 4, the heel is subject to an exterior force, shock or fall, moving it towards the left of the ski in a horizontal plane, namely towards the bottom of the FIG. In this case, if the force exceeds the resistance offered by the opposing force of the spring **28** acting through the part **25** and the roller **13**, this roller runs over the surface **27** of the part **25**, until the lever **9** reaches the unlocking position shown in FIG. **4** this time pivoting about the axis of the shafts **17** and **18** (FIG. **1**) thus completely freeing the boot as in the preceding case.

Naturally, if an outside force is applied in any other direction than that which has been described previously, spring **28** always acts on the rollers **11**, **12**, and **13** to provide an opposing force. If this opposing force is insufficient to compensate for the exterior forces, the heel grip will open and free the boot.

In order to fit the boot to or remove it from the ski, an equally simple and original device is provided as can be particularly seen in FIGS. **1** and **2**. A shaft **31** of generally cylindrical shape is rotatably mounted in two bearings provided in the body **19** and has a cutout middle portion leaving a flat surface **32** (FIG. **1**). A lever ending in a bent over part **34** is attached to an end **33** of the shaft **31** outside the body **17**. The skier can turn the shaft **31** by depressing part **34** by hand or with the end of his ski stick. The surface **32** acts as a lever on a small movable plate **134**, held by the spring **28** contained in a housing in part **25**. Rotation of the shaft **31** thus causes cancellation of the effect of the spring **28** on the lever **9** which is thus freed and enables the skier to remove his boot from the ski by lifting his heel.

To fix the boot to the ski, the skier places his booted foot on the ski, the lever **9** still being raised as the roller **12**, which has previously run over the surface **27** to the concave surface **30**, immobilizes the lever in the position for freeing the boot, as shown in FIG. **3**. The heel descends to meet the end of a flat part **35**, integral with the lever **9**. The skier thus bears on this lever, which pivots in the counterclockwise direction (looking at FIG. **3**) and fits on the heel in the normal position, as in FIG. **1**.

FIG. **5** shows another embodiment of the safety heel clip according to the invention.

The gripping component **40** for the boot comprises a semispherical part **37** the flat planar end of which cooperates with a planar surface of a thrust piece **36** also having a semispherical configuration. The flat end face or pressure face of the part **37** is provided with an antifriction device, ball bearings **38** for example. Alternatively, or in addition to ball bearings **38**, the cooperating faces of parts **36** and **37** could be coated with a synthetic material such as polytetrafluoroethylene which enables satisfactory sliding of the surfaces.

A spring **28** exerts a biasing force on the first piece **36** opposed to the pivoting movement of the holding component **40** about the center of a swivel joint **39**.

When an abnormal thrust is applied to the holding component **40** this pivots, acting on the thrust piece **36** by means of part **37**. The thrust piece **36** is thus translationally moved in a rectilinear fashion, compressing the spring **28**. If the travel of the first piece **36** exceed a certain amount the part **37** is released, thus freeing the boot.

Another original detail of the invention arises in the simple possibility, well within the possibilities of a skier, of replacing as desired, the means supplying the opposing force, particularly by substituting a hydraulic jack device for the spring **28**, for example a jack device similar to that described in French Patent Application No. 1 054 (Haute-Savoie). In fact, it is only necessary to unscrew the fitted plug **29**, and to replace it by such a jack having the free end of a piston pressing on the plate **34**, thus replacing the action of the spring **28** by an appropriate hydraulic pressure.

What is claimed is:

1. A device for releasably fixing the heels of boots to skis comprising: a support, means for attaching said support to a ski, a lever having first and second ends, means mounting said lever on said support intermediate said first and second ends for pivotal movement at least about axes horizontal and vertical in relation to the surface of a ski upon which the device is to be fixed, boot heel gripping means on said first end of said lever, pressure applying means including a bearing surface for applying said bearing surface against said second end of said lever, slide-permitting means between said second end and said bearing surface for permitting said second end to slide horizontally and vertically against said bearing surface, said pressure means normally urging said lever so that said first end normally assumes a boot-gripping position and said pressure means urging said lever to cause said first end to assume a horizontal and/or vertically displaced boot-freeing position whenever said first end if upwardly displaced beyond a limiting value of sidewardly displaced beyond a limiting value.

2. A device according to claim **1**, wherein said second end of said lever carries one roller having a horizontal axis and two rollers having vertical axes.

3. A device according to claim **1**, wherein said bearing surface has means defining a recess in which said horizontal roller is housed when in said vertically displaced boot-freeing position.

4. A device according to claim **1**, wherein said bearing surface is located on a thrust piece longitudinally movable in said support and guided by ball bearings or rollers.

5. A device according to claim **4**, wherein said pressure applying means is a compression spring compressed and disposed between a positionally adjustable part of said support and said thrust piece.

6. A device according to claim **1**, wherein said bearing surface and the corresponding surface of said second end are both planar.

7. A device according to claim **6**, wherein said slide-permitting means is a plate coated with a synthetic material on either or both of said surfaces.

8. A device according to claim **6**, wherein said slide-permitting means comprise ball bearings on either of said surfaces.

9. A device according to claim **1**, wherein said second end bears against said bearing surface in at least three distinct points.

10. A device for releasably attaching the heel of a ski boot to a ski comprising: a support member; means for connecting said support member to a ski; a lever having first and second end portions; means mounting said lever intermediate said first and second end portions on said support member for pivotal movement in both vertical and horizontal planes between a common locking position and a plurality of unlocking positions; boot heel gripping means connected to said lever at said first end portion for releasably gripping the heel of a ski boot when said lever is in said locking position; and force applying means for continuously applying a force of a predetermined magnitude to said second end portion of said lever to maintain same in said locking position and responsive to a predetermined extent of pivotal movement of said lever in one of said planes to effect further movement of said lever in that plane to thereby move said lever to one of said unlocking positions.

11. A device according to claim **10**, wherein said force applying means comprises a movable bearing surface, a plurality of antifriction members rotatably mounted on said second end portion of said lever at least one of which is rotatable about a vertical axis and at least one of which is rotatable about a horizontal axis, and spring means continuously biasing said bearing surface into contact with said antifriction members to thereby apply said force through said antifriction members to said lever.

12. A device according to claim **11**; wherein said bearing surface has means therein defining a vertically extending groove configured to receive therein one of said antifriction members which is rotatable about the horizontal axis when said lever is pivoted in the vertical plane.

13. A device according to claim **11**; including means mounting said bearing surface for translational movement towards

and away from said second end portion of said lever, and wherein said antifriction members comprise rotatable rollers.

14. A device according to claim **10**; wherein said force applying means comprises one bearing surface connected to said second end portion of said lever, another bearing surface movably disposed in opposed relationship from said one bearing surface, a plurality of antifriction members disposed between said bearing surfaces facilitating relative movement therebetween, and spring means continuously biasing said another bearing surface towards said one bearing member to thereby apply said force through said antifriction members and one bearing surface to said lever.

15. A device according to claim **14**; wherein each of said bearing surfaces comprise a semispherical member having a planar surface disposed in opposed relationship to the planar surface of the other semispherical member, and wherein said antifriction member comprises a plurality of ball bearings positioned between said planar surfaces.

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