Dec. 14, 1965 P. ISAAC 3,222,922

SKI AND BOOT RELATIVE TORQUE INDICATORS

Filed June 12, 1961 3 Sheets-Sheet 1

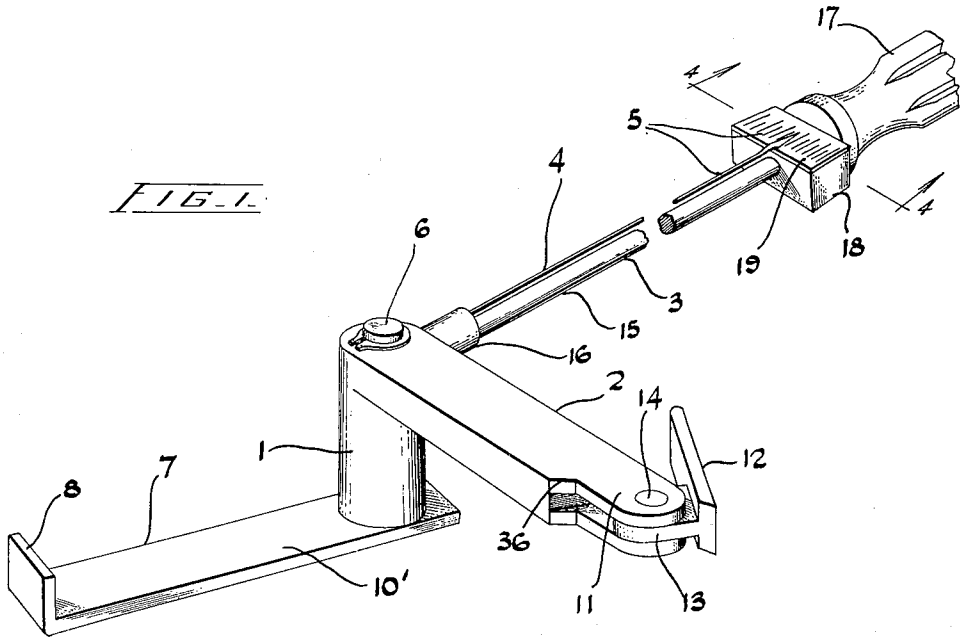


FIG. 1.

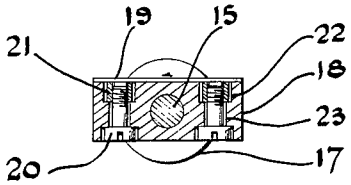


FIG. 4.

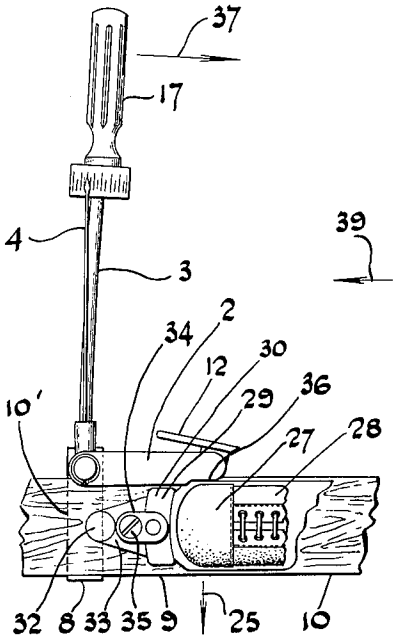


FIG. 2.

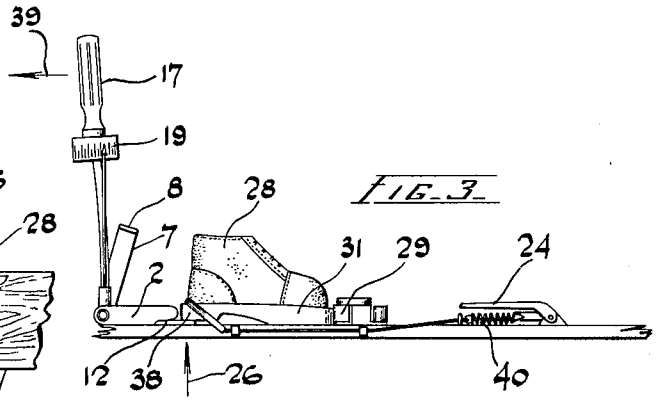


FIG. 3.

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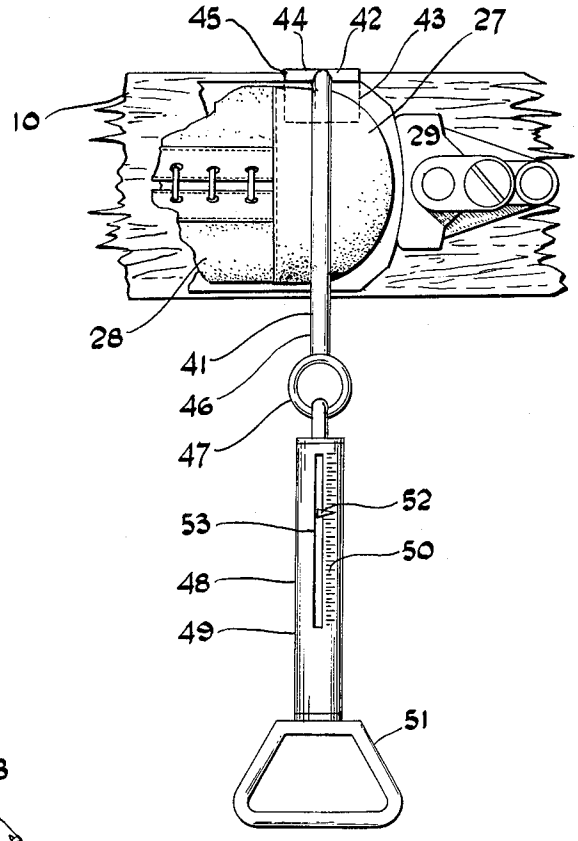


FIG. 5.

FIG. 6.

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SKI AND BOOT RELATIVE TORQUE INDICATORS

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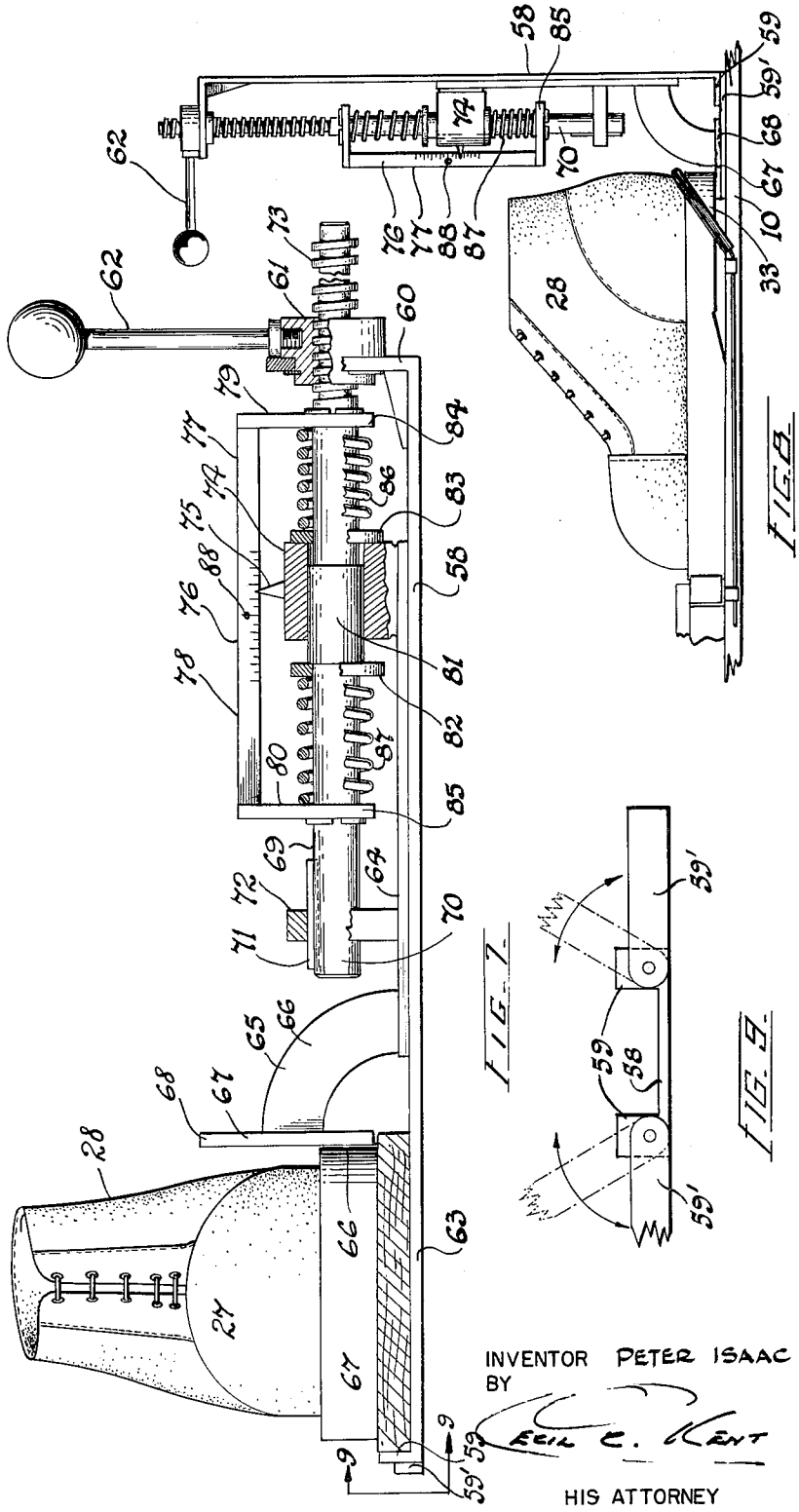


FIG. 8

FIG. 7

FIG. 9

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3,222,922

SKI AND BOOT RELATIVE TORQUE INDICATORS

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8 Claims. (Cl. 73—133)

The present invention comprises a device for measuring or gauging the tolerable torque between a boot and a ski both in terms of horizontal twisting motion about the heel of the boot, and vertical rotary motion about the toe of the boot, tending to separate the boot from the ski at the heel thereof.

It is well recognized that many skiing accidents are due to a ski being fastened too rigidly to the associated boot. Hence, ski harness of various designs has included arrangements for adjusting the resistance to separation under stress between a ski and a boot in the two directions aforesaid. However, as far as has been ascertained, no invention has been designed for measuring the torque required to separate a boot from a ski responsive to tightening variations applied to the associated harness whereby it is possible to effect release of the boot from the ski at any preselected torque such as it is possible to do with the present invention.

A further object of the present invention is to provide a device of the character herewithin described which will foster the establishment of a tolerable torque standard for various persons of different weights and age either by the medical profession or responsible ski association or institute, to the end that skiers may use the present invention in association with such standard, and set their harness to release the boot from the ski according to standard data for their type, and hence reduce the incidence of injuries both as to quantity and severity.

The present invention has further applications such as in the making of equal (or measurably different) settings for both skis, and detecting the malfunctioning of harness, to mention just two of the uses which would be recognized readily by persons of skiing experience. In addition, the invention in all the three embodiments herein exemplified, is conspicuously simple to manufacture, assemble and use, being also capable of sale at a reasonable price, and free of any requirement such as replacement parts, servicing or the like.

With the foregoing objects in view, and such others as may become apparent as this specification proceeds, the present invention consists of the following arrangement and construction of parts all as hereinafter more particularly described, reference being made to the accompanying figures in which:

FIGURE 1 is a perspective representation of a simple and preferred embodiment of the present invention.

FIGURE 2 is a plan representation of the embodiment of FIGURE 1 in situ and in plan, showing the said device as applicable to measuring torque at the toe of a ski boot in a plane parallel to that of the ski.

FIGURE 3 is a view similar to FIGURE 2 but at right angles thereto and intended to indicate the manner of use of the embodiment of FIGURE 1 as applied to measure vertical stress between the heel of a ski boot and the ski.

FIGURE 4 is a detail on the line 4—4 of FIGURE 1.

FIGURE 5 is a plan representation of an alternative embodiment of the present invention.

FIGURE 6 is an elevational representation of the embodiment of FIGURE 5 depicting the use of same as applied to the heel of a boot.

FIGURE 7 is a front elevation of a further embodiment of the present invention as primarily designed for use in sports stores where skiing equipment is sold, and at skiing resorts where maintenance, renting and the

like facilities are maintained, this figure illustrating the manner in which horizontal torque is applied against the toe of a boot.

FIGURE 8 is a representation of the modification of the invention depicted in FIGURE 7 but illustrating the manner of use thereof as applied against the heel of a ski boot.

FIGURE 9 is a view on the line 9—9 of FIGURE 7.

In the drawings like characters of reference designate similar parts in the several figures.

Describing first the embodiment of the accompanying FIGURES 1 through 4, it will be seen that what is there represented comprises a hollow cylindrical bearing portion 1 to the upper end portion of which is affixed load moving means collectively designated 2, and, at right angles thereto effort applying means collectively designated 3. Also projecting from member 1 is a pointer 4 constituting part of indicating means collectively designated 5. Rotatably secured to the lower end of member 1 by means of the keyed stub-shaft 6, are device setting means collectively designated 7, the same, in this embodiment taking the form of a ski traversing stirrup provided with an upwardly projecting shoulder 8 designed to bear against the edge 9 of a ski 10, while the portion 10' extends across and beneath the ski as clearly depicted in the accompanying FIGURE 2.

Load moving means 2, and effort applying means 3, in addition to being rigidly secured to the upper end of member 1 are preferably in right-angular relationship. Considered in detail, means 2 constitute a lever conformed at the distal end 11 thereof in the manner most clearly depicted in the accompanying FIGURE 1; that is to say is bifurcated to receive the swingable heel-lift component 12 journalled at the bifurcated end by means of the lug and stub-shaft details 13 and 14 respectively.

Effort applying means 3 embody a shaft 15 which is flexible under stress being secured in a short sleeve or collar 16 integral with member 1. Upon the end of shaft 15 is a handle 17 for convenient manual operation of the present device, but interposed between shaft 15 and handle 17 is a scale block 18 constituting part of indicating means 5. Scale block 18 is most clearly depicted in the accompanying FIGURE 4 from which it will be observed that the actual reading scale 19 thereon is slightly adjustable laterally by virtue of the provision of countersunk bolts 20 engageable with internally screw-threaded sockets 21 projecting from the rear side of plate 19 into cavities 22. These cavities, together with the apertures 23 within which bolts 20 are received, provide a tolerance for the said bolt and socket assemblies. In this way indicating needle 4 can be accurately zeroed.

The accompanying FIGURES 2 and 3 indicate sufficiently the manner in which the first embodiment of the present invention is employed for testing the tolerable torque between a boot and a ski, at the toe and at the heel of the latter respectively. There are many different forms of ski harness collectively designated 24 but all operate to the same end which is to maintain a rigid connection between boot and ski, which connection is only intended to be broken when excessive stress is applied between boot and ski either in parallel horizontal planes as indicated by arrow 25 of FIGURE 2, or in right-angularly related planes as indicated by arrow 26 of FIGURE 3.

One manner in which the toe 27 of a boot 28 is secured to ski 10 against horizontal rotation is conventionally designated at 29. The arcuate toe-bearing plate 30 exerts pressure against the front end of the sole 31 of boot 28. It swings about pivot point 32 via plate 33. Detail 34 including the adjustable screw 35 constitutes means whereby, upon rotation of the latter, varying re-

sistance to yielding, of the toe-plate **30** may be achieved.

In light of the last foregoing explanation, it will now be apparent that in order to gauge the stress in pounds at which plate **30** should yield, load moving means **2** are caused to lie against the sole **31** of boot **28** in the toe region thereof while setting means **7** under-span the ski as aforesaid. At this point it will be observed that the distal end **11** of means **2** is slightly stepped-back at **36** in order the more conveniently to accommodate the toe portion of sole **31** at the corner thereof. Heel piece **12** is swung out of position for horizontal torque testing. If now an effort be applied to handle **17** in the direction of arrow **37**, it will be apparent that shaft **15** will deflect while needle **4** remains straight, portion **8** acting as the fulcrum of a lever system in the toe testing position while the lever constituting the principal component of load moving means **2** bears clockwise against the edge of the boot sole in the manner by now clearly apparent.

To operate the first embodiment of the present invention with respect to the heel **38** of boot **28**, setting means **7** are swung out of use. Then toe-piece **12** is inserted between heel **38** and the ski. Now handle **17** is urged counter clockwise as indicated by arrow **39**. Thus in this use of the device, member **1** functions as the fulcrum, and when sufficient stress is applied to handle **17**, boot **28** obviously yields upwardly at the heel, and about the toe portion so that the heel clamping portion **40** of any conventional harness **24** may be adjusted to yield at the requisite stress attainment measured in pounds on scale **19**.

In the second embodiment of the present invention as illustrated in the accompanying FIGURES 5 and 6 there is shown load moving means collectively designated **41** in the form of a rectangular, double angulated bracket **42** having an underplate **43** intended to be inserted between sole and ski, an intermediate vertical portion **44** which bears against the edge of the sole, and an upper flange **45** to which is secured a toe-cap overspanning portion **46** connectible by means of ring **47** to indicating means collectively designated **48** and taking the form of a slotted and spring-loaded barrel **49** suitably scaled as at **50** and terminating in a pulling handle **51**, it being understood that pointer **52** is suitably connected to a spring within barrel **49** so that upon the application of tension to handle **51**, relative movement takes place between pointer **52** and slot **53**.

In the use of this embodiment for testing heel stress, there is substituted for the toe-cap overspanning portion **46**, a species of clevis **54** taking the form of U-shaped portion **55** designed to extend downwardly on either side of the rear portion **56** of boot **28**, being of course engageable with ring **47** as shown, and terminating at the base in the angular heel lift **57** insertable between boot heel and ski, being secured to the lower ends of the U-shaped portion **55**.

Obviously upon the application of an upward effort, parting stress at the heel of a boot may be accurately measured with respect to the associated ski.

In the embodiment illustrated in the accompanying FIGURES 7 through 9 there is depicted a third variation of the inventive concept disclosed in the present application. In this embodiment a mounting structure collectively designated **58** is usable horizontally as in FIGURE 7 or vertically as in FIGURE 8. Such mounting structure comprises an elongated plate terminating at one end in an upstanding projecting portion **59** which, in horizontal stress measurement functions as a fulcrum like detail **8** of FIGURE 1, but in vertical use functions as a foot for supporting the mounting structure, rotatable extensions **59'** being provided to stabilize this embodiment against overturning as best illustrated in FIGURES 8 and 9. At the opposite end of mounting structure **58** is a right-angularly related bearing plate **60** having journalled therewithin a keyed, rotatable, internally screw-threaded bushing **61** projecting from which is a handle **62**.

Mounting structure **58** also includes at the left end thereof with respect to the accompanying FIGURE 7, what is designated in one or more of the claims appended hereto as a load supporting stirrup **63** when such structure is employed for measuring torque in horizontal planes. Sustained upon the mounting structure and to the right of the portion **63** is a load moving assembly collectively designated **64** including an end component collectively designated **65** engageable selectively either against the edge **66** of the sole **67** of boot **28** in the toe region thereof, or between said boot and ski **10** in the heel region. Such end component comprises the upstanding fish plate **66** and bearing plate **67** secured at right angles thereto for lifting the heel of boot **28**. From the accompanying FIGURE 8 it is apparent that both the projecting end portion **68** of plate **67** and the pair of extensions **59'** are insertable between boot-sole and ski as aforesaid.

The effort applying means in this third embodiment are collectively designated **69** and may be said to constitute the shaft **70** splined and keyed as at **71** upon support **72** against rotation, the opposite end of such shaft being screw-threaded as at **73** for endwise movement under the rotary influence of bushing **61**.

Load moving assembly **64** also carries at the opposite end thereof to that to which end component **65** is secured, a collar **74** through which shaft **70** extends. Projecting from this collar is a pointer **75** constituting part of indicating means for measuring stress, collectively designated **76** and including the double angulated bracket **77**, which in turn comprises a scaled bar portion **78**, and end supports **79** and **80** the lower ends of which encircle, and are keyed against end shifting movement to, shaft **70**.

The portion **81** of shaft **70** which is encircled by collar **74** is of greater diameter than the remainder of the shaft. It will also be observed that secondary collars **82** and **83** encircle shaft **70** on either side of portion **81**. Between these secondary collars and the shaft encircling collar portions **84** and **85** of parts **79** and **80** are springs **86** and **87**.

From the foregoing it will be apparent that, in relation to the accompanying FIGURE 7, rotation of handle **62** clockwise from the position in which portion **81** is centered with respect to collar **74**, shaft **70**, in moving leftwardly causes compression of spring **86** (in virtue of the keyed portion **84** which is the agency causing such compression against collar **83**). Scale bar **78** obviously also moves leftwardly from the zero point **88** and hence the amount of pressure required to cause boot **28** to swivel about the heel thereof under the influence of portion **67** can conveniently be measured.

When the third embodiment of the present invention now being described is employed in the vertical position of the accompanying FIGURE 8 to lift heel **33**, it will be apparent that handle **62** is to be rotated counter clockwise. By rotation in such direction spring **87** is compressed under the influence of the keyed shaft encircling sleeve portion **85**. At the same time a scale bar **76** travels in the opposite direction. Hence it is to be understood that both in the first and third embodiments of the present invention, the markings on either side of the zero point **88** stand for the same amount of stress in one direction as the other.

What I claim as my invention is:

1. A device for measuring the torque between a boot and a ski comprising in combination load moving means in the form of a load bearing arm one end of which is bearable against said boot, device setting means connected to and co-acting with said load moving means for positioning and holding said device against said ski, an effort applying resilient arm, a rigid indicator rod, said load bearing arm and said resilient arm being fixed immovably relative to each other in angular relationship at one end of each, the end at which said load bearing arm is fixed being opposite to that which is bearable against said boot, said indicator rod being fixed

immovably relative to said load moving means to the junction of said two arms to lie parallel with said resilient arm, and a measuring scale adjacent said rod whereon the extent of deflection of said resilient arm relative to said rod may be read.

2. The device according to claim 1 in which said load bearing arm is a two-part arm, said two parts being pivotally and serially connected, one part being connected to said resilient arm, and constituting the main portion, and the other a distal, heel lifting portion, said heel lifting portion being rotatable between an angular, out-of-use relationship with respect to said main portion, and a heel lifting, in-line relationship.

3. The device according to claim 1 wherein the junction of said arms constitute a load bearing fulcrum, and in which said device setting means constitute an additional fulcrum in the form of a ski transversing stirrup rotatably attached to said junction in a plane parallel to but spaced from that of said load bearing arm and bearable against said ski, whereby said load bearing arm may be caused to bear against the edge of the sole of said boot in the toe region thereof upon the application of a rotary force upon said effort applying arm.

4. A device for indicating the torque between a boot and a ski harnessed thereto comprising in combination, load moving means applicable against said boot for rotating said boot relative to said ski about the heel of said boot in a horizontal plane or about the toe of said boot in a vertical plane, effort applying and amplifying means for exerting a force upon said load moving means, a mounting structure one end of which constitutes device setting means which embodies a transversely ski-spanning load supporting stirrup when the device is used for indicating torque horizontally about said heel and embodies a load supporting foot when said device is used to indicate torque vertically about said toe of said boot, said load moving means being in the form of a load moving assembly slidably sustained upon said mounting structure, being engageable selectively against the edge of the sole of said boot in the toe region thereof or between said boot and ski in the heel region of the former, said effort applying and amplifying means being connected to said load moving assembly and taking the form of a balanced, spring-loaded, screw-threaded shaft with means for rotatably end shifting said shaft, and means for indicating said torque embodying an indicating scale assembly on said shaft and said load moving assembly.

5. A device indicating the torque between a boot and a ski harnessed thereto, at least including, in combination, load moving means applicable against said boot for rotating said boot relative to said ski, device setting means for positioning and holding said device against said ski during application of said load moving means, effort applying and amplifying means for exerting torque upon said load moving means, and means for indicating said torque.

6. The device according to claim 5 in which said device setting means span said ski transversely therebeneath, and are adapted and arranged to bear against an edge of said ski.

7. The device of claim 5 in which said load moving means are pivotally connected to said device setting means, to exert a rotary effort when said load moving means are applied against the toe of said boot.

8. A device for indicating the torque between a boot and a ski harnessed thereto about the toe of said boot, at least including, in combination, load moving means applicable between the heel of said boot and said ski, said load moving means exerting a vertical rotary levering effort, the fulcrum of which bears against the upper surface of said ski or on an object near said ski, effort applying and amplifying means for applying a load to said boot through the agency of said load moving means, said effort applying and amplifying means comprising a resilient arm which is attached to said load moving means in an angular relationship thereto, and means for indicating said torque comprising a rigid indicator rod and a scale, said indicator rod being attached to said load moving means such that it is parallel to said arm, said scale being attached to said effort applying and amplifying means and being movable past the distal end of said indicator rod when said effort applying and amplifying means are actuated.

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