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(71) Applicant: **YAMAHA CORPORATION**
10-1, Nakazawa-cho
Hamamatsu-shi
Shizuoka-ken (JP)

(72) Inventor: **Matsuda, Hideki, c/o Yamaha Corporation**
10-1, Nakazawa-cho
Hamamatsu-shi,
SHizuoka-ken (JP)

(74) Representative: **Geyer, Ulrich F., Dr.**
Dipl.-Phys. et al
WAGNER & GEYER,
Patentanwälte,
Gewürzmühlstrasse 5
D-80538 München (DE)

(54) Ski and simple process for fabricating thereof.

(57) A ski is implemented by a lower assembly (11) with a running surface (11d) and an upper assembly (12) integral with the lower assembly, and the upper assembly is a lamination of a thermosetting resin-impregnated non-woven fabric member (12a)and an outer cover film (12b) of thermoplastic resin covering the lower assembly; the thermosetting resin-impregnated non-woven fabric member allows a forming die (13) to transfer a decorative pattern (13c/13d) on the outer cover film without change of a designed flexibility of the lower assembly.

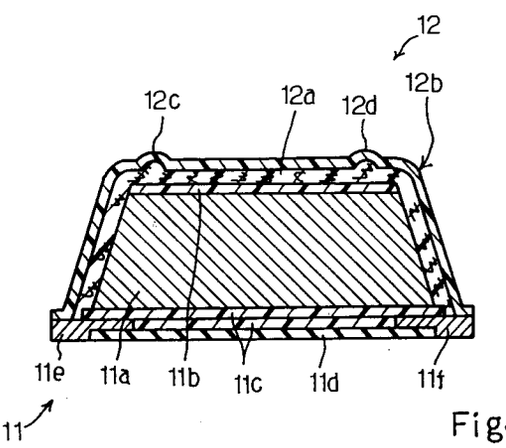

Fig. 3

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FIELD OF THE INVENTION

This invention relates to a pair of skis for sliding on snow and, more particularly, to a structure of the ski and a process of fabricating the ski.

DESCRIPTION OF THE RELATED ART

A pair of skis is used for sliding on snow, and a typical example of the prior art ski is illustrated in 0figure 1 of the drawings. The prior art ski is imaginary split into a lower assembly 1 and an upper assembly 2.

The lower assembly 1 comprises a core member 1a made from an aluminum honeycomb, a wood plate or a foam plastic plate, upper and lower reinforcing plates 1b and 1c of fiber-reinforced plastic or high strength aluminum alloy bonded to the upper surface and the lower surface of the core member 1a, a sole plate 1d of ultra high molecular polyethylene and edges 1e and 1f of carbon steel or stainless steel attached to both sides of the lower reinforcing plate 1c and the sole plate 1d.

On the other hand, the upper assembly 2 comprises a curved outer cover film 2a of nylon a filler 2b of urethane foam attached at both side edges thereof to the edges 1e and 1f and a filler 2b of urethane foam filling a hollow space between the curved outer cover film 2a and the lower assembly 1.

In order to fabricate the prior art ski, the manufacturer prepares the lower assembly 1, and the upper assembly 2 is formed by using a forming die 3 as shown in figure 2A. Namely, the curved outer cover film 2a is placed on the inner surface of the lower block 3a of the forming die 3, and the upper block 3b is coupled to the lower block 3a. A cavity is formed between the inner surface of the lower block 3a and the inner surface of the upper block 3b, and foamable urethane resin 2c is introduced into the cavity. The urethane resin 2c is foamed, and the upper assembly 2 is shaped in the cavity.

The upper assembly 2 is taken out from the die 3, and is assembled with the lower assembly 1 as shown in figure 2B. The lower assembly 1 is bonded or welded to the upper assembly 2.

Decorative marks, letters and/or logograms are embossed on the inner surface of the lower block 3a, and the decorative marks, the letters and/or the logograms are transferred to the outer surface of the curved outer cover layer 2a during the shaping work in the die 3.

Thus, while the lower assembly 1 and the upper assembly 2 are produced independently, the letters and the logograms are transferred to the curved outer cover film 2a in the die 3, and the transfer work does not have a bad influence on the strength of the lower assembly 1 and, accordingly, the prior art ski.

However, the prior art ski is expensive due to the complex fabricating process.

SUMMARY OF THE INVENTION

It is therefore an important object of the present invention to provide a low price ski with decorative marks and letters.

It is also another important object of the present invention to provide a process of fabricating the low price ski.

To accomplish the object, the present invention proposes to take up force for transferring a relief by means of a resin-impregnated non-woven fabric sheet provided between a lower assembly and an outer cover film.

In accordance with one aspect of the present invention, there is provided a ski for sliding on snow, comprises: a) a lower assembly providing a mechanical strength to the ski, and having a running surface for sliding on the snow and edges provided on both sides of the running surface; and b) an upper assembly integral with the lower assembly and having a relief on an outer surface thereof, the upper assembly comprising a resin-impregnated non-woven fabric member covering the lower assembly except for the running surface and the edges, and having a resiliency after a thermal setting, and an outer cover layer of a synthetic resin covering the resin-impregnated non-woven fabric member and having an upper surface with the relief.

In accordance with another aspect of the present invention, there is provided a process of fabricating a ski for sliding on snow, comprising the steps of: a) preparing a die unit having a first block and a second block with a pattern for producing a relief and a lower assembly providing a mechanical strength to the ski and having a running surface for sliding on the snow and edges provided on both sides of the running surface; b) covering the lower assembly with a lamination of a resin-impregnated non-woven fabric sheet and a thermoplastic resin film except for the running surface and the edges, the resin impregnated in the non-woven fabric sheet being a thermosetting resin; and c) pressing the lower assembly covered with the resin-impregnated non-woven fabric sheet and the thermoplastic resin film between the first block and the second block under application of heat for shaping the ski with the relief transferred from the pattern in the second block.

BRIEF DESCRIPTION OF THE DRAWINGS

The features and advantages of the ski and the process according to the present invention will be

more clearly understood from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a cross sectional view showing the structure of the prior art ski;

Figs. 2A and 2B are cross sectional view showing the process of fabricating the prior art ski;

Fig. 3 is a cross sectional view showing the structure of a ski according to the present invention;

Figs. 4A and 4D are cross sectional views showing a process of fabricating the ski according to the present invention;

Fig. 5 is a partially cut-away perspective view showing another ski according to the present invention; and

Fig. 6 is a partially cut-away perspective view showing yet another ski according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

First Embodiment

Referring to figure 3 of the drawings, a ski embodying the present invention largely comprises a lower assembly 11 and an upper assembly 12. The lower assembly 11 is similar to that of the prior art ski.

Namely, the lower assembly 11 comprises a core member 11a, an upper reinforcing plate 11b, lower reinforcing plates 11c, a sole plate 11d and a pair of edges 11e/11f. The core member 11a is made from an aluminum honeycomb, and a wood plate or a foam plastic plate are available for the core member 11a.

The upper and lower reinforcing plates 11b and 11c are made of fiber-reinforced plastic, and high strength aluminum alloy may be used for the upper and lower reinforcing plates 11b and 11c. The upper reinforcing plate 11b is bonded to the upper surface of the core member 11a, and the lower reinforcing plates 11c are bonded to the lower surface of the core member 11a. Therefore, the core member 11a is sandwiched between the upper reinforcing plate 11b and the lower reinforcing plates 11c, and is reinforced by these plates 11b and 11c.

The sole plate 11d is made of ultra high molecular polyethylene, and is attached to the lower surface of the lower reinforcing plates 11c. Since the lower reinforcing plates 11c are different in width, and grooves are defined along a longitudinal direction of the ski. The longitudinal direction of the ski is normal to the paper where figure 3 is illustrated. The edges 1e and 1f are mode of carbon steel or stainless steel, and are partially inserted into the grooves, respectively. The edges 11e and 11f are fixed, and extend along both sides of the ski.

The upper assembly 12 comprises a resin-impregnated non-woven fabric member 12a and an outer cover layer 12b. The resin-impregnated non-woven fabric member 12a covers the core member 11a and the upper reinforcing plate 11b, and both side edges of the resin-impregnated non-woven fabric member 12a are bonded to the upper surfaces of the edges 11e and 11f. The outer cover layer 12b covers the resin-impregnated non-woven fabric member 12a, and the side edges of the outer cover layer 12b are fixed to the upper surfaces of the edges 11e and 11f. As a result, the upper assembly 12 is integrated with the lower assembly 11.

The resin-impregnated non-woven fabric member 12a is formed from a resin-impregnated non-woven fabric sheet through heat treatment, and the resin-impregnated non-woven fabric sheet is formed by impregnating a thermosetting resin such as, for example, epoxy resin or unsaturated polyester resin into a non-woven fabric sheet with a low elasticity such as, for example, a polyester fabric sheet, a rayon fabric sheet or a nylon fabric sheet and. In this instance, the thermosetting resin is 500 to 1200 weight parts for each 100 weight parts of the non-woven fabric sheet or the fibers.

In order to accelerate the impregnation, it is desirable for the non-woven fabric to previously fill miniature vacant spaces with micro hollow particles. For example, the micro hollow particles such as micro-balloon, shirasu-balloon or foamed resin beads are dispersed into the non-woven fabric sheet before the impregnation. The shirasu-balloon is made from ejecta of siliceous clay, and is analogous to expanded perlite defined in section "heat insulating material" of the international standards ISO 9229. Other cellular materials are available.

The resin-impregnated non-woven fabric sheet is not so rigid as a fiber-reinforced plastic resin, but is still resilient. Namely, the low resiliency fibers of the non-woven fabric sheet maintains the flexibility against the heat treatment changing the resin-impregnated non-woven fabric sheet to the resin-impregnated non-woven fabric member 12a. For this reason, the resin-impregnated non-woven fabric member 12a has only small influence on the flexual rigidity of the ski, and the ski according to the present invention easily achieve the designed characteristics.

The resin-impregnated non-woven fabric member 12a ranges 1 millimeter to 5 millimeter thick, and the uniformity in thickness is not required. The resin-impregnated non-woven fabric member 12a may be varied in the thickness in the longitudinal direction of the ski or in a lateral direction of the

ski.

The outer cover layer 12b is formed of a thermoplastic resin such as, for example, ABS (Acrylonitrile Butadiene Styrene) resin or nylon elastomer, and ranges 0.1 millimeter to 1.0 millimeter thick. While the thermosetting resin impregnated in the non-woven fabric is being treated with heat, the thermoplastic resin is bonded to the resin-impregnated non-woven fabric member 12a, and the outer cover layer 12b becomes integral with the resin-impregnated non-woven fabric member 12a. In this instance, two ridges 12c and 12d are formed on the upper surface of the outer cover 12b in the longitudinal direction of ski, and are a relief formed in the outer cover film 12b.

Description is hereinbelow made on a process sequence for fabricating the ski according to the present invention with reference to figures 4A to 4D of the drawings. The process sequence starts with preparation of the lower assembly 11 and a forming die 13 as shown in figure 4A. In this instance, the core member 11a, the upper reinforcing plate 11b, the lower reinforcing plates 11c, the sole plate 11d and the edges are integrated at this stage.

The lower assembly 11 is placed in a shallow recess of a lower block 13a of the forming die 13, and a resin-impregnated non-woven fabric sheet 14 covers the lower assembly 11. Both side edges of the resin-impregnated non-woven fabric sheet 14 are held in contact with the upper surfaces of the edges 11e and 11f. The resin-impregnated non-woven fabric sheet 14 is flexible, and is topographical over the lower assembly 11. A thermoplastic resin film 15 in turn covers the resin-impregnated non-woven fabric sheet 14, and both side edges of the thermoplastic resin film 15 are held in contact with the upper surfaces of the edges 11e and 11f as shown in figure 4B. The resin-impregnated non-woven fabric sheet 14 is thicker than the resin-impregnated non-woven fabric member 12a.

An upper block 13b of the forming die 13 has an inner surface defining a recess, and parts of the inner surface defines grooves 13c and 13d extending along the longitudinal direction of the ski as shown in figure 4C.

The upper block 13b is pressed against the lower block 13a, and the lower block 13a and the upper block 13b encapsulate the lower assembly 11 covered with the resin-impregnated non-woven fabric sheet 14 and the thermoplastic resin film 15. The encapsulated structure is heated to 80 degrees to 130 degrees in centigrade under 0.5 MPa to 1.0 MPa for 10 minutes to 30 minutes. Then, the impregnated resin is thermally set, and the thermoplastic resin film 15 is partially shaped into the ridges 12c and 12d. The resin-impregnated non-woven fabric sheet 14 is also embossed, and the pattern of the upper block 13b is transferred to the upper assembly 12. Moreover, the thermoplastic resin film and the impregnated resin makes the upper assembly 12 integral with the lower assembly 11 as shown in figure 4D.

As will be understood from the foregoing description, the process according to the present invention is simpler than the prior art process, because the assembling work for the upper assembly 12 and the integration work between the upper and lower assemblies 12 and 11 are concurrently carried out.

In the above described process sequence, the lower assembly 11 has been already integrated before insertion into the forming die 13. However, if the core member 11a, the upper and lower reinforcing plates 11b and 11c, the sole plate 11d and the edges 11e and 11f are only set up on the lower block 13a together with the resin-impregnated non-woven fabric sheet 14 and the thermoplastic resin film 15, not only the upper assembly 12 but also the lower assembly 11 are concurrently integrated during the heat application in the forming die 13, and the process sequence becomes much simpler.

Moreover, in case where the resin-impregnated non-woven fabric member 12a is partially changed in thickness, the core member 11a may be topographically changed in thickness. In this instance, the non-woven fabric sheet 14 takes up difference in thickness of the non-woven fabric member 12a, and the forming die 13 with the same cavity is available for different products.

Second Embodiment

Turning to figure 5 of the drawings, a piece of lower and upper assemblies is cut out from another ski embodying the present invention. The lower structure and the upper structure of the ski are similar to those of the first embodiment except for a relief 22b on the outer cover film 22, and, for this reason, the components of the lower and upper assemblies are labeled with the same references as those of the first embodiment without detailed description.

The outer cover film 22 is partially embossed for forming a step portion 22c extending from the upper surface to the side surfaces of the ski, and the relief 22b is formed as similar to the ridges 12c and 12d of the outer cover film 12.

A lamination of resin-impregnated non-woven fabric sheets is available for the upper assembly, and the resin-impregnated non-woven fabric sheets may be partially removed for changing the thickness of the lamination of resin-impregnated non-woven fabric sheets. Such a laminated structure partially changed in thickness allows a forming die to form a relief on the outer cover film 15.

Third Embodiment

Turning to figure 6 of the drawings, a piece of lower and upper assemblies is cut out from yet another ski embodying the present invention. The lower structure and the upper structure of the ski are similar to those of the first embodiment except for a rib 32b or a relief on the outer cover film 32, and, for this reason, the components of the lower and upper assemblies are labeled with the same references as those of the first embodiment without detailed description.

The outer cover film 32 is partially embossed for forming the rib 32b extending on the right side along the longitudinal direction of the ski, and the rib 32b is formed through a process similar to the process for forming the ridges 12c and 12d of the outer cover film 12.

As will be appreciated from the foregoing description, the ski according to the present invention is fabricated through the simple process, and the fabrication cost is decreased.

Moreover, the low resiliency fibers maintains the flexibility of the resin-impregnated non-woven fabric member, and the resin-impregnated non-woven fabric member does not affect the characteristics of the ski according to the present invention.

Finally, the resin-impregnated non-woven fabric sheet allows the forming die to transfer a pattern to the outer cover film without bad influence on the lower assembly.

Although particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the present invention. For example, the lower assembly is not limited to the structure shown in the drawings, and any structure known to a person skilled in the art is available for the ski according to the present invention. Moreover, the relief may be letters, logograms and/or decorative marks.

Claims

1. A ski for sliding on snow, comprises:

a) a lower assembly (11) providing a mechanical strength to said ski, and having a running surface (11d) for sliding on said snow and edges (11e; 11f) provided on both sides of said running surface; and

b) an upper assembly (12) integral with said lower assembly and having a relief (12c/12d; 22b; 32b) on an outer surface thereof,

characterized in that

said upper assembly comprises

a resin-impregnated non-woven fabric member (12a) covering said lower assembly except for said running surface and said edges, and having a resiliency after a thermal setting, and

an outer cover layer (12b; 22; 32) of a synthetic resin covering said resin- impregnated non-woven fabric member and having an upper surface with said relief.

2. The ski as set forth in claim 1, in which said resin-impregnated non-woven fabric member contains fibers with low-resiliency.

3. The ski as set forth in claim 2, in which said fibers are selected from the group consisting of polyester fibers, rayon fibers and nylon fibers.

4. The ski as set forth in claim 2, in which a thermosetting resin selected from the group consisting of epoxy and unsaturated polyester is impregnated into said fibers.

5. The ski as set forth in claim 4, in which said thermosetting resin ranges from 500 weight parts to 1200 weight parts for each 100 weight parts of said fibers.

6. The ski as set forth in claim 1, in which said synthetic resin is a thermoplastic resin selected from the group consisting of acrylonitrile butadiene styrene and nylon elastomer.

7. A process of fabricating a ski for sliding on snow, comprising the steps of:

a) preparing a die unit (13) having a first block (13b) and a second block (13a) with a pattern (13c/13d) for producing a relief (12c/12d; 22; 32) and a lower assembly (11) providing a mechanical strength to said ski and having a running surface (11d) for sliding on said snow and edges (11e/11f) provided on both sides of said running surface;

b) covering said lower assembly (11) with a lamination of a resin-impregnated non-woven fabric sheet (14) and a thermoplastic resin film (15) except for said running surface and said edges, the resin impregnated in the non-woven fabric being a thermosetting resin; and

c) pressing said lower assembly (11) covered with said resin-impregnated non-woven fabric sheet (14) and said thermoplastic resin film (15) between said first block (13b) and said second block (13a) under application of heat for shaping said ski with the relief (12c/12d) transferred from said pattern

(13c/13d) in said second block.

8. The process as set forth in 7, in which components (11a/11b/11c/11d/11e/11f) of said lower assembly (11) are integrated before said step a).

9. The process as set forth in 7, in which components (11a/11b/11c/11d/11e/11f) of said lower assembly (11) are integrated in step c) together with said resin-impregnated non-woven fabric sheet (14) and said thermoplastic resin film (15).

10. The process as set forth in claim 7, in which hollow micro particles are dispersed in a non-woven fabric sheet before impregnating a thermosetting resin into said non-woven fabric sheet, thereby preparing said resin-impregnated non-woven fabric sheet (14).

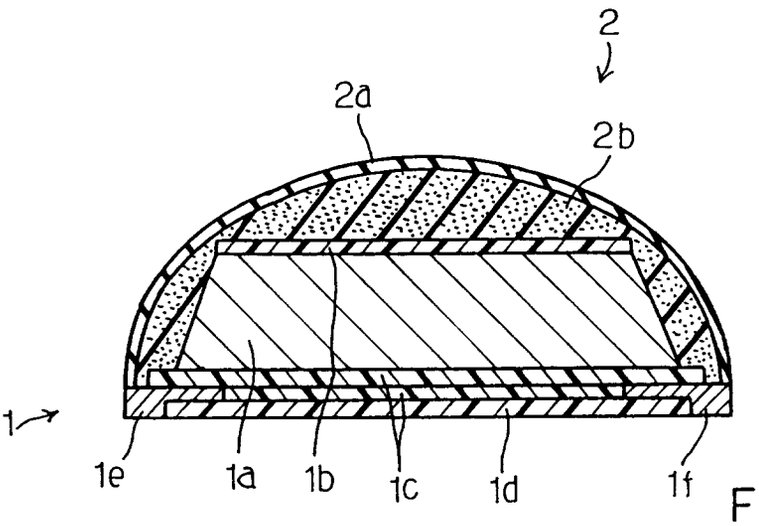

Fig. 1
PRIOR ART

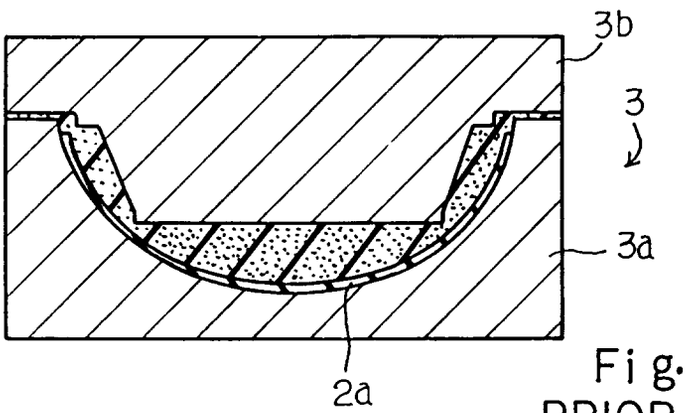

Fig. 2A
PRIOR ART

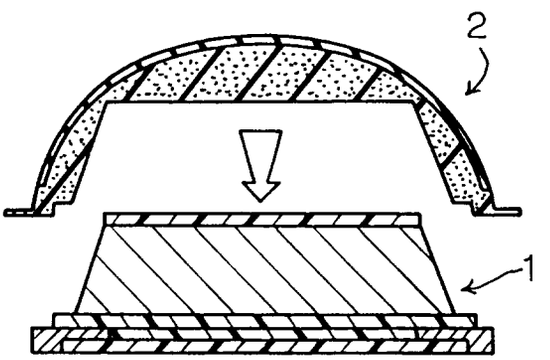

Fig. 2B
PRIOR ART

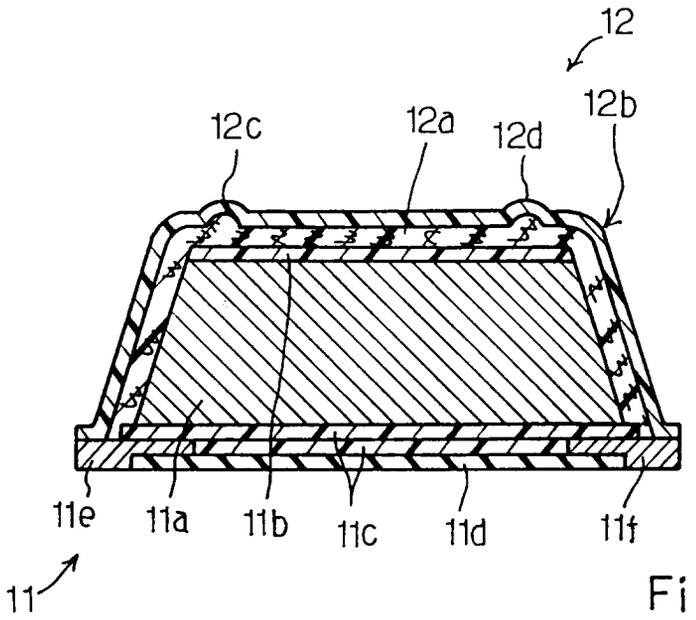

Fig. 3

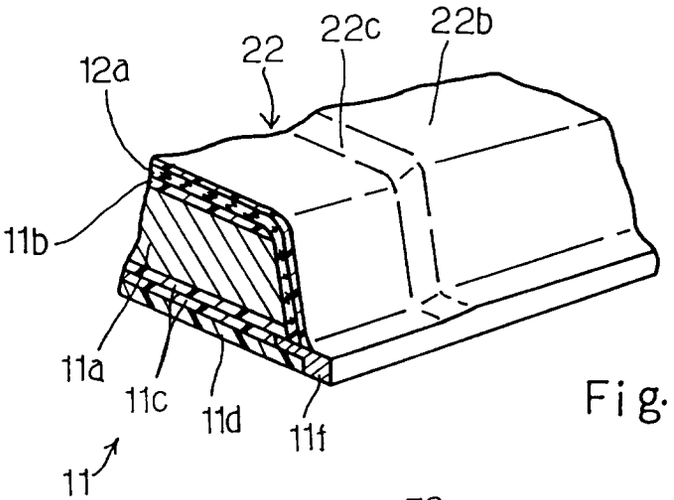

Fig. 5

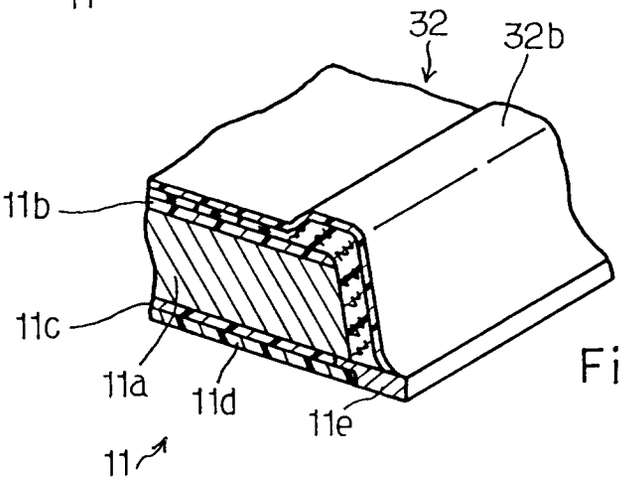

Fig. 6

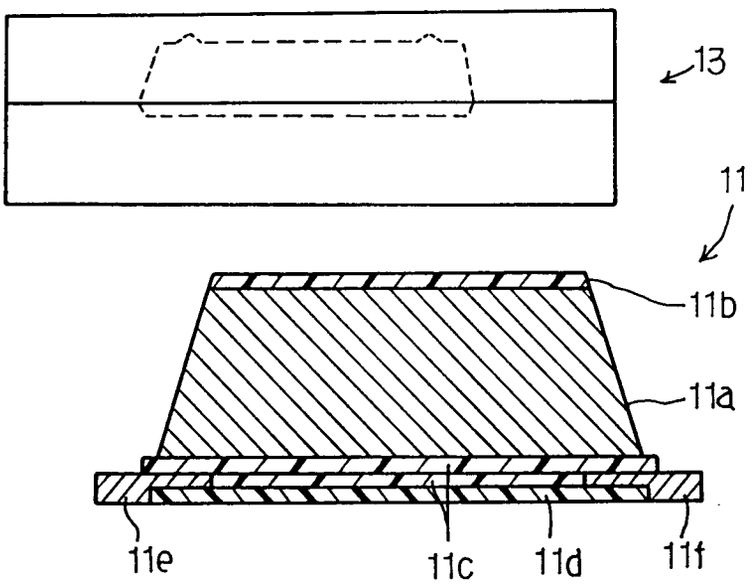
13
11
11b
11a
11e
11c
11d
11f

Fig. 4A

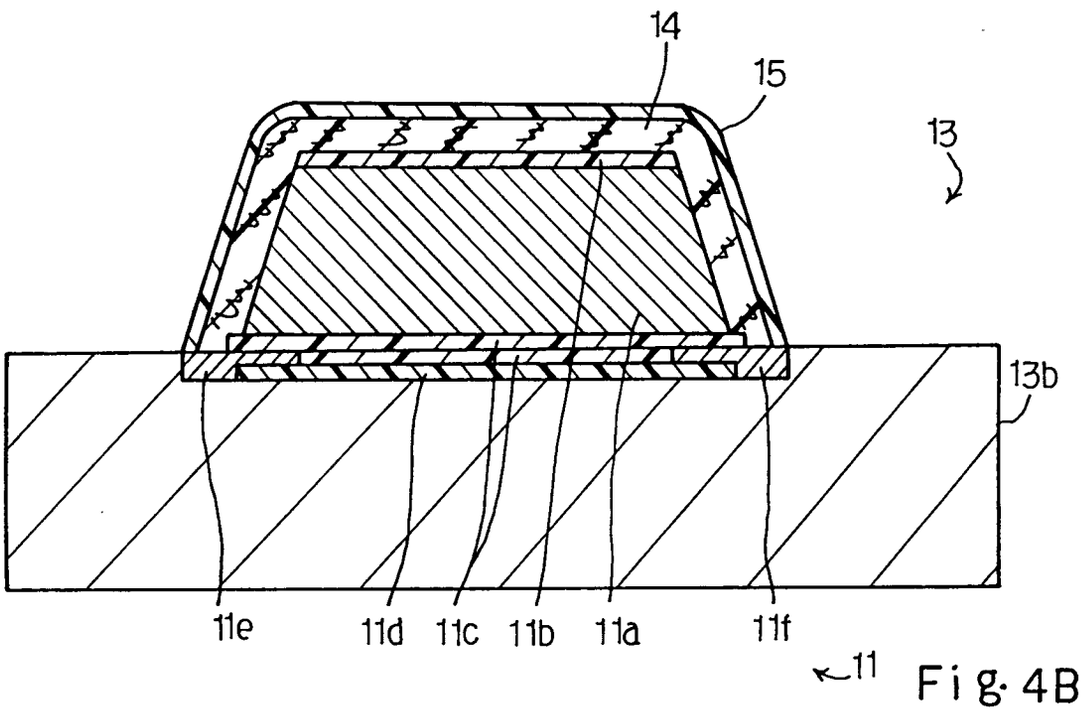
14
15
13
13b
11e
11d
11c
11b
11a
11f
11

Fig. 4B

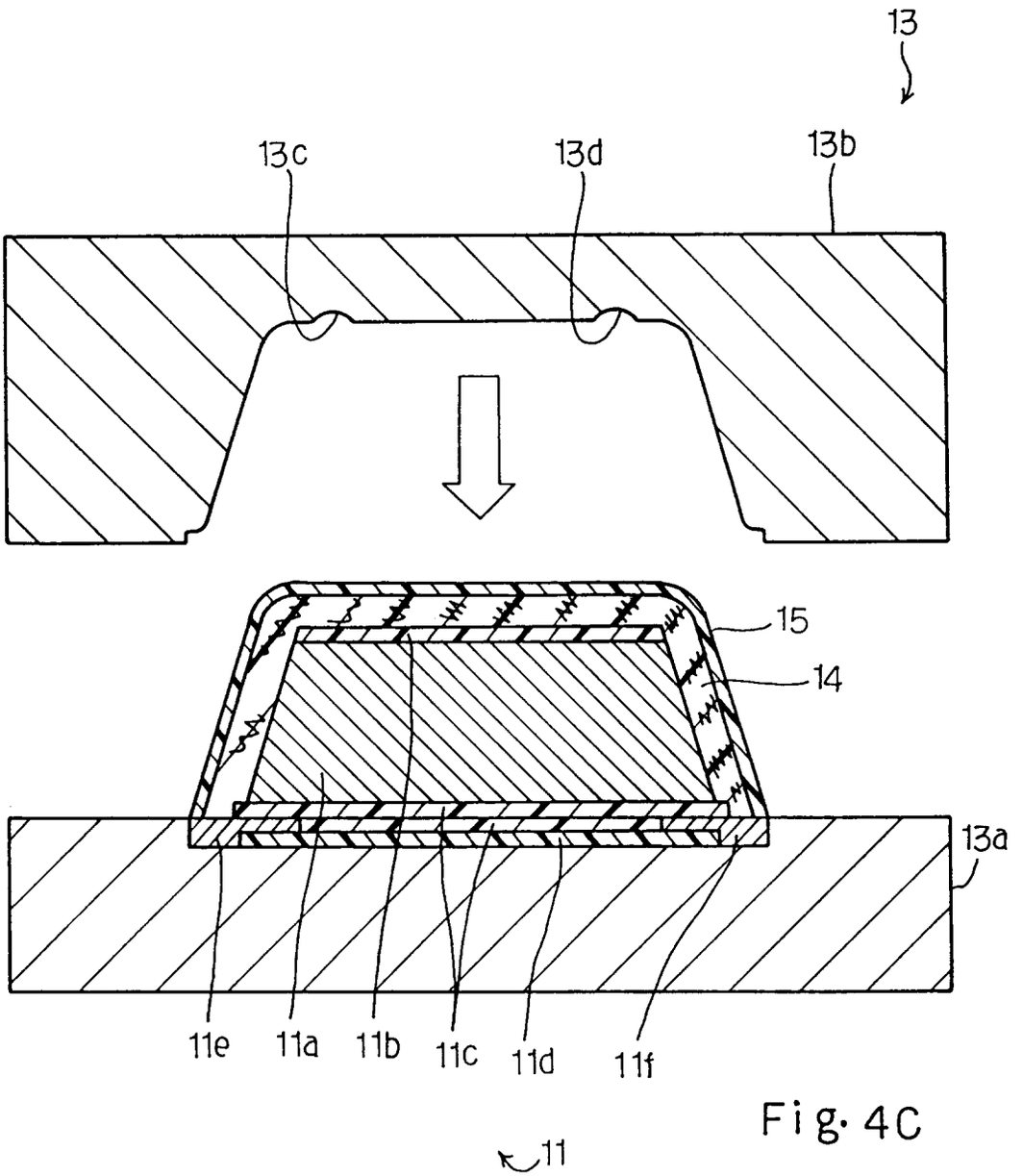

Fig. 4C

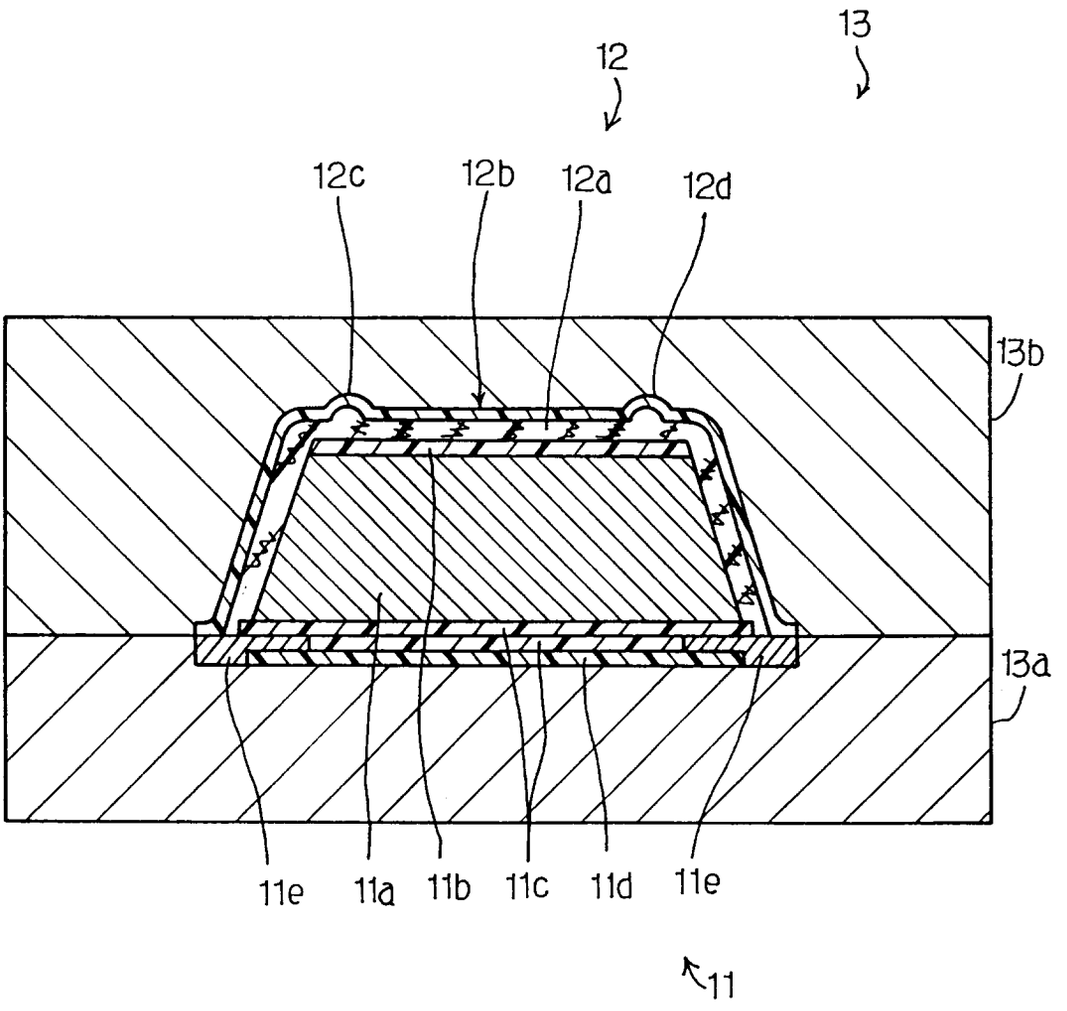

Fig. 4D