Jan. 26, 1971 B. PAYRHAMMER 3,558,151

REAR TIGHTENER FOR SAFETY SKI BINDINGS

Filed April 15, 1969 5 Sheets-Sheet 1

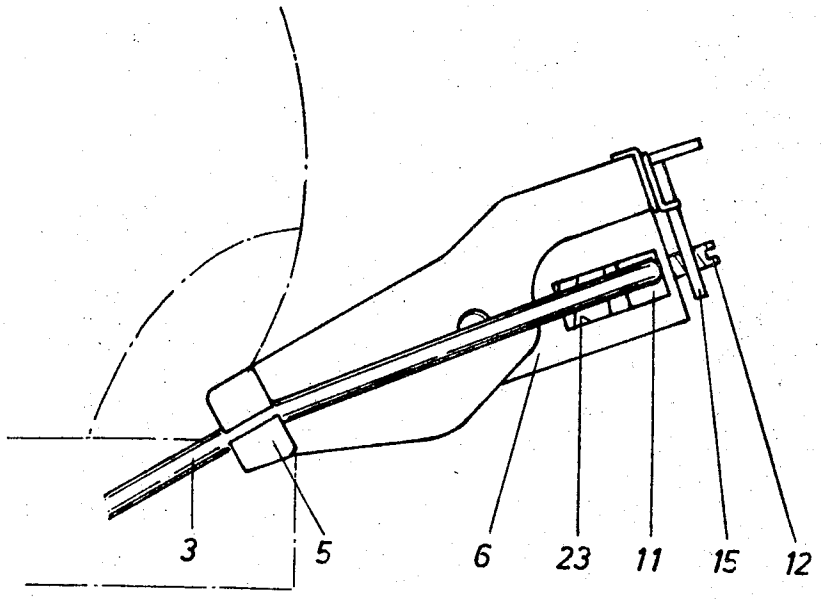

Fig.1

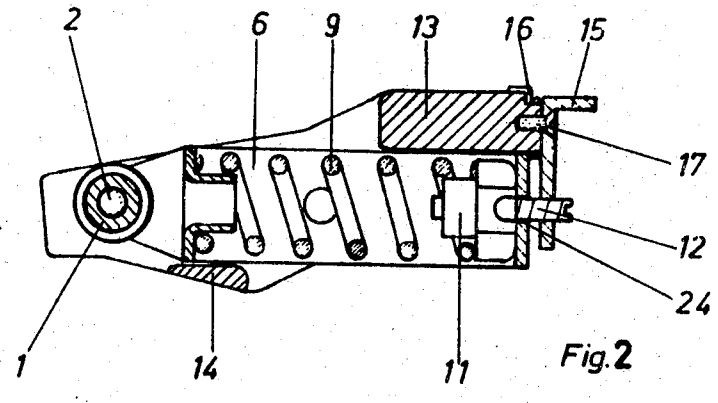

Fig.2

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REAR TIGHTENER FOR SAFETY SKI BINDINGS

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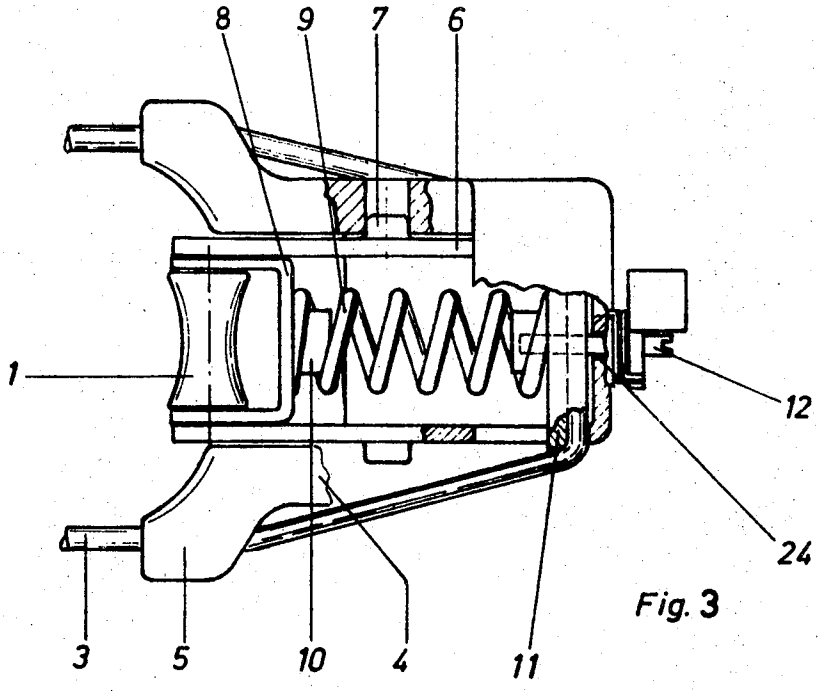

Fig. 3

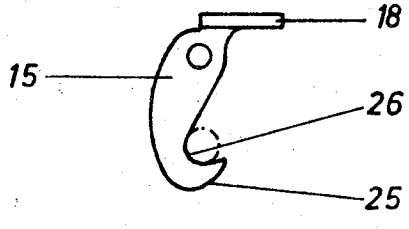

Fig. 4

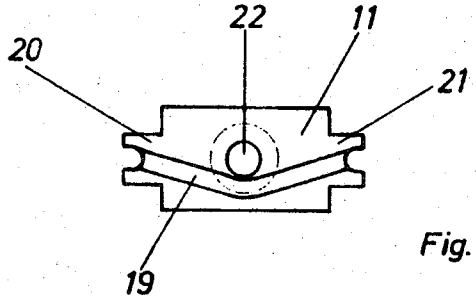

Fig. 5

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REAR TIGHTENER FOR SAFETY SKI BINDINGS

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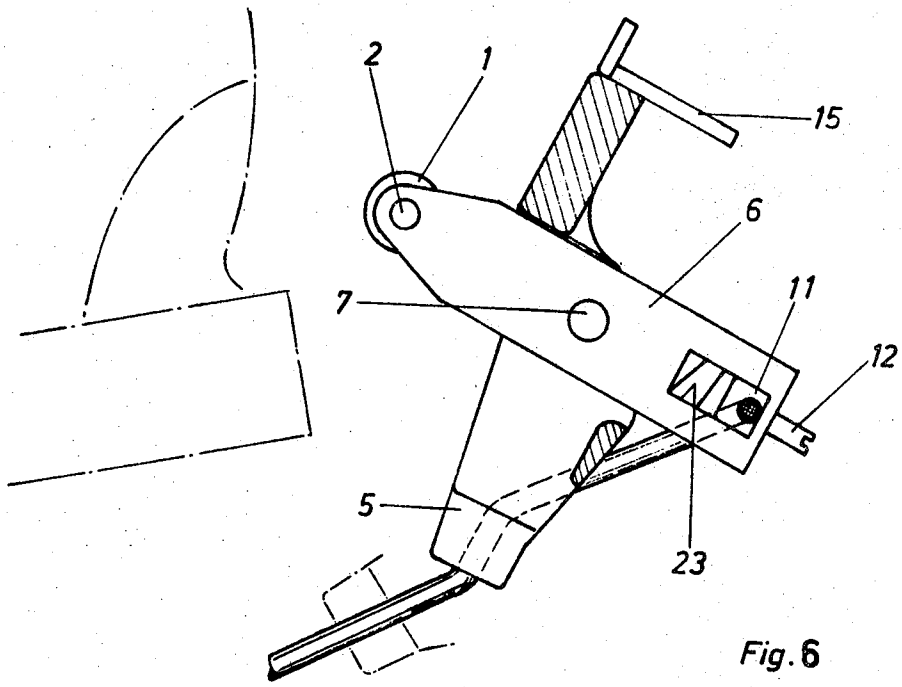

Fig. 6

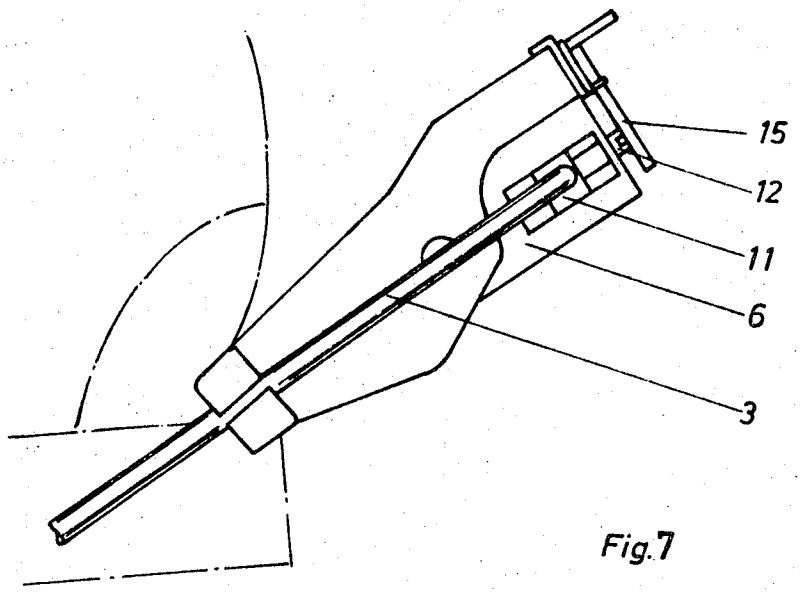

Fig. 7

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REAR TIGHTENER FOR SAFETY SKI BINDINGS

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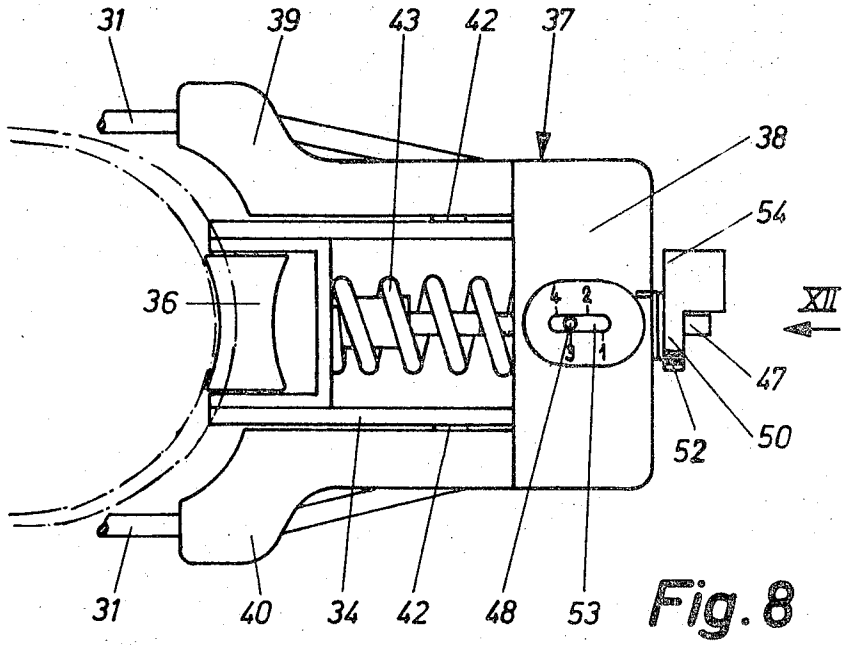

Fig. 8

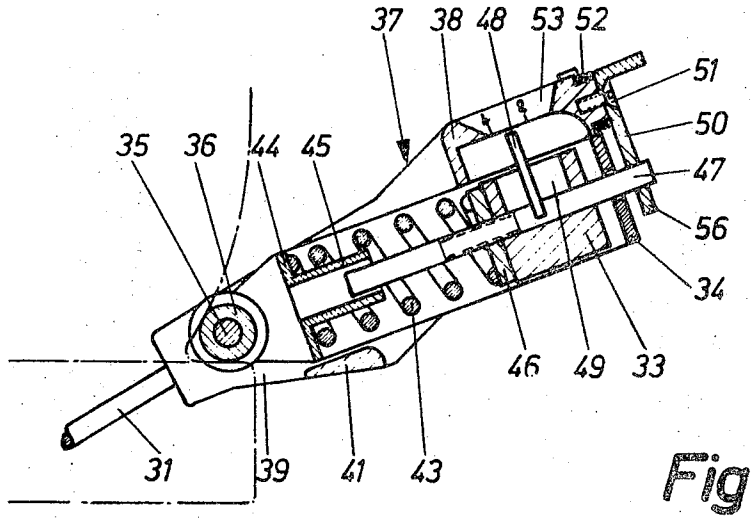

Fig. 9

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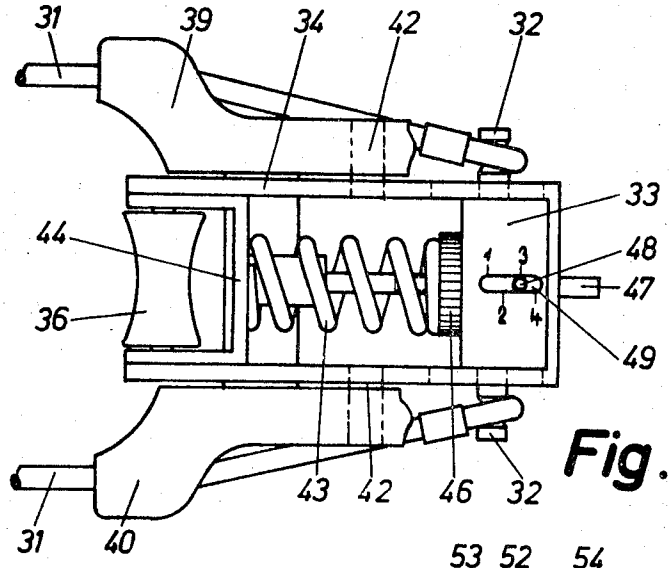

Fig.10

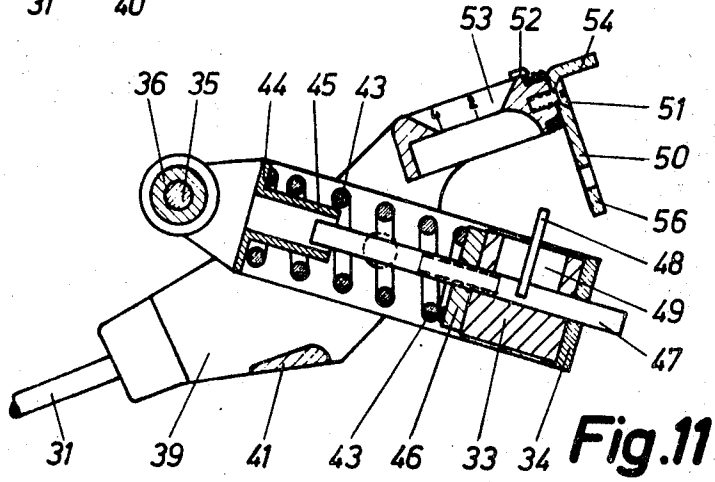

Fig.11

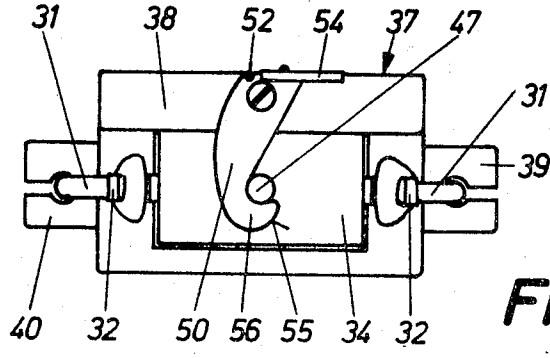

Fig.12

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3,558,151

REAR TIGHTENER FOR SAFETY SKI BINDINGS

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Claims priority, application Germany, Mar. 7, 1969, 1,911,740
Int. Cl. A63c 9/08
U.S. Cl. 280—11.35 4 Claims

ABSTRACT OF THE DISCLOSURE

A skiing boot pusher is disposed substantially between the legs of a U- or V-shaped retaining frame and is held on the same for pivotal movement about an axis which is transverse to the longitudinal axis of the ski and parallel to the tread of the ski. The free ends of the legs constitute guides for two tension elements, by which the rear tightener is held on the ski and which act on the pusher through the intermediary of at least one spring, which spring or springs produce the force for holding down the heel and the contact pressure by which the toe portion of the skiing boot is forced against a retaining device. A safety clutch is provided between the pusher and retaining frame and prevents a pivotal movement of the two parts relative to each other when the rear tightener is ready for use whereas it is disengaged to disconnect the two parts in response to an overload. The pusher extends rearwardly beyond the axis on which it is pivoted to the retaining frame and forms a two-armed lever having a forward arm which has a free end engageable with the heel of the boot. The other arm of the lever forms a guide which extends in the longitudinal direction of the lever and is in guiding engagement with a slider, to which the tension elements are connected. Each spring has one end bearing on the slider and another end bearing on a fixed part of the pusher. The clutch member carried by the pusher consists of a pin, which is mounted in the slider for longitudinal movement therein. The clutch member carried by the retaining frame consists of a locking member, which can be arbitrarily released. The pin is nonrotatably mounted in the slider and on a screw-threaded portion carries a knurled nut, which is disposed between the slider and that end of the spring which bears on the slider.

The present invention relates to a rear tightener for safety ski bindings, which rear tightener comprises a skiing boot pusher, which is disposed substantially between the legs of a U- or V-shaped retaining frame and is held on the same for pivotal movement about an axis which is transverse to the longitudinal axis of the ski and parallel to the tread of the ski, the free ends of the legs constituting guides for two tension elements, by which the rear tightener is held on the ski and which act on the pusher through the intermediary of at least one spring, which spring or springs produce the force for holding down the heel and the contact pressure by which the toe potrion of the skiing boot is forced against a retaining device, and a safety clutch being provided between the pusher and the retaining frame and preventing a pivotal movement of the two parts relative to each other when the rear tightener is ready for use whereas it is disengaged to disconnect the two parts in response to an overload.

In such known rear tighteners, the pivotal axis of the pusher is disposed at that end thereof which cannot be engaged with the heel of the boot and near the outer end of the retaining frame. The inner ends of the tension elements are guided in or on the retaining frame.

Whereas these rear tighteners have a sound mode of operation and can easily be handled, it has been found in practice that they have various disadvantages. The safety clutch is subjected to heavy wear and is not free of trouble in operation for a prolonged time and unless proper maintenance is provided for. There is also the risk that the heel of the boot is not entirely released by the pusher after a safety opening operation thereof, particularly when the forward pressure is high.

For this reason it is an object of the invention so to improve and design the rear tighteners of the kind mentioned first hereinbefore that the disadvantages thereof will be avoided without appreciable additional expense.

In a rear tightener for safety ski bindings, which rear tightener comprises a skiing boot pusher, which is disposed substantially between the legs of a U- or V-shaped retaining frame and is held on the same for pivotal movement about an axis which is transverse to the longitudinal axis of the ski and parallel to the tread of the ski, the free ends of the legs constituting guides for two tension elements, by which the rear tightener is held on the ski and which act on the pusher through the intermediary of at least one spring, which spring or springs produce the force for holding down the heel and the contact pressure by which the toe portion of the skiing boot is forced against a retaining device, and a safety clutch being provided between the pusher and retaining frame and preventing a pivotal movement of the two parts relative to each other when the rear tightener is ready for use whereas it is disengaged to disconnect the two parts in response to an overload, the object set forth above is accomplished in that the pusher extends rearwardly beyond the axis on which it is pivoted to the retaining frame and the pusher forms a two-armed lever having a forward arm which has a free end engageable with the heel of the boot whereas the other arm of the lever forms a guide which extends in the longitudinal direction of the lever and is in guiding engagement with a slider, to which the tension elements are connected, each spring has one end bearing on the slider and another end bearing on a fixed part of the pusher, and the clutch member carried by the pusher consists of a pin, which is mounted in the slider, and the clutch member carried by the retaining frame consists of a locking member, which can be arbitrarily released.

When such rear tightener is being opened, the pivotal movement of the pusher results in a reduction of the distance between the slider and the free leg ends of the retaining frame so that the entire rear tightener can be pushed further outwardly along the tension elements and a catching of the heel of the boot by the pusher will be reliably precluded.

The clutch pin is suitably mounted in the slider for longitudinal movement therein so that the resistance to a release can be conveniently adjusted. The pin may be desirably screw-threaded and mounted in a tapped hole of the slider.

In a structural development of the invention it has proved desirable to use a hook as a locking member carried by the retaining frame and a spring which holds said locking member in its locking position. The hook may have an angled-off arm, which serves as a handle for arbitrarily disengaging the clutch. To ensure that the two clutch members will be automatically engaged when the tightener is brought into position for use, the hook may have at its free end portion an oblique run-up surface, which is run up by the clutch pin as the pusher is swung in so that the hook is then swung out against the force of its return spring. When the pin has moved past the nose of the hook, the return spring will return the hook to its locking position, in which the nose of the hook engages the pin from behind.

It has proved desirable to provide the two tension elements in the form of the leg portions of a U-shaped cable having a bight portion which is held in a recess of the

slider. A rear tightener which has thus been designed can be made in a relatively simple manner and at low cost.

In a preferred embodiment of the invention, the pin may be nonrotatably mounted in the slider and on a screw-threaded portion may carry a knurled nut, which is disposed between the slider and that end of the spring which bears on said slider. The pin is suitably held against rotation in the slider by a bolt which extends in an elongated hole of the slider.

Because the resistance to a release must be different for different skiers, there would be a requirement for keeping on stock a large number of rear tighteners differing as to their resistance to a release unless that resistance could be adjusted.

An adjustment of the resistance to a release requires an indicating device to avoid a wrong adjustment. In a rear tightener which embodies the invention described hereinbefore, an indicating device can be provided in a simple manner in that the free end of the bolt forms a pointer and at least one longitudinal edge of the slot carries a scale.

To enable a cooperation of the rear tightener with a certain kind of retaining devices for the toe portion of the skiing boot, which retaining devices are responsive to the contact pressure, it is desirable or even necessary to ensure that the contact pressure is functionally dependent on the force by which the heel is held down. To avoid a wrong adjustment in this respect, an improved rear tightener according to the invention comprises a retaining frame which is formed with a slot, which lies over the slot in the slider and exposes the free end of the pin when the rear tightener is ready for use, and at least one longitudinal edge of the slot in the retaining frame is provided with a scale. The bolt end which serves as a pointer may then be used also to indicate the contact pressure. The two scales are suitably similar and must only be mutually oppositely directed.

Embodiments of the invention will now be described more fully with reference to the accompanying drawings, in which

FIG. 1 is a side elevation showing a rear tightener according to the invention in a condition ready for use.

FIG. 2 is a central longitudinal sectional view showing the rear tightener of FIG. 1.

FIG. 3 is a top plan view, partly cut open, showing the rear tightener of FIG. 1.

FIG. 4 is a rear elevation showing a hook which constitutes a locking member.

FIG. 5 is a rear elevation showing the slider of the rear tightener according to FIGS. 1 to 3.

FIG. 6 is a sectional view taken on line VI—VI of FIG. 3 and showing the rear tightener in opened condition.

FIG. 7 is a view similar to FIG. 1 showing a rear tightener immediately before a safety release.

FIG. 8 is a top plan view showing a rear tightener according to a second embodiment of the invention ready for use.

FIG. 9 is a central longitudinal sectional view showing the rear tightener of FIG. 8.

FIG. 10 is a view similar to FIG. 8 and shows the rear tightener when the skiing boot has not been inserted and with the right-hand end of the retaining frame cut open.

FIG. 11 is a sectional view similar to that of FIG. 9 and showing the rear tightener in an open condition.

FIG. 12 is an elevation showing the rear tightener viewed in the direction XII of FIG. 8.

In the rear tightener shown in FIGS. 1–7 and in that shown in FIGS. 8–12, the tension elements **3** and **31**, respectively, consist preferably of wire ropes covered with plastics material and are secured to the ski by means of a suitable heel plate, which is known in various designs and for this reason is not shown here. The tension elements are held on the heel plate for adjustment in length or the heel plate is longitudinally slidably held on the ski, e.g., on a baseplate secured to the ski. This adjustment in length or longitudinal adjustment serves to adjust the rear tightener to skiing boots differing in size and to adjust the contact pressure between the skiing boot and a device for retaining the toe portion of such boot.

The rear tightener shown in FIGS. 1–7 comprises a pusher **6**, which is pivoted by lateral pivot pins **7** to the legs of a substantially U-shaped retaining frame **4**. The free leg ends **5** of the retaining frame serve as guides for the tension elements **3**. At its left-hand end in FIG. 3, the pusher **6** carries on a pin **2** a roller **1**, which is engageable with the heel groove of a skiing boot, which is indicated in dash-dot lines in FIGS. 1, 6 and 7. The pusher consists of a frame and comprises a helical compression spring **9**, which bears at one end on a spring abutment **8**, which is provided with a centering pin **10**. The other end of the helical compression spring bears on a slider **11**, which has lateral extensions **20**, **21**, which are mounted in slots **23** in the side walls of the pusher **6** for slidable movement in the longitudinal direction of said pusher. A centering pin which is provided on the slider serves to locate the spring end in position.

In this embodiment, the two tension elements **3** are formed by the leg portions of a U-shaped cable, the bight portion of which is held in a recess **19** of the slider **11**. Under the influence of the helical compression spring **9**, the slider **11** is normally held in its outer limiting position, which is apparent from FIG. 3. The slider **11** has a central tapped hole **22** (see particularly FIG. 5), which extends longitudinally of the pusher **6** and is in threaded engagement with a screw-threaded pin **12**. The latter extends through a bore **24** (see FIG. 3) in the rear wall of the pusher **6**.

The screw-threaded pin **12** forms one member of a safety clutch. The other clutch member consists of a hook **15**, which is rotatably mounted on the web **13** of the retaining frame **4** by a screw **17**. The hook is normally held in its locking position by a torsion spring **16**. An angled-off arm **18** of the hook serves as a handle for a pivotal movement of the hook against the force of the torsion spring **16** when an arbitrary disengagement of the clutch is desired. For an automatic engagement of the two members of the clutch when the rear tightener is moved into its position for use, the hook is provided at its free end portion with an oblique run-up surface **25**, on which the screw-threaded pin **12** runs up when the pusher **6** is swung in so that the hook is swung out against the force of the spring **16**. When the pin has moved past the nose **26** of the hook, the latter is returned by its return spring to its locking position, in which the nose of the hook engages the pin from behind so that the pusher **6** and the retaining frame **4** are locked together.

The retaining frame has a cross-member **14**, which is parallel to the web **13** and connects the two legs.

FIG. 1 shows the rear tightener in condition ready for use. The helical compression spring **9** is under a suitable initial stress and owing to the oblique position of the pusher **6** and of the retaining frame **4** produces the force for holding down the heel and the contact pressure between the toe portion of the skiing boot and a device (not shown) for retaining such toe portion. When the skier desires to step out of the binding, he need only actuate the handle **18**, e.g., with the aid of a ski stick tip, to swing the hook **15** against the force of the return spring **16** so that the hook **15** releases the screw-threaded pin **12**. When the clutch between the retaining frame **4** and the pusher **6** has thus been disengaged, the heel of the skiing boot can be lifted from the rear tightener, as is shown in FIG. 6.

The binding is open as shown in FIG. 6 when it is to be applied to the boot. The skier initially introduces the toe portion of the skiing boot into the retaining device provided for this purpose and then places the skiing boot on the ski. The roller **1** of the pusher **6** is then inserted into the heel groove, whereby that end of the pusher which is on the right in FIG. 6 is swung upwardly and the pusher

enters the retaining frame so that the screw-threaded pin **12** is locked behind the nose **26** of the hook **15**.

When an approximately vertically upwardly directed tensile force acts on the leg of the skier while he is skiing, such force will be transmitted by the boot to the pusher **6** so that the stress of the helical compression spring **9** is increased because the slider **11** is held in position by the tension elements **3**. The retaining frame **4** is displaced together with the pusher so that the hook **15** moves relative to the screw-threaded pin **12** in the longitudinal direction of the latter. If the tensile force acting on the leg of the skier is dangerous to such leg, the spring **9** will be correspondingly compressed and the retaining frame **4** will perform such a large movement relative to the slider **11** that the hook **15** releases the screw-threaded pin **12**. The condition immediately before the release of the screw-threaded pin **12** is shown in FIG. 7. As soon as the screw-threaded pin **12** has been released, that end of the pusher **6** which is on the left in the drawings can move upwardly independently of the retaining frame **4** so that the skiing boot is disengaged from the roller **1**. The rear tightener is now again in the condition shown in FIG. 6.

The extent to which the screw-threaded pin **12** is screwed into the slider **11** will control the stress to be applied to the helical compression spring **9** until a safety release of the rear tightener occurs. In this way, the rear tightener can be adjusted to present a desired resistance to a release. It has been mentioned hereinbefore that the contact pressure is varied in that the tension elements **3** are adjusted longitudinally or in length.

In the embodiment of the rear tightener according to the invention which has just been described, the adjusted resistance to a release is indicated by that end portion of the screw-threaded pin **12** which protrudes from the pusher **6**. The length of that end portion is proportional to the force required for a release. The contact pressure between the skiing boot and the device for retaining the toe portion of the skiing boot is indicated by the displacement of the lateral extensions **20**, **21** of the slider **11** in the slots **23** of the pusher **6**. The embodiment of a rear tightener according to the invention shown in FIGS. 8–12 has improved indicating means.

This second embodiment substantially corresponds to the first in design and mode of operation. Two tensile elements **31** are connected to the binding by means of eyes held on respective pins **32** of a slider **33**. Just as the slider **11**, the slider **33** is mounted in a pusher **34** and the pins of the slider are slidable in slots formed in the side walls of the pusher and extending in the longitudinal direction thereof. The pusher again carries a pin **35**, on which a roller **36** is mounted, which is engageable with the heel groove of the skiing boot, which is indicated by dash-dot lines in FIGS. 8 and 9. Just as in the embodiment described hereinbefore, the rear tightener comprises a substantially U-shaped retaining frame **37**, which has a web **38** and legs **39** and **40**, which are connected by an additional cross-member **41**. In this embodiment too, the free limb ends of the retaining frame serve to guide the two tension elements **31**. The pusher **34** is pivoted to the legs **39**, **40** by lateral pivot pins **42**. The pusher again accommodates a helical compression spring **43**, which bears on a spring abutment **44**, which has a hollow pin **45** for centering the spring. The other end of the spring bears on the slider **33** with a knurled nut **46** interposed. A pin **47** is longitudinally slidably mounted in the slider and has a screw-threaded portion in threaded engagement with the knurled nut. A rotation of the pin in the slider is prevented by a bolt **48**, which is guided in a slot **49** of the slider.

The pin **47** forms one member of a safety clutch. The other member of the clutch consists again of a hook **50**, which is rotatably secured to the web **38** of the retaining frame **37** by a screw **51** and under the action of a torsion spring **52** tending to hold the hook in its locking position (see particularly FIG. 12). The web **38** of the retaining frame contains a slot **53**, which lies over the slot **49** in the slider **33** when the rear tightener is ready for use (see particularly FIG. 9).

Just as the hook **15** of the embodiment described first, the hook **50** has an angled-off arm **54**, which serves as a handle for arbitrarily disengaging the clutch. For an automatic engagement of the two clutch members as the rear tightener is moved into position for use, the hook is formed at its free end with an oblique run-up surface **55**. When the hook is in locking position, a nose **56** of the hook engages the pin **47** from behind (see FIG. 12).

FIGS. 8 and 9 show the rear tightener ready for use. To step out of the binding, the skier must disengage the clutch and to that end applies pressure to the arm **54** of the hook to disengage the latter from the pin **47**. The heel of the skiing boot can now be lifted from the rear tightener, as is shown in FIG. 11. When the rear tightener of this embodiment and of the embodiment shown in FIGS. 1 to 7 is opened, the pivotal movement of the pusher will reduce the distance between the slider and the free leg ends of the retaining frame so that the entire rear tightener can be pushed further outwardly along the tension elements and the heel of the boot cannot be caught by the pusher.

The application of the binding and the safety release take place just as with the first embodiment of the rear tightener according to the invention, shown in FIGS. 1 to 7, so that the description will not be repeated here.

The pin **47** extends through a hole in the rear wall of the pusher and by a rotation of the knurled nut **46** is selectively moved out of or into the pusher **34**. The resistance to a release is thus adjusted when the rear tightener is open, as is shown in FIG. 11. The free end of the bolt **48** serves as a pointer. The longitudinal edges of the slot **49** in the slider **33** are provided with a scale, which divides the range of adjustment into, e.g., four stages, as is shown in FIG. 10. When the skier steps into the binding, he can check the contact pressure applied by the rear tightener provided that the latter has previously been adjusted to the proper resistance to a release. For a check of the contact pressure, an indicating device is provided, which is formed by the free end of the bolt **48** and a scale at the longitudinal edges of the slot **53** in the web **38**. This scale is like the scale on the slider **33** but oppositely directed. When the skier has adjusted the resistance to a release to the scale value **3**, e.g., the proper contact pressure will be obtained if the pointer is in register with the value **3** on the scale on the web **38** (see FIG. 3) when the rear tightener is ready for use, i.e., when the skiing boot has been inserted. To vary the contact pressure, the tension elements **31** are adjusted longitudinally or in length, just as in the embodiment described first.

What is claimed is:

1. A rear tightener for safety ski bindings, which rear tightener comprises a skiing boot pusher, which is disposed substantially between the legs of a U- or V-shaped retaining frame and is held on the same for pivotal movement about an axis which is transverse to the longitudinal axis of the ski and parallel to the tread of the ski, the free ends of the legs constituting guides for two tension elements, by which the rear tightener is held on the ski and which act on the pusher through the intermediary of at least one spring, which spring or springs produce the force for holding down the heel and the contact pressure by which the toe portion of the skiing boot is forced against a retaining device, a safety clutch being provided between the pusher and retaining frame and preventing a pivotal movement of the two parts relative to each other when the rear tightener is ready for use whereas it is disengaged to disconnect the two parts in response to an overload, the pusher (**6**, **34**) extending rearwardly beyond the axis (**7**, **42**) on which it is pivoted to the retaining frame (**4**, **37**), the pusher forming a two-armed lever having a forward arm which has a free end (roller **1**, **36**) engageable with the heel of the boot whereas the other arm of the lever forms a guide (**23**) which extends in the

longitudinal direction of the lever and is in guiding engagement with a slider (**11, 33**), to which the tension elements (**3, 31**) are connected, each spring (**9, 43**) having one end bearing on the slider (**11, 33**) and another end bearing on a fixed part (**8, 44**) of the pusher (**6, 34**), the clutch member carried by the pusher (**6, 34**) consisting of a pin (**12, 47**), which is mounted in the slider (**11, 33**) for longitudinal movement therein, and the clutch member carried by the retaining frame (**4, 37**) consisting of a locking member (**15, 50**), which can be arbitrarily released, characterized in that the pin (**47**) is nonrotatably mounted in the slider (**33**) and on a screw-threaded portion carries a knurled nut (**46**), which is disposed between the slider and that end of the spring (**43**) which bears on the slider.

2. A rear tightener according to claim **1**, characterized in that the pin (**47**) is held against rotation in the slider (**33**) by a bolt (**48**), which is guided in a slot (**49**) of the slider.

3. A rear tightener according to claim **2**, characterized by a device for indicating the resistance to a release, the

free end of the bolt (**48**) forming a pointer and at least one longitudinal edge of the slot (**49**) carrying a scale.

4. A rear tightener according to claim **3**, characterized in that a slot (**53**) formed in the retaining frame (**37**) lies over the slot (**49**) of the slider (**33**) and exposes the free end of the bolt (**48**) when the rear tightener is ready for use and at least one longitudinal edge of the slot (**53**) in the retaining frame (**37**) carries a scale.

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