

W. F. EGAN.
METHOD OF MAKING HOLLOW BODIES.
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1,349,372.

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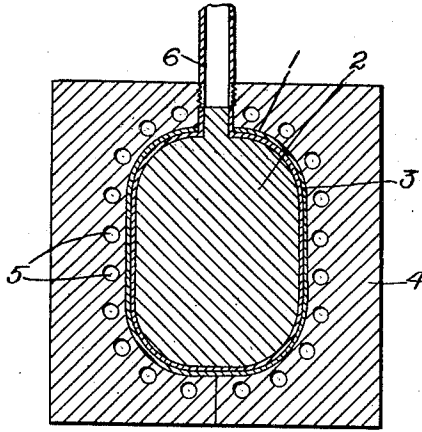


Fig. 1.

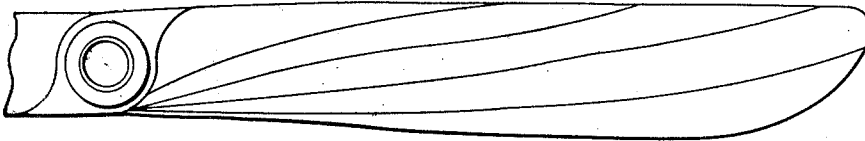


Fig. 2.

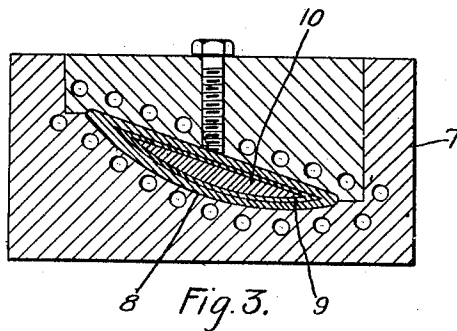


Fig. 3.

WITNESSES:

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METHOD OF MAKING HOLLOW BODIES.

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To all whom it may concern:

Be it known that I, WILLIAM F. EGAN, a citizen of the United States, and a resident of Wilksburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Making Hollow Bodies, of which the following is a specification.

My invention relates to hollow bodies and more particularly to hollow bodies comprising superimposed layers of fibrous material impregnated with a binder adapted to harden under heat and pressure. The primary object of my invention is to provide a method by which such bodies may be formed.

My invention has particular relation to bodies formed of fibrous sheet material impregnated with a binder such as a phenolic condensation product. It is sometimes desirable to construct hollow bodies composed of such material and to reinforce them by means of a suitable metal. While the metal possesses some advantageous features which may supplement those possessed by a fibrous material, impregnated with a phenolic condensation product, it is desirable that these materials be combined in such manner that the advantageous qualities of both materials be retained.

It is well known that fibrous material impregnated with a hardened phenolic condensation product is unaffected by moisture, oils, weak acids and alkalis while most metals are materially affected by them. One object of my invention resides, therefore, in reinforcing a hollow body of fibrous material with a metal in such manner that the impregnated fibrous material will protect the metal against corrosion while the metal will supplement the mechanical strength of the fibrous material.

A still further object of my invention is to provide hollow bodies of fibrous material impregnated with a hardened binder and reinforce them with a metal which may be utilized in protecting the fibrous material during the process of forming the body.

With these and other objects in view, my invention will be more fully described, illustrated in the drawings, in the several views of which corresponding numerals indicate like parts, and then particularly pointed out in the claims.

In the drawings, Figure 1 is a transverse, sectional view of a mold and a container

being formed therein in accordance with my invention; Fig. 2 is a side elevation, parts being broken away, of an airplane propeller constructed in accordance with my invention, and Fig. 3 is a transverse, sectional view of a mold and a propeller being formed therein, as hereinafter set forth.

In practising my invention, I may construct a hollow body by employing a fusible metal core of suitable material and having the contour of the article ultimately desired. Such core may then have deposited thereon, electrolytically, a metal of higher fusing point and relatively great mechanical strength. The metal electro-deposited on the core may be of any desired thickness which may be readily controlled during the deposition. A fusible core incased with a metal of higher fusing point, in this manner, may then have superimposed upon it layers of fibrous material impregnated with a suitable binder, after which the body thus assembled may be disposed in a suitable mold and subjected to heat and pressure. The amount of heat employed may be sufficient to not only fuse the inner core but also to harden the binder with which the fibrous material is impregnated and the pressure may be applied simultaneously with the heat to compact the fibrous material. After the layers of fibrous material have been sufficiently compacted and the binder has been hardened, the molten core may be drained from the body, leaving the electro-deposited casing within the hollow body of fibrous material.

In Fig. 1 is shown a container 1 composed of layers of fibrous material, such as paper, muslin or duck impregnated with a suitable binder, such as a phenolic condensation product. The container 1 may be formed by employing a relatively low-fusing-point core 2 which may comprise lead, Woods metal, Rose metal or any one of such low-fusing-point metals as are ordinarily employed in various molding operations. The fusible core 2 is preferably given the outline of the article which it is desired to make, after which the core 2 may have deposited thereon, electrolytically, a metal 3 of higher fusing point and greater mechanical strength. The electro-deposited metal may be brass or any such metal having qualities similar to brass, the metal employed being governed, to a certain extent,

by the nature of the article to be formed about it.

The core 2, having the electro-deposited casing 3, may then have superimposed thereon the layers of fibrous material, impregnated with a phenolic condensation product, to form a container 1, and the assembled body, disposed in a suitable mold 4 having heating ducts 5 through which steam may be passed to heat the mold. However, the manner of heating the mold and the particular mold employed forms no part of my invention. In this instance, the mold 4 is preferably provided with an inlet pipe 6 through which some additional molten metal may be forced to help fuse the inner core. The pipe 6 may also be employed to drain the fused core from the body after it has been completely formed. After the body or container 1, with the core 2, has been placed in the mold 4, heat may be applied to fuse the core 4 and to harden the binder with which the fibrous material is impregnated, pressure being applied, simultaneously with the heat, to compact the fibrous material.

A small amount of molten metal may be forced into the pipe 6 while pressure is being maintained on the mold to help fuse the core 2 to facilitate its being drained from the container when the fibrous material has been sufficiently compacted and the binder, with which it is impregnated, has been hardened. When the fused core 2 is drained from the container 1, the electro-deposited casing 3, being of a higher-fusing-point metal, remains in a solid condition and, therefore, is left in its original position within the superimposed layers of fibrous material after the fused core has been drained therefrom. The casing of higher-fusing-point metal which engages the fibrous material protects the latter against any injurious effects of the molten metal which would otherwise engage it. Furthermore, the high-fusing-point casing supplements the mechanical strength of the fibrous material in the finished body.

In Fig. 2 is shown a propeller which may be constructed by following the method above set forth. Exactly the same manner of forming the fusible core which, of course, in this instance would be a different shape, is followed. In Fig. 3 a mold 7 is shown in which a hollow propeller 8 of fibrous material having an inner casing 9 of high-fusing-point metal may be formed. A fusible core 10 may be of any suitable material, such as above mentioned. The mold 7 will, of course, be provided with a suitable means for draining the fusible core 10 from the molded body, this means of draining not being shown in the drawing. When forming a propeller by this method, the fusible

core may best be drained from the hub of the propeller which, being midway between the extending blades, offers the most convenient point of withdrawal of the fused core.

Although I have described a method and a plurality of bodies which may be formed in accordance with my invention, it is obvious that, by slightly different methods, various articles, comprising superimposed layers of fibrous material impregnated with a hardened binder having a lining of metal, may be formed within the scope of my invention and I desire, therefore, that no limitations shall be imposed except such as are indicated in the appended claims.

I claim as my invention:

1. A method of making hollow bodies that comprises superimposing layers of sheet material impregnated with a binder about a core including a metal having a low fusing point and a metal having a relatively high fusing point, applying heat and pressure to the body in a mold and removing the low fusing-point metal.

2. A method of making hollow bodies that comprises superimposing layers of sheet material impregnated with a binder about a core including a metal having a low fusing point inclosed by a metal covering having a relatively high fusing point, applying heat and pressure to the body in a mold and removing the metal having a low fusing point.

3. A method of making hollow bodies that comprises superimposing layers of sheet material impregnated with a binder about a core including a metal having a low fusing point inclosed by a metal covering having a relatively high fusing point, disposing the body in a suitable mold, applying heat to fuse the core and to harden the binder, applying pressure to compact the sheet material simultaneously with the application of heat and removing the fused core from the body after the binder has been hardened.

4. A method of making hollow bodies that comprises forming a core of a relatively low-fusing-point metal, electro-depositing thereon a metal having a comparatively high fusing point, superimposing layers of sheet material impregnated with a binder on the core, disposing the assembled body in a suitable mold, applying heat and pressure to compact the fibrous material and to harden the binder and to fuse the low-fusing-point metal and removing the fused metal from the body.

5. A method of making hollow bodies that comprises forming a core, having the outline of the article desired of a relatively low-fusing-point metal, electro-depositing thereon a metal having a relatively high

fusing point, superimposing layers of sheet material impregnated with a phenolic condensation product on the core, disposing the assembled body in a suitable mold, applying
5 heat and pressure to compact the fibrous material and to harden the phenolic condensation product and to fuse the low-fusing-

point metal and removing the fused metal therefrom.

In testimony whereof I have hereunto 10
subscribed my name this 31st day of Jan.,
1919.

WILLIAM F. EGAN.