

Nov. 2, 1965

H. N. PHELPS
PROCESS FOR MAKING A TEXTILE SHUTTLE AND
TEXTILE SHUTTLE BLANK BISCUIT

3,215,762

Original Filed April 19, 1960

2 Sheets-Sheet 1

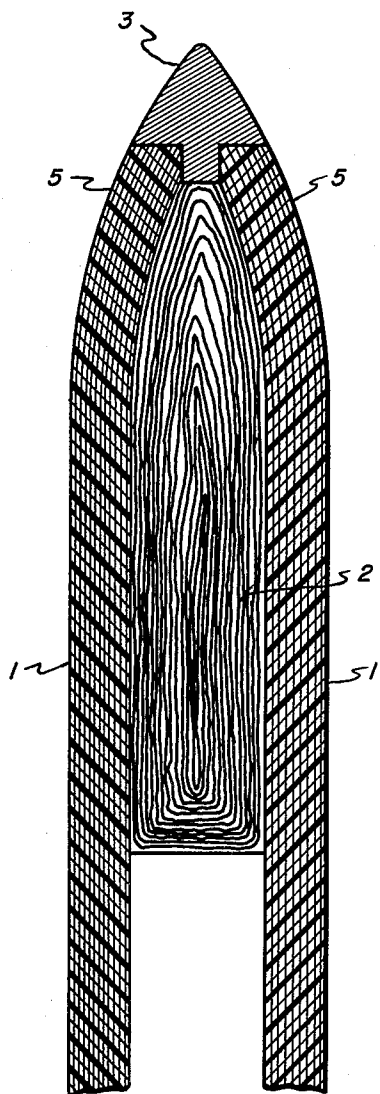


FIG-1

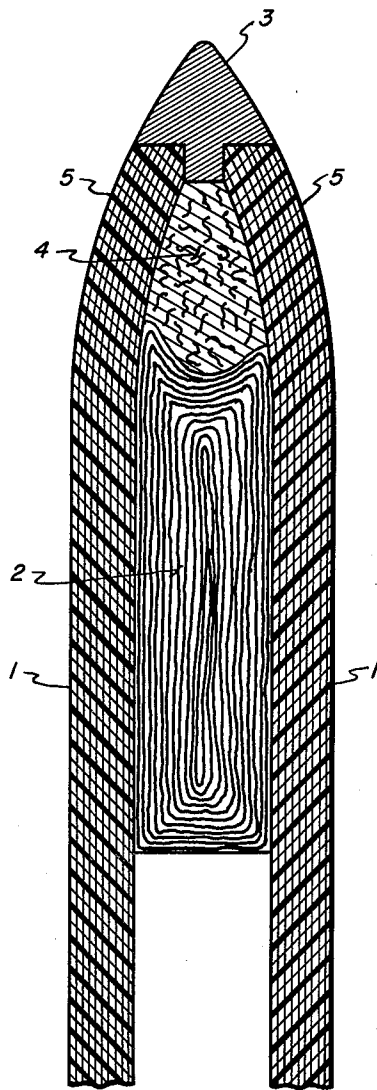


FIG-2

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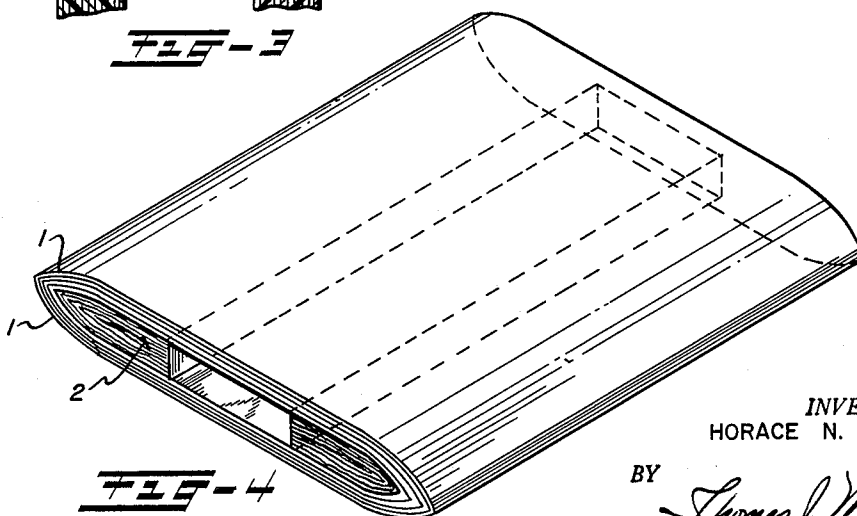
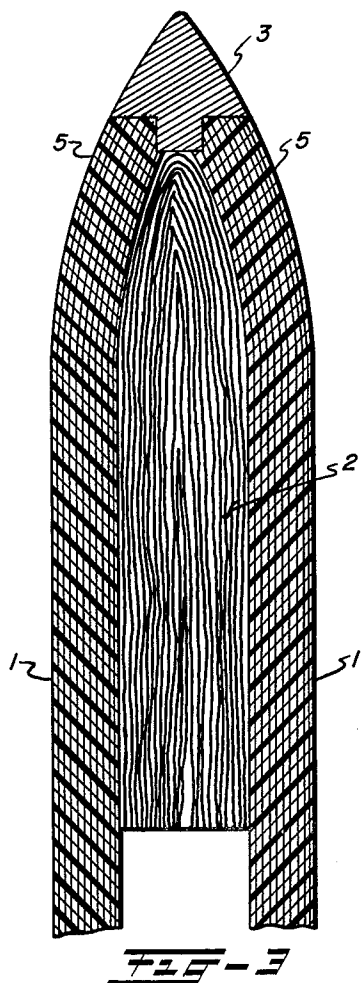
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1

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PROCESS FOR MAKING A TEXTILE SHUTTLE AND TEXTILE SHUTTLE BLANK BISCUIT

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Original application Apr. 19, 1960, Ser. No. 23,163, now Patent No. 3,089,522, dated May 14, 1963. Divided and this application Nov. 6, 1962, Ser. No. 235,745 12 Claims. (Cl. 264-152)

This application is a division of my copending application Serial No. 23,163, filed April 19, 1960, now U.S. Patent No. 3,089,522.

This invention relates to a novel method of making a textile shuttle. This invention further relates to a novel method of making a textile shuttle comprising bonding side members to end member so as to form a unitary structure with a bobbin cavity. More particularly, this invention relates to a novel method of making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings, wherein said side members are thermosetting synthetic resin-impregnated laminae and said shoulder areas are reinforced with a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod, said rod being oriented so as to have its axis perpendicular to the plane of the shuttle having said bobbin openings. This invention further relates to a novel method of making a textile shuttle in which the shoulder areas are reinforced, at least in part, with a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod, said rod being oriented so as to have its axis perpendicular to the plane of the shuttle having the bobbin openings, while the remaining portions of said shoulder areas are reinforced with a thermosetting synthetic resin-impregnated mass of macerated cellulosic fibers.

In order to be considered commercially acceptable, a textile shuttle must have considerable strength and endurance. Textile shuttles have traditionally been made from wood, and particularly from hardwoods such as dogwood and the like. However, it has been found from experience that wooden shuttles have relatively short working lives under the severe conditions of stress, strain and impact incident to the weaving operation. In an attempt to overcome this deficiency, the art has turned to molded textile shuttles, and more particularly to shuttles made from thermosetting synthetic resin-impregnated laminae, which have been manufactured in various modifications for a number of years. Illustrative of some of the more recent developments in the molding of textile shuttles are U.S. Patents Nos. 2,781,791 to Neely, 2,824,581 to Heard and 2,905,208 to Goreau.

While it is true that molded textile shuttles in general are greatly superior in strength and endurance to the hardwood shuttles which they replace, their manufacture is oftentimes quite complicated, involving many steps over and beyond those necessary to produce a wooden shuttle. This in turn can lead to increased production costs, which in many cases are not completely offset by the savings resulting from the longer useful life of the molded shuttle. In contrast to this, the process of the present invention not only produces very serviceable textile shuttles having excellent strength and endurance but also accomplishes this in a simple and economical manner.

It is, therefore, an object of this invention to provide a novel method of making a textile shuttle.

It is also an object of this invention to provide a novel method of making a textile shuttle comprising bonding side members and end members having shoulder areas

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so as to form a unitary structure with a bobbin cavity having bobbin openings, said side members being thermosetting synthetic resin-impregnated laminae and said shoulder areas being reinforced, at least in part, with a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod, said rod being oriented so as to have its axis perpendicular to the plane of the shuttle having said bobbin openings.

A further object of this invention is to produce textile shuttles having outstanding strength and endurance by a comparatively simple technique.

A still further object of this invention is to produce textile shuttles by a process which eliminates certain of the steps previously used in the manufacture of textile shuttles, thereby producing a product through the medium of a more economical process.

These and other objects of this invention will be discussed in greater detail hereinbelow.

In the process of the present invention use is made of a round rod of thermosetting resin-impregnated fabric. In preparing such a rod the fabric is merely impregnated with the selected resinous material and then rolled into the shape of a rod. The resin conventionally used in such an operation is a thermosetting synthetic resin, such as a thermosetting phenolic resin, of which many are known in the art. These rods are generally cylindrical in shape although for certain purposes their end cross-sectional area could be in the shape of an ellipse rather than a circle. The height of the cylindrical rod or its elliptical counterpart will depend on the thickness of the shuttle being prepared. These rods are placed in the shuttle mold between the reinforcing side laminae at each of the extremes of the bobbin cavity and, especially when these rods are elliptical in cross-sectional area, they can extend from the bobbin cavity to the extreme end of the shuttle. As a modification of this concept, however, one may utilize a rolled rod of the class described in only a part of the shoulder area extending from the bobbin cavity toward but not reaching the end of the shuttle. The remaining portion of the shoulder area may then be reinforced with a thermosetting synthetic resin-impregnated mass of macerated fibers, preferably macerated cellulosic fibers. In this latter modification the rod should extend at least about 50% of the distance from the end of the bobbin cavity to the end of the shuttle. By using a rolled rod of this class one is able to insert in each end of the shuttle mold a single unit, namely, the rod, rather than a plurality of laminae such as in the use of staggered plies.

These rods of resin-impregnated fabric are placed in the shuttle mold in such a way as to have the axis of the rod oriented in a position perpendicular to the plane of the shuttle having the bobbin openings, and during the bonding operation the rolled rods are forced into the body of the shuttle and become part of its unitary structure. It can be seen from the configuration of these rolled rods that their use imparts considerable additional reinforcing strength to the ultimately produced shuttle, especially since the layers of fabric which are oriented in a position parallel with the long axis of shuttle are integrated with one another through the medium of the layers of the fabric joined therewith which are perpendicular to the long axis of the shuttle. This structural feature alone imparts considerable additional strength to the shuttle.

As previously indicated, it is desirable to have at least 50% of the space in the shoulder area in each end of the shuttle occupied by one of these rolled rods. One may occupy the entire area with a rolled rod, i.e., the entire area extending from the end of the bobbin cavity to the extreme end of the shuttle. However, it is common

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practice in manufacturing all textile shuttles, whether made from hardwood or from thermosetting synthetic resin-impregnated laminae, to reinforce their tip ends with a metallic end piece or tip member, which tends to protect the ends of the shuttles from breaking under impact, thereby extending their useful life. Thus, it may in some instances be preferred to utilize a rolled rod which extends from the end of the bobbin cavity through only about 70% to 80% of the total area involved, and to occupy the remaining portion of the space to be reinforced in the shoulder area, i.e., the space between the end of the rolled rod and the extreme end of the shuttle, with a resin-impregnated mass of macerated fibers. This will facilitate the insertion of the metallic end pieces or tip members into the end portions of the shuttle. When producing textile shuttles according to the process of the present invention, the metallic end pieces or tip members can be inserted in the shuttle by introducing them into the shuttle mold along with the other components of the shuttle, thus producing a molded shuttle with built-in metallic end pieces or tip members. Alternatively, a shuttle blank can first be fabricated and the metallic end pieces or tip members can then be inserted therein by a drilling and bonding technique.

The side members of the shuttle comprise a plurality of laminae which have been impregnated with a thermosetting synthetic resin. These resin-impregnated laminae are so well known in the art that it is deemed unnecessary to engage in a prolonged discussion of their preparation at this point. It is sufficient to say that these wall members carry a thermosetting synthetic resin, such as a B-stage phenolic resin, which is readily converted under heat and pressure to a thermoset condition. Obviously, other thermosetting synthetic resins, such as urea-formaldehyde resins, melamine-formaldehyde resins, epoxy resins and the like can be used. However, because of the cost factors involved, the phenolic resins are preferred.

Reference is made to the accompanying drawings, which will enable one to understand the concept of the present invention more readily.

FIGURE 1 shows one end of a shuttle produced according to the process of the present invention in a cross-sectional view. In FIGURE 1 the shoulder area is occupied almost completely and entirely with a rolled rod 2.

FIGURE 2 shows a preferred embodiment of a shuttle produced according to the process of the present invention in cross-section. In FIGURE 2 use is made of the rolled rod 2 in only part of the shoulder member and the remaining portion is occupied with a resin-impregnated mass of macerated cellulosic fibers 4.

FIGURE 3 shows another preferred embodiment of a shuttle produced according to the process of the present invention in cross-section. In FIGURE 3 the resin-impregnated mass of macerated cellulosic fibers is omitted and only the terminal part of a rolled rod 2, a flattened tube of resin-impregnated fabric, is used in the shoulder member.

FIGURE 4 is an isometric drawing of a shuttle blank biscuit, partly in section, which is a more complete illustration of the preferred embodiment shown in FIGURE 3 but which shows the biscuit prior to being cut into individual shuttle blanks and prior to the insertion of the metallic end piece or tip member 3.

In each of the figures, the laminated sidewalls 1 are composed of layers of resin-impregnated fabric, and each sidewall converges or tapers towards the end of the shuttle to define the shoulders 5. In FIGURES 1 and 2, the rolled rod 2 is composed of a resin-impregnated layer of fabric rolled into a tube and flattened into a rod. In FIGURES 1, 2 and 3, the metallic end piece or tip member 3 is inserted in the end of the shuttle. In FIGURE 2 the macerated resin-impregnated cellulosic fiber occupies the space between the laminated sidewalls 1 from the rolled rod 2 to the metallic end piece or tip member 3.

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It will be observed that the rolled rod 2 in FIGURES 1 and 2 and the terminal part of the rod 2 in FIGURES 3 and 4 is oriented in such a way as to have its axis perpendicular to the plane of the shuttle having the bobbin openings.

The macerated fibers 4 in FIGURE 2 need not be individual fibers but instead may be resin-impregnated chopped fabric, preferably chopped cellulosic fabric. As in the laminated sidewall members 1 the fabric used to make the rolled rod 2, as well as the fabric and/or fibers in the macerated material 4, is impregnated with any thermosetting synthetic resin, such as those mentioned hereinabove, and preferably with a thermosetting phenolic resin.

In manufacturing a shuttle blank biscuit such as that illustrated in FIGURE 4, one would take two sets of layers of fabric impregnated with a thermosetting synthetic resin and insert the lower set of layers into the mold. A block of metal, preferably iron or steel of the appropriate size, is positioned so as to provide for the bobbin opening. On each side of the block of metal, there is positioned a terminal portion of a collapsed tube of thermosetting synthetic resin-impregnated fabric. These partial terminal ends of the collapsed tube are prepared by rolling the resin-impregnated fabric around a mandrel a precalculated number of revolutions. The cylindrical tube is then removed from the mandrel and flattened out under heat and pressure to a substantially unitary structure having the appearance of a flattened tube or rod. The curing of the resin is advanced slightly at this point but not to the thermoset stage. In other words, the resin is still a thermosetting resin. This flattened tube is then severed into two parts by cutting the tube or rod on a straight line perpendicular to the direction of rotation of the fabric in the rod. This cut can be accomplished at the exact midpoint of the rod, but it is preferred that one section of the rod be somewhat larger than the other in order to position the bobbin opening in the generally desired location. When each of these two terminal positions of the rolled rod are placed on opposite sides of the metal slab, the upper layers of resin-impregnated fabric are superimposed thereabove in spaced relationship to the lower layers of resin-impregnated fabric and the mold is shut, causing the ends of the layers of resin-impregnated fabric to converge or become tapered, thereby defining the shoulder areas. The individual components are then subjected to the required measure of heat and pressure in order to convert them into a unitary structure and to convert the resin to a thermoset condition. When the cycle is completed the blank biscuit is removed from the mold and the metal bar extracted therefrom. This shuttle blank is then cut, along a line perpendicular to the pointed ends of the biscuit, into a plurality of shuttle blanks. These shuttle blanks are then ready for any desired finishing processes, including contouring and insertion of the metallic end pieces or tip members. Thus, a plurality of shuttle blanks can be produced simply by manufacturing one shuttle blank biscuit. This technique also permits the production of a plurality of different size shuttles having different locations and sizes of bobbin openings.

It will be obvious to those skilled in the art that other changes and variations can be made in practicing the present invention without departing from the spirit and scope thereof as defined in the appended claims.

I claim:

1. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting synthetic resin-impregnated fabric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod and severed

perpendicular to the direction of rotation of said rolled fabric, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, and consolidating this assembly, under heat and pressure, into a unitary structure.

2. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting synthetic resin-impregnated fabric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod and severed perpendicular to the direction of rotation of said rolled fabric so as to extend to the end of said biscuit, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, and consolidating this assembly, under heat and pressure, into a unitary structure.

3. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting synthetic resin-impregnated fabric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting synthetic resin-impregnated layer of fabric rolled into the shape of a rod and severed perpendicular to the direction of rotation of said rolled fabric so as to extend part way towards the end of said biscuit, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, filling the remainder of said shoulder areas with a thermosetting synthetic resin-impregnated mass of macerated fabric and consolidating this assembly, under heat and pressure, into a unitary structure.

4. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting phenolic resin-impregnated fabric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting phenolic resin-impregnated layer of fabric rolled into the shape of a rod and severed perpendicular to the direction of rotation of said rolled fabric, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, and consolidating this assembly, under heat and pressure, into a unitary structure.

5. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting phenolic resin-impregnated fab-

ric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting phenolic resin-impregnated layer of fabric rolled into the shape of a rod and severed perpendicular to the direction of rotation of said rolled fabric so as to extend to the end of said biscuit, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, and consolidating this assembly, under heat and pressure, into a unitary structure.

6. A process for the manufacture of a shuttle blank biscuit from which a plurality of textile shuttle blanks may be obtained which comprises: assembling a plurality of plies of thermosetting phenolic resin-impregnated fabric in spaced relationship to each other as the upper and lower layers of said biscuit with their ends tapered so as to define a shoulder area at each end of said biscuit, positioning in each of said shoulder areas the terminal ends of a thermosetting phenolic resin-impregnated layer of fabric rolled into the shape of a rod and severed perpendicular to the direction of rotation of said rolled fabric so as to extend part way towards the end of said biscuit, said terminal ends being positioned with their severed ends facing each other in opposing positions between said layers with a space between said terminal ends to provide for a bobbin cavity having bobbin openings and oriented so as to have the direction of rotation of said rolled fabric perpendicular to the plane of the biscuit having said bobbin openings, filling the remainder of said shoulder areas with a thermosetting phenolic resin-impregnated mass of macerated cellulosic fabric and consolidating this assembly, under heat and pressure, into a unitary structure.

7. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting synthetic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting synthetic resin-impregnated layer of fabric to form a tube, (3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of said shoulder areas, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, and (6) consolidating this assembly, under heat and pressure, into a unitary structure.

8. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting synthetic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting synthetic resin-impregnated layer of fabric to form a tube, (3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of said shoulder areas so as to extend from the end of said bobbin cavity to the end of the shuttle, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, and (6) consolidating this assembly, under heat and pressure, into a unitary structure.

9. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting synthetic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting synthetic resin-impregnated layer of fabric to form a tube, (3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of the said shoulder areas so as to extend from the end of said bobbin cavity part way towards the end of the shuttle, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, (6) filling the remainder of said shoulder areas with a thermosetting synthetic resin-impregnated mass of macerated fibers and (7) consolidating this assembly, under heat and pressure, into a unitary structure.

10. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting phenolic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting phenolic resin-impregnated layer of fabric to form a tube, (3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of said shoulder areas, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, and (6) consolidating this assembly, under heat and pressure, into a unitary structure.

11. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting phenolic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting phenolic resin-impregnated layer of fabric to form a tube,

(3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of said shoulder areas so as to extend from the end of said bobbin cavity to the end of the shuttle, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, and (6) consolidating this assembly, under heat and pressure, into a unitary structure.

12. A method for making a textile shuttle having side members and end members having shoulder areas bonded into a unitary structure with a bobbin cavity having bobbin openings which comprises: (1) assembling a pair of side members comprising thermosetting phenolic resin-impregnated laminae in spaced relationship to each other with their ends tapered so as to define a shoulder area at each end of said shuttle, (2) rolling a thermosetting phenolic resin-impregnated layer of fabric to form a tube, (3) flattening said tube into the shape of a flattened rod, (4) positioning one of said flattened rods in each of said shoulder areas so as to extend from the end of said bobbin cavity part way towards the end of the shuttle, (5) orienting said flattened rods in such a manner that the axes of the rods about which the fabric was rolled are perpendicular to the plane of the shuttle having said bobbin openings, (6) filling the remainder of said shoulder areas with a thermosetting phenolic resin-impregnated mass of macerated fibers and (7) consolidating this assembly, under heat and pressure, into a unitary structure.

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