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UNITED STATES PATENTS

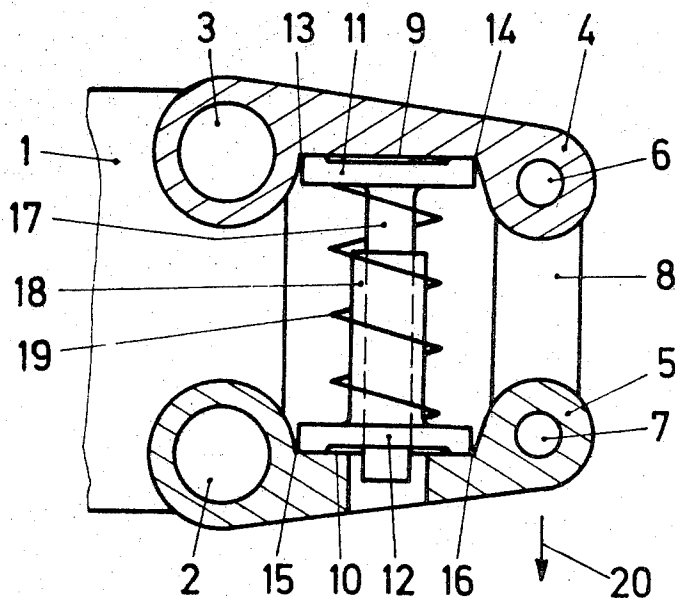
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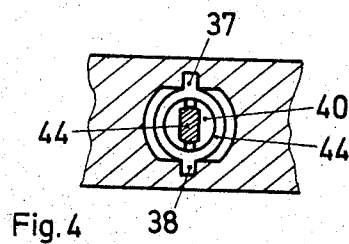
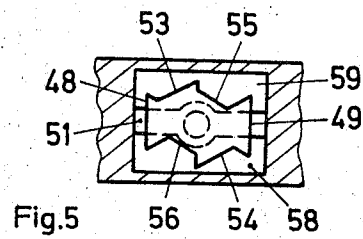
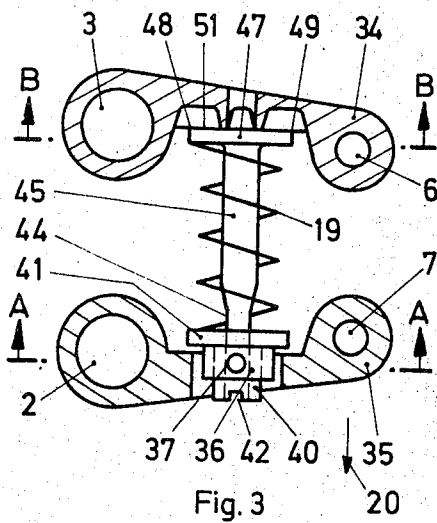
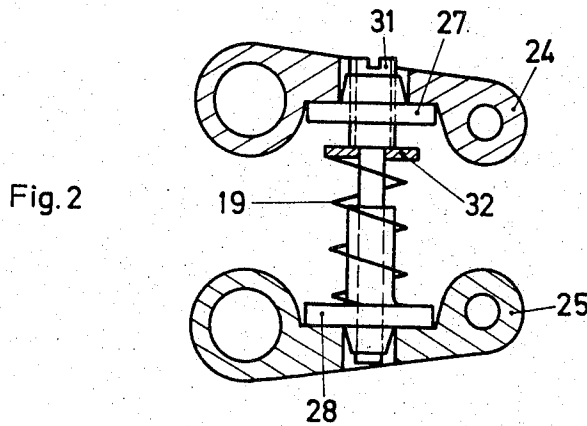
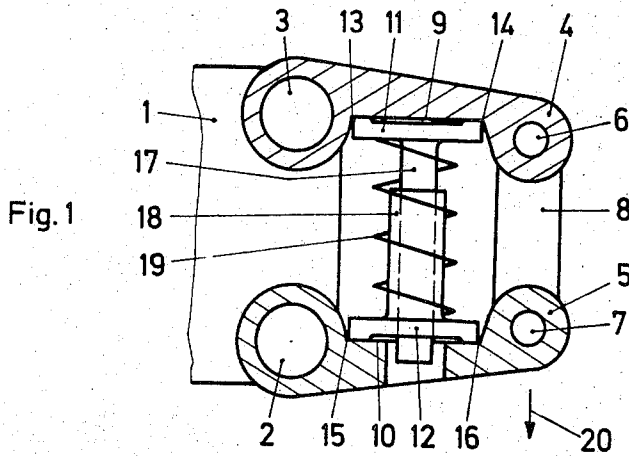
Attorney, Agent, or Firm—Michael S. Striker

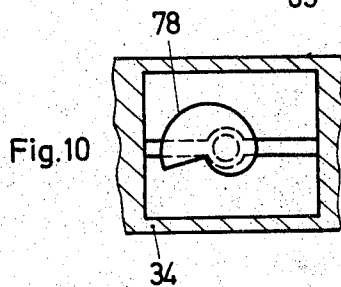
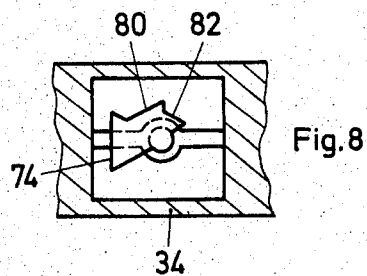
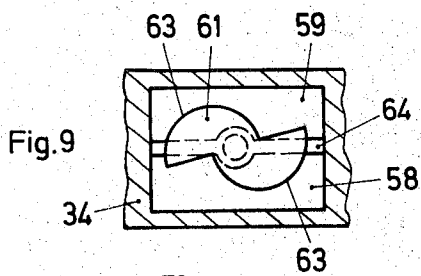
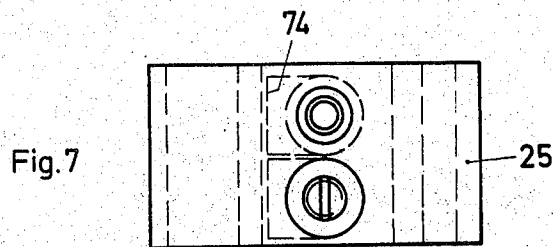
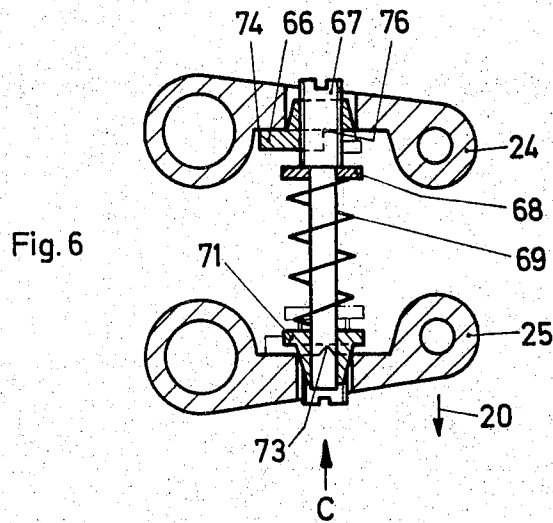
ABSTRACT

In a ski binding having a four-bar kinematic chain which includes two opposite first elements one of which is to be secured to a ski and the other of which carries a boot-engaging portion and is displaceable in a predetermined plane from and to a rest position, and two opposite second elements linked with the first elements, the invention provides a pretensioned energy storing spring which acts between the second elements of the chain, and at least one abutment interposed between the spring and one of the second elements. The abutment engages the associated second element in point or line contact at a surface thereof which extends substantially normal to the plane of movement of the displaceable element, and the abutment is spaced from the locus at which the force of the spring acts upon the other second element by a distance which decreases with increasing displacement of the movable first element from its rest position.

18 Claims, 13 Drawing Figures







SHEET 3 OF 3

FIG. 12

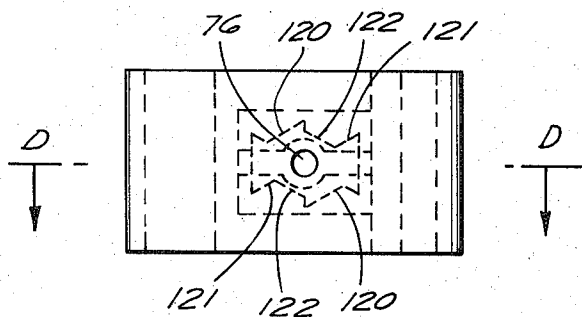


FIG. 11

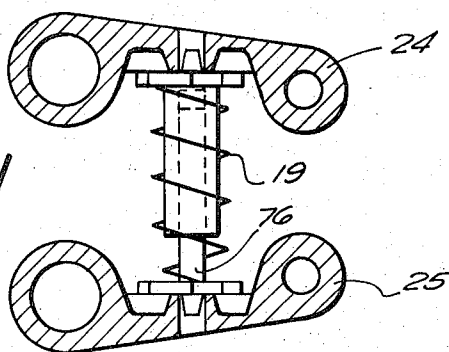
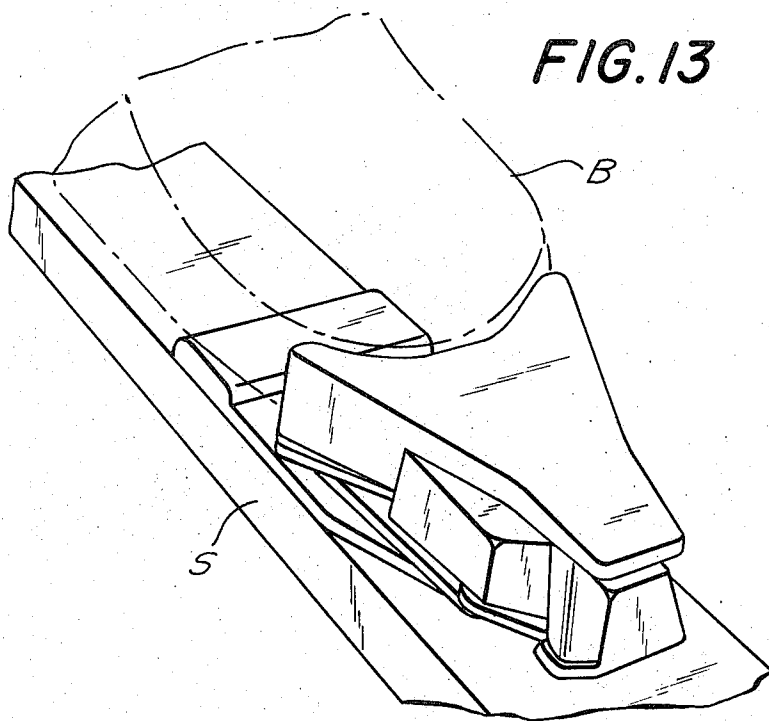


FIG. 13



SKI BINDING CONSTRUCTION

BACKGROUND OF THE INVENTION

The present invention relates generally to a ski binding construction, more particularly to an arrangement for the elastic retention of ski binding components, more particularly safety ski binding components.

In ski bindings it is frequently necessary to maintain a component, for instance a sole holder, in such a manner in a predetermined position that the component will become movable against the action of a biasing element in one or in two mutually opposite directions only after an initial predetermined force has been overcome. It is immaterial in this connection whether such movement is to take place in direction transversely or normal to the longitudinal axis of the ski, or in any other direction. To solve this problem, the prior art has proposed to so pivot the component to be displaced by means of two pivoting arms to another component of the binding which is at least at times connected with ski, so that a four-bar kinematic chain is obtained the movable component or coupling of which constitutes the component which is to be displaced. In such a construction the kinematic chain is maintained in its rest position by biasing means which act on at least two of the four bars or elements of the chain. For instance, springs or spring-loaded snap-in ball couplings may be used for this purpose which act via suitable abutments on surfaces of turnable components of the arrangement.

The difficulty with the prior art proposals is that when they are actuated, that is when a displacement is to take place, substantial friction must be overcome which will vary considerably in dependence upon the extent to which the arrangement may have been lubricated and/or the extent to which it may have become contaminated with dirt or the like. This is particularly disadvantageous in the case of safety ski bindings, that is release bindings, in which it makes it impossible to obtain an exact and reproducible setting for the magnitude of the force required to trigger the release of the release binding.

It is a general object of the present invention to overcome the disadvantages of the prior art.

More particularly it is an object of the present invention to provide, in a ski binding having a four-bar kinematic chain, an arrangement which avoids the aforementioned disadvantages.

An additional object of the invention is to provide such an arrangement which operates with a minimum of frictional resistance.

In keeping with these objects, and with others which will become apparent hereafter, one feature of the invention resides in a ski binding having a four-bar kinematic chain including two opposite first elements one of which is to be secured to a ski and the other of which carries a boot-engaging portion and is displaceable in a predetermined plane from and to a rest position, and two opposite second elements linked with the first elements, in a combination which comprises pretensioned energy storing means acting between these second elements, and abutment means interposed between the energy storing means and one of the second elements. According to the invention, the abutment means engages the one second element in at most line contact at a surface thereof which extends substantially

normal to the aforementioned plane and such engagement is effective at the latest on initiation of the displacement of other first element. The abutment means is spaced from the locus at which the energy storing means acts upon the other of the second elements by a distance which decreases with increasing displacement of the other first element from the rest position thereof.

The construction according to the present invention has significant advantages. In the first place, the frictional force which arises on displacement of the displaceable first element and which must be overcome, is very small because the area on which this force must be transmitted is reduced to a point or to a line. The force required for effecting the displacement of the displaceable first element corresponds to all intents and purposes to the balancing force of the energy storing means, so that it can be precisely predetermined. Furthermore, a contamination of the arrangement with dirt, slush or the like, or even various degrees of lubrication which may be encountered at different times or under different operating conditions, will remain largely without influence upon the force which counteracts the movement of the displaceable first element from its rest position.

The balancing force assures that the arrangement will have a damping effect on the useful movements of the ski boot with reference to the ski, and will always return the ski boot to its normal starting position on the ski. It is well known that such movements of the boot with reference to the ski take place almost constantly during skiing but of course are not usually sufficient to trigger a release of the release binding, if the latter type of binding is provided. If indeed the binding is of the release type or safety binding type, then at the end of the visible displacement path within the length of which damping effects are obtained, a release arrangement may be provided so that if the movement of the boot with respect to the ski exceeds the length of the permissible path, the binding will release. Because the release force corresponds to the biasing force which obtains when the end of the aforementioned path has been reached, it is clear that this force is to all intents and purposes independent of the condition of contamination or lubrication of the binding.

It is currently preferred to so construct the arrangement according to the present invention that the point or line-contact is obtained by at least one edge, that is by a knife-like abutment edge, so that the cooperation between the abutment and the second element of the kinematic chain upon which the abutment acts, is essentially that of the beam of the scale with the knife edge on which it is balanced.

The invention also proposes that the biasing force exerted by the energy storing means may cooperate in both directions with an abutment, in which the abutments are provided with knife-edged abutment edges which abut against the respective second elements in response to movement of the displaceable first element in one or in the opposite direction. It is possible to provide each of the abutments with at least two such abutment edges, which are located at opposite sides of and equidistantly spaced from the axes along which the biasing action of the energy storing means is transmitted, such equidistant spacing obtaining when the displaced first element is in its rest position; in this case a force of identical magnitude is opposed to the displacement

of the displaceable first element as it moves from and to its rest position. If a safety release binding is provided with the arrangement according to the present invention, then such release will take place in both directions of displacement of the first element with a constant and identical-magnitude force. According to a further embodiment, the same results can be achieved in that one abutment has an abutment portion, such as an abutment edge, which is located either on the axis along which the force of the energy storing means is exerted or which crosses this axis, whereas the other abutment has at least two abutment edges equidistantly spaced from this axis at opposite sides thereof.

In either of the two last-mentioned possibilities, the biasing force may be made adjustable. In this case, a variable damping force or resistance to triggering of the release binding can be obtained which is of equal magnitude in both directions of displacement of the displaceable first element. The same result can also be obtained, rather than with an adjustable biasing force, in that one of the abutments is provided with two or more pairs of abutment edges which are located at opposite sides of the aforementioned axis, with the abutment being turnable about this axis so that in dependence upon such turning, the one or another pair of abutment edges can engage the respectively associated second element. Edges of each pair are equidistantly spaced from the axis, but this spacing is different in different pairs so that, depending upon the distance from the axis, the biasing force can be varied in that the pretension of the energy storing means is influenced sooner or later as calculated from the moment at which displacement of the displaceable first element begins.

The abutment means may utilize two abutment elements each of which may have one abutment edge located on the aforementioned axis, and one of them may have at least one additional abutment edge which is laterally spaced from this axis. It is possible to utilize two sets of such abutment elements, and to provide each of them with energy storing means, for instance in the form of a helical spring, with the biasing force exerted by one of the energy storing means being different from that exerted by the other. When the thus obtained two arrangements which differ from one another in the biasing force exerted by their respective energy storing means, are positioned to act in parallelism upon the second elements of the four-bar kinematic chain, a damping or release-resisting force is obtained which is constant in both opposite directions of displacement of the displaceable first element but which differs in magnitude. In other words, in one direction the force will be greater and in the other direction it will be lesser, but in either case it will be constant. This is desired in some circumstances and it will be appreciated that if the biasing force can be made adjustable, the variations in the force can be selected at will or as required.

This latter possibility also exists if both abutments of each set in the aforementioned embodiment each have an abutment edge which is located on the respective axis along which the energy storing means transmits its biasing force, whereas the other abutment has two or more abutment edges which are spaced at different distances from these axes. The last-mentioned edges will be turnable with respect to and about these axes. Both abutments may also be provided with several pairs of such edges which can be turned about the axis.

Still a further concept of the invention proposes that the abutment edges may be in the form of continuous arcuate curves to thus permit an essentially continuous adjustment analogous as in the case of an adjustment of the biasing force.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a sectional top-plan view of one embodiment of the invention;

FIG. 2 is a view similar to FIG. 1 of another embodiment, with some components omitted for the sake of clarity;

FIG. 3 is a view similar to FIG. 2 but illustrating a further embodiment of the invention;

FIG. 4 is a fragmentary section detail view, on an enlarged scale, taken on line A—A of FIG. 3;

FIG. 5 is a view similar to FIG. 4 but taken on line B—B of FIG. 3;

FIG. 6 is a view similar to FIG. 1 illustrating a further embodiment of the invention;

FIG. 7 is a view of FIG. 6 as seen in the direction of the arrow C;

FIG. 8 is a view similar to FIG. 5 illustrating a further embodiment of the invention;

FIG. 9 is a view similar to FIG. 8 illustrating still another embodiment of the invention;

FIG. 10 is a view similar to FIG. 9 illustrating another embodiment of the invention;

FIG. 11 is a view similar to FIG. 1 illustrating a further embodiment of the invention and in a section taken on line D—D of FIG. 12;

FIG. 12 is a fragmentary detail view in section of FIG. 11; and

FIG. 13 is a perspective view illustrating an arrangement according to the present invention mounted on a fragmentarily shown ski and provided with a boot-engaging portion.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing the drawing in detail, and firstly the embodiment illustrated in FIG. 1, it will be seen in this embodiment that the arrangement utilizes a four-bar kinematic chain having the elements 1 and 8 which extend in parallelism, and the associated elements 4 and 5 which also extend in parallelism and which are pivoted to the elements 1 and 8. In particular, the element 1 is to be fixedly mounted on a ski which is not illustrated in FIG. 1, but the arrangement and mounting of an embodiment as in FIG. 1 is illustrated by way of orientation in FIG. 13, where the boot-engaging portion (omitted in FIG. 1) is also illustrated. Pivoted to the element 1 by pivots 2 and 3 are the elements or arms 4 and 5 which in turn are pivoted by the pivots 6 and 7 to the element 8. It is the element 8, which is shown in detail only in FIG. 1 but which should be understood to be present also in all other embodiments where it has been illustrated only in phantom lines, which is displaceable from its rest position illustrated in FIG. 1 in the direc-

tion of arrow 20, and back to its rest position. The element 8 carries a boot-engaging portion, for instance a sole holder. It can also itself be configured as a boot-engaging portion, or be coupled or otherwise connected with the boot-engaging portion as long as it can move with the same, or vice versa.

The arms 4 and 5 have surfaces which extend normal to the plane of the drawing and are identified with reference numerals 9 and 10, respectively. Advantageously, the planes of the surfaces 9 and 10 extend through the pivot axes of the pivots 2 and 3, respectively. Abutment members 11 and 12 abut against the surfaces 9 and 10, respectively, and have edges 13 and 14 (for member 9) and 15 and 16 (for member 10) which extend normal to the general plane of the drawing. The abutment 11 has a guide portion or shaft 17 which is glideably accommodated in a sleeve 18 provided on the abutment 12. A helical spring presses the abutments 11 and 12 apart and into engagement with the surfaces 9 and 10, respectively.

It will be seen that in the illustrated rest position the surfaces 9 and 10 are parallel with one another and the abutments 11 and 12 abut over the entire width of surfaces 9 and 10. The direction in which the spring exerts a biasing force coincides with the longitudinal axis of the portion 17.

If a force is exerted upon the member 8 tending to displace it in the direction of the arrow 20 in FIG. 1, then the locus at which the force is transmitted from the spring 19 to the arm 4, shifts via the abutment 11 in direction towards the edge 14 thereof, and the locus at which the force is transmitted to the arm 5 shifts via the abutment 12 towards the edge 15 of the latter. When the externally acting force upon the member 8 is sufficiently increased so that the loci coincide with the respective edges 14 and 15, the member 8 can be displaced in the direction of the arrow 20 out of its rest position. When the external force is increased beyond this first limiting value, a corresponding relative pivoting of the arms 4 and 5 with reference to the abutments 11 and 12 takes place about the edges 14 and 15; at the same time, the distance between the edges 14 and 15 at which the force of the spring 19 is now transmitted to the arms 4 and 5, decreases. This results in a further axial compression of the already pre-tensioned spring 19, so that the force required for further displacing the member 8 in direction of arrow 20 increases. The pivotal displacement of the arms 4 and 5 increases with an increase in the external force acting upon the member 8, and the magnitude of the force required to bring about further movement of member 8 increases in proportion to the shortening or compression of the spring 19.

If the arrangement is used in a safety release binding, with the element 8 acting as a sole holder of such a safety release binding, then the element 8 is so guided that it will be suddenly released only after it has been displaced in the direction of the arrow 20 by some millimeters, whereupon it can be further displaced without any significant external force and will release the toe of the boot from the binding. This is not particularly illustrated but the manner in which the release is accomplished is well known from safety bindings.

The release of the safety binding takes place when a second boundary force, the triggering or release force, is reached. The variation of this force, that is the

adjustment of this force, can be effected by changing the pre-tension of the spring 19.

When during skiing the second boundary force, the force at which the release binding is triggered and releases the boot, is not quite reached in the case of a displacement of the boot with reference to the ski, then a relaxation of the force acting upon the boot and via the same upon the element 8 permits the latter to be restored to its rest position shown in FIG. 1 under the influence of the force exerted by the spring 19. In other words, the relative movement of the boot and ski which took place has not been sufficient to trigger the release of the safety binding.

It will be appreciated that if the element 8 is displaced from the illustrated rest position of FIG. 1 in the direction opposite to the arrow 20, the relationship and operation will be the same, except that now the force vector of the spring 19 passes through the edges 13 and 16, rather than through the edges 14 and 15 as before.

What is essential in accordance with the present invention is the fact that at the engagement of the edges 14 and 15 with the arms 4 and 5, respectively, or in the alternate case at their engagement of edges 13 and 16 with the arms 4 and 5, respectively, no friction of any consequence will take place as the arms 4 and 5 pivot about their pivots 2 and 3. In other words, the engagement of the edges with the associated arms is analogous to the engagement of the knife edge of a scale with the balance beam thereof. Because of this, it is possible to predetermine very precisely at which external force the displacement of the element 8 from its rest position will begin, that is, what external force must be acting upon the element 8 before the first boundary value is exceeded.

The embodiment of FIG. 2 is reminiscent of that of FIG. 1, except that here the abutment 27 is provided with a threaded stem or bolt 31 on to which there is threaded a disc 32. By threading the disc 32 in one or the opposite axial direction of the stem 31, the pre-tension of the spring 19 can be increased or decreased whereby the second boundary value of the force, that is the release force of the binding, can be varied at will. The second abutment is identified with reference numeral 28 and the arms 24 and 25 correspond to the arms 4 and 5 in FIG. 1.

The embodiment in FIGS. 3-5 is also capable of permitting an adjustment of the displacement force. In this embodiment, the arms 34 and 35 are provided corresponding to the arms 4 and 5 of FIG. 1. The arm 35 is provided with an opening 35a in which there is mounted a ring element 36, being turnable about the pivots 37 and 38 as shown in FIG. 3 and 4. A sleeve 40 is turnably accommodated in the ring element 36, being provided with a bead or shoulder 41 and with a slot 42 in which a screwdriver or the like may be engaged. An appropriately flattened bore of the sleeve 40 suitably accommodates a correspondingly flattened portion 44 of a bolt 45 which latter constitutes an extension of an abutment 47 which abuts the arm 34 on the one hand and the biasing spring 19 on the other; the spring 19 in turn abuts the shoulder 41.

The element 8 is displaced in the direction of the arrow 20, the force exerted by the spring is transmitted to the arm 34 via the edge 49, whereas the edge 48 lifts off at the arm 34; if from the position illustrated in FIG. 3 the element 8 is displaced counter to the arrow 20,

the edge 49 lifts off from the arm 34 and the force is transmitted to the latter via the edge 48. The arm 35 has the biasing force of the spring 19 transmitted to it at all times via the common axes of the pivots 37 and 38.

If the kinematic chain is a parallelogram, and if the surface 51 corresponding to the surface 9 of FIG. 1 intersects the axis of the pivots 3 and 6, whereas the common axis of the pivots 37 and 38 intersects the axis of the pivots 2 and 7, a decrease in the distance between the pivot 38 and the edge 49 during displacement of the element 8 in direction of the arrow 20 corresponds to a shortening of the distance between the pivot 37 and edge 48 in the event element 8 is displaced from the position of FIG. 3 in direction counter to the arrow 20. In other words, in so far as the forces are concerned which developed during such displacement, symmetry exists.

FIG. 3 shows that the force required for effecting displacement of the element 8 can be varied. For this purpose, the abutment 47 is provided with a plurality of oppositely located pairs of edges 48 and 49; 53 and 54, and 55 and 56 (see FIG. 5). Each respective one of these edges can be moved to operative position by inserting a screwdriver into the slot 42 and turning the bolt 45 in an appropriate sense. The surface 51 on the arm 34 is reduced in this embodiment to a narrow strip at the opposite sides of which recesses 58 and 59 provide sufficient room for the overhanging round corners of the abutment 47 when the element 8 is moved from its rest position. The narrower the surface 51 is, the more pairs of abutment edges can be provided on the abutment 47.

It will be appreciated that the first boundary value of the force required for displacing the element 8 from its rest position will be the smaller the lesser the distance between the edges of the respective pair of abutment edges (48 and 49; 53 and 54; 55 and 56) which at any given time is in operative position. This first boundary value decreases to zero as the distance similarly decreases, because the respective edge has been reached a priori and no compressing of the spring takes place during displacement of element 8. By resorting to the embodiment of FIGS. 3-5, the force required for releasing, for instance, a toe-engaging jaw of a binding provided with the arrangement according to the invention can be made adjustable, and moreover the selected force will be precisely reproducible whenever desired.

In the case of ski bindings it will frequently be desired to deviate somewhat from the ideal parallelogram, giving the path of movement of the element 8 a curved contour rather than to arrange the element for straight-line displacement. This has been done in the embodiment of FIGS. 3-5 and, although there is a deviation from the symmetry of forces in the case of the displacement of the element 8 in the direction of arrow 20 or counter thereto, this deviation is minor, especially if the path to be traversed by the element 8 from rest position to operative position is not particularly long.

In the event that the release force, that is the rapidity with which the force acting on the element 8 increases, is to be made continuously variable, then the abutment can be constructed in accordance with the embodiment of FIG. 9 in which the pairs of edges are replaced by a curved edge, configured for instance as a logarithmic spiral and identified with reference numeral 63. In

other respects the embodiment of FIG. 9 resembles that of FIG. 3.

FIGS. 6 and 7 illustrate an embodiment in which a binding provided with the arrangement according to the present invention will act differently, depending upon whether the element 8 is displaced in the direction of the arrow 20 or counter thereto. Furthermore, in each direction of displacement the force required for triggering the release of the binding is individually adjustable. This is frequently desired or advantageous.

In FIGS. 6 and 7 there are provided two springs 69 (only one shown) two abutments 66 (only one shown) two adjusting bolts 67 and 67a (see FIG. 7) two pressure plates 68 (one shown) and two abutments 71 (one shown) each of which abuts a knife edge 73 provided on the arm 25. In other words, two complete sets each composed of an element 66, 67, 68, 69, 71 and 73, are provided and act in parallelism between the arms 24 and 25. The abutment 66 is provided with an edge 74 which is laterally offset from the axis of the bolts 67 and a further edge 76 which passes through this axis and which is in actuality composed of two separate portions. The edge 76 has the same effect as a pair of edges whose spacing from one another has been reduced to zero.

When in the embodiment of FIGS. 6 and 7 the element 8 is displaced from the illustrated rest position of FIG. 6 in the direction of the arrow 20, then the force exerted by the springs 69 passes through the edges 73 and 76 (whose spacing from one another does not vary if the arrangement is constructed as a parallelogram, and varies only insignificantly if the arrangement is not a parallelogram) into the arms 24 and 25, so that no external triggering force is required. If the element 8 is displaced counter to the arrow 20, then the force exerted by the springs 69 passes at the moment of release through the edges 73 and 74 and the arrangement will behave in the manner as described above with respect to FIG. 3.

In this embodiment the arrangement is such that in each direction of displacement of the element 8, that is in the direction of the arrow 20 or counter thereto, only one of the two complete sets will become active, that is either the set having the bolt 67 or the set having the bolt 67a. For this reason it is possible in this embodiment to individually adjust the force required for displacing the element 8 in one or the other direction, and to effect such adjustment separately and to any desired extent.

It is also possible to use in place of the bolt 67 an abutment having the edges 74, 80 and 82 as shown in FIG. 8, with these edges being spaced at different distances from the axis of the bolt 67. Another possibility is that illustrated in FIG. 10 where the single edge is configured as a curve which begins in the region of the central axis of the bolt 67 and extends radially outwardly and constantly increasing radius of curvature.

The embodiment in FIGS. 11 and 12 utilizes additional pairs of edges on one of the abutments, with pairs being designated with reference numeral 120, 120; 121, 121 and 122, 122, respectively. The abutment can be turned about the longitudinal axis of the bolt 67 to move a respective desired pair of edges into operative abutting position.

FIG. 13, finally illustrates for purposes of orientation an arrangement such as shown in FIG. 1, but mounted on a ski S and with the element 8 being provided with

a toe-engaging jaw J which is to engage the toe of a ski boot.

In all embodiments it should be understood that illustrated compression springs can also be replaced with tension springs, and that whatever spring is used can also act between the elements 1 and 8 instead of the elements 4 and 5 or the analogous elements described in the various embodiments.

With respect to the embodiment of FIGS. 6 and 7 it should still be pointed out that when the arrangement is moved so that the element 8 shifts in the direction of the arrow 20, only one of the springs 69 will exert a force whereas the other one does not, and that when the element 8 is displaced counter to the arrow 20, the spring 69 which previously exerted a force does not do so now and the other spring which previously did not exert a force will now exert such a force. This will, of course, already have been understood.

In place of line contact it is also possible to provide for point contact in the various embodiments.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described as embodied in a ski binding, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by letters Patent is set forth in the appended claims:

1. In a ski binding having a four-bar kinematic chain including two opposite first elements one of which is to be secured to a ski and the other of which carries a boot-engaging portion and is displaceable in a predetermined plane from and to a rest position, and two opposite second elements which are linked with said first elements and one of which has a surface which extends substantially normal to said plane, a combination comprising pre-tensioned energy storing means acting between said second elements; and abutment means interposed between said energy storing means engaging said surface of said one second element and having at most line contact with said surface no later than upon initiation of the displacement of said other first element from said rest position, and said abutment means being spaced from the locus at which said energy storing means acts upon the other of said second elements by a distance which decreases with increasing displacement of said other first element from said rest position thereof.

2. A combination as defined in claim 1, said abutment means including at least one abutment edge arranged to engage said surface of said one second element.

3. A combination as defined in claim 1, wherein said abutment means is also interposed between said energy storing means and said other second element.

4. A combination as defined in claim 3, said abutment means including a pair of abutment edges each arranged to engage a respective one of said second elements in response to displacement of said other first element from and to said rest position, respectively.

5. A combination as defined in claim 3, wherein said energy storing means acts upon said second elements along a given axis; and wherein said abutment means comprises a first pair and a second pair of abutment edges with each pair being arranged to engage a respective one of said second elements in response to displacement of said other first element from and to said rest position thereof, the abutment edges of each pair being located at opposite sides of said axis and being equi-distantly spaced from the latter when said other first element is in said rest position.

6. A combination as defined in claim 3, said energy storing means acting upon said second elements along a given axis; and wherein said abutment means includes a first abutment edge arranged to engage one of said second elements in response to displacement of said other first element and being located on said axis, and at least two second abutment edges arranged to engage the other of said second elements in response to displacement of said other first element and being located at opposite sides of said axis and equi-distantly spaced from the same when said other first element is in said rest position.

7. A combination as defined in claim 6; and further comprising varying means for varying the biasing force exerted by said energy storing means.

8. A combination as defined in claim 7, said abutment means comprising two abutment members each associated with one of said second elements, and wherein said energy storing means comprises a helical spring extending between and having one end bearing upon one of said abutment members; said varying means comprising a disk member interposed between the other of said abutment members and the other end of said spring and being displaceable axially of the latter.

9. A combination as defined in claim 7, said abutment means comprising a first abutment member having said first abutment edge, and a second abutment member having said second abutment edges; said second abutment member being turnable about said axis and having at least two additional abutment edges angularly offset with reference to said at least two abutment edges and also located at opposite sides of said axis, said additional abutment edges constituting said varying means and being positionable for abutment with said other second element in response to turning of said second abutment member about said axis.

10. A combination as defined in claim 4, said energy storing means acting upon said second element along a given axis, and said abutment means comprising two abutment members each of which is provided with one of said abutment edges, the latter being located on said axis; and wherein said abutment means further comprises an additional abutment edge provided on one of said abutment members and being laterally spaced from said axis.

11. A combination as defined in claim 10; further comprising additional abutment means similar to and

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engaging said second elements in parallel with the first-mentioned abutment means, and additional pretensioned energy storing means cooperating with said additional abutment means and also acting between said second elements, said additional energy storing means exerting a biasing force different from that exerted by the first-mentioned energy storing means.

12. A combination as defined in claim 11; and further comprising varying means for individually varying the biasing force exerted by the respective energy storing means.

13. A combination as defined in claim 11, wherein said one abutment member of each of said abutment means is provided with at least one further abutment edge spaced from the respective axis by a distance different from the distance between the respective axis and the respective additional abutment edge; and wherein each of said one abutment members is turnable about the respective axis for engagement of said additional or said further abutment edge with the respective second element.

14. A combination as defined in claim 4, said abutment means including two abutment members and having one of said abutment edges located at one side of the axis along which the force of said energy storing means acts upon said second elements; further com-

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prising an additional abutment edge on each of said abutment members located at the other side of said axis with both abutment edges being equi-distantly spaced from said axis; and at least one additional pair of abutment edges on each of said abutment members also located at opposite sides of said axis but spaced equidistantly therefrom by an other distance than the first-mentioned abutment edges, said abutment members being turnable about said axis.

15. A combination as defined in claim 14, wherein said abutment edges are of continuous arcuately curved configuration.

16. A combination as defined in claim 15, wherein each abutment edge curves in radially outward direction from the vicinity of said axis and at an increasing radius of curvature.

17. A combination as defined in claim 15, wherein said abutment edges of each pair curve in diametrically opposite radially outward directions from the vicinity of said axis and at an increasing radius of curvature.

18. A combination as defined in claim 4, wherein said abutment edges curve in radially outward direction from the vicinity of the axis along which said energy storing means acts upon said second elements, and at an increasing radius of curvature.

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