

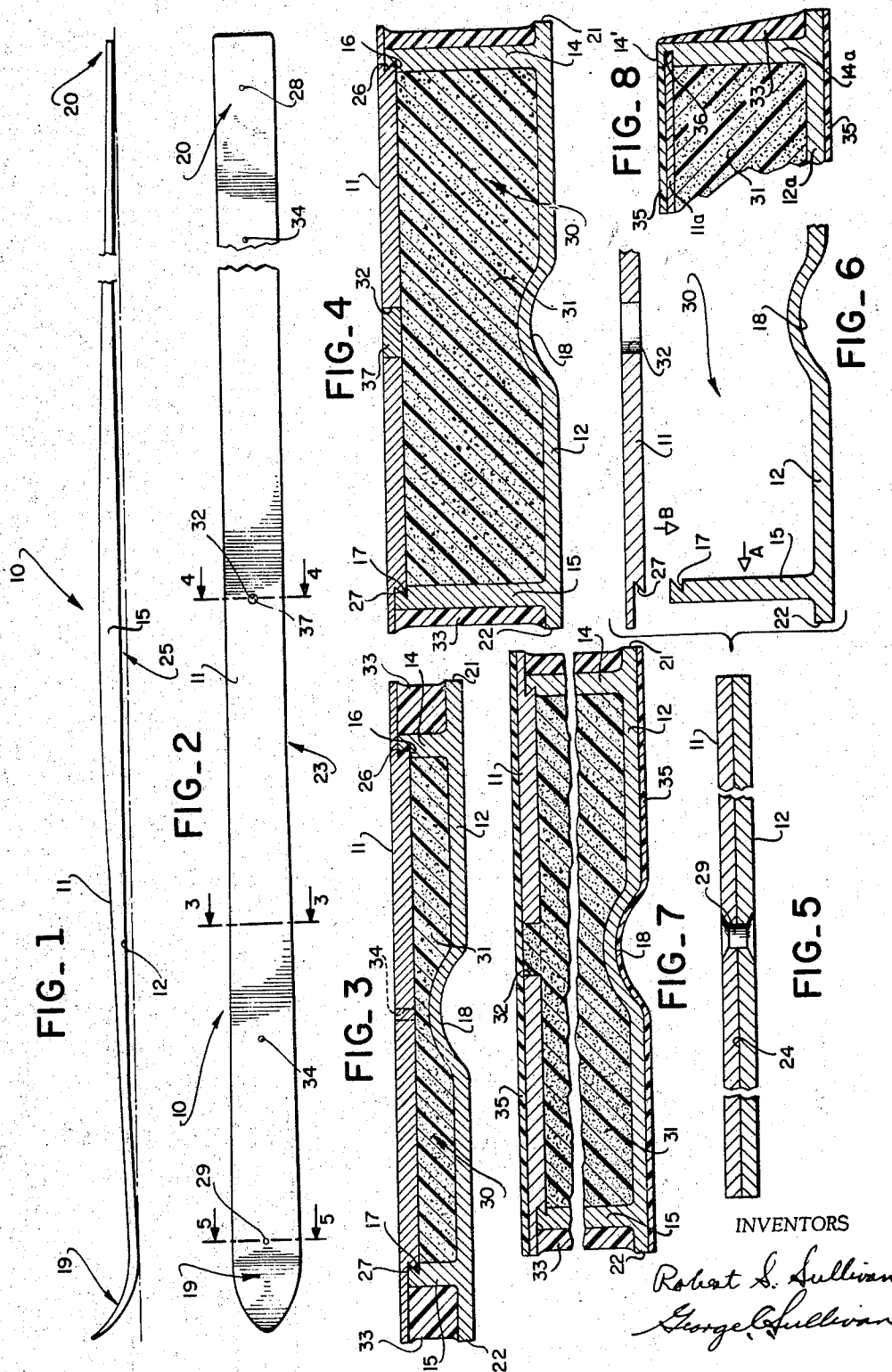
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METAL SKI WITH CELLULAR PLASTIC STRUCTURE

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## 3,208,761 METAL SKI WITH CELLULAR PLASTIC STRUCTURE

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This invention relates to skis and has for its principal objects to provide an improved ski construction which shall have the advantages over skis hitherto manufactured and used of being lighter in weight, simpler in construction, inexpensive to manufacture, easy to assembly, and very efficient and durable in use.

The modern skis is usually made of a solid piece of wood or laminated pieces of various woods, such as ash, oak, birch, spruce or hickory, or a combination thereof. Other types of laminated skis have been proposed in which wood, metal and plastic laminae have been employed.

Skis of this construction and type have certain disadvantages in that changes of temperature, moisture, and rough usage cause warping or bending, and in some cases breakage, usually due to the deterioration of the bonded laminations resulting from internal stresses caused by flexing and different coefficients of expansions, thus causing the ski to lose its resilience and efficiency.

Other skis have been proposed wherein a center core of wood, plastic, or other materials is preformed, and then glued or laminated between an upper member and a lower runner of either wood, laminated plastic, or metal. This arrangement, however, increases the weight of the ski and, in addition, causes an abrupt change in the flexibility and, in some cases, a possible permanent set wherein the latter cannot be readily restored to its original shape.

An object of the present invention is to provide a durable, resilient and efficient ski which is inexpensive to manufacture due to its ease of assembly and requiring a minimum of machining and labor.

Another object of this invention is to provide a lightweight, two-piece aluminum or non-ferrous metal ski with preferably at least one piece made of lightweight metal extrusion which is inexpensive in itself. Another object of this invention is the advantage of a lightweight metal extrusion, such as aluminum, or an aluminum alloy, which may be anodized for hardness and durability.

Still another object of the present invention is the use of foamed or cellular materials which, when applied as a liquid or semi-liquid and then allowed to react or foam up, will form a relatively strong, lightweight mass or body adhering to the adjacent surfaces, thereby eliminating the tedious, costly and time-consuming method of tailoring or forming a separate core for each ski, and laminating the same to the outer sheets or members.

A further object of this invention is to provide a lightweight aluminum extruded runner and a top sheet of metal with a cellular plastic structure therebetween which has the ability to adhere to adjacent surfaces after curing, and having the characteristic of separate, individual cells which provide an effective seal against moisture and temperature and being completely metal enclosed.

Other objectives and features of the present invention will become apparent from the following detailed description of typical preferred embodiments throughout which reference will be made to the accompanying drawings wherein:

FIGURE 1 is a side elevation of the preferred form of a ski;

FIGURE 2 is a plan view of a ski embodying our invention;

FIGURE 3 is a cross-section taken at line 3—3 of FIGURE 2;

FIGURE 4 is a cross-section taken at line 4—4 of FIGURE 2;

FIGURE 5 is a cross-section taken at line 5—5 of FIGURE 2;

FIGURE 6 is a cross-section of the ski showing a typical manner in which the upper sheet member and the bottom runner member are snapped or laced together;

FIGURE 7 is a cross-section of the ski showing a modified construction of a plastic covering applied to the bottom and top of the ski; and

FIGURE 8 is a modified cross-sectional view of a ski having an alternate joint construction in accordance with our invention.

Referring in detail to the drawings and more particularly to FIGURES 1—5, one will find an improved ski generally designated 10, having a top cover or member 11, and a lower portion or runner 12, generally U-shaped and preferably fabricated of aluminum or aluminum alloy extrusions, having side walls 14 and 15 which stand upwards from runner 12 and having grooves, substantially V-shaped in cross-section, 16 and 17, which are cut or milled longitudinally along the top inner face of side walls 14 and 15. The lower runner 12 is provided with a central guiding groove or channel 18 which feathers or diminishes as it progresses longitudinally to the front or upturned portion 19, becoming substantially flat at the front or upturned portion. Bottom portion of runner 12 is also provided with flanges 21 and 22 which extend outward from side walls 14 and 15 and diminish substantially at the waist 23 and flare outwardly as they progress longitudinally rearward from waist portion 23 and also forwardly to the upturned toe portion 19, as best shown in FIGURE 2. Side walls 14 and 15 are tapered gradually, forwardly and rearwardly along the ski, by milling or machining, until they blend or feather in with the substantially flat surface 24 of runner 12, as shown in FIGURE 1 and FIGURE 5.

Tapering the side walls 14 and 15 longitudinally permits lightening the ski and provides progressively greater flexibility as the end portions of the ski are approached. Obviously the U-shaped bottom member 12 and the upper member 11 could be reversed but such is not a preferred embodiment of the invention.

The upper portion or top cover 11 may be an extrusion or flat sheet stock provided with grooves 26 and 27, substantially V-shaped in cross-section, to mate in locking engagement with grooves 16 and 17 when side walls 14 and 15 are sprung outwardly in assembly, as best shown by arrow A, and the top cover 11 is forced downwardly, as shown by arrow B, all as shown in FIGURE 6. Grooves 26 and 27 snap into engagement with grooves 16 and 17 of the side walls 14 and 15 effecting a relative simple and rigid structure of substantially rectangular cross-section. Top cover 11 can also be laced from one end to the other if springing is undesirable.

It is to be noted that the top cover 11 is provided with a diminishing waist portion at 23 and flares progressively outward towards the toe and heel portions respectively; otherwise top cover 11 and bottom runner 12 are substantially the same in plan view, as best shown in FIGURE 2.

The upper and lower portions, now locked into engagement by grooves 16 and 17 joining with grooves 26 and 27 of the top cover, are now shaped to desired form, providing the upturned toe portion 19. These portions can then be firmly secured into place by rivets or fasteners 28 and 29 as shown in FIGURE 2 and FIGURE 5.

It is preferred, however, to provide the ski, which is constructed of relative lightweight aluminum or aluminum alloy extrusions, with a substantial hardening process, such as hardanodizing, to effect an appropriate hardened surface, particularly on the lower bottom portion 25 of runner 12 and flanges 21 and 22, thus protecting the same from deterioration due to use and wear. While several

anodizing or hardening processes may be used, a preferred and typical hardening process is described in U.S. Patent Nos. 2,692,851 and 2,692,852, issued October 26, 1954. It is also preferred to provide at least the bottom of the runner 12 with a dry lubricant material, such as molybdenum disulfide, graphite, or a combination of the two materials with a suitable resin, which can be applied and cured thereto, thus resulting in a smooth, lubricated surface, with minimum frictional resistance.

In accordance with the present invention, a cellular plastic 31 is applied to the substantially rectangular cavity 30. This cellular plastic 31 can be a foamed alkyd resin, polyisocyanate,; preferably it is installed into cavity 30 by pouring into place through aperture 32 (FIGURE 4 and FIGURE 6) and then allowed to react or foam up to form a relatively strong, lightweight core automatically adhering rigidly to the adjacent surfaces. It is desirable to use a cellular material such as described above, in that it has a multiplicity of substantially uniformly shaped and proportioned spherical cells. These materials have the desirable characteristic of adhering to the inner surfaces of runner 12, cover member 11 and side walls 14 and 15, to effect a rigid bond or adhesion with said surfaces, once setting and curing has been accomplished. After the cellular plastic 31 has foamed and cured, with respect to aperture 32, it may be cut off to the level of top portion 11. If desired, a plug or stopper 37 can be press-fitted into aperture 32 and shaved or machined flush with top cover 11 to blend in with the continuity of the top surface of the metal ski.

A plastic material 33 may be employed to fill in the channels formed by flanges 21 and 22 of the runner 12 and the exterior top portion 11, thus providing side walls 14 and 15 with a protective coating and effect a finished appearance.

Bleed holes 34 are provided in top cover 11 to facilitate the elimination of trapped air and gases created by the foaming alkyd resin polyisocyanate as it is poured into cavity 30 and expands therethrough. The bleed holes may then be plugged similar to 37, shaved flush with top surface of cover 11, as described above, or provided with a rivet to more securely fasten the sheets together.

As best shown in FIGURE 7, a plastic covering 35 can be employed to cover either the bottom runner 12 or top cover 11 to provide a protective layer for said surfaces which is attractive in appearance and facilitates ease of cleaning and waxing of the ski.

The characteristics of a plastic employed for the above-described purpose are that it must be tough and weather resistant, that is, it must maintain its physical characteristics within a large range of temperatures normally encountered in the use of skis. It must be capable of being bonded to metal and neither become brittle at cold temperatures nor lose its form at temperatures that would be encountered in direct sunlight at high altitude.

Referring to FIGURE 8 of the drawings, a lower runner 12a is shown, having side walls 14a, and a substantially uniformly rectangular shaped groove or slot 36 is provided at the upper and inner surfaces of side walls 14a which join in locking engagement with cover 11a. If desirable, covering 35 of plastic or the like, is employed to provide a protective coating, as described above, and effects a smooth, continuous surface, joining with top portion 14' of sidewall 14a, thereby adding a finished quality and an adherent beauty to the ski.

Having described only typical forms of the invention, we do not wish to be limited to the specific details herein set forth but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims:

#### We claim:

1. A lightweight metal ski comprising an upper member providing an upper surface, a lower member providing a lower surface, at least one of said members being a substantially U-shaped section having spaced parallel side walls, said side walls tapering in elevation forwardly and rearwardly from about the mid-section of said ski to form a substantially rectangular cavity of decreasing cross-section, and means to join said upper and lower members consisting of an inner core of cellular plastic material which is foamed in situ, and adheres to the adjacent inner surfaces of said members to provide a rigid bond therebetween to form a unitary structure.

2. A lightweight metal ski as set forth in claim 1, in which filler members extend between said runner edge and the top of said ski, secured to the outside of said side wall members.

3. The invention set forth in claim 1 in which the surfaces of said lower member subjected to wear are provided with an abrasion-resistant coating.

4. The invention set forth in claim 3 in which said abrasion-resistant coating is hard anodizing.

5. The invention set forth in claim 3 in which said abrasion-resistant coating is a plastic material.

6. A lightweight metal ski comprising an upper member providing an upper surface, a lower member providing a lower surface, said lower member being a substantially U-shaped section having spaced parallel side walls, said side walls tapering in elevation forwardly and rearwardly from about the mid-section of said ski to form a substantially rectangular cavity of decreasing cross-section, and means to bond said upper and lower members consisting of an inner core of cellular plastic material which is foamed in situ to adhere to the adjacent inner surfaces of said members to provide a rigid bond therebetween and form a unitary structure, said lower surface extending beyond said side walls to form runner edges on said ski.

7. A lightweight metal ski comprising an upper cover member and a lower U-shaped member, said U-shaped member having side walls extending upwardly from a bottom surface, said U-shaped member having portions of said bottom surface extending laterally outwardly from said side walls to form runner edges on said ski, said upper cover member having tongue portions and said side wall portions having grooves formed adjacent the top portions of said side walls to receive said tongue portions, said side wall portions tapering from maximum depth at the center of the ski to zero depth adjacent the ends of the ski where the top and bottom portions meet, means to secure said top and bottom portions adjacent each end of the ski together, and a filler core means of plastic material foamed in situ to bond said upper and lower members into a unitary structure.

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