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SPINNING BUCKET AND METHOD OF MAKING IT

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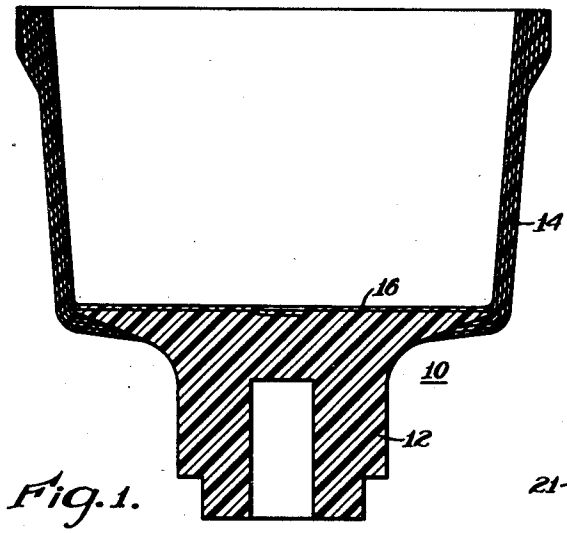


Fig. 1.

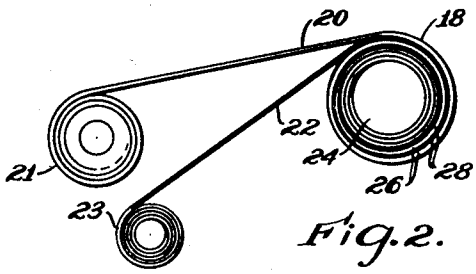


Fig. 2.

Fig. 3.

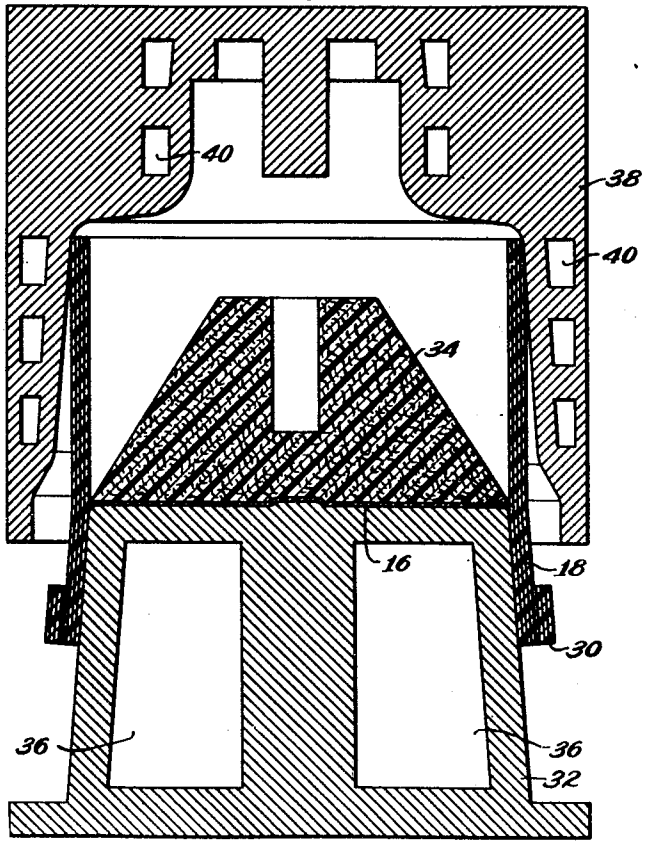
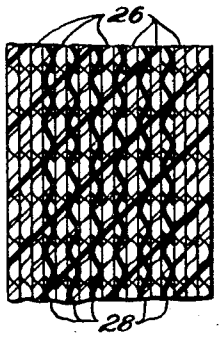


Fig. 4.



INVENTOR

Oscar W. Anderson.

BY

James M. Ely

ATTORNEY

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SPINNING BUCKET AND METHOD OF MAKING IT

Oscar W. Anderson, Pittsburgh, Pa., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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6 Claims. (Cl. 57—76)

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This invention relates to spinning buckets and the method of making them.

Spinning buckets of impregnated fibrous material are extensively employed in the manufacture of rayon. As the buckets are operated at a high rate of speed, it has been necessary to reinforce the buckets to enable them to withstand the centrifugal force developed during use. Steel wires or bands have been generally incorporated in the internal structure of the wall member of the bucket as the reinforcing medium, such bands or wires being disposed circumferentially within the confines of the wall of the bucket.

In using steel wire as the reinforcing agent, considerable difficulty is sometimes encountered in effecting a bond between the resinous binder of the bucket and the steel. Where an initial bond is effected, it is found that such bond is sometimes destroyed in use because of the difference in the coefficient of expansion between the steel and the completely reacted resin. Further, as the steel reinforcement is sometimes attacked by the acids encountered in the spinning of rayon, the steel bands must necessarily be embedded within the confines of the wall member requiring additional handling of the components of the bucket during the process of making the spinning bucket thereby greatly adding to the cost of the bucket.

Recently, the commercial production of fiberglass cloth has made available acid resistant cloth which has a very high tensile strength. Attempts have heretofore been made to employ such acid resistant glass cloth as the reinforcing agent in spinning buckets but such attempts have not proven satisfactory since the glass cloth ruptures under the pressure and strain introduced in the molding process. A modified form of cloth which utilizes a combination of glass fiber warp threads and cotton woof threads has been used to a small extent, but the additional cost of producing the special glass-fiber cotton yarn fabric detracts from its general use.

An object of this invention is to provide a new and improved spinning bucket having fiber glass cloth in the wall member thereof as a reinforcing medium.

Another object of this invention is to utilize a plurality of turns of fiber glass cloth as the reinforcing medium in the side walls of the spinning bucket and to so cushion such glass cloth during the molding process that the glass cloth will not rupture.

A further object of this invention is the provision of a spinning bucket having a wall member which incorporates fiber glass cloth having a cord fabric weave therein as the reinforcing member.

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A more specific object of this invention is to provide a molded spinning bucket having a wall member in which alternate turns of impregnated cellulosic material and of impregnated fiber-glass cloth are employed internally of the wall member, the cellulosic material fuctioning to cushion the glass cloth to prevent rupture thereof during the molding of the bucket.

Another object of this invention is to provide a method of making spinning buckets of impregnated fibrous material in which fiber glass is introduced as a reinforcing medium in such a manner as to be cushioned against stresses encountered during molding.

Other objects of this invention will become apparent from the following description when taken in conjunction with the accompanying drawing, in which:

Figure 1 is a view in section of a spinning bucket embodying this invention;

Fig. 2 is a schematic representation, greatly out of proportion, of the formation of a cylinder employed in forming a wall member of the spinning bucket of Fig. 1;

Fig. 3 is a vertical section through a mold illustrating the molding of the spinning bucket shown in Fig. 1; and

Fig. 4 is a view in section greatly enlarged of a section of the cylinder or side wall of the spinning bucket embodying the teachings of this invention.

Referring to Fig. 1 of the drawing, there is illustrated a spinning bucket 10 having a base member 12 and a wall member 14 extending outwardly from the base member. The base member 12 and the wall member 14 are formed of fibrous material impregnated with a heat convertible resinous binder such as phenol formaldehyde, urea formaldehyde, or the like. The base member 12 is preferably formed of a quantity of comminuted or chopped fabric impregnated with a resinous binder and one or more facing sheets 16 of cloth disposed over the upper end of the base member so that when molded the bottom of the internal cavity of the spinning bucket 10 will have a finished appearance. As opposed to the chopped or macerated material forming the base member 12, the wall member 14 is preferably formed of a plurality of turns or layers of fibrous material impregnated with resinous binder, the lower end of the wall member 14 merging with and being bonded to the com-

minuted material forming the base member 12.

In practice, the side wall member 14 is initially wound in the form of a cylinder 18 which can be cut into predetermined lengths to give a required height to the wall member 14 when molded integrally with the base member 12. As illustrated in Fig. 2 of the drawing, the cylinder 18 is formed of composite material in that turns 26 of cellulosic material 20 impregnated with the resinous binder and turns 28 of fiber glass cloth 22 preferably of a cord fabric weave which is also impregnated with the resinous binder are wound in a predetermined manner from supply rolls 21 and 23, respectively, onto a mandrel 24 to a required thickness to give a wall member 14 of predetermined thickness when molded.

In forming the cylinder 18, a number of turns 26 of the impregnated cellulosic material, such as cotton cloth, are wound directly upon the mandrel 24 and when a predetermined number of the turns 26 are formed thereon, the impregnated glass cloth 22 is interleaved with the impregnated cellulosic material to form a plurality of continuous turns 28 alternately with the turns 26 of the impregnated cellulosic material. In positioning the glass cloth 22 in the assembly, it is preferred to so introduce the cloth 22 that the warp threads thereof are disposed circumferentially about the cylinder to impart strength thereto and to the wall member of the molded bucket. A glass cloth particularly useful in the cylinders is one having a cord fabric weave with a construction of 49 warp threads and 30 filler threads per inch and about .009 inch thick with a weight of 8.9 ounces per square yard. The alternate layers 26 and 28 of impregnated cotton cloth and impregnated glass cloth, respectively, are thus formed until a predetermined number, usually 6 or 7, of the turns 28 of glass cloth are embodied in interleaved relation with the turns 26 of cotton cloth, after which only turns 26 of the cotton cloth are added to the composite structure forming the cylinder 18. Thus the cylinder 18 is formed of only a predetermined number of turns of the impregnated cotton cloth at the inner and outer surfaces of the cylinder 18 and of alternate layers or turns of the impregnated cotton cloth and fiber glass cloth disposed internally of the cylinder.

Where it is desired to have a thicker rim member at the upper edge of the spinning bucket 10, as illustrated in Fig. 1, a band 30 of impregnated cotton cloth is positioned about the end of the cylinder 18, as illustrated in Fig. 3, to cooperate with the cylinder 18 in forming the rim. With the cylinder 18 formed in the manner described and severed into predetermined lengths depending upon the required height of the wall member 14, the cylinder 18 is positioned over the end of a male mold member 32 as illustrated in Fig. 3, with one or more of the facing sheets 16 being disposed over the end of the mold member 32 and a preform 34 being positioned on the sheet 16. The preform 34 is a compacted and partially cured mass of chopped or macerated fibrous material impregnated with resinous binder and is of a predetermined size and weight for forming the base member 12.

With the clyinder 18 and the preform 34 disposed on the male mold member 32 as illustrated, a heating medium, for example, steam is supplied to the cavities 33 of the mold member 32 and a female mold member 38 which is also heated by means of steam or the like being supplied to the cavities 40, is positioned over the upper end of the cylinder 18. As shown, the female mold member 38 has a cavity therein for cooperating with the male mold member 32 for imparting the required shape to the molded spinning bucket 10. The mold members 32 and 38 have cooperating side wall surfaces which are slightly tapered for giving a slope to the molded wall member 14.

Where desired, the cylinder 18 and the preform 34 can be preheated to soften the resinous binder before positioning them with respect to the mold member 32. After the components are assembled as illustrated in Fig. 3, the female mold member 38 is actuated downwardly or the male member 32 is actuated upwardly to heat and compact the cylinder 18 and the preform 34 to form the spinning bucket 10 illustrated in Fig. 1. The heat and pressure may vary somewhat depending on the resinous binder employed, but should be sufficient to effectively cure the resin and consolidate the components into an integral body. In practice, a pressure of about 3000 pounds per square inch and heat at a temperature of 180° C. to 185° C. for a period of time of 45 to 50 minutes is satisfactory for molding the buckets. During the molding operation, the end of the cylinder 18 adjacent the base member 12 is turned inwardly as illustrated in Fig. 1 and merges with and is bonded to the comminuted material forming the base member 12.

During the molding operation as described hereinbefore, the cylinder 18 is forced over the tapered mold member 32, with the result that stresses are set up in the turns of the cylinder 18 since the tapered mold member 32 has a larger outer diameter than the inner diameter of the cylinder 18. However, by winding the cylinder 18 in the manner described hereinbefore, with alternate turns 26 of cotton cloth and turns 28 of fiber glass of the cord fabric weave as better illustrated in Fig. 4, it is found that the layer 26 of cotton cloth disposed between adjacent layers 28 of the glass cloth is resilient and so cushions the glass cloth as to offset any stresses induced therein during the molding operation and thereby prevents rupture of the glass cloth. Thus in the final product illustrated in Fig. 1, the wall member 14 embodies as an integral part thereof continuous turns 28 of fiber glass, the turns being separated one from the other by a turn 26 of cotton cloth, the turns of the glass cloth extending throughout the width of the wall member 14 and having such high tensile strength as to withstand the centrifugal force encountered in use.

In practice, since the glass cloth of the composite structure has a higher elastic modulus than the cotton cloth, it is found that the centrifugal stresses are taken up by the warp threads of the turns 28 of fiber glass in such a fashion that there is a more homogeneous distribution of stresses throughout the structure and that the resulting structure has sufficient strength to withstand the forces encountered in service. Spinning buckets formed in accordance with this invention and loaded as in actual practice have been operated at speeds of up to 17,400 R. P. M. without failure of the bucket structure.

By forming the spinning bucket in the manner described hereinbefore, previous modes of forming spinning buckets have been greatly simplified resulting in savings in production costs and eliminating numerous preforming operations and inspections. Further, in eliminating the various operations required heretofore, the amount of scrap has been greatly reduced with resultant

economies in the manufacturing cost of the spinning bucket.

A distant advantage of the spinning bucket produced in accordance with this invention as opposed to the prior art steel wire reinforced buckets is the elimination of residual stresses introduced by reason of the difference in thermal coefficient of contraction of the steel wire reinforcement with respect to the impregnated fibrous material.

The spinning buckets of this invention are formed of standard materials and can be readily reproduced while the method can be readily duplicated. The strength of the resulting bucket is sufficient for all service requirements. Further, since the reinforcing member is of fibrous material and is utilized as part of the wall member, the weight of the spinning bucket is reduced with respect to the prior art reinforced spinning buckets.

I claim as my invention:

1. A spinning bucket comprising a base and a wall member extending from the base, the wall member comprising a plurality of internal and external layers of cloth impregnated with a resinous binder, the external layers of the wall member being fibrous cellulosic material and the internal layers being alternate layers of cloth of fibrous cellulosic material and of cloth of fiber glass having a cord fabric weave.

2. A spinning bucket comprising a base member and a wall member extending from the base, the wall member comprising a plurality of internal and external layers of cloth impregnated with a resinous binder, the external layers of the wall member being of cotton cloth and the internal layers being alternately cotton cloth and fiber-glass cloth having a cord fabric weave.

3. A spinning bucket comprising a base member and a wall member extending from the base, the wall member comprising continuous turns of cotton cloth and turns of fiber-glass cloth having a cord fabric weave interleaved between certain of the internal turns of cotton cloth only to give alternate layers of cotton cloth and fiber glass cloth internally only of the wall member and outer layers of cotton cloth, the cloth of the wall member being impregnated with a resinous binder.

4. A spinning bucket comprising a base member and a wall member extending from the base, the wall member comprising a plurality of layers of cotton cloth and fiber glass cloth having a cord fabric weave impregnated with a resinous binder consolidated into an integral unit with the base member, the layers of the impregnated fiber-glass cloth in the wall member being fewer in number than the layers of impregnated cotton cloth and being interleaved between predetermined internal layers of the impregnated cotton cloth only to provide alternate layers of cotton cloth and fiber-glass cloth internally only of the wall member and outer layers of cotton cloth.

5. In the method of making spinning buckets, the steps comprising, winding a plurality of turns of impregnated cotton cloth to form a cylinder having a predetermined diameter, continuing the winding of additional turns of the cotton cloth while interleaving a turn of impregnated fiber-glass cloth between adjacent turns of the cotton cloth to introduce a predetermined number of alternate layers of cotton cloth and fiber-glass cloth in the cylinder to provide a resilient layer between adjacent layers of the fiber-glass cloth, thereafter winding additional layers of the impregnated cotton cloth to complete the cylinder, and molding the cylinder and other moldable material to produce a spinning bucket having a wall member formed of the cylinder, the resilient layer of cotton cloth cushioning the adjacent layers of fiber-glass cloth as they are stressed during the molding operation to prevent rupture of the turns of the fiber-glass cloth.

6. A spinning bucket comprising a base and a wall member extending from the base, the wall member comprising a plurality of internal and external layers of cloth impregnated with a resinous binder, the external layers of the wall member being fibrous cellulosic material and the internal layers being alternate layers of cloth of fibrous cellulosic material and of cloth of fiber glass having a cord fabric weave and having the warp threads thereof disposed circumferentially about the wall member.

OSCAR W. ANDERSON.

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