United States Patent [19]

Moore et al.

[11] **3,876,204**

[45] **Apr. 8, 1975**

[54] **HOLLOW BALL BAT WITH DAMPENING MEANS**

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[73] Assignee: **Aluminum Company of America**, Pittsburgh, Pa.

[22] Filed: **Sept. 6, 1973**

[21] Appl. No.: **394,682**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 245,625, April 19, 1972, abandoned.

[52] **U.S. Cl.** ..... **273/72 A**

[51] **Int. Cl.** **A63B 59/06**

[58] **Field of Search** .... 273/67 R, 72 R, 72 A, 80 R, 273/80 B, 82 R, 70; 220/65; 229/4.5, 14 B, 14 C, 14 H, 89–93, DIG. 2

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[57] **ABSTRACT**

A hollow ball bat having a tubular bat body provided with a handle portion, a barrel portion and a connecting portion. A tubular paperboard dampening element secured to the interior surface of the barrel portion and having an external surface in engagement with the barrel portion interior surface. Such engagement may include about 30 to 75 percent of the barrel interior surface. The paperboard tube may be provided with corrugations on its exterior surface and may have a length of about 3.5 to 9 inches.

The ball bat has an end closure closing the barrel portion and the dampening member is secured to the end closure. In a preferred form, the end closure is an end plug having a reduced diameter lower portion which extends into the dampening member.

14 Claims, 9 Drawing Figures

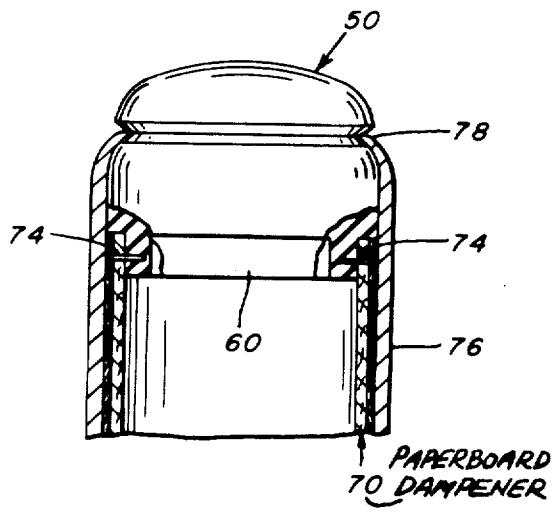


FIG. 1.

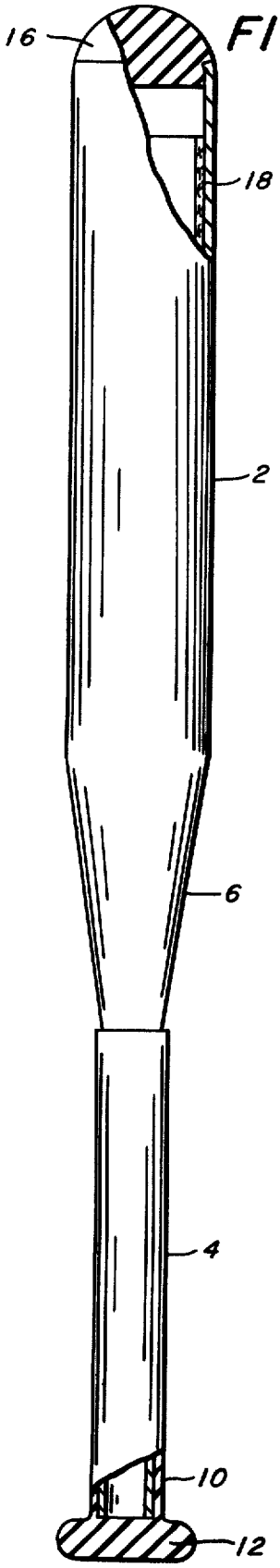


FIG. 2.

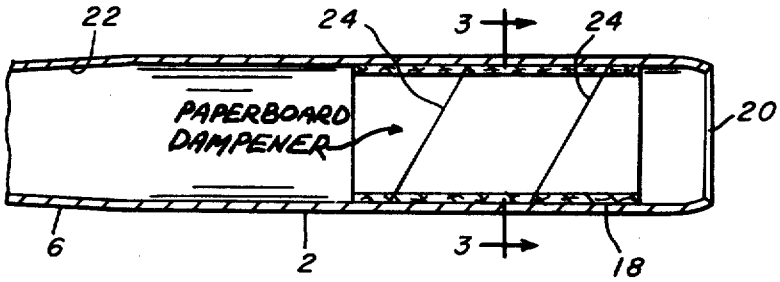


FIG. 3.

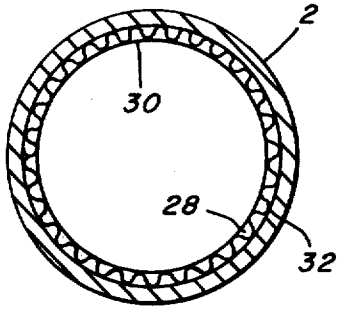


FIG. 5.

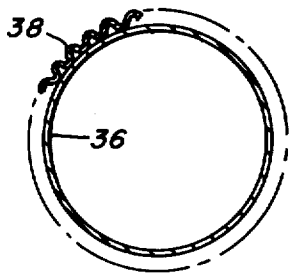


FIG. 4.

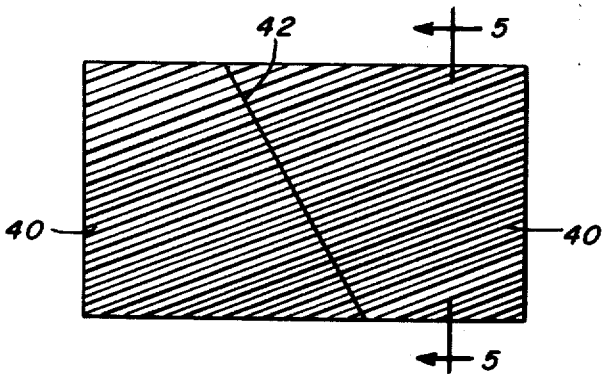
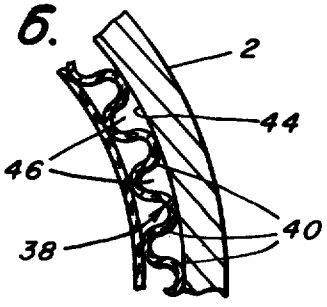
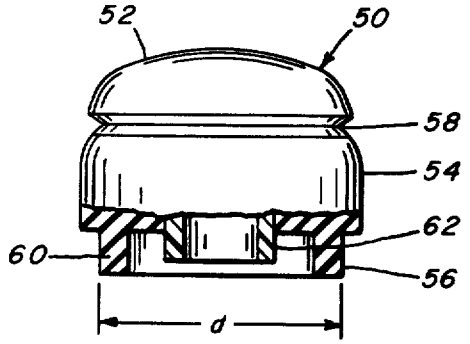


FIG. 6.





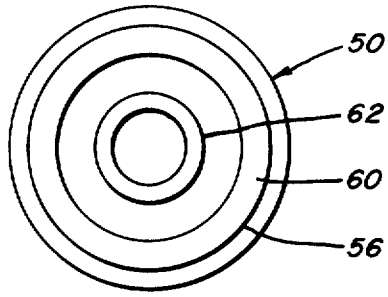


FIG. 8

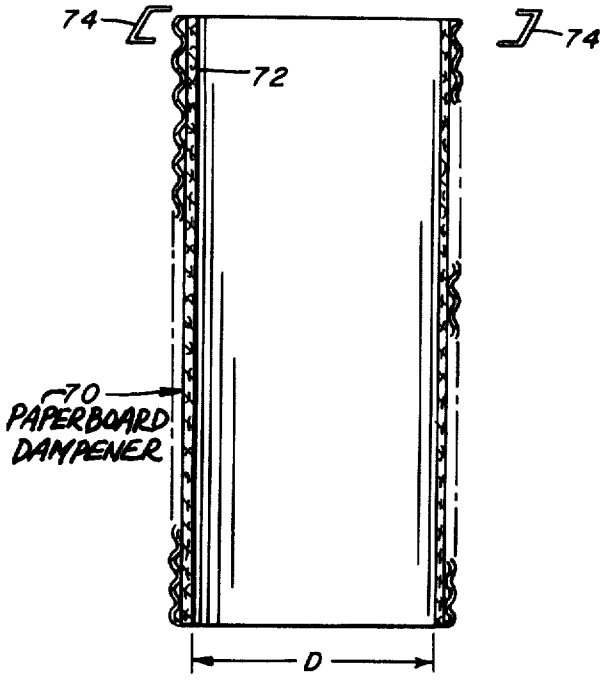


FIG. 7.

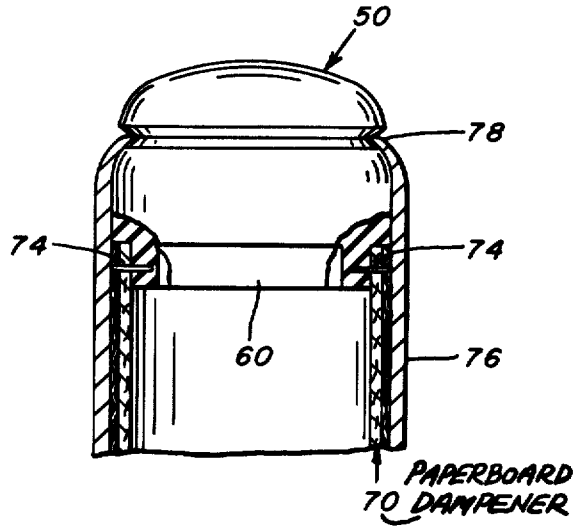


FIG. 9.

HOLLOW BALL BAT WITH DAMPENING MEANS

This application is a continuation-in-part of U.S. Ser. No. 245,625, filed Apr. 19, 1972 and entitled "Hollow Ball Bat with Dampening Means" and now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a hollow ball bat provided with internally secured dampening means to reduce vibrations and noise created during use of the bat. More specifically, this invention relates to the use of a paperboard tube which is secured a predetermined position within the barrel portion of the bat.

2. Description of the Prior Art

In recent years the use of hollow ball bats has become increasingly popular. These bats frequently are composed of a material such as aluminum or steel and have a handle portion, a barrel or hitting portion and a connecting portion. One conventional version has a handle portion of a first diameter, a barrel portion of a second larger diameter and a tapered connecting portion. In order to prevent undesired entry of moisture, dirt and other foreign matter into the hollow bat interior, it has been known to provide separate or integrally formed end closures at both ends of the bat. Bat structures of this general type are shown in U.S. Pats. 1,611,858, 2,967,710 and 3,479,030.

As a result of the great strength and durability of the metal bat, it has been found that tubular bats may be employed with great success. It has, therefore, been unnecessary to employ more expensive structures having substantially solid cross sectional configurations. One problem which has been encountered with the tubular metal bats has been the susceptibility to undesirable vibration and noise upon impact with a ball. Several methods of dampening the vibrations and noise have been previously suggested. A bat provided with a tubular metal core and an exteriorly disposed sponge covering adapted to reduce noise characteristics was suggested in U.S. Pat. No. 2,099,521. While perhaps effective to diminish noise, such a structure is undesirable as the mechanics of the game are substantially altered in a detrimental fashion as a result of the spongy nature of the bat's impact surface.

In co-pending U.S. application Ser. No. 149,443 and Ser. No. 149,444, now abandoned, there have been suggested vibration and noise dampening means which are provided within the bat interior and, therefore, do not alter the desired hardness of the bat impact surface or the wearing characteristics of such impact surface.

It has also been suggested to employ end caps of solid cross sectional configuration which extend into the bat bore in an effort to deaden sound. See U.S. Pat. 3,479,030. This same patent discloses the use of a tapered adhesively secured plug of solid cross sectional configuration as an insert into the handle portion of the bat in an effort to effect sound deadening.

As ball bats are subjected to repeated cycles of severe mechanical shock during ordinary use, it is essential that durable and effective vibration and sound deadening means be provided in the hollow metal ball bat. Also, in order for the metal bat to remain competitive with the wooden bat, it is necessary to provide dampening means which are readily introduced into the bat and permanently secured in a predetermined position in an economical fashion. In addition, such dampening means should be provided in such a fashion as to avoid any detrimental alteration in the mechanics of the game.

SUMMARY OF THE INVENTION

The above-described need has been met by the ball bat of the present invention. The hollow ball bat is provided with a handle portion, a barrel portion and a connecting portion. Dampening means in the form of a tubular paperboard dampening element is secured within the interior of the barrel portion of the bat, preferably at a position spaced inwardly from the free end of the barrel portion. The tubular paperboard element is preferably circumferentially substantially continuous and may be secured to the bat surface by frictional contact. The paperboard tube preferably has a length of about 3.5 to 9 inches with about 5 to 9 inches being the preferred length. The tube may have a corrugated exterior surface which is in contact with the barrel portion interior surface. The tubular paperboard element is secured to a bat end closure and is preferably introduced into the bat therewith to establish a predetermined position for the dampening member.

It is an object of this invention to provide a hollow ball bat having a concealed tubular paperboard dampening element secured within the barrel portion of the bat.

It is another object of this invention to provide a paperboard sleeve which may be employed economically and secured within the barrel portion of the bat in a predetermined position in engagement with the interior surface of the barrel portion.

It is a further object of this invention to provide such a dampened bat construction which is adapted to withstand the abuse and severe mechanical shock to which the bat will be subjected during normal use and handling.

It is yet another object of this invention to provide for securing the dampening member to a bat closure in order to facilitate handling and assembly of the dampening member and closure, as well as effecting and retaining predetermined positioning of the dampening member within the bat barrel portion.

These and other objects will be more fully understood from the following description on reference to the illustrations appended hereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partially broken away elevational view of a form of ball bat construction of this invention.

FIG. **2** illustrates a fragmentary cross sectional view of a form of bat body of this invention.

FIG. **3** is a cross sectional view taken through **3—3** of FIG. **2** showing the dampening member secured within the bat barrel.

FIG. **4** is an elevational view showing the exterior surface of a form of dampening element of this invention.

FIG. **5** is a cross sectional view of the dampening element shown in FIG. **4** taken through **5—5.**

FIG. **6** is a fragmentary cross sectional illustration showing contact between a segment of the dampening element and the bat body.

FIG. **7** is an exploded partially schematic view of a form of end plug closure, a dampening member and fastening means employed in this invention.

FIG. **8** is a bottom plan view of the end plug closure shown in FIG. **9.**

FIG. 9 is a partial cross sectional view of an end plug closure - dampening member assembly of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The term "secured" and words of similar import as used herein when referring to the relationship between the paperboard tubular dampening element and the barrel interior will include retention effected by frictional engagement with or without additional friction improving means, adhesive means and other means of effecting joinder therebetween, as well as combinations thereof. The term "secured" and words of similar import as used herein to refer to the relationship between the paperboard tubular dampening member and an end plug or closure will include retention effected by frictional engagement, with or without additional friction improving means, mechanical fasteners such as staples, nails, screws and the like, adhesive means and other means of effecting joinder therebetween, as well as combinations thereof.

Referring now more specifically to FIG. **1**, there is shown a ball bat having a metal body, which is preferably aluminum, provided with a barrel portion **2**, a handle portion **4** and a tapered connecting portion **6**. In the form shown, the handle portion **4** of the bat is covered by a grip member **10** which has a tubular section overlying the bat handle **4** and a closed knob-like end wall **12**. The barrel portion of the bat has an end plug **16** secured within its outer end. (For convenience of reference herein, the term "outer" and words of similar import shall be employed to refer to a direction toward the free end or opening of the barrel portion **2** and the word "inner" and words of similar import shall be employed to refer to a direction moving away from the free end or opening of the barrel portion **2**.)

In FIG. **1**, it is noted that a paperboard dampening element **18** is positioned within the bat barrel portion **2** in a manner to be discussed more fully below.

In the preferred practice of the present invention a wound paperboard tube, which may be spirally or convolutely wound, has an exterior cross sectional configuration generally the same as the configuration of the adjacent portion of the barrel interior surface. (In the case of a corrugated outer member, the exterior configuration will be that established by connecting the peaks of the corrugations). The tube has an exterior diameter approximating that of the interior surface of the bat barrel portion **2** or slightly larger than the same. This facilitates insertion and retention of the paperboard dampening element within the desired portion of the bat barrel.

As is shown in FIG. **2**, the paperboard tubular element **18** is secured within the bat barrel at a position spaced inwardly from the free end **20** of the bat barrel. It is also noted that the preferred form provides an element **18** which terminates at a position spaced outwardly from the inner extremity **22** of the bat barrel **2**. While, if desired, one may provide a tubular paperboard dampening element originating at or adjacent free end **20** or at or adjacent inner extremity **22** or extending into connecting section **6** or handle **4**, it is preferred to provide the spacing discussed above. It has been found that a paperboard tube having a length of at least about 3.5 inches is preferred to obtain maximum dampening. A slight improvement in dampening characteristics is found by increasing the length of the tube up to about 9 inches. While a length in excess of 9 inches may be provided, no significant improvement in dampening characteristics is obtained and increased cost is encountered. In the preferred form of the invention, the dampening element will be in surface to surface contact with about 30 to 75 percent of the barrel. For convenience of reference the term "surface to surface" as used herein shall include contact which is not continuous as in the case of a corrugated exterior. In computing the area of contact in such cases the full surface of the dampening element exposed to the barrel surface shall be counted and not merely the surface areas of the corrugations. As a result the "surface" of a given corrugated element will be the same as an uncorrugated tube of the same length and diameter.

In general, the paperboard tubular element **18** may conveniently and economically be provided by spiral or convolute winding and subsequent cutting to the desired length. If desired, the tube may be provided with exteriorly disposed friction or adhesion promoting means, such as a plastic, rubber or adhesive covering, for example. In the form of paperboard element **18** shown in FIG. **2** seams **24** of the type established in spirally winding a fibrous paperboard tube are provided. If desired, multiple plies may be employed in such a wound tube to increase strength and improve dampening characteristics.

Referring to FIGS. **2** and **3** once again, there is shown somewhat schematically a paperboard sleeve **28** having a smooth surface **30** and a barrel contacting surface **32** which is provided with a plurality of corrugations adapted to frictionally engage the interior surface of barrel portion **2**. This form of paperboard sleeve **28** is preferably made by providing a composite tube having an independently formed core member. The corrugations serve as force concentrators which increase the frictional contact between the paperboard tube **28** and the bat barrel **2**. If desired, an adhesive may be provided intermediate the sleeve **28** and the barrel **2** in order to improve the desired relative retaining characteristics.

Referring now to FIGS. **4** through **6**, a more detailed illustration of the composite structure will be considered. FIG. **5** shows a composite tubular paperboard dampening element which has a generally uniform core member **36** secured within corrugated member **38**. This composite structure may be established in a conventional manner as by winding a core **36** over a mandrel and winding a previously corrugated member thereover, with a suitable adhesive being interposed. In a preferred form, the average thickness of the wall of the corrugated member is about 0.090 to 0.125 inch.

AS is shown in FIG. **4**, the corrugated member **38** has the corrugations **40** generally angularly disposed with respect to the longitudinal direction of the paperboard tube. This provides an angular resisting force with a component which resists relative axial movement between the corrugated member **38** and the bat barrel. Also shown in FIG. **4** is a seam **42** at which abutting or overlapping edges of adjacent wraps of the outer member **38** meet.

Considering now FIG. **6**, there is shown the barrel portion of a metal bat **2** which has an interior surface **44** and the corrugated member **38** which is provided with corrugations **40**. It is noted that the corrugations **40** are in contact with the interior surface **44** and are

partially compressively deformed in order to facilitate resistance to relative axial movement between the paperboard sleeve and the bat barrel. If desired, adhesive may be provided in a convenient fashion by permitting the recesses **46** in the corrugated member **38** to serve as reservoirs to receive the same. It should also be noted that the corrugations **40** serve to provide integral reinforcement to the tubular paperboard or cardboard sleeve and as a result contributes to resistance to undesired permanent deformation of the sleeve.

It is noted that the tubular paperboard element has a diameter approximating that of the interior barrel surface **44.** (In embodiments employing the corrugated exterior, the term "diameter" shall refer to the distance between radially projecting corrugation peaks.) It may be preferable to provide a paperboard diameter that is slightly larger than the diameter across interior surface **44** in order to improve frictional retention characteristics. It is contemplated that the paperboard tube, whether it is provided with the preferred exterior corrugations or has a generally smooth exterior surface, can be axially inserted into the barrel portion **2** to provide a rapid, economical and convenient means of effecting the desired assembly. If desired, additional friction improving means such as tape, coatings or resilient elements may be secured to the tube exterior or barrel interior to facilitate improved frictional retention.

It will be appreciated that in the preferred embodiment of the invention the tube will be generally continuous both longitudinally and circumferentially. If desired, openings may be provided in the tube to facilitate radial constriction upon insertion into the barrel. The term "continuous" as used in this context shall be intended to include such apertured tubes so long as the aperture does not extend the entire length of the tube. While for convenience of forming, handling and insertion, it is preferred that the tube have joined edges to establish a sleeve, it is contemplated that one may form a tube by wrapping a paperboard element into a generally tubular shape with either overlapped, abutting or spaced confronting edges. Such structures shall be included within the terms "tubular dampening element," "tube" and words of similar import as employed herein.

A preferred form of the invention, which involves providing spacing between barrel opening **20** or the free end and the outermost end of the paperboard or cardboard sleeve **18,** facilitates the use of a plug type closure such as that shown at **16** in FIG. **1.** Entry of the plug into the barrel does not produce interference between the plug **16** and tube **18.** Alternatively, as the dampening means of this invention is contained completely within the bat interior, more rigid and durable end closures such as metal end closures, formed either separately or integrally with the bat body, may be provided as the closure need not be relied upon for its sound and vibration dampening characteristics.

Referring now to FIGS. **7** through **9** a preferred embodiment of the invention will be considered. In this form of the invention, as is shown in the exploded view of FIG. **7,** an end plug **50** is provided with an upper surface **52,** a generally cylindrical lateral surface **54** and a lower recessed annular surface **56** which is part of annular band **60** and has a reduced diameter with respect to the immediately overlying portion **54.** It is noted also that the end plug **50** contains an outwardly open annular recess **58** which is adpated to receive a portion of the bat body to provide an interlocking joint therebetween. In the form illustrated, as is shown in FIG. **8,** the bat end plug **50** has recessed surface **56** provided by annular band **60** which is spaced radially outwardly from a central annular core portion **62.**

Referring once again to FIG. **7** there is shown a corrugated tubular paperboard dampening member **70** which preferably has an internal diameter D generally equal to or slightly smaller than the exterior diameter *d* of the lower plug portion taken at surface **56.** As a result, portion **60** will be received within the interior of a dampening member **70** in order to provide frictional interengagement between interior surface **72** of dampening member **70** and exterior surface **56** of the plug member **50.** This interengagement is preferably annularly substantially continuous. While if desired, frictional contact may be relied upon providing the means for securing of the end plug **50** to the dampening member **70** it will generally be preferred to use substitute or supplemental fastening means such as mechanical means or adhesive means, for example. As shown in FIG. **7,** a pair of diametrically opposed staples **74** in the form shown are generally circumferentially oriented with respect to dampening member **70** will pass through the dampening member **70** and into annular band **60** of the plug thereby effecting a permanent joint therebetween.

The completed assembly is shown in FIG. **9** which illustrates the annular band **60** received within the dampening member **70** and secured in such position by means of staples **74.** The tubular bat body **76** has radially inwardly projecting portions **78** received within the annular groove **58.**

While for convenience of illustration herein a specific form of plug member **50** has been shown, it will be appreciated that numerous forms of plugs having portions cooperatively associated with the dampening member in such fashion as to permit effective securement may be provided. For example, the recessed portion defining surface **56** need not be an annular band **60,** but could be a solid or generally solid cylindrical section. In addition, the recessed surface may be dispensed with and the dampener member **70** may be secured to the end closure without requiring introduction of a portion of the end closure into the dampening member. For example adhesives placed around the upper edge of the dampening member **70** could permit direct bonding to an end plug. The plug **50** may be made of any suitable material or combinations of materials including, rubber, plastic and the like. U.S. Pat. No. 3,703,290 discloses one suitable form of composite plug which may be fabricated to establish the shape shown in FIG. **7,** if desired.

It will be appreciated that this method of the invention provides a number of advantageous features. First of all, as the end closure or end plug **50** is presecured to the dampening member **70,** there is no need to separately handle, install and secure the dampening element **70** to the bat body. In the form shown in FIGS. **7** through **9** the preassembly permits controlled rolling of the unit without clogging hoppers, conveyors and other handling apparatus while such transfer of the plugs alone could not readily be provided. In addition, insertion of the plug **50** into bat body **76** provides for automatic precise positioning of the dampening member **70** within the bat at the desired predetermined axial position. Further, while the dampening member **70**

may preferably be secured to the interior surface of the bat body **76**, as by frictional engagement, the positive securement to the end plug **50** provides sufficient resistance to undesired movement of the dampening member within the hollow bat interior to eliminate the need to rely upon the dampening member **70** - bat body frictional engagement. The substantial mechanical shock encountered during impact between the bat and a ball will not produce meaningful undesired displacement of the dampening member **70**.

While for convenience of reference the description will frequently refer to a single paperboard element, it will be appreciated that several such elements axially abutted or axially spaced and having a combined length suitable to accomplish the objectives may be provided if desired.

While for exemplary purposes bat bodies made entirely of metal, such as aluminum, have been described, it will be appreciated that hollow bats made of nonmetallic materials, such as rigid plastic, or combinations of metals and nonmetals may be employed with this invention.

While for purposes of simplicity of discussion reference has been made herein to bats having handle and barrel portions each having a constant diameter different from the other and a tapered connecting portion disposed therebetween, the invention is not so limited. For example, bats having a very abrupt transition between handle and barrel or bats having a generally continuous tapered form from one end to another are also contemplated by this invention. With respect to the latter category, the barrel will be considered as being that portion of the bat which would normally be that predetermined for efficient use in making contact with the ball and the connecting portion will be the section interposed between the barrel and handle portions.

It will, therefore, be appreciated that the hollow ball bat of this invention provides an economical and effective means of dampening noise and vibrations without altering the mechanical aspects of the game. In addition, a durable, easy to assemble and effective concealed structure adapted for use in conventional hollow bats is provided.

Whereas particular embodiments of the invention have been described above for purposes of illustration, it will be evident to those skilled in the art that numerous variations of the details may be made without departing from the invention as defined in the appended claims.

We claim:

1. A hollow ball bat comprising

a tubular bat body having a handle portion, a barrel portion and a connecting portion,

an end closure disposed at the barrel end of said tubular bat body,

a tubular paperboard dampening element disposed within said barrel portion and having an exterior surface in contact with the interior surface of said barrel portion,

said end closure being an end plug having a section extending into said barrel portion,

said end plug having an exterior surface portion in contact with the interior surface of said barrel portion and further having a reduced diameter annular lower section disposed within said dampening element, means permanently securing said tubular paperboard dampening element to said end plug lower section whereby said paperboard dampening element will be restrained against undesired relative axial movement with respect to said bat body and impact between said ball bat and a ball will result in said dampening element reducing the noise and vibration in said ball bat to a level below that which would exist in the absence of said dampening member,

said end plug having an upper end outer surface extending beyond the barrel end portion and further having an outwardly open annular groove disposed between said reduced diameter lower section and the upper end of said plug, and

said bat body having an annular generally radially inwardly directed portion extending into said annular groove, whereby relative axial movement of said end plug with respect to end ball bat is resisted.

2. The hollow ball bat of claim **1**

wherein said securing means is a frictional interengagement.

3. The hollow ball bat of claim **1**

wherein said securing means is a mechanical fastener means.

4. The hollow ball bat of claim **3** including

said mechanical fastener means including at least one staple passing through said dampening element and into said plug lower section.

5. The hollow ball bat of claim **1**

wherein said securing means is a adhesive means securing.

6. The hollow ball bat of claim **1** including

said paperboard dampening element having a length of about 3.5 to 9 inches.

7. The hollow ball bat of claim **6** including

said paperboard dampening element having an exterior member provided with corrugations which engage said barrel portion interior surface.

8. The hollow ball bat of claim **6** including

said paperboard dampening element being in surface to surface contact with about 30 to 75 percent of said barrel portion interior surface.

9. The hollow ball bat of claim **8** including

said paperboard dampening element being circumferentially substantially continuous and having a length of about 5 to 9 inches.

10. A ball bat dampening element - end closure preformed sub-assembly consisting essentially of

an elongated tubular paperboard dampening element having an exterior surface generally of the same size as the interior surface of the bat body barrel within which it will be received,

an end closure adapted for partial introduction into a bat body barrel to provide a closure therefor,

said end closure being an end plug having an upper surface, a generally cylindrical lateral surface adjacent said upper surface and having an exterior diameter generally equal to the exterior diameter of said dampening element, and a reduced diameter annular lower section received within said dampening element, and means permanently securing said dampening element to said end plug lower section.

11. The dampener - end closure assembly of claim **10**

wherein said securing means is a frictional engagement.

12. The dampener - end closure assembly of claim **10**

wherein said securing means is a mechanical fastener.

13. The dampener - end closure assembly of claim 12 including

said mechanical fastener means including at least one staple passing through said dampening element into said end plug lower portion.

14. The dampener - end closure assembly of claim 10 including

said paperboard dampening element having a length of about 3.5 to 9 inches and

said paperboard dampening member having an exterior surface provided with corrugations which engage said barrel portion interior surface.

* * * * *