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1,475,764

L. T. FREDERICK

COMPOSITE ARTICLE

Filed May 12, 1919

Fig. 1.

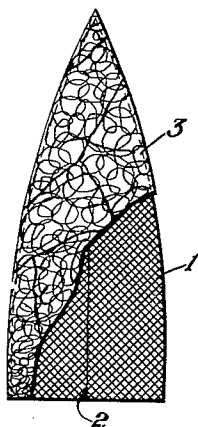


Fig. 2.

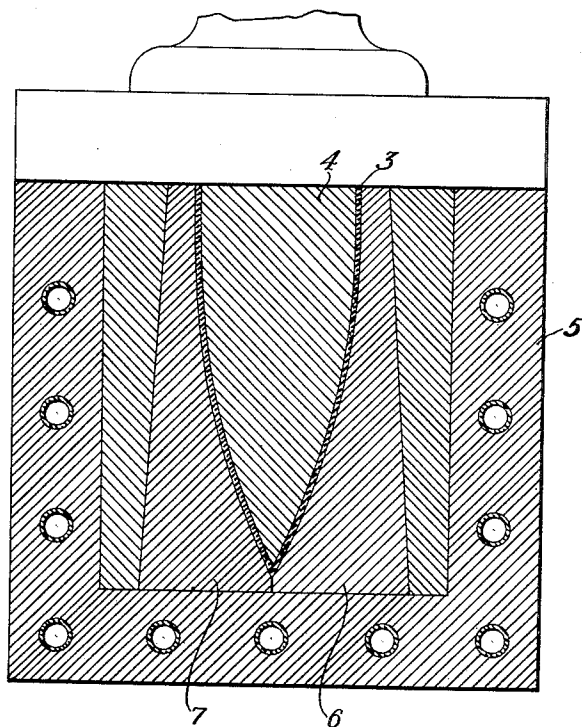
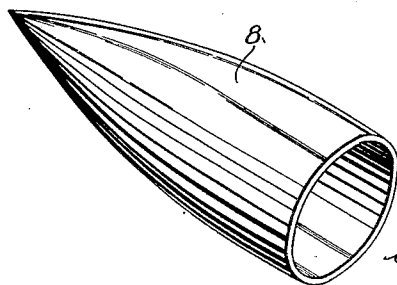


Fig. 3.



WITNESSES:

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LOUIS T. FREDERICK, OF WILKINSBURG, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA.

COMPOSITE ARTICLE.

Application filed May 12, 1919. Serial No. 296,568.

To all whom it may concern:

Be it known that I, LOUIS T. FREDERICK, 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 Composite Articles, of which the following is a specification.

My invention relates to composite articles and it has, for its primary object, the provision of articles formed of fibrous material and a binder adapted to harden under the application of heat and pressure.

Heretofore, articles have been formed of fibrous material and a suitable binder in which the fibrous material has been employed in sheet form and cut or stacked to form the shape of the article desired. The binder employed has been of such nature that, when subjected to heat, it would harden and impart rigidity of form to the shaped sheets of fibrous material. Although articles formed in this manner are very satisfactory for a great variety of purposes, the method of forming them is open to some objection because of the fact that the sheets of fibrous material are sometimes difficult to handle in order to obtain the desired shape of the article.

For example, in the construction of stream-line tail pieces for motor generator sets which are employed in airplane work, the tail pieces have been formed by employing sheets of duck which were impregnated with a suitable binder and so cut that stacked layers of the material could be formed into an elongate body having a closed end of stream-line shape. In order to obtain the particular stream-line shape of this article, considerable difficulty was met with in arriving at the particular method of cutting the material and stacking it to provide the stream-line contour.

One object of my invention, therefore, resides in a method of constructing articles, particularly non-planiform articles, in such manner that the shape of the article may be provided with little difficulty.

Referring to the drawings, Fig. 1 is a side elevation of a supporting member or screen partially covered by paper pulp, illustrating the manner of forming a hollow body in accordance with my invention; Fig. 2 is a

transverse sectional view of a mold in which the body may be subjected to heat and pressure, and Fig. 3 is a perspective view of the finished body.

In practising my invention, I may employ a pulp formed of any suitable materials, particularly those well known in paper manufacture. I prefer to employ, however, a pulp containing strong fibres and to shape an article of the pulp upon any suitable supporting member. The pulp may be so employed in a saturated form that the deposition of it upon the supporting member may be readily accomplished. The supporting member upon which the pulp may be deposited is preferably of the shape of the article desired and, after the pulp has been deposited thereon, it may be so subjected to slight pressure and to sufficient heat that it shall be dried and compacted to sufficient rigidity of form to permit of removing the supporting member. After the article has been thus formed, it may be impregnated with a suitable binder, such as a phenolic condensation product, and may then be subjected to further heat and pressure to compact the material and to harden the binder.

In forming an article, such as the stream-line tail piece above mentioned, considerable difficulty may be avoided in the manufacture thereof by forming the article of pulp deposited upon a screen or other suitable supporting member and then removing it from the screen and impregnating it with a binder which may be subsequently hardened. A tail piece formed in this manner may not have as great mechanical strength as one formed of stacked sheets of fibrous material, but it will possess sufficient mechanical strength for the purpose for which it is intended.

In order to facilitate an understanding of my invention, the manner of forming a hollow body, closed at one end, is illustrated in the drawings, in Fig. 1 of which 1 indicates a supporting member formed of close-mesh screen which is preferably cut along its entire length, as indicated at 2. Paper pulp 3, or pulp of other material, in a moist conditions, may be deposited upon the supporting member 1 to thus form the desired body. The pulp 3 is shown as covering only a portion of the screen or supporting mem-

ber 1 in order to illustrate the manner of forming the body. After the pulp has been deposited upon the supporting member, it may be heated to thoroughly drive off its moisture content and, if necessary, some pressure may be applied to compact the pulp sufficiently to permit of removing the supporting member 1. The removal of the supporting member 1 is facilitated by having it cut, as indicated at 2, whereby one of the cut edges may be depressed to diminish the diameter of the supporting member and facilitate releasing it from the compacted pulp.

After the formed pulp 3 has been removed from the supporting member 1, it may be impregnated with a suitable binder, such as a phenolic condensation product, and a core member 4 of suitable shape may be inserted in the impregnated body and the body disposed in a mold 5. Heat and pressure may be applied to the mold which, of course, has splits 6 and 7 of suitable shape to receive the body 3 and its core member 4. It should be noted that the pressure applied during the forming of the pulp to compact it sufficiently to permit of the removal of its supporting member is only sufficient to cause the adhesion of the fibrous particles. Further pressure is applied to the mold 5, together with heat, to thoroughly compact the material and to harden the binder to its substantially insoluble and infusible state. If the body is then removed from the mold it presents the appearance of the article 8 shown in Fig. 3. A stream-line tail piece for motor-generator sets of airplanes has been employed by way of illustration but it will be apparent that articles of similar character may be constructed in substantially the same manner.

On account of the fact that the pulp may be readily impregnated and contains innumerable fibres, the pulp may be united into a very homogeneous and exceptionally rigid body by employing a phenolic condensation product as the binder. The fibres of the pulp are knitted together and, on account of the great number of engaging surfaces through the material, greater mechanical strength may be obtained than could be attained in an article formed of pulp in any other manner.

Furthermore, by employing pulp, articles, having shapes hard to obtain by employing sheet material, may be easily constructed. For example, articles which are so formed as to be almost completely enclosed may be readily formed by practising my invention. A container, such as a barrel, may be formed by depositing the pulp upon a screen in which only a small opening may remain in one of its ends. After the article has been thus formed, it may be impregnated with the binder and the pressure and heat

necessary to harden the binder and form a unitary body may be applied after the manner disclosed in an application filed Oct. 8, 1917, by C. T. Allcutt, bearing Serial No. 195,262 and assigned to the Westinghouse Electric & Manufacturing Company.

As disclosed in the above mentioned application, a fusible core may be introduced into the body, and heat and pressure may be applied by this means. The fusible core may comprise an alloy, such as Rose metal or Woods metal, which melts at a comparatively low temperature and will, therefore, not injure the pulp impregnated with the phenolic condensation product in the course of the application of the pressure to the core. Of course, the article must be disposed within a suitable casing and the fused core introduced into the article and pressure applied thereto together with sufficient heat to harden the phenolic condensation product. After the binder has been thoroughly hardened, the core may be drained from the article in substantially the same manner in which it was introduced into the article. An article, therefore, which it is desired to construct with only a small opening in one part thereof, may be readily formed by employing the fusible core in applying the pressure to compact the material.

It will be readily appreciated from the foregoing description that a wide variety of articles may be formed in accordance with my invention. The particular manner of forming the body desired may also be accomplished by practising various methods and I desire, therefore, not to be restricted to any particular shape of article or method of forming it except in so far as limitations may be imposed by the prior art of the appended claims.

I claim as my invention:

1. A method of manufacturing hollow composite articles that comprises forming the article by depositing fibrous pulp upon a suitable supporting member, removing the member, impregnating the pulp with a phenolic condensation product, and subjecting the body thus formed to heat and pressure.

2. A method of manufacturing hollow composite articles that comprises forming the article by depositing paper pulp upon a suitable supporting member, removing the member, impregnating the pulp with a phenolic condensation product and subjecting the body thus formed to heat and pressure.

3. A method of manufacturing hollow composite articles that comprises depositing paper pulp upon a core having the shape of the article desired, subjecting the pulp to heat and pressure sufficient to volatilize its liquid content and compact the pulp, impregnating the body with a phenolic condensation product and applying further heat and pressure to harden the phenolic

condensation product and compact the body.

4. A method of manufacturing hollow composite articles that comprises forming an article of paper pulp, drying and compacting the pulp by applying heat and pressure thereto, impregnating the body thus formed with a phenolic condensation product and subjecting the body to heat and pressure to form a hard and unitary article. 10

In testimony whereof, I have hereunto subscribed my name this 30th day of April, 1919.

LOUIS T. FREDERICK.