



US 20040127310A1

(19) **United States**

(12) **Patent Application Publication**  
**Hsu**

(10) **Pub. No.: US 2004/0127310 A1**

(43) **Pub. Date: Jul. 1, 2004**

(54) **COMPOSITE MATERIAL BAT**

**Publication Classification**

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(51) **Int. Cl.<sup>7</sup> ..... A63B 59/06**

(52) **U.S. Cl. .... 473/567**

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**625 SLATERS LANE**

**FOURTH FLOOR**

**ALEXANDRIA, VA 22314**

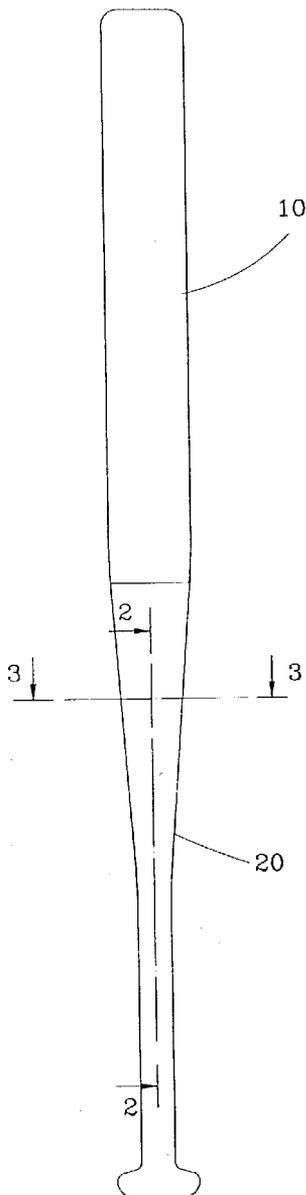
(57) **ABSTRACT**

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A composite material bat comprising: a hitting part with a large diameter and a holding part with a smaller diameter. It forms a conical area at the shoulder of where the hitting part and the holding part connects. Wherein the improvement is characterizing in that the holding part includes an inner shell and an outer shell, said inner shell has better rigidity or stiffness than said outer shell and said outer shell has better flexibility than said inner shell.

(21) Appl. No.: **10/331,609**

(22) Filed: **Dec. 31, 2002**



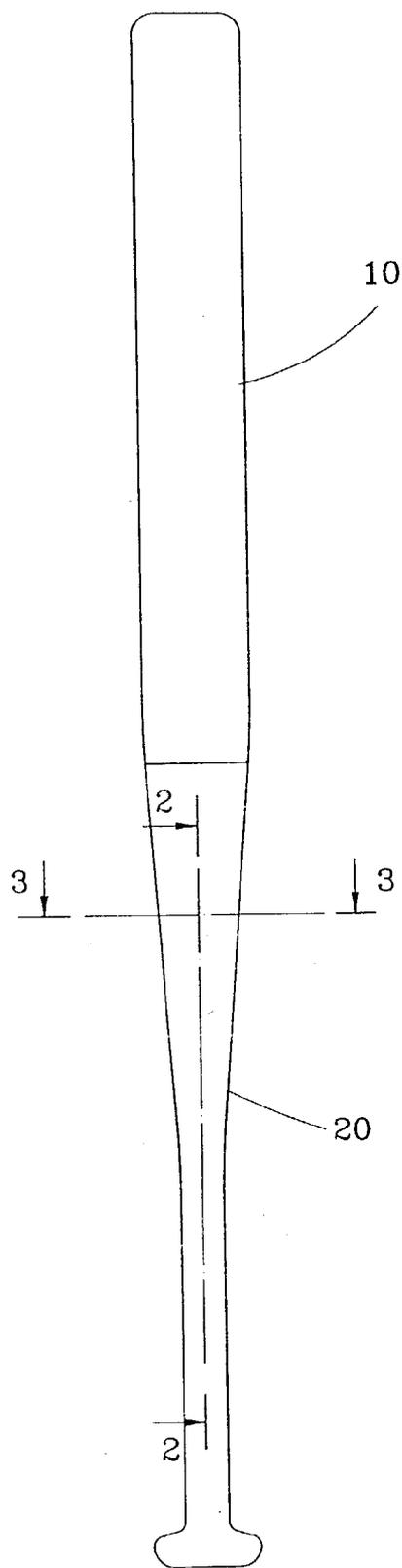


FIG. 1

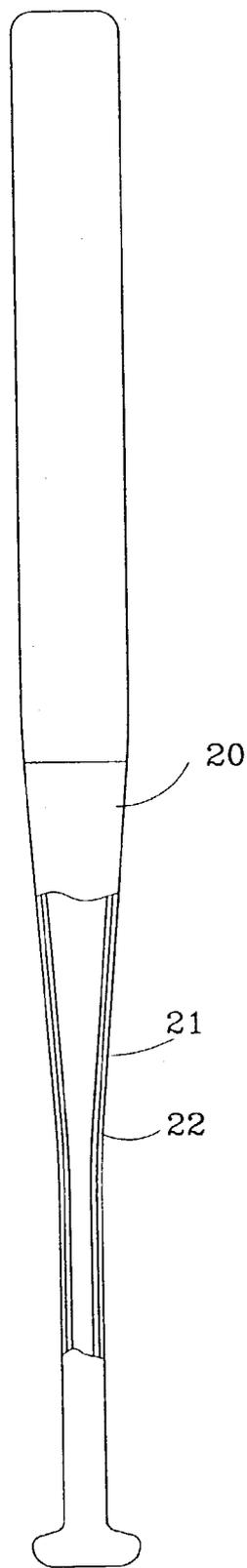


FIG. 2

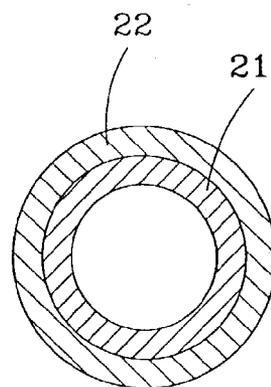
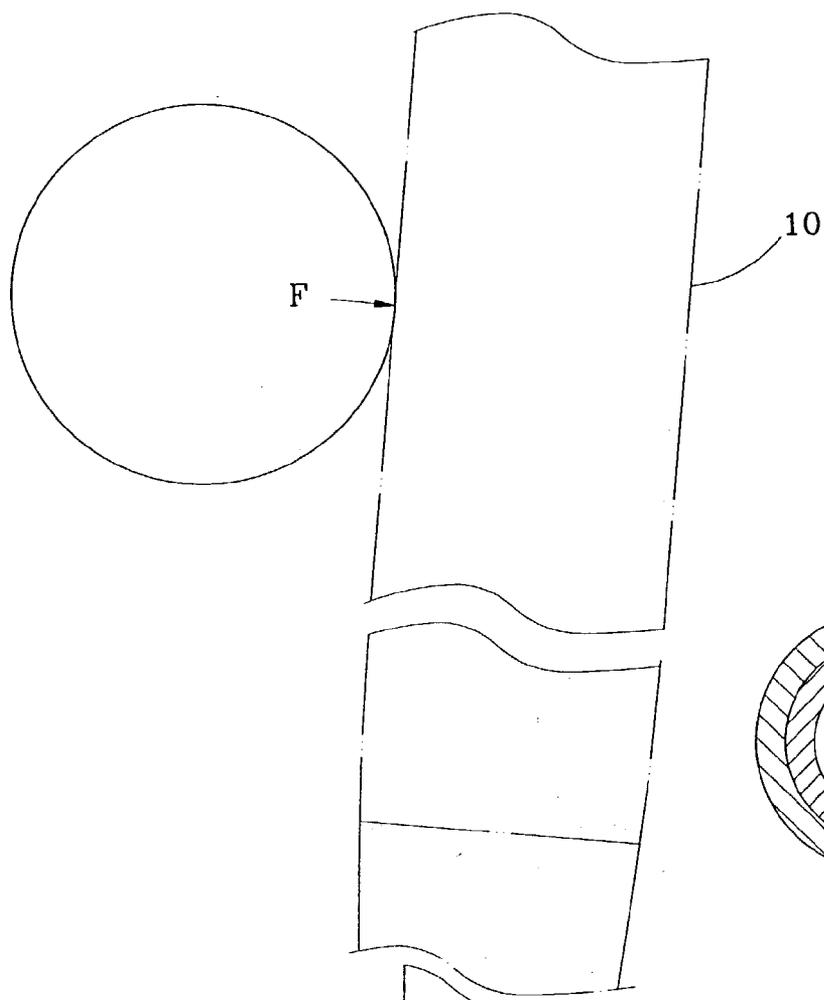


FIG. 3

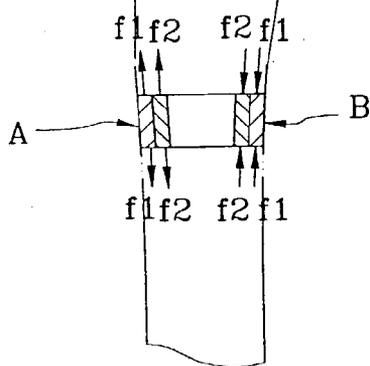


FIG. 4

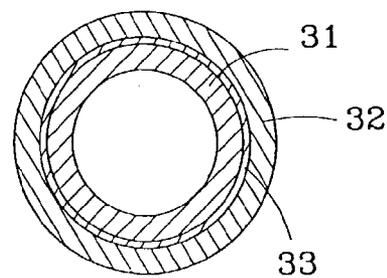


FIG. 5

## COMPOSITE MATERIAL BAT

### SUMMARY OF THE INVENTION

[0001] A compound material bat comprising: a hitting part with a large diameter and a holding part with a smaller diameter; it forms a conical area at the shoulder of where the hitting part and the holding part connects. Wherein the improvement is characterized in that the holding part is including an inner shell and an outer shell, said inner shell has better rigidity or stiffness than said outer shell and said outer shell has a better flexibility than said inner shell. Said outer shell of said holding part made of reinforced fiber thermoplastic and said inner shell of said holding part made of reinforced fiber thermosetting material or metal.

### BACKGROUND OF THE INVENTION

#### [0002] 1. Field of the Invention

[0003] The present invention relates to sports products and, more specifically, to a composite material bat using in baseball or softball.

#### [0004] 2. Description of the Related Art

[0005] A bat has basic limitations of weight and size. Manufacturers must design difference functions for the hitting portion holding portion and bending portion of the bat under these limitations in order to make best performance. As usually, the hitting portion requires more intensity and impact resistance and the design for the holding portion requests better cushion and confidence of holding and the bending point is also an important subject for the designer. As we know, a whole bat usually made of same material. These materials can be wood metal or reinforced fiber composite. Some of these designs are focus on the hitting portion and make a regional stepped up design. However, the same material bat is difficult to combine these different requests of hitting portion and holding portion. Moreover, most of these prior arts focused on the hitting portion of the bat. There were few cases focused on the holding portion and tried to improve it. For example, the U.S. Pat. No. 5,131,651 is the one who focused on the cushion and the flexibility in these few cases. Especially, said case makes plural holes between the holding portion and the conical bending portion then cover a cover layer at the out side in order to increase the flexibility and cushion and reduce rigidity. But, it will be complicate to form plural holes on the reinforced carbon fiber material in the production process.

[0006] The main object of the present invention is to provide a composite material bat which has a better cushion and flexibility at holding portion while not affecting the structure strength of the hitting portion.

[0007] In order to reach the main object, present invention is to provide a composite material bat, which is combined with a hitting part with a large diameter and a holding part with a smaller diameter. Said holding part is combined with an inner shell and an outer shell. Said inner shell has better rigidity than said outer shell and said outer shell has a better flexibility than said inner shell. By the way, it can make the holding part performing better cushion and the flexibility and also maintain the sufficient intensity of the structure. Said hitting part which can be designed separately can create a bat with best performance by using the more impact resistance materials and structures.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is the view of the outer shape of first embodiment of the present invention.

[0009] FIG. 2 is a sectional assembly view of the section line 2-2 shows in FIG. 1.

[0010] FIG. 3 is a sectional assembly view of the section line 3-3 shows in FIG. 1.

[0011] FIG. 4 is a diagram showing the force which functions on the holding part when the holding part of the present invention is bending.

[0012] FIG. 5 is a sectional assembly view like FIG. 3 of the second embodiment of present invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Referring to FIGS. 1 to 3, a bat of present invention is combined with a tube shaped hitting part 10 that has a large diameter and a tube shaped holding part 20 that has a smaller diameter. It forms a conical area at the shoulder of where the hitting part and the holding part connects. Said holding part includes an inner shell 21 and an outer shell 22. Said inner shell 21 made of reinforced fiber thermosetting plastic (e.g. carbon fiber or glass fiber or boron fiber reinforced epoxy.) or metal (e.g. alloy of aluminum or titanium or magnesium etc.) or thermoplastic with better rigidity. These materials provide better rigidity. Said outer shell 22 made of reinforced fiber thermoplastic or reinforced engineering plastic (e.g. reinforced fiber nylon of carbon or glass or boron.) Said outer shell provides better flexibility and cushion but less rigidity or stiffness than the inner shell.

[0014] Referring to FIG. 4, it shows the force functions on the holding part 20 of the bat when the bat hitting a ball. Said bat will bend when it hit a ball and suffer a force F. The holding part will bear the tension f1-f2 in the FIG. 4 side A and the compression P1-P2 in the FIG. 4 side B. Said outer shell 22 that has less rigidity or stiffness can be used at the out side of the bat to increase the flexibility and cushion. The designer can choose appropriate materials and the thickness to design a perfect holding part by the way of using different material at the inner shell and the outer shell. Moreover, the design can produce a bat that has a best performance at all respects and excellent hitting feeling by the way of selecting reinforced hitting part.

[0015] Referring to the FIG. 5, it is a view that shows the structure of the second embodiment of present invention. In this embodiment, said inner shell 31 made of metal and outer shell 32 made of thermoplastic. Moreover, there is a middle cushion layer 33 between the inner shell 31 and the outer shell 32. Said middle layer made of materials with energy absorption property like butyl rubber to absorb the shock wave of hitting and reduce the harm of the arm of the batter furthermore.

What the invention claimed is:

#### 1. A composite material bat comprising:

a hitting part with a large diameter and a holding part with a smaller diameter; it forms a conical area at the shoulder of where the hitting part and the holding part connects;

wherein the improvement is characterizing in that

said holding part includes an inner shell and an outer shell, said inner shell has better rigidity or stiffness than said outer shell and said outer shell has better flexibility than said inner shell.

2. The composite material bat as claimed in claim 1, said outer shell of said holding part made of reinforced fiber thermoplastic.

3. The composite material bat as claimed in claim 2, said inner shell of said holding part made of reinforced fiber thermosetting material or metal.

4. The composite material bat as claimed in claim 1, further comprising a middle cushion layer between said inner shell and said outer shell.

5. The composite material bat as claimed in claim 4, said reinforced fiber thermosetting material made of the base material of epoxy.

6. The composite material bat as claimed in claim 1, further comprising a middle cushion layer between said inner shell and said outer shell.

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