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(54) METHOD AND APPARATUS OF FORMING A BAGPIPE CHANTER

(76) Inventor: **Jay Craig**, Seattle, WA (US)

Correspondence Address:
MR. JAY CRAIG
3439 16TH AVENUE WEST
SEATTLE, WA 98119 (US)

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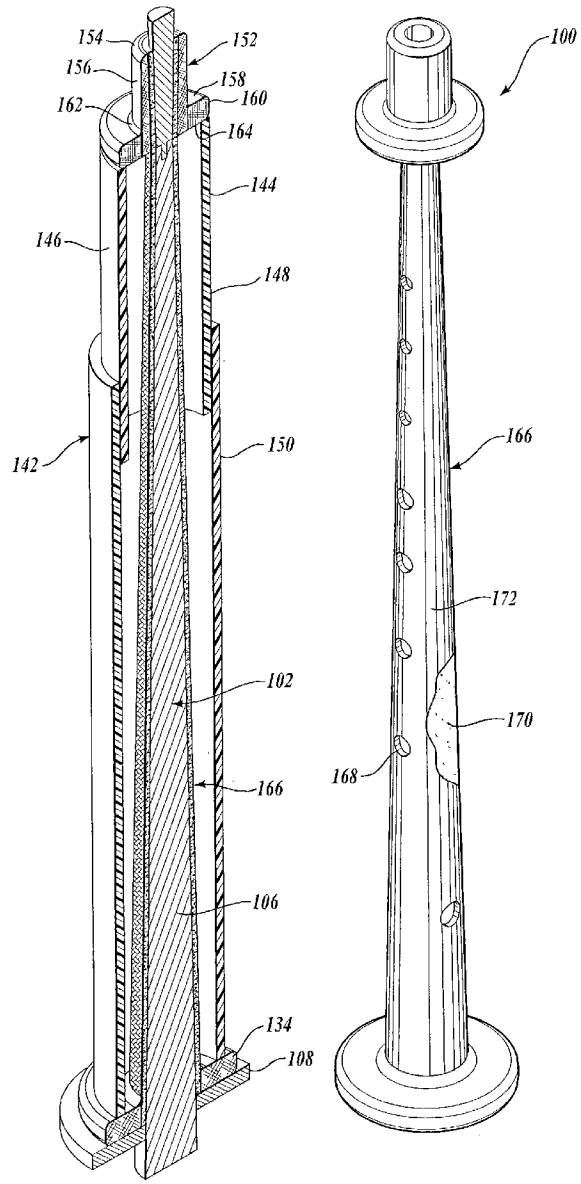
(57) **ABSTRACT**

A method of forming a chanter **(100)** suitable for use with a bagpipe is provided. The method includes applying a first material **(132)** about an outer surface **(130)** of a mold **(102)** and attaching a first fitting **(134)** to the first material. The method further includes attaching a second fitting **(152)** to the first material at a selected separation distance from the first fitting to form a unitary body **(166)** and removing of the unitary body from the mold. A mold **(102)** used in forming a chanter **(100)** of a bagpipe is also provided. The mold includes a first tapered portion **(104)** having an outer surface and a second tapered portion **(106)** having an outer surface. At least a portion of the outer surfaces of the first and second tapered portions collectively form at least a portion of a shape of an inner longitudinally oriented air passageway of a chanter.



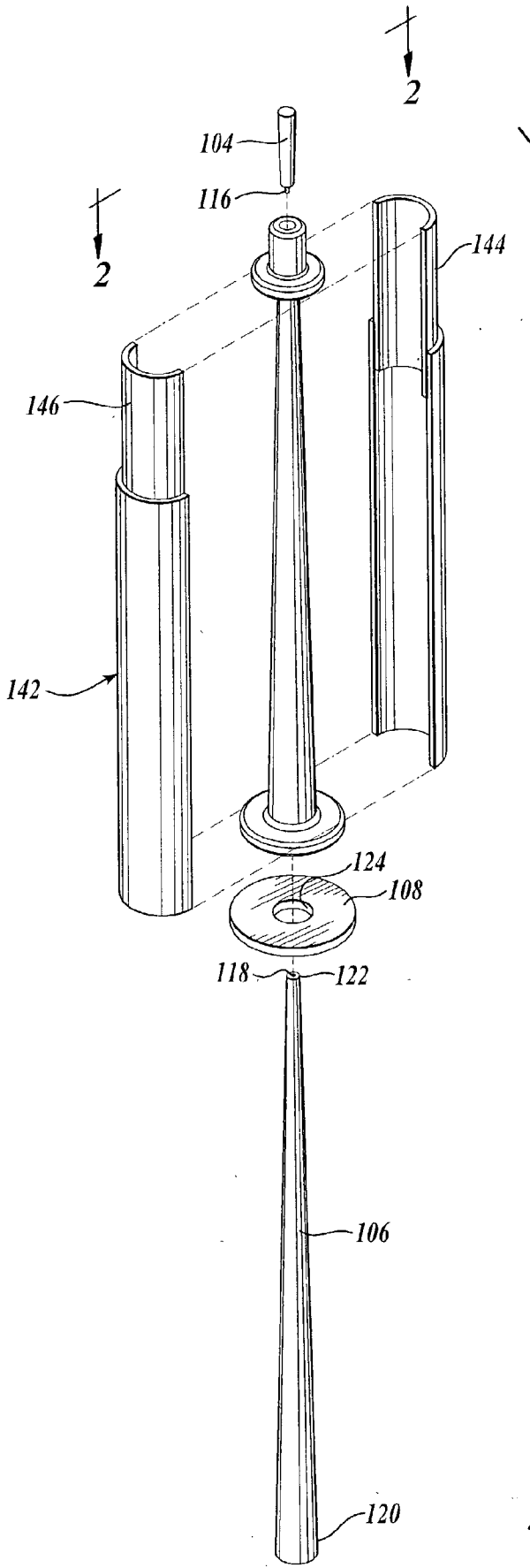


Fig. 1.

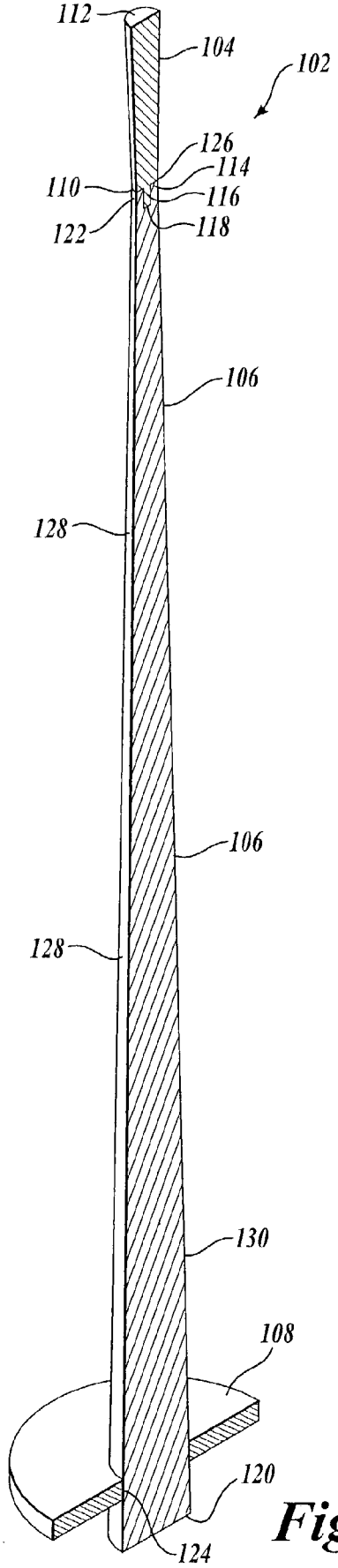

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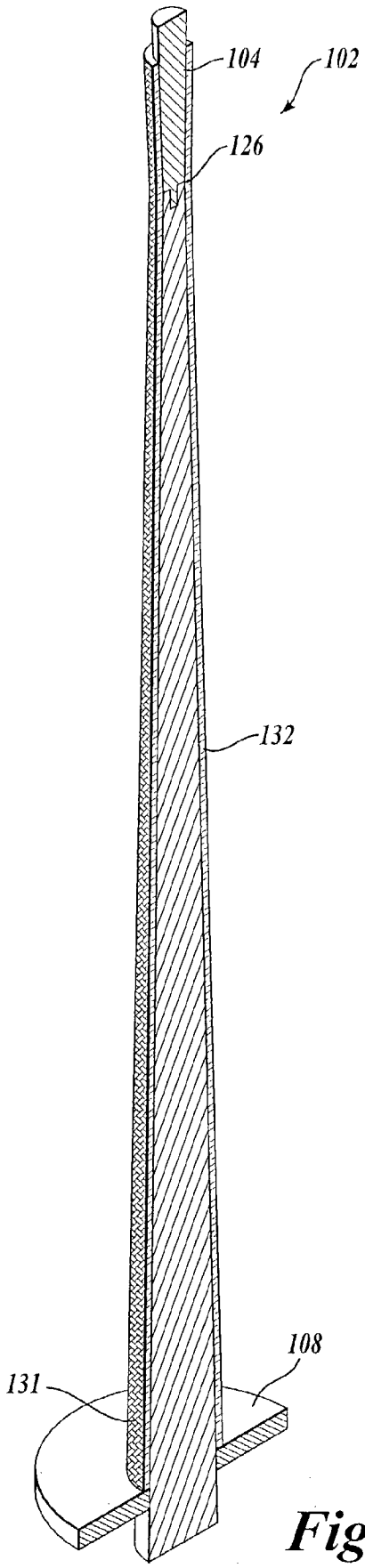
Fig.2.


104
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131

Fig.3.

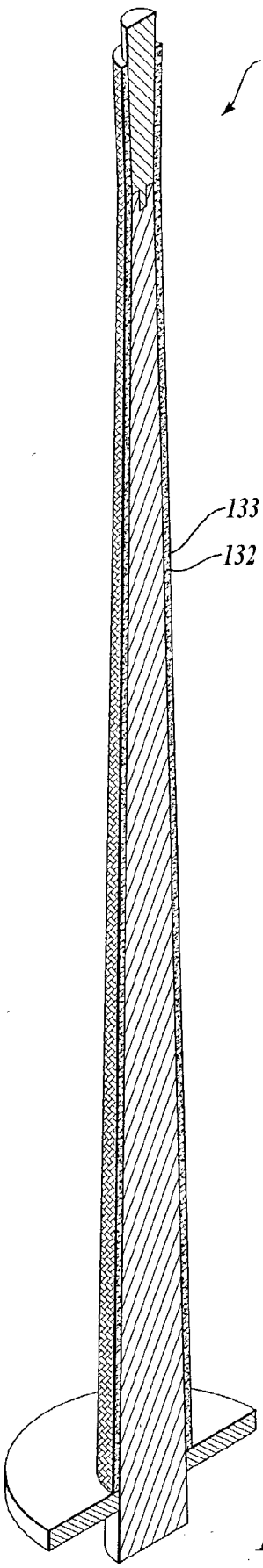


Fig.4.

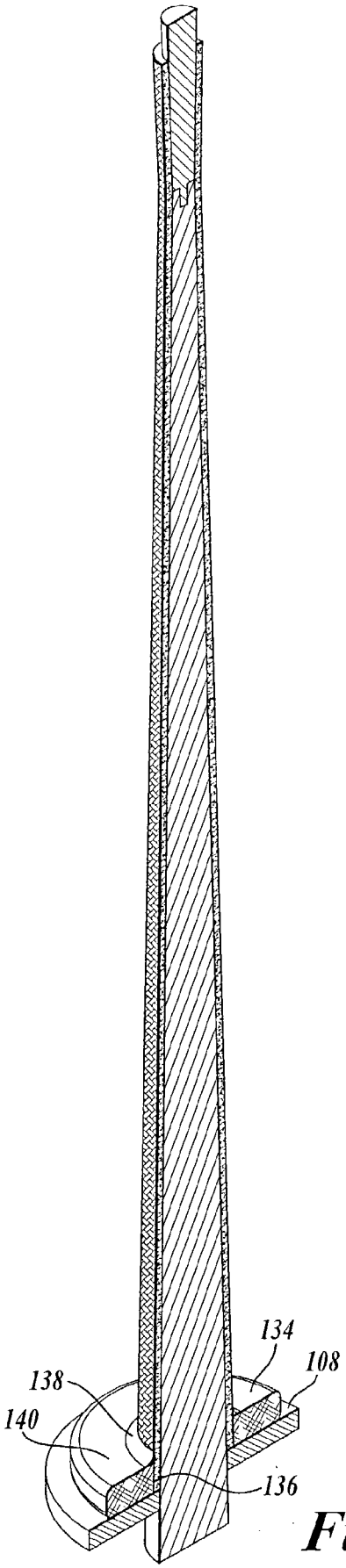
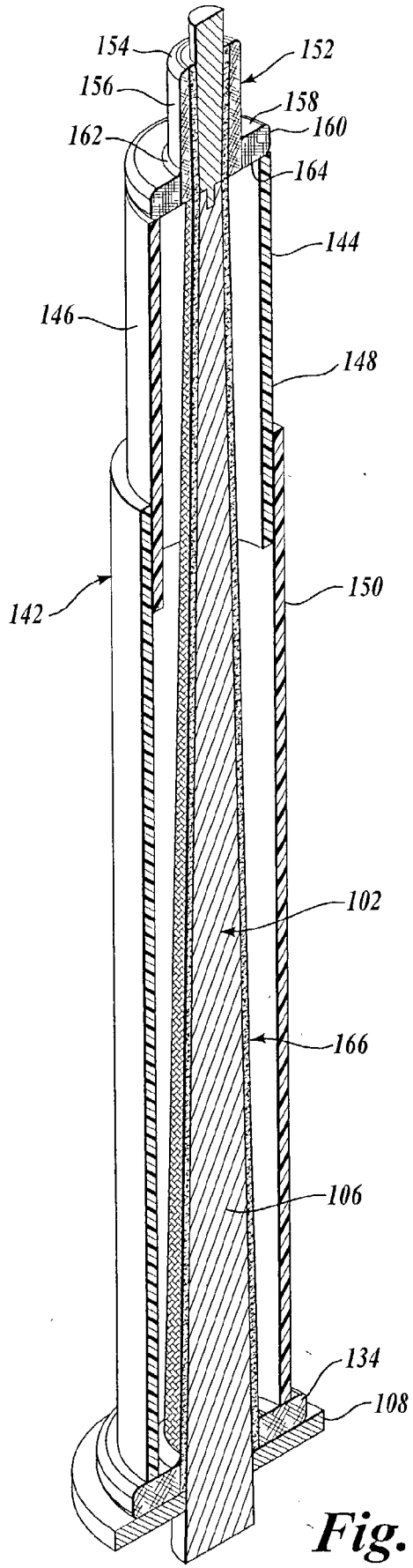


Fig.5.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134
108

Fig. 6.

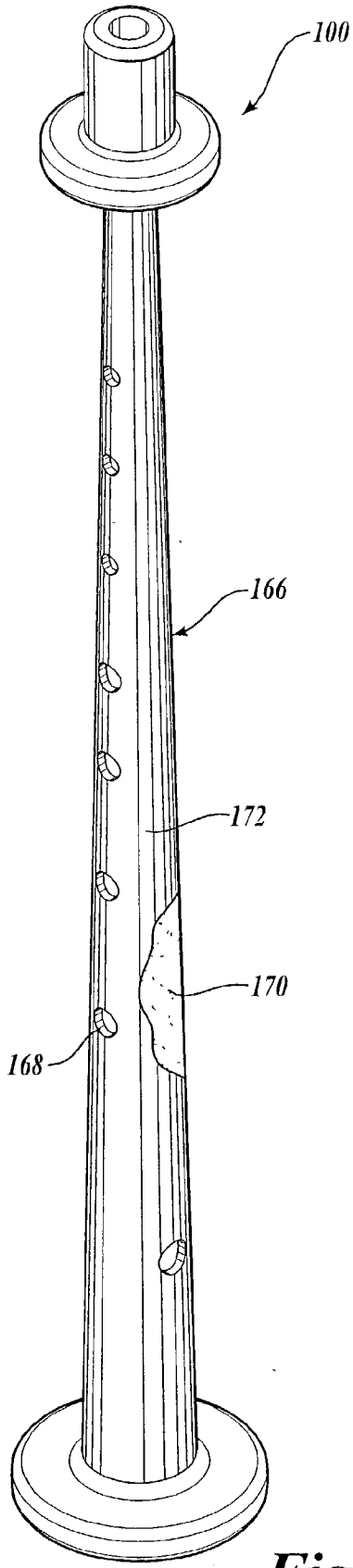
100
166
172
170
168

Fig. 7.

METHOD AND APPARATUS OF FORMING A BAGPIPE CHANTER

FIELD OF THE INVENTION

[0001] The present invention relates generally to methods of forming chanters and, more particularly, to methods of forming chanters using composite materials.

BACKGROUND OF THE INVENTION

[0002] Chanters of bagpipes are typically formed from wood, with the exception of practice chanters, which are sometimes formed from plastics. In formation, a piece of stock material, either of wood or plastic, is machined upon a lathe to form the outer surface of the chanter. The stock material is then bored along a longitudinal axis of the stock material to create an inner air passageway. The chanter is then drilled perpendicular to the longitudinal axis to form finger note holes to allow the user to perform note changes during use.

[0003] Although previously developed methods for forming chanters are effective, they are not without their problems. For instance, the methods of lathe machining and boring produces chanters that are slightly different between successively manufactured chanters due to tolerances in the machining process. Thus, each chanter formed is unique. These slight differences between chanters cause each chanter to have a unique sound, which when several bagpipes are played simultaneously, can cause discontinuities in the sounds produced, which may be displeasing to the ear. Further, for the wood formed chanters, the preferred wood is African black wood. Although African black wood may produce a pleasant sound in a chanter, it is limited in supply, thus costly, and is prone to warping and cracking, which distorts the sound of the chanter and causes the longevity of the chanter to be significantly reduced.

SUMMARY OF THE INVENTION

[0004] In accordance with one embodiment of the present invention, a method of forming a chanter suitable for use with a bagpipe is provided. The method includes applying a first material about an outer surface of a mold and attaching a first fitting to the first material. The method further includes attaching a second fitting to the first material at a selected separation distance from the first fitting to form a unitary body and removing of the unitary body from the mold.

[0005] In accordance with another embodiment of the present invention, a method of forming a chanter suitable for use with a bagpipe is provided. The method includes applying a first material upon a split mold having a first portion and a second portion and forming a first fitting upon the first material. The method further includes forming a second fitting upon the first material at a selected separation distance from the first fitting and curing the first material, thereby forming a unitary body including the first material and the first and second fittings. The method still further includes removal of the first portion from the second portion of the split mold and removal of the unitary body from the second portion of the mold.

[0006] In accordance with still another embodiment of the present invention, a mold used in forming a chanter of a bagpipe is provided. The mold includes a first tapered portion having an outer surface. The mold also includes a second tapered portion having an outer surface, the second tapered portion operable to removably couple to the first tapered portion such that at least a portion of the outer surfaces of the first and second tapered sections collectively form at least a portion of a shape of an inner longitudinally oriented air passageway of a chanter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The foregoing aspects and many of the attendant advantages of this invention will become better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

[0008] **FIG. 1** is an exploded view of a partially completed chanter shown in relation to a mold and a split spacer used in the formation of a chanter, the mold, split spacer and partially completed chanter all formed in accordance with one embodiment of the present invention;

[0009] **FIG. 2** is a cross-sectional view of the mold shown in **FIG. 1**, wherein the cross-sectional cut is taken substantially through section **2-2** of **FIG. 1**, wherein the mold is shown in assembled form;

[0010] **FIG. 3** is a cross-sectional view of the mold shown in **FIG. 2**, wherein a first material formed in accordance with one embodiment of the present invention has been applied to the mold, the first material also shown in cross-section;

[0011] **FIG. 4** is a cross-sectional view of the mold and first material shown in **FIG. 3**, wherein the first material has been impregnated with a second material formed in accordance with one embodiment of the present invention;

[0012] **FIG. 5** is a cross-sectional view of the mold and first and second materials shown in **FIG. 4**, wherein a first fitting is shown engaged by a base formed in accordance with one embodiment of the present invention and by the first and second materials, the first fitting also shown in cross-section;

[0013] **FIG. 6** is a cross-sectional view of the mold, first and second materials, and first fitting shown in **FIG. 5**, wherein a second fitting formed in accordance with one embodiment of the present invention is shown spaced a selected separation distance from the first fitting by the split spacer, the second fitting also shown in cross-section; and

[0014] **FIG. 7** is a perspective view of a finished chanter formed in accordance with one embodiment of the present invention, wherein a portion of an outer second coating is removed to better show an underlying first coating.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0015] FIGS. **1-6** illustrate one embodiment of a method of forming a chanter **100** in accordance with one embodiment of the present invention, the completed chanter **100** illustrated in **FIG. 7**. FIGS. **1-6** also illustrate a mold **102** used in the formation of the chanter **100** shown in **FIG. 7**. Referring to **FIGS. 1 and 2**, the mold **102** in the illustrated embodiment includes a tip **104**, a main body **106**, and a base **108**.

[0016] The tip **104** is suitably a truncated cone, tapering along a longitudinal length of the tip **104** from a first diameter at a first distal end **112** to a second smaller diameter at a second distal end **114**. The tip **104** includes an attachment shaft **116** configured to cooperatively mate within a receiving cavity **118** in the main body **106**. The attachment shaft **116** removably attaches the tip **104** to the main body **106**.

[0017] The main body **106** is generally shaped as an elongated truncated cone, tapering along a longitudinal length of the main body **106** from a first diameter at a first distal end **120** to a second smaller diameter at a second distal end **122**. The receiving cavity **118** for cooperatively mating with the attachment shaft **116** of the tip **104** is disposed in the second distal end **122** of the main body **106**, thereby allowing the removable coupling of the tip **104** to the main body **106**. Although specific structures for mating the tip **104** to the body **106** is depicted in the illustrated embodiment, it should be apparent to those skilled in the art that alternate mating methods are suitable for use and within the spirit and scope of the present invention.

[0018] The base **108** is suitably circular in shape and includes a centrally located bore extending therethrough. The bore has a diameter **124** sized to form an interference fit with the main body **106**. Although in the illustrated embodiment the base **108** is coupled to the main body **106** through an interference fit, it should be apparent to those skilled in the art that other methods of attachment are suitable for use and within the scope of the present invention, such as integrally forming the base **108** with the main body **106**, supporting the base **108** with a shoulder or lip in the main body **106**, supporting the base **108** with structure located externally of the mold **102**, etc. It should also be apparent that the base may be eliminated all together and, therefore, such an embodiment is also within the scope of the present application.

[0019] The inner diameter **124** of the base **108** may be tapered to correspond to the taper of the main body **106**. As should be apparent to those skilled in the art, alternate bases may be formed having varying inner diameters **124** such that the location along the length of the main body **106** at which the base **108** forms an interference fit may be selected by choosing a base **108** having an inner diameter **124** corresponding to the outer diameter of the main body **106** at the location of desired interference fit. Thus, the position of the base **108** between the first and second distal ends **120** and **122** of the main body **106** may be determined by selecting a base **108** having an appropriately sized inner diameter **124**.

[0020] To assemble the mold **102**, a base **108** having an appropriately sized inner diameter **124** selected by the user is placed upon the main body **106** until the inner diameter **124** forms an interference fit with the main body **106**. The attachment shaft **116** of the tip **104** is inserted within the receiving cavity **118** of the main body **106**, removably coupling the tip **104** to the main body **106** to form a waist **126** at their interface. The waist **126** includes an outer diameter. The outer diameter represents the smallest outer diameter of the mold **102** found between the base **108** and a second fitting **152** (see **FIG. 6**).

[0021] A mold release agent **128** is applied to an outer surface **130** of the mold **102**. One suitable mold release agent **128** is wax, another being a Polyvinyl Alcohol (PVA) based mold release agent. It should be apparent to those skilled in the art that other mold release agents **128**, are also within the scope of the present invention.

[0022] Referring to **FIG. 3, a** first material **132** is applied to the outer surface **130** of the mold **102** and extends between the base **108** and a selected location above the waist **126**. In the illustrated embodiment, the first material **132** abuts the base **108**, however, it should be apparent to those skilled in the art that the first material **132** may also alternatively flare out onto the base **108**. In one embodiment, the first material **132** includes reinforcing fibers, a few suitable examples being carbon, glass, or aramid reinforcing fibers. In another embodiment, the first material **132** includes individual strands **131** woven or interlaced into a tubular weave and slipped onto the mold **102**, such that the mold **102** passes through the center of the tubular weave. In still yet another embodiment, the reinforcing fibers of the first material **132** are collected into strands **131** which are interlaced with one another (woven) such that the length of individual strands **131** pass at oblique angles relative to a longitudinal axis of the mold **102** when disposed on the mold **102**. Woven as such, the diameter of the tubular weave forming the first material **132** may be selectively adjusted by pulling on the tubular weave along its longitudinal length, thereby causing a corresponding decrease in the diameter of the tubular weave of the first material **132** so as to conform the first material **132** to the shape of the mold **102**. In another alternate embodiment, the first material **132** is wound upon the mold **112** by techniques well known in the art.

[0023] Referring to **FIG. 4, a** second material **133** is placed upon the first material **132**. In the illustrated embodiment, the second material **133** is suitably a fluid capable of hardening into a solid. In the illustrated embodiment, the second material **133** impregnates interstices of the first material **132**, such as between the interstices of individual reinforcing fibers of the first material **133**, to form a composite material. In one embodiment, the second material **133** is a polymer matrix, such as a plastic. In another embodiment, the first material **132** is impregnated with a second material **133** that is a thermoplastic or thermoset resin, such as a polyester, isophthalic polyester, isopolyester, vinyl ester, epoxy, or phenolic resin. Although in the illustrated embodiment, the second material **133** is placed upon the first material **132** after the first material **132** has been laid upon the mold **102**, it should be apparent to those skilled in the art that other methods are also within the scope of the present application. As a non-limiting example the first material **132** may be preimpregnated with the second material **133** and then laid upon the mold **102**, such that resulting configuration is a combination of the first and second materials **132** and **133**.

[0024] Referring to **FIG. 5, a** first fitting **134**, in the form of a disc having an inner diameter **136**, is disposed upon the mold **102** such that the mold **102** passes through the inner diameter **136**. The first fitting **134** is referred to as a "soul" in the art of chanter manufacturing and is adapted to be coupled to the bag portion of a bagpipe. The first fitting **134** is positioned to engage the base **108** such that the first fitting **134** is supported thereupon. The inner diameter **136** of the first fitting **134** engages the first and second materials **132** and **133**. A third material **138** is placed at the interface of the upper surface of the first fitting **134**, the inner diameter **136** of the first fitting **134** and the first and second materials **132**

and **133**. The third material **138** is suitably a pliable material, such as a paste or curable liquid. Some examples of suitable materials are polyester or epoxy putties. The third material **138** forms a contoured transition, such as a bevel or chamfer, between the first fitting **134** and the first and second materials **132** and **133**. The first fitting **134** is suitably formed from fiberglass. Although a first fitting formed from fiberglass has been described, the first fitting may also be formed from other materials, such as any rigid or semi-rigid material, same suitable examples being plastic, metal, wood, etc.

[**0025**] Referring to **FIG. 6, a** spacer **142** is placed upon the first fitting **134**. The spacer **142** includes an elongated cylindrical structure encircling the mold **102**. The spacer **142** may include a split along its longitudinal length such the spacer **142** is bifurcated into first and second halves **144** and **146**. As best seen in **FIG. 1**, the first and second halves **144** and **146** may be placed around the mold **102** and secured to one another by any method known in the art, such as by strapping materials, clamps, etc. (not shown for clarity.)

[**0026**] Returning to **FIG. 6**, the spacer **142** is formed by securing a small diameter split pipe **148** within a larger diameter split pipe **150**, such that the outer diameter of the small diameter split pipe **148** engages the inner diameter of the large diameter split pipe **150**. As discussed in further detail below, the length of the spacer **142** is chosen to allow adjustment of a separation distance extending between the first and second fittings **134** and **152**. Although a specific construct of a spacer **142** has been described, it should be apparent to those skilled in the art that any number of constructs of spacers **142** are suitable to provide a separation distance between the first and second fitting **134** and **152** and, therefore are also within the scope of the present invention. For instance, spacers constructed from posts, preferably three or more which extend between the first and second fittings **134** and **152**, or horse shoe or forked shaped support members which engage and support the first and second fittings **134** and **152** are within the scope of the present invention.

[**0027**] The second fitting **152** is commonly known in the art of chanter manufacturing as a "reed seat," and is adapted to receive a reed therein. The second fitting **152** includes a cylindrical portion **154** having an outer surface **156**. A disc **158** is placed upon the outer surface **156** of the cylindrical portion **154** to form a base **160**. The cylindrical portion **154** and disc **158** are coupled to each other by an interference fit. Although an interference fit has been described, it should be apparent that the cylindrical portion **154** and disc **158** they may be coupled together in any number of ways, including integrally forming the disc **158** with the base **160**.

[**0028**] The second fitting **152** is disposed upon the mold **102** such that the mold **102** and first and second materials **132** and **133** pass through the second fitting **152**. The second fitting **152** is positioned to engage the spacer **142** such that the second fitting **152** is supported thereupon at a selected separation distance from the first fitting **134**. A fourth material **162**, substantially similar to the third material **138**, is placed at an interface between the lower surface **164** of the base **160** and the first and second materials **132** and **133**. The fourth material **162** forms a contoured transition, such as a bevel or chamfer, between the base **160** and the first and second materials **132** and **133**. The second fitting **152** is suitably formed from fiberglass or any suitable rigid or semi-rigid material, such as plastic, wood, metal, etc.

[**0029**] Referring to **FIGS. 1, 6** and **7**, the first and second materials **132** and **133** are cured by any suitable means known in the art, such as oven curing or leaving the first and second materials **132** and **133** to cure at room temperature. Once sufficiently cured, a unitary body **166** comprising the first fitting **134**, the second fitting **152**, the first, second, third and fourth materials **132**, **133**, **138**, and **162** is formed. The spacer **142** may be removed by disengaging the first half **144** of the spacer **142** from the second half **144** of the spacer **142**. The tip **104** may be disengaged from the main body **106** of the mold **102** by applying an upward separation force to the tip **104**. An upward separation force may be applied to the base **108** to disengage the unitary body **166** from the main body **106** of the mold **102**. Finger note holes **168** are formed in the unitary body **166** by techniques well known in the art. The finger note holes **168** are oriented perpendicular to the longitudinal axis of the unitary body **166** in locations well known in the art.

[**0030**] A first coating **170** may be applied to the exterior of the unitary body **166**. In the illustrated embodiment, the first coating **170** is a gel coat, such as a quick-setting resin. However, it should be apparent that any number of coatings **170** known to those skilled in the art and able to provide at least an improved surface appearance and texture are also suitable for use with certain embodiments of the present invention. One such suitable coating **170** is a high-build, chemical-resistant, thixotropic polyester coating.

[**0031**] The exterior surface of the unitary body **166** is then machined, such as by a lathe, to provide a selected exterior surface shape. The exterior surface of the unitary body **166** may then be painted with any suitable paint, such as a linear polyurethane epoxy, to form a second coating **172** upon the unitary body **166**. The second coating **172** may be textured to provide a textured surface amenable to provide a gripping surface for the hands of the user. In one method practiced in accordance with the present invention, the exterior surface is textured with sand paper to a selected surface roughness.

[**0032**] While the preferred embodiment of the invention has been illustrated and described, it will be appreciated that various changes can be made therein without departing from the spirit and scope of the invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A method of forming a chanter suitable for use with a bagpipe comprising:

(a) applying a first material about an outer surface of a mold;

(b) attaching a first fitting to the first material;

(c) attaching a second fitting to the first material at a selected separation distance from the first fitting to form a unitary body; and

(d) removing of the unitary body from the mold.

2. The method of claim 1, wherein the first material comprises reinforcing fibers.

3. The method of claim 1, further comprising impregnating the first material with a fluid curable into a solid.

4. The method of claim 1, further comprising curing the unitary body.

5. The method of claim 1, further comprising placing a spacer between the first and second fittings to position the first fitting at the selected separation distance from the second fitting.

6. The method of claim 1, further comprising:

(a) placing a first portion of a spacer between the first and second fittings;

(b) placing a second portion of the spacer between the first and second fittings; and

(c) joining the first and second portions of the spacer to one another.

7. The method of claim 1, further comprising placing a removable base upon the mold, the removable base adaptable to engage one of the first or second fittings.

8. The method of claim 7, wherein removing the unitary body from the mold further comprises;

(a) splitting the mold into at least a first portion and a second portion;

(b) removing the first portion of the mold; and

(b) imparting a force upon the base to initiate movement of the unitary body, thereby releasing the unitary body from the second portion of the mold.

9. The method of claim 1, further comprising forming a coating upon an outer surface of the unitary body.

10. The method of claim 9, wherein the coating is a gelcoat.

11. The method of claim 9, further comprising modifying the coating to provide a textured gripping surface to the coating.

12. The method of claim 1, wherein at least a portion of the outer surface of the mold is shaped to substantially match an inner surface of a chanter.

13. The method of claim 1, wherein the mold comprises at least two pieces removably coupled to one another.

14. The method of claim 1, wherein the mold comprises a tip having a length removably coupled to a main body having a length, wherein the tip and main body are tapered along their respective lengths.

15. The method of claim 14, wherein the top is tapered along its length in a first direction and the main body is tapered along its length in a second direction opposite the first direction.

16. The method of claim 1, further comprising applying a mold release agent to the mold prior to applying the first material.

17. The method of claim 1, wherein the first material comprises carbon fibers.

18. The method of claim 1, wherein the first material is in the form of a tubular weave.

19. The method of claim 18, wherein the tubular weave is formed from individual strands of the first material, the individual strands interwoven so as to pass at oblique angles to a longitudinal axis of the mold when the tubular weave is disposed upon the mold.

20. The method of claim 1, further comprising forming holes in the unitary body, wherein the holes are oriented substantially perpendicular to a longitudinal axis of the unitary body.

21. The method of claim 1, further comprising placing a third material at the interface of the first material and the first or second fitting to provide a contoured surface between the first material and the first or second fitting.

22. A method of forming a chanter suitable for use with a bagpipe comprising:

(a) applying a first material upon a split mold having a first portion and a second portion;

(b) forming a first fitting upon the first material;

(c) forming a second fitting upon the first material at a selected separation distance from the first fitting;

(d) curing the first material, thereby forming a unitary body including the first material and the first and second fittings;

(e) removal of the first portion from the second portion of the split mold; and

(f) removal of the unitary body from the second portion of the mold.

23. The method of claim 22, wherein the first material comprises a tubular weave of material, wherein the split mold is placed within the tubular weave of material.

24. The method of claim 22, further comprising placing a fluid upon the first material, the fluid curable into a solid.

25. The method of claim 22, wherein the split mold has a longitudinal length and the split mold is split laterally into the first portion and the second portion at an interface.

26. The method of claim 25, wherein a smallest outer diameter of the mold found between the first and second fittings is located at the location of the interface.

27. The method of claim 22, wherein the first fitting is disc shaped.

28. The method of claim 22, wherein the second fitting includes a cylindrical portion and a disc shaped base portion.

29. The method of claim 22, further comprising machining the unitary body to create an outer surface of the unitary body having a preselected shape.

30. The method of claim 22, further comprising placing a coating upon the unitary body.

31. The method of claim 30, wherein the coating is a paint.

32. The method of claim 30, wherein the coating is a gelcoat.

33. The method of claim 31, further comprising modifying the paint to provide a textured finish.

34. The method of claim 22, wherein the unitary body is removed from the split mold by splitting the mold into at least a first portion and a second portion and removing the first and the second portions from the unitary body.

35. A mold used in forming a chanter of a bagpipe, the mold comprising;

(a) a first tapered portion having an outer surface; and

(b) a second tapered portion having an outer surface, the second tapered portion operable to removably couple to the first tapered portion such that at least a portion of the outer surfaces of the first and second tapered portions collectively form at least a portion of a shape of an inner longitudinally oriented air passageway of a chanter.

* * * * *