

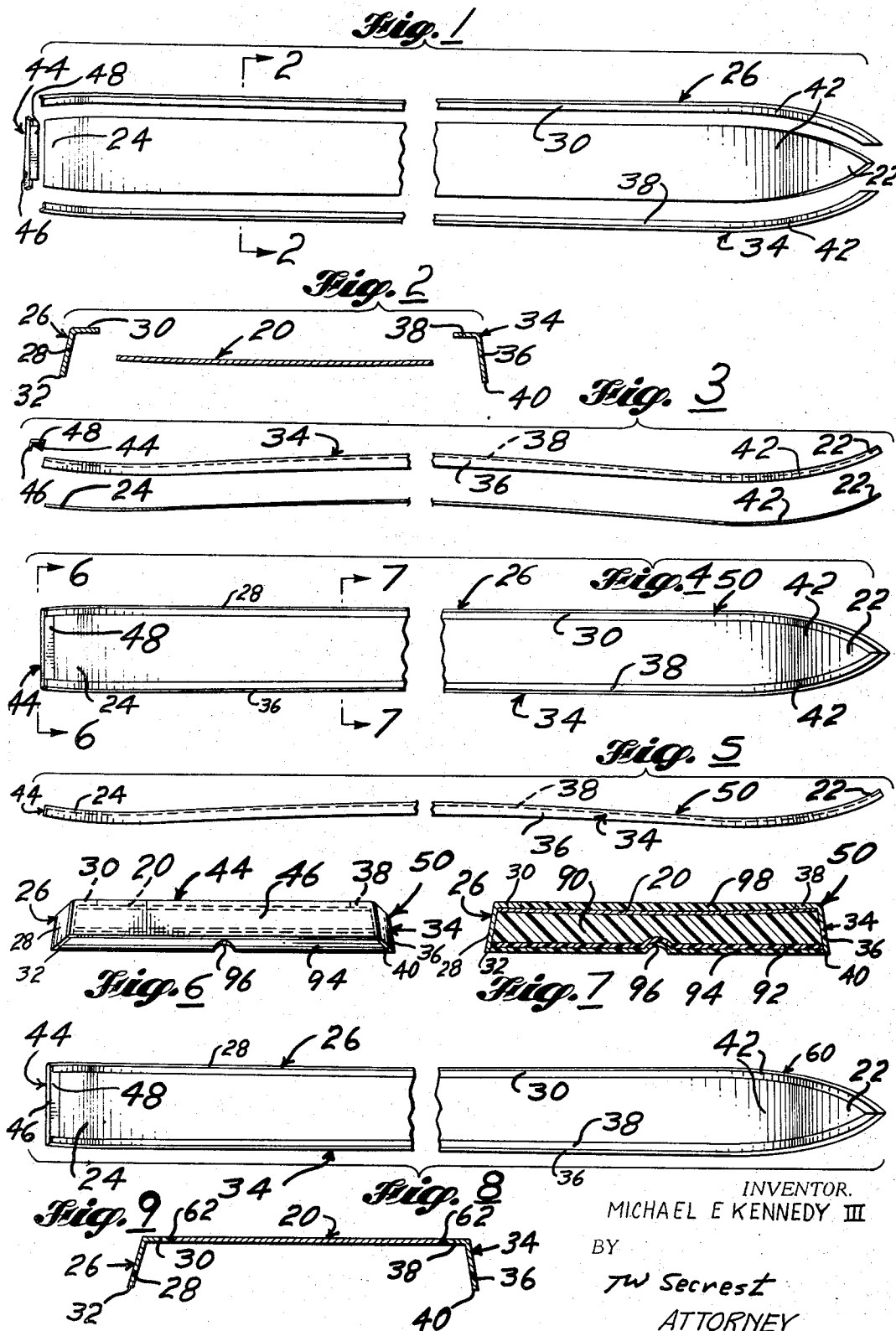
Dec. 17, 1968

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COMPOSITE METAL AND PLASTIC SKI AND METHOD  
OF MANUFACTURE FOR SAID SKI

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Filed Aug. 5, 1966

2 Sheets-Sheet 1



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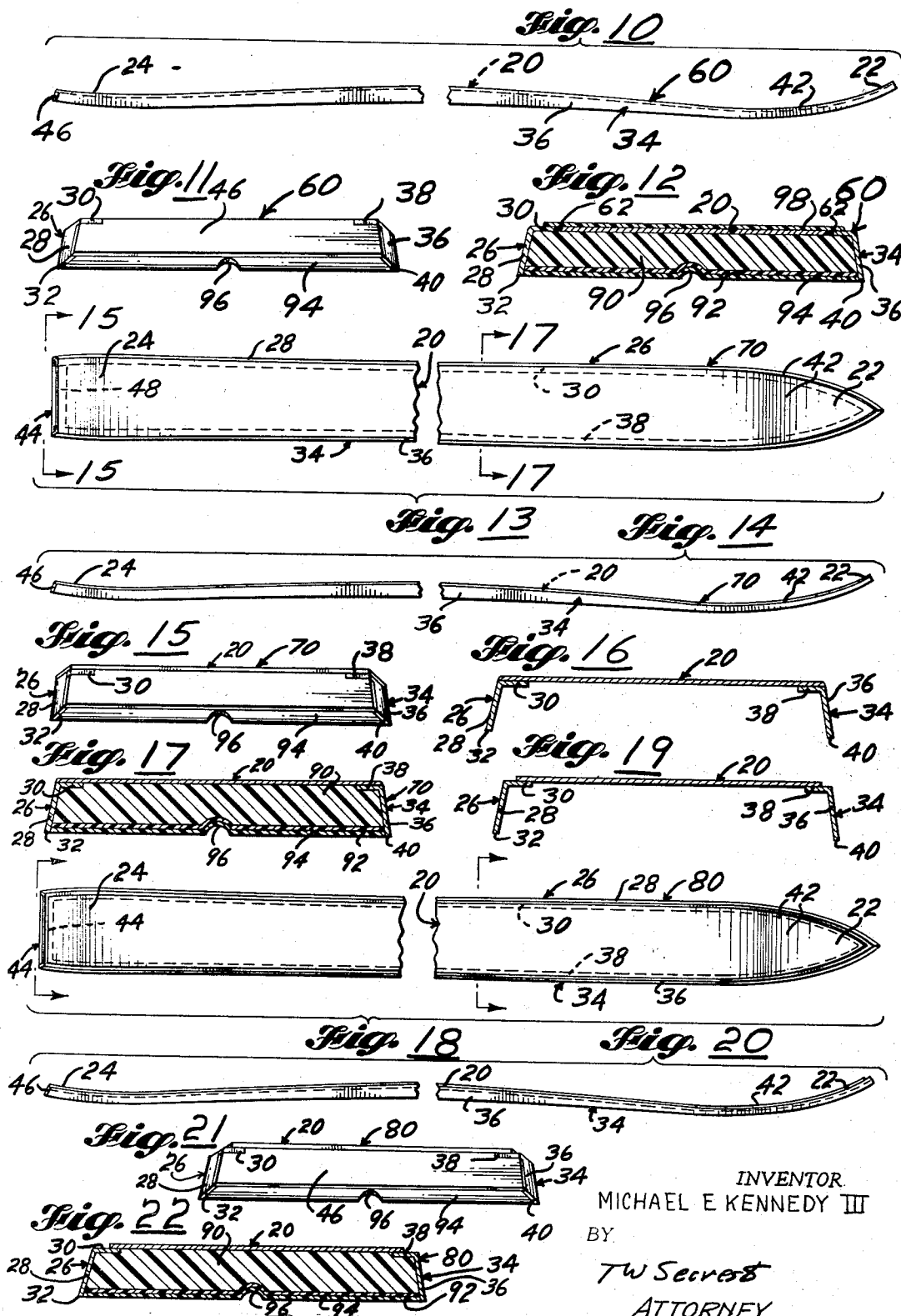
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## COMPOSITE METAL AND PLASTIC SKI AND METHOD OF MANUFACTURE FOR SAID SKI

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### ABSTRACT OF THE DISCLOSURE

A ski which comprises a base, side edges and a tail bridge. The lower ends of the side edges comprise the running edges. In addition to the base and the side edges there is a body portion of plastic. The plastic may be a solid polymeric foam. Then, on the outside of the plastic there is a running surface such as polyethylene.

This invention is for a ski and the method of making the ski.

At the present time most people have heard of skis in one form or another. One of the earliest known and earliest used skis was a piece of wood which was shaped in an elongated configuration with a upturned tip for riding over small snowbanks and snow obstructions. The thickness of the piece of wood was varied to give more flexibility to the ski. Then, an improvement in the ski was made by rabbeting the bottom side edges of the wood and inserting a metal runner. This provided a metal running edge. Later, it was decided that better properties could be imparted to the ski by laminating different woods to form a laminated ski. Also, the laminated ski had rabbeted bottom edges for receiving a metal running edge. Further, wood and metal were laminated together to form skis and then the use of plastics was introduced in conjunction with wood and in conjunction with wood and metal to form skis. Over the years there has been an evolution in the structure of the ski and the method of making the ski. I have skied for a number of years and have thought of various types of skis. In an attempt to improve the ski I have developed the subject invention. This invention is a ski and a method for making a ski from metal and plastic. I have made skis from metal and plastic according to this invention and have tested these skis and have found the ski to be a fine ski. Accordingly, an object of this invention is to provide a ski which may be used by both a beginner and an intermediate skier; a further object of this invention is to provide a ski which may be made from stamped metal parts; a still further object of this invention is to provide a ski in which the stamped metal parts are welded together; another object of this invention is to provide a ski having a flexible tip and tail so as to permit the ski to flow smoothly over a mogul and which ski is more resilient and does not break upon hitting a mogul as it has a softer tip and the tip absorbs the blow without going to one side of the mogul; another object is to provide a ski which is durable; a still further object is to provide a ski which is more stable and gives a more comfortable ride than previously available skis as the ski appears to hug the snow better than other skis as it follows the contour of the snow so that it appears as if the energy is not transmitted through the ski as readily as in a metal sandwich ski as the ski appears to absorb the energy; another object is to provide a ski which allows a certain amount of torque and twist; a still further object is to provide a ski having a top edge and a running edge which are integral and of one piece of construction; another object is to provide a metal ski having good memory; a still further object is to provide a ski which is relatively inexpensive to manufacture as production line techniques can be em-

2

ployed; and, a still further object is to provide a ski having a polyurethane core which functions as a dampener and gives body to the ski and yet appears to soak up and absorb shock energy.

These and other important objects and advantages of the invention will be more particularly brought forth upon reference to the accompanying drawings, the detailed specification of the invention and the appended claims.

In the drawings:

FIGURE 1 is an exploded plan view looking down on the metal components of the ski;

FIGURE 2, taken on line 2—2 of FIGURE 1, illustrates a lateral cross-sectional view of some of the metal components of the ski;

FIGURE 3 is a side elevational view illustrating some of the metal components of the ski;

FIGURE 4 is a plan view looking down on one preferred embodiment of the ski;

FIGURE 5 is a side elevational view of the ski;

FIGURE 6 is an end perspective view taken on line 6—6 of FIGURE 4;

FIGURE 7, taken on line 7—7 of FIGURE 4, is a lateral cross-sectional view of the ski;

FIGURE 8 is a fragmentary plan view looking down on another preferred embodiment of the ski;

FIGURE 9 is a lateral cross-sectional view of the metal frame of the ski and illustrates the butt weld for welding the base to the side;

FIGURE 10 is a fragmentary side elevational view of the ski;

FIGURE 11 is an end perspective view of the ski;

FIGURE 12 is a lateral cross-sectional view of the ski and illustrates detailed construction of the ski;

FIGURE 13 is a plan view looking down on a fragmentary portion of another preferred embodiment of the ski;

FIGURE 14 is a fragmentary side elevational view of the ski;

FIGURE 15, taken on line 15—15 of FIGURE 13, is an end perspective view of the ski;

FIGURE 16 is a lateral cross-sectional view of the skeleton frame of the ski and shows the lap joint with the base on top of the side;

FIGURE 17, taken on line 17—17 of FIGURE 13, is a lateral cross-sectional view illustrating the details of construction of the ski;

FIGURE 18 is a fragmentary plan view looking down on still another preferred embodiment of the ski;

FIGURE 19 is a lateral cross-sectional view of the skeleton frame of the ski and illustrates the base and sides of the ski;

FIGURE 20 is a fragmentary side elevational view of the ski;

FIGURE 21 is an end perspective view of the ski; and, FIGURE 22 is a lateral cross-sectional view of the ski and illustrates the details of construction.

In FIGURES 1, 2 and 3 it is seen that these figures illustrate the metal components of the ski. There is a base 20 having a tip 22. The base 20 also has a tail portion 24. It is seen that the tail portion 24 is slightly wider in width, see FIGURE 1, than the middle portion of the base 20. Also, the tip 22 is much narrower than the middle portion or the tail of the base 20. There are two side edges. One side edge 26 comprises a leg 28 and an inwardly directed member 30. On the lower end of the leg 28 there is a running edge 32. There is another side 34 having a leg 36 which at its upper portion bends inwardly into an inwardly directed member 38. The leg 36 at its lower edge forms a running edge 40. Looking forward on the ski or from the tail 24 to the tip 22 the side 26 will be referred to as the left side and the side 34 will be referred to as the right side. In FIGURE 3 it is seen that

the length of the leg 36 varies. Towards the middle or in the middle portion of the ski the leg is of its longest length and at the tip and just before the tip the leg at the curve 42 is of its shortest length. Towards the rear of the ski the length of the leg is longer than at 42 but shorter than at the middle portion of the ski. Further, there is a tail bridge 44 having a cross portion 46 and a cap or inwardly directed portion 48. These metal pieces, 20, 26, 34 and 44 are combined to form the skeleton frame of the ski.

In FIGURES 4, 5, 6 and 7 there is illustrated a species 50 of the ski.

In FIGURES 8, 9, 10, 11 and 12 there is illustrated a species 60 of the ski.

In FIGURES 13, 14, 15, 16 and 17 there is illustrated a species 70.

In FIGURES 18, 19, 20, 21 and 22 there is illustrated a species 80.

These four metal components, 20, 26, 34 and 44 are combined in different ways to form the four skis 50, 60, 70 and 80.

In the ski 50 it is seen that the inwardly directed members 30 and 38 are positioned above the base 20 and in an overlapping relation with the base 20. These members, 30 and 38, are welded or bonded to the base 20 to form an underneath lap joint 52. The members 30 and 38 may be welded to the base 20 or the members 30 and 38 may be bonded to the base 20 by means of one of the modern adhesives or synthetic resin.

The ski 60, see FIGURE 9, is such that the outside edges of the base 20 are positioned adjacent the inside edges of the inwardly directed members 30 and 38 and welded at 62 to form a butt joint. Again, instead of welding the inside edges of the members 30 and 38 to the outside edges of the base plate 20 it is possible to bond the base plate and the inwardly directed members by means of a resin or an adhesive.

The ski 70, see FIGURE 16, is such that the outside edges of the base 20 overlap the inwardly directed members 30 and 38. The base 20 may be welded to the inwardly directed members 30 and 38 or may be bonded to these members by means of a resin or an adhesive. In FIGURE 16 it is seen that the outside edges of the base 20 are flush with the outside surface of the legs 28 and 36. This is a lap joint.

The ski 80, see FIGURE 19, is of a modified construction of the ski 70. Again, the outside edges of the base 20 overlap a portion of the inwardly directed members 30 and 38. The base 20 may be welded to the inwardly directed members 30 and 38 or may be bonded by means of an adhesive or a resin. In FIGURE 19 it is seen that the base 20 does not completely overlap the inwardly directed members 30 and 38 but overlaps only a portion of these members so that the outside edges of the base 20 are not flush with the outside surfaces of the legs 28 and 36.

The skis, 50, 60, 70 and 80 comprise a body portion in addition to the skeleton metal frame. The body portion comprises a plastic 90. Below the plastic 90 and between the legs 28 and 36 there is a fibrous core 92. Further, below the fibrous core 92 there is a running surface 94. It is seen that in the central portion of the body 90, fibrous core 92 and running surface 94 that there is a longitudinal groove 96.

The plastic body or plastic core 90 may be a solid polymeric foam. A suitable solid polymeric foam may be polyurethane, polystyrene, epoxy, polyester foam or a combination of these foams. The solid polymeric foam may be an open-cell or closed-cell foam having a density in the range of four to thirty (4-30 lbs.) pound per cubic foot. The foam may be foamed in place.

The reinforcing material 92 may be of a cloth base such as a nylon, Dacron, fiber glass, cotton or rayon cloth. To this cloth there is added a resin such as a polyester resin or an epoxy resin or a polyurethane resin. The resin may

be cured so as to make the cloth a rigid structure. The cloth is bonded to the solid polymeric foam 90. The cloth may be bonded by means of the resin or the cloth may be bonded by pouring the ingredients of the foam, before foaming, through the cloth and into the channel formed by the base 20 and the legs 28 and 36. Then the ingredients are foamed in place. The metal may be primed so that the foam 90 bonds to the metal and in particular to the base 20 and to the legs 28 and 36 and where appropriate to the inwardly directed members 30 and 38. If the resin is added to the cloth of the reinforcement 92 then the resin bonds to the metal.

In regard to the running surface 94 this running surface is positioned outside of the reinforcement 92 and between the ends of the legs 28 and 36 and adjacent to the running edges 32 and 34. The running surface may be of many different materials such as polyethylene, polytetrafluorethylene, polyvinylalcohol, polyvinylchloride, or polypropylene. Further, the running surface 94 may be a filled polyurethane, a filled epoxy or a filled polytetrafluoroethylene. These materials may be filled with graphite or molybdenum disulfide, to name a few.

The reinforcement 92 may vary in thickness from one one thousandths of an inch to three hundredths of an inch ( $\frac{1}{1000}$ "- $\frac{3}{100}$ "). The running surface 94 may vary in thickness from five one hundredths of an inch to thirteen one hundredths of an inch ( $\frac{5}{100}$ "- $\frac{13}{100}$ "). If the running surface 94 be polyethylene, then the polyethylene may be bonded to the reinforcing material 92 by an adhesive having a catalyst. The adhesive may be spread on the reinforcing material 92 or on the surface of the polyethylene. Then the polyethylene may be applied to the reinforcing material 92. The catalyst causes a generation of heat in the adhesive so that the polyethylene bonds to the reinforcing material 92. Or, the polyethylene 94 may be flame treated by exposing to a blow torch or the like or radiation may be used on the polyethylene. Then, the polyethylene may be applied to the reinforcing material 92 and the temperature raised to approximately one hundred degrees Fahrenheit (100° F.). By applying pressure to the polyethylene, the polyethylene is bonded to the reinforcing material 92. On top of the base 20 there may be positioned an abrasive resistant surface or material 98, see FIGURE 7 and FIGURE 12. This abrasive resistant material 98 may be a strip of polyvinyl chloride or Formica. On 98 the skier positions his boot. Therefore, it is desirable to have an abrasive resistant material on this surface as well as a decorative material.

The materials of construction of the metal components 20, 26, 34 and 44 may be stainless steel. I have used a stainless steel referred to as SS17-4PH. The thickness of the base 20 is approximately thirty (30) mils or thirty thousandths of an inch (0.030") and the thickness of the sides 26 and 34 is approximately fifty (50) mils or fifty thousandths of an inch (0.050"). The width of the base 20 varies from approximately two and three fourths of an inch to about three and one-half inches (2.75"-3.50") depending upon the position in the ski. Further, the length of the legs 28 and 36 vary from approximately two hundred thousandths of an inch to approximately one inch (0.200"-1.00"), again, depending upon the position in the ski. Near the middle of the ski the legs are of a maximum or near maximum length while near the ends of the skis the legs are not so long and at the curve 42 the legs are of approximately a minimum length. Further, near the middle of the ski the width of the base 20 is near a minimum while near the ends of the ski such as the tail of the base at 24 and at the curve 42 the base is of a near maximum width.

In a lateral cross-sectional view it is seen that the reinforcing material 92 in conjunction with the legs 28 and 36 and in conjunction with the base 20 make a box section. The characteristics of the ski may be varied, for different purposes, by the reinforcing material 92. More particularly, by having a stiff reinforcing material 92

the ski becomes stiff and rigid. By having a more flexible reinforcing material 92 the ski becomes less rigid and more flexible. As is seen, the reinforcing material 92 in conjunction with the thickness of the metal, and also the metal itself, and the length of the legs 28 and 36 make it possible to vary the properties of the ski with very little change in the basic structure of the ski. Another way of expressing this is that the same basic ski, with slight modification of the components, may be used for racing, competition, pleasure, or downhill skiing. Further, it is possible to make a ski for a child from this basic structure. In addition, one major way to vary the properties of the ski is by the variation of the reinforcing material 92. By the use of fiberglass, fiber such as nylon, Dacron, cotton, rayon and the like the different ways of treating these fibers and the use of a resin in conjunction with fibers makes it possible to vary the properties of the ski. This reinforcing material 92, to reiterate, adds stiffness to the ski and also completes the box section. Further, the properties of the ski may be varied by the metal used and the thickness of and the length of the legs 28 and 36.

From the foregoing it is seen that I have provided a ski whose metal frame components may be stamped from metal so as to form the base 20, the sides 26 and 34, and the tail bridge 44. Then, the metal components may be welded or bonded to form the skeleton frame. After the skeleton frame has been formed it is possible to make a body for the ski or make a body in the ski from a plastic and then to provide a reinforcing material and a running surface. The metal sides, 26 and 34, provide the running edge for the ski. The reinforcing material 92 is bonded to the inside surface of the legs 28 and 36 near the bottom of the legs so as to provide a brace and to add rigidity to the structure of the ski. A tail bridge 44 is provided so as to assist in tying together the rear portion of the sides 26 and 34 and the rear of the base 20.

The ability to stamp the metal components 20, 26, 34 and 44 makes it possible to provide an inexpensive ski having a metal frame and which metal frame may be bonded to plastic to make an inexpensive metal and plastic ski. Without this ability to stamp out the metal components the cost of labor for making the metal components would be so high as to lessen the possibility of commercial success of the ski.

Having presented my invention what I claim is:

1. A ski; said ski comprising:
  - (a) a base;
  - (b) two spaced apart sides;
  - (c) said base and said sides being bonded so that the sides depend from opposite edges of the base;
  - (d) each of said sides comprising a leg and an inwardly directed member;
  - (e) said ski in a lateral cross-sectional view presenting the general configuration of a U with said base and depending sides;
  - (f) said base and said sides defining a skeleton frame; and,
  - (g) a body being bonded to said skeleton frame.
2. A ski according to claim 1 and comprising:
  - (a) the lower ends of said sides forming the running edges of said ski.
3. A ski according to claim 1 and comprising:
  - (a) the lower part of said sides being tied together with a brace.
4. A ski according to claim 1 and comprising:
  - (a) said body being a plastic body; and,
  - (b) the lower ends of said sides forming the running edges of said ski.
5. A ski according to claim 4 and comprising:
  - (a) said sides being directed outwardly; and,
  - (b) a brace tying together the lower parts of said sides.
6. A ski according to claim 1 and comprising:

- (a) the lower ends of said sides being the running edges of the ski;
- (b) said body comprising a solid polymeric foam between said sides;
- (c) a fibrous reinforcement material between said sides; and,
- (d) a running surface between said sides.
7. A ski according to claim 1 and comprising:
  - (a) the lower ends of said sides being the running edges of the ski;
  - (b) said body comprising a solid polymeric foam between said sides;
  - (c) a resin impregnated fiberglass reinforcement material between said sides and bonded to said foam and to said sides; and,
  - (d) a polyethylene running surface bonded to said reinforcement material and to said sides.
8. A ski according to claim 1 and comprising:
  - (a) a tail bridge bonded to the rear of the base and the two sides.
9. A ski according to claim 1 and comprising:
  - (a) said base and said sides being bonded so that the legs depend from the inwardly directed upper members.
10. A ski according to claim 9 and comprising:
  - (a) the lower ends of said legs forming the running edges of said ski.
11. A ski according to claim 9 and comprising:
  - (a) the lower part of said legs being tied together with a brace.
12. A ski according to claim 9 and comprising:
  - (a) said body being a plastic body; and,
  - (b) the lower ends of said legs forming the running edges of said ski.
13. A ski according to claim 12 and comprising:
  - (a) said legs being directed outwardly; and,
  - (b) a brace tying together the lower parts of said legs.
14. A ski according to claim 9 and comprising:
  - (a) the lower ends of said legs being the running edges of the ski;
  - (b) said body comprising a solid polymeric foam between said legs;
  - (c) a fibrous reinforcement material between said sides; and,
  - (d) a running surface between said sides.
15. A ski according to claim 9 and comprising:
  - (a) the lower ends of said legs being the running edges of the ski;
  - (b) said body comprising a solid polymeric foam between said legs;
  - (c) a resin impregnated fiberglass reinforcement material between said legs and bonded to said foam and to said legs; and,
  - (d) a polyethylene running surface bonded to said reinforcement material and to said sides.
16. A ski according to claim 9 and comprising:
  - (a) a tail bridge bonded to the rear of the base and the two sides.
17. A ski according to claim 9 and comprising:
  - (a) said base being bonded to said sides in a position with the upper surface of said base below the underneath surfaces of the inwardly directed members to form underneath lap joints and with the legs depending from said inwardly directed members.
18. A ski according to claim 17 and comprising:
  - (a) the lower ends of said legs forming the running edges of said ski.
19. A ski according to claim 17 and comprising:
  - (a) the lower part of said legs being tied together with a brace.
20. A ski according to claim 17 and comprising:
  - (a) said body being a plastic body; and,
  - (b) the lower ends of said legs forming the running edges of said ski.

21. A ski according to claim 20 and comprising:  
 (a) said legs being directed outwardly; and  
 (b) a brace tying together the lower parts of said legs.
22. A ski according to claim 17 and comprising:  
 (a) the lower ends of said legs being the running edges of the ski; 5  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a fibrous reinforcement material between said sides; and, 10  
 (d) a running surface between said sides.
23. A ski according to claim 17 and comprising:  
 (a) the lower ends of said legs being the running edges of the ski; 15  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a resin impregnated fiberglass reinforcement material between said legs and bonded to said foam and to said legs; and, 20  
 (d) a polyethylene running surface bonded to said reinforcement material and to said sides.
24. A ski according to claim 17 and comprising:  
 (a) a tail bridge bonded to the rear of the base and the two sides. 25
25. A ski according to claim 9 and comprising:  
 (a) the outer edges of said base being bonded to inner edges of the inwardly directed members to form butt joints. 25
26. A ski according to claim 25 and comprising:  
 (a) the lower ends of said legs forming the running edges of said ski. 30
27. A ski according to claim 25 and comprising:  
 (a) the lower part of said legs being tied together with a brace.
28. A ski according to claim 25 and comprising: 35  
 (a) said body being a plastic body; and,  
 (b) the lower ends of said legs forming the running edges of said ski.
29. A ski according to claim 28 and comprising: 40  
 (a) said legs being directed outwardly; and,  
 (b) a brace tying together the lower parts of said legs.
30. A ski according to claim 25 and comprising:  
 (a) the lower ends of said legs being the running edges of the ski; 45  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a fibrous reinforcement material between said sides; and,  
 (d) a running surface between said sides.
31. A ski according to claim 25 and comprising: 50  
 (a) the lower ends of said legs being the running edges of the ski;  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a resin impregnated fiberglass reinforcement material between said legs and bonded to said foam and to said legs; and 55  
 (d) a polyethylene running surface bonded to said reinforcement material and to said sides.
32. A ski according to claim 25 and comprising: 60  
 (a) a tail bridge bonded to the rear of the base and the two sides.
33. A ski according to claim 9 and comprising:  
 (a) said base being bonded to said sides in a position with the lower surface of said base above the upper surfaces of said inwardly directed members to form lap joints and with the legs depending from the inwardly directed members. 65
34. A ski according to claim 33 and comprising: 70  
 (a) the lower ends of said legs forming the running edges of said ski.
35. A ski according to claim 33 and comprising:  
 (a) the lower part of said legs being tied together with a brace.
36. A ski according to claim 33 and comprising: 75

- (a) said body being a plastic body; and  
 (b) the lower ends of said legs forming the running edges of said ski.
37. A ski according to claim 36 and comprising:  
 (a) said legs being directed outwardly; and  
 (b) a brace tying together the lower parts of said legs.
38. A ski according to claim 33 and comprising:  
 (a) the lower ends of said legs being the running edges of the ski;  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a fibrous reinforcement material between said sides; and  
 (d) a running surface between said sides.
39. A ski according to claim 33 and comprising:  
 (a) the lower ends of said legs being the running edges of the ski;  
 (b) said body comprising a solid polymeric foam between said legs;  
 (c) a resin impregnated fiberglass reinforcement material between said legs and bonded to said foam and to said legs; and  
 (d) a polyethylene running surface bonded to said reinforcement material and to said sides.
40. A ski according to claim 33 and comprising:  
 (a) a tail bridge bonded to the rear of the base and the two sides.
41. A method for making a ski, said method comprising:  
 (a) forming a metal base;  
 (b) forming two metal sides;  
 (c) forming each of said metal sides with an inwardly directed member;  
 (d) bonding the two metal sides to said base so that in a lateral cross-sectional view the ski appears in the general configuration of a U;  
 (e) positioning a solid polymeric foam between said sides;  
 (f) positioning a fibrous reinforcement material between said sides; and  
 (g) positioning a running surface between said sides.
42. A method according to claim 41 and comprising:  
 (a) positioning the upper surface of the base below the lower surfaces of the inwardly directed members and bonding the base to the sides to form an underneath lap joint with the legs depending from the inwardly directed members.
43. A method according to claim 41 and comprising:  
 (a) forming each of said metal sides with an inwardly directed member; and  
 (b) positioning the edges of the base adjacent to the edges of the inwardly directed members and bonding the base to the members to form a butt joint with the legs depending from the inwardly directed members.
44. A method according to claim 41 and comprising:  
 (a) forming each of said metal sides with an inwardly directed member; and  
 (b) positioning the lower surface of the base above the upper surfaces of the inwardly directed members and bonding the base to the sides to form a lap joint with the legs depending from the inwardly directed members.

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156—196