United States Patent [19]

Benner

[11] **3,924,865**

[45] **Dec. 9, 1975**

[54] **STEEL EDGE**

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[22] Filed: **Dec. 4, 1972**

[21] Appl. No.: **312,129**

[30] **Foreign Application Priority Data**

Dec. 3, 1971 Germany 2159993

[52] **U.S. Cl.** ..... **280/11.13 N**

[51] **Int. Cl.²** **A63C 5/04**

[58] **Field of Search** ..... 280/11.13 N, 11.13 D, 11.13 E, 280/11.13 Q, 11.13 V, 11.13 J, 11.13 L, 11.13 M

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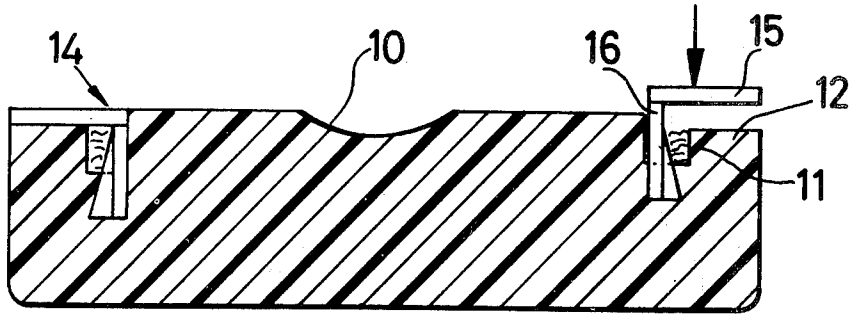
Primary Examiner—Leo Friaglia
Assistant Examiner—David M. Mitchell
Attorney, Agent, or Firm—Bacon & Thomas

[57] **ABSTRACT**

Steel edge, particularly for skis made of a synthetic resin, consisting of a profiled strip fixedly connected with the body of the ski, which strip essentially corresponds to the length of the ski edge, is flat along its underside, and is flush with the sole of the ski, characterized in that substantially vertical extensions emanate from the profiled strip, these extensions being arranged at a spacing from the outer rim of the strip and being anchored in the underside of the ski body by the use of pressure and/or heat.

9 Claims, 17 Drawing Figures



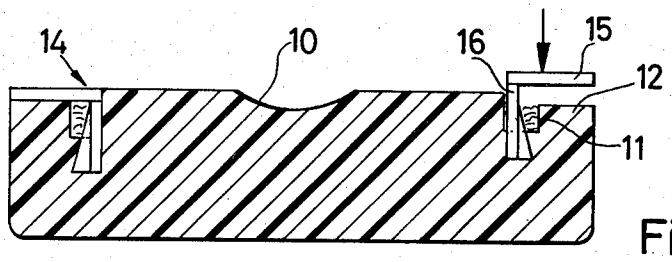


Fig. 1

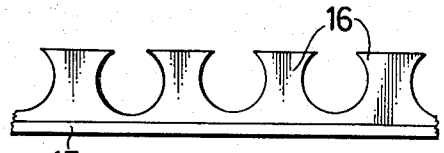


Fig. 2

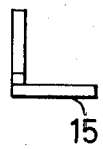


Fig. 2a

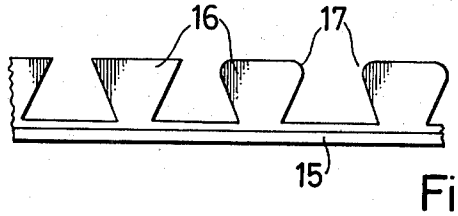


Fig. 3

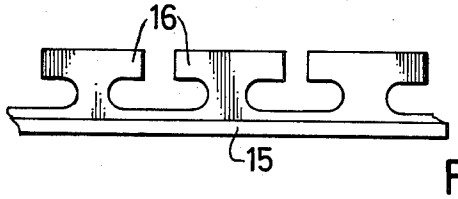


Fig. 4

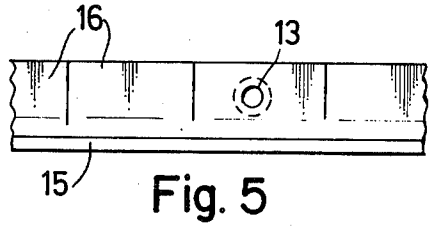


Fig. 5

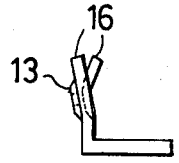


Fig. 5a

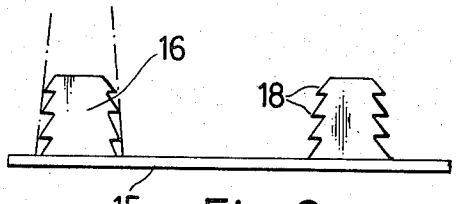


Fig. 6

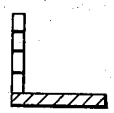


Fig. 6a

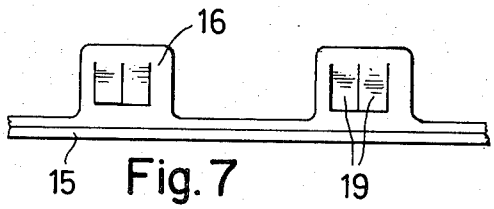


Fig. 7

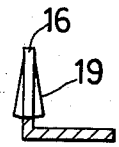


Fig. 7a

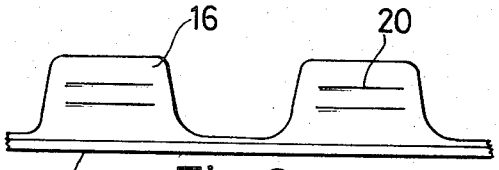


Fig. 8

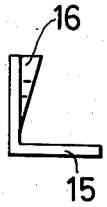


Fig. 8a

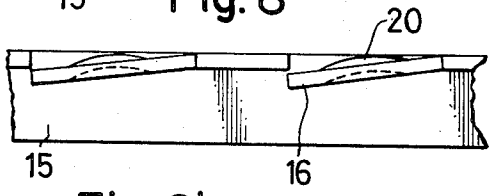


Fig. 8b

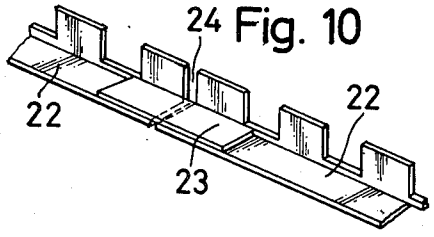


Fig. 10

Fig. 9

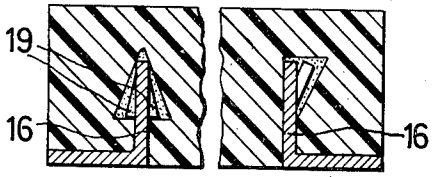


Fig. 9a

STEEL EDGE

BACKGROUND OF THE INVENTION

This invention relates to a steel edge, particularly for plastic skis, consisting of a profiled strip fixedly connected with the body of the ski, which strip essentially corresponds to the length of the ski edge, is flat along its underside, and is flush with the sole of the ski.

The edges of the running surface of a ski are ordinarily reinforced by a profiled strip, called "steel edge," in order to impart better tracking properties to the ski on icy or packed ground and in order to prevent premature wear and tear on the relatively soft body of the ski. Lest the elasticity of the ski be impaired, a flat-strip profile is extensively employed, composed of shorter longitudinal sections; this profile is attached to the body of the ski by means of screws at regular spacings. The process of connecting the sections to be joined by screws is extremely time-consuming.

Furthermore, so-called "angle edges" are known which are received in cutouts in the body of the ski and are attached flush by means of screws with their horizontal profiled legs. From the outer rim of the horizontal leg, a thickened, vertical leg extends downwardly and forms the actual, visible steel edge. The downwardly projecting length of this vertical leg corresponds to the thickness of a tread coating to be glued onto the underside of the ski body, this coating covering the horizontal legs of the angle edges and being enclosed between the vertical legs. The horizontal leg of the angle edge consists essentially of individual horizontal ears disposed at longitudinal intervals, which contain the screw holes, while the vertical leg is interrupted by slots extending in a transverse or oblique direction at shorter spacings, so that a certain flexibility of the edge profile is achieved and a continuous edge profile can be employed.

In case of a ski made entirely of a synthetic resin, for example of polyurethane foam or hard polystyrene foam, with peripherally compressed marginal zones, advantageous sliding properties are initially provided, so that an additional tread lining is unnecessary and the use of the conventional angle edge would only cause uncalled-for expenses.

SUMMARY OF THE INVENTION

The invention is based on the objective of providing a steel edge, particularly for all plastic skis, which, in the form of a continuous profiled strip, can rapidly be mounted permanently to the body of the ski, avoiding additional preparatory working steps. According to the invention, it is suggested for this purpose that substantially vertical extensions project from the profiled strip which are disposed at a spacing from its outer edge; these extensions are mounted, by the use of pressure and/or heat, in preformed, but more narrowly dimensioned recesses in the underside of the ski body.

On the basis of this suggestion, the required recesses can be initially provided, in a plastic ski, within the injection mold, so that an additional machining of the ski body is eliminated. The steel edge is thus no longer attached by screws, but rather joined, via the extensions, in a form-fitting and pressure connection with the material of the ski body; consequently, the screw bores in the profiled strip are eliminated, which otherwise, to accommodate screws having sufficient holding force, exhibit a not inconsiderable diameter and therefore

also require a relatively large width of the profiled strip. According to the invention, the profiled strip can be made substantially narrower and also thinner, so that a flexibility is obtained which is sufficient for most purposes and an impairment of the elasticity of the ski body need not be feared. Of course, this factor also results in a reduced weight of the ski.

The extensions at the profiled strip can be tongue-shaped extensions; they can be disposed within the same plane and can be bent out of this plane at least partially. In this way, a good anchorage in the ski body is attained with the aid of a simple profile shape. In order to enhance this connection, the tongues can be vertically slit, and the thus-formed sections can be bent alternatingly in opposite directions out of their common plane. Additionally, the tongues can have corrugations formed by longitudinal slots which extend away from the plane of the tongues. These measures contribute toward a reinforcement of the desired form-fitting and, if possible, also interlocking connection (when the extensions are elastic) between the extensions and the body of the ski.

The extensions can correspond, with respect to their height, approximately to the width of the profiled strip and can originate from the side opposite to the outer edge of the profiled strip or from the proximity thereof. In this way, a simple angular profile or an approximated T-profile is produced which is either drawn or manufactured by bending flat stock into a sharp edge. The extensions can be produced by punching out the profiled web, and they can also be wider along their topsides than on their base. Thus, the flexibility of the steel edge is ensured by the cutouts or punched-out portions in the vertical profiled web, not considering the total dimensions which are considerably reduced as compared to conventional steel edges.

In one embodiment of this invention, the steel edge is accommodated in the body of the ski in a continuous slot, the width of which corresponds approximately to the maximum width of the vertical projection of the tongues, whereas the depth of the slot is shallower than the height of the extensions. In case of twisted or bent extensions, the slot can be wider than if the extensions are disposed in one plane. In each case, however, the cross section of the slot is dimensioned so that the synthetic resin displaced while the tongues are impressed therein escapes at least partially into adjoining zones of the slot cross section and can be received therein.

In another embodiment, the extensions consist of pins of any desired cross section arranged at longitudinal spacings along the profiled strip, these pins being provided with peripheral ribs. These pins can be passed, as rivets, through openings in the profiled strip and riveted in place.

The extensions provided at the profiled strip are suitably rolled or pressed into the ski body with the aid of ultrasonics. For this purpose, a roller welding machine can be employed, equipped with an ultrasonic head. By means of ultrasonics, the melting process of the synthetic resin material in the body of the ski is initiated only by frictional heat at the external zones of the extensions, while the edge profile proper and the ski remain cold. By the use of these measures, the thus-occurring welding temperature, for example in case of polystyrene hard foam, is maintained within ranges wherein the synthetic resin, though being deformable and sometimes somewhat plastic, does not yet become brittle. Experiments have shown that, with the aid of

the ultrasonic method, substantially higher holding forces are provided by pins welded into polystyrene foam than by wood screws. On the basis of this observation, it is thus possible even in the smaller edge profile, intended by the present invention, to effect a rivet mounting, since the cross section of these rivets, with the same holding force, can be kept smaller than in case of the screws customary heretofore.

In accordance with a further embodiment, the tongue-type extensions can be mounted in the slot by the introduction of a deformable auxiliary substance, the bottom of the slot being widened at least in the zone of the extensions. The auxiliary substance can consist of an adhesive retaining its resiliency within limits, so that in any event a certain relative longitudinal movability of the steel edge is obtained and the application of the steel edge is not limited to plastic skis. The auxiliary substance can also consist of an elastic profiled strip which is pressed into the slot together with the extensions and is partially displaced during this step into recesses within and/or between the extensions. If the slot has a greater width in its bottom zones than at its entrance, the desired form-fitting connection is produced between the spread-apart extensions and the elastic profiled strip, on the one hand, and the special cross section of the slot, on the other hand.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in greater detail below with reference to embodiments illustrated in the drawings.

FIG. **1** shows a ski body consisting of hard foam material, with a steel edge according to this invention;

FIGS. **2–8** are schematic views and partial crosssectional views of various examples;

FIGS. **9** and **9***a* show a cross section through other embodiments; and

FIG. **10** is a modification of the steel edge of this invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

According to FIG. **1**, the ski body, shown in cross section, consists of a hard synthetic resin foam and has been manufactured in one working step in an injection mold. During this manufacturing step, the central running groove **10** and lateral groves **11** as well as adjoining lateral recessed faces **12** have been molded into the ski body. In a preferred steel edge **14**, the width of the profiled strip **15** is about 4 mm. and the vertical height of the extensions **16** of the profiled strip is likewise about 4 mm. The thickness of the material of the steel edge **14**, which latter is preferably produced as an angular profile, ranges between about 0.4 mm. and 1.0 mm. Considering these dimensions and assuming that the extensions **16** have been bent or slightly twisted out of their plane, the width of the groove **11** is approximately 1.5 mm. to 2 mm. and the depth thereof is about 2.5 mm. to 3 mm., but on the side of the face **12**, only about 1.5 mm., so that the anchored steel edge **14** is flush with the running surface. The recess **12** can be omitted if a running surface tread is glued onto the ski between two steel edges, for example when the steel edge is used in other types of skis made of wood or also combinations of wood and plastic. In this case, a continuous, deeper groove can be provided which is filled with an adhesive or into which is pressed an elastic profiled strip, for example together with the tongue-shaped extensions according to one of FIGS. **2** through **8**. This profiled strip enters the recesses within or between the tongues or is expanded into these recesses, and retains the tongues by virtue of the fact that the groove near its bottom, has a greater width than at its entrance (FIG. **9**). This profiled strip can consist, for example, of a rubbery material which is first flattened upon being pressed into the slot and is then expanded again at a greater depth in the slot and thus provides a locking connection.

Another way of mounting the steel edge of this invention in a ski made entirely of a synthetic resin is effected with the use of pressure and ultrasonics. In this method, a so-called roller welding machine provided with an ultrasonic head is employed, by means of which the steel edge is rolled under pressure and simultaneous transmission of ultrasound into the plastic material. The temperature occurring in this process can be controlled so that it remains in the range between 70° and 80° C., wherein the synthetic resin material is just barely deformable, optionally slightly plastic.

In accordance with FIG. **2**, the extensions **16** are produced by punching out circular holes at regular intervals in the vertical profiled web. The starting material can be an angular profile or also a profile shaped like a T wherein the vertical web from the center of the flat strip is offset toward the inside in order to obtain improved support and pressure introduction during rolling. According to FIG. **3**, the extensions have been produced by triangular punched-out portions. The tips of the extensions **16** can be rounded-off at point **17** in order to obtain an easier penetration during welding and to prevent hairline cracks in the hard foam. FIG. **4** shows T-shaped extensions **16** preferably suitable for mounting the steel edge with the use of an auxiliary material (elastic adhesive or profiled strip). In the various embodiments, the tongues can be bent out of the original profile plane alternatingly toward opposite sides, or they can be slightly twisted out of this plane.

According to FIG. **5**, the vertical web of the steel edge profile is only slit, the individual extensions produced by the slits being bent or twisted alternatingly toward opposite directions. These measures also provide an enlarged surface area contributing toward an improved mounting of the tongues within the plastic material. Additionally, transverse bores or protuberances **13** can be provided in any desired form of the extensions **16.**

In FIG. **6**, the extensions **16** are provided with projections **18** similar to barbs and have an over-all form which is slightly tapered conically in the upward direction. This configuration can be employed in tongue-like extensions produced by punching out sections from an angular profile or also in pin-shaped extensions which then have the projections **18** along their periphery. The pins are passed through corresponding openings in the flat strip and riveted thereon.

According to FIG. **7**, the extensions **16** contain several vertical cuts linked to one another by means of a transverse bottom cut. The thus-produced tongues **19** are bent out of the plane of the extension toward one side or toward both sides, resulting, in view of the small thickness of the material, in a certain elasticity of the tongues **19.** This improves the anchoring in the plastic material, since the tongues spread elastically after being pressed or welded into the material. By utilizing the measures explained in connection with FIG. **7**, or similar measures, in case of a steel edge which is not mounted by welding, then the desired form-fitting

mounting of the steel edge is obtained, when the slot prepared in the ski body has a suitable cross section, and the edge is mounted with the simultaneous use of a suitable elastic adhesive or profiled strip making it possible for the steel edge to be shifted longitudinally relative to the ski body, yet ensuring, at the same time, a support at right angles and vertically with respect to the body of the ski.

Similar advantages are afforded by the variant of FIG. 8 wherein the extensions 16 exhibit cuts extending in the longitudinal direction, producing corrugations 20 or also tongues. Such additional corrugations result in particularly high holding forces and can be utilized either by themselves or in conjunction with the bending of the extensions.

FIG. 9 shows, in a schematic cross section, two different groove shapes in the ski body, making it possible to hold the steel edge in a form-fitting connection and simultaneously providing the relative longitudinal movability of the steel edge with respect to the ski body. In this connection, the steel edge can be provided, on the one hand, similar to FIG. 7, with elastic tongues 19 which spread similarly to a straddling dowel after pressing the steel edge into the groove. Additionally, an elastic adhesive or an elastic profiled strip can be employed in order to improve the form-locking connection between the steel edge and the ski. On the other hand, an expansion or widened portion is provided at the bottom of the groove, wherein the extensions 16, fashioned in principle similarly to FIG. 5, are alternatingly bent from the original plane toward the side and have a sufficient elasticity, due to the small thickness of the material, for being introduced through a narrower entrance into the groove which widens at the bottom. In place of or additionally to the elasticity of the extensions 16, an elastic profiled strip or an elastic adhesive is also employed in the embodiment.

The subdivision of a one-piece steel edge into segments according to FIG. 10 can be necessary and practicable in case thicker steel edges must be used for heavy-duty and/or more wear-resistant skis, which edges then have no longer inherently the required flexibility. The segments 22 are joined by means of bridging strips 23 to a prefabricated segmental strip, there being an expansion joint 24 of about 1 mm. between the respective individual segments. The elastic bridging strip consists, for example, of rubber vulcanized to the edge, or also of a very thin metallic band. The prefabricated segmental strip of FIG. 10 can either be initially inserted in the injection mold, as way all the other embodiments, and can be retained therein, for example, by magnetic means until the foaming process in the mold is finished; or the strip is likewise suitable for being subsequently welded into a semifinished groove by means of ultrasonic methods, wherein the elastic bridging strip 23 is expanded by the use of pressure downwardly into the expansion joint and fills the latter.

What is claimed is:

1. In a ski having a body fabricated of wearable, flexible material, a wearing edge construction on at least the two bottom edges of the ski body comprising, for each edge;

a longitudinal anchoring groove having its cross-sectional profile defined by two opposing groove flanks and a groove bottom, said groove extending vertically from the ski bottom spaced from an adjacent bottom edge and extending substantially parallel to the bottom edge and having a cross-sectional depth which is greater than its cross-sectional width;

a wear resistant metallic edge profile of generally L-shaped cross section, having a horizontal leg portion covering at least that portion of the bottom surface of the ski which is included between said groove and the bottom edge of the ski, and a substantially vertical leg portion received between said groove flanks;

a succession of longitudinally spaced cuts in the vertical leg portion of the edge profile, the cuts extending from the top edge thereof over a major portion of the height of the leg portion, whereby the vertical leg portion is subdivided into successive tongue-shaped vertical extensions;

a gap associated with each of said cuts permitting the tongue-shaped extensions to longitudinally approach one another under deflection of the ski body tending to longitudinally bow said edge profile; and

bonding means arranged in said groove for retaining the vertical leg portion of the edge profile within the groove flanks, said bonding means having resilience sufficient to retain said vertical extensions in said groove while permitting longitudinal movement of said extensions within said groove.

2. A steel edge construction as defined in claim 1, wherein:

the gaps associated with the cuts in the vertical leg portion are longitudinal in direction and are constituted by missing length increments of the vertical leg portion.

3. A steel edge construction as defined in claim 1, wherein:

the gaps associated with the cuts in the vertical leg portion are transverse in direction and constituted by transversely alternating offsets of said tongue-shaped extensions from a common alignment plane.

4. A steel edge construction as defined in claim 1, wherein:

at least a portion of said vertical leg portion of the edge profile is displaced from the plane of said leg portion for engagement with the groove flanks, said portion being elastic by virtue of a thin material guage providing flexibility of said leg portion.

5. A steel edge construction as defined in claim 4, wherein:

the flanks of the anchoring groove diverge in the direction of groove depth, thereby defining a groove profile with a comparatively small width at its entry and a comparatively larger width deeper inside the groove, whereby a snap-fit engagement is achieved between said groove flanks and said leg portions.

6. A steel edge construction as defined in claim 4, wherein:

the tongue-shaped vertical extensions, formed from the vertical leg portion, include laterally protruding auxilliary anchoring means.

7. A steel edge construction as defined in claim 4, wherein:

at least a portion of each of the tongue-shaped vertical extensions, formed from the vertical leg portion, is alternatingly transversely offset from a common alignment plane so as to define a side set as in a saw.

8. A steel edge construction as defined in claim 4, wherein:

at least some of the tongue-shaped vertical extensions include a vertically oriented generally double-U-shaped transverse cut therethrough defining two adjacent smaller anchoring tongues, the latter being resiliently connected to said tongue-shaped extensions near their upper ends and alternatingly side set in relation to their lower ends.

9. A ski as defined by claim **1,** wherein said horizontal leg portion of the metallic edge profile is continuous in the longitudinal direction along the entire length of the ski edge.

* * * * *