

March 26, 1940.

M. P. CHAPLIN ET AL

2,195,240

MOLDED PULP ARTICLE

Filed Oct. 26, 1937

2 Sheets-Sheet 1

Fig. 2.

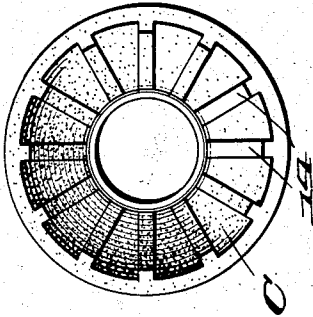


Fig. 4.

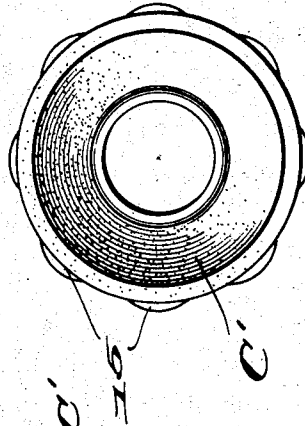


Fig. 1.

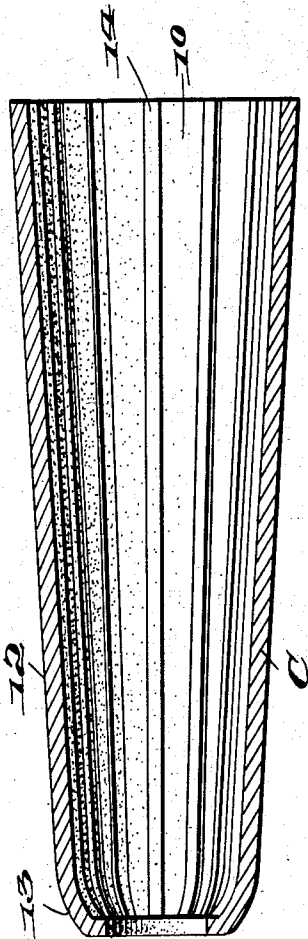
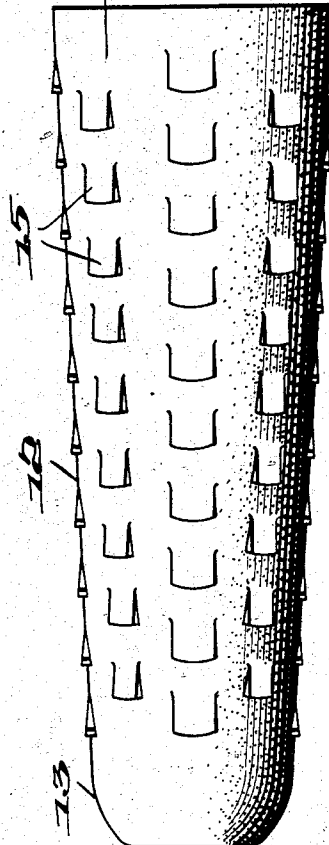


Fig. 3.



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2 Sheets-Sheet 2

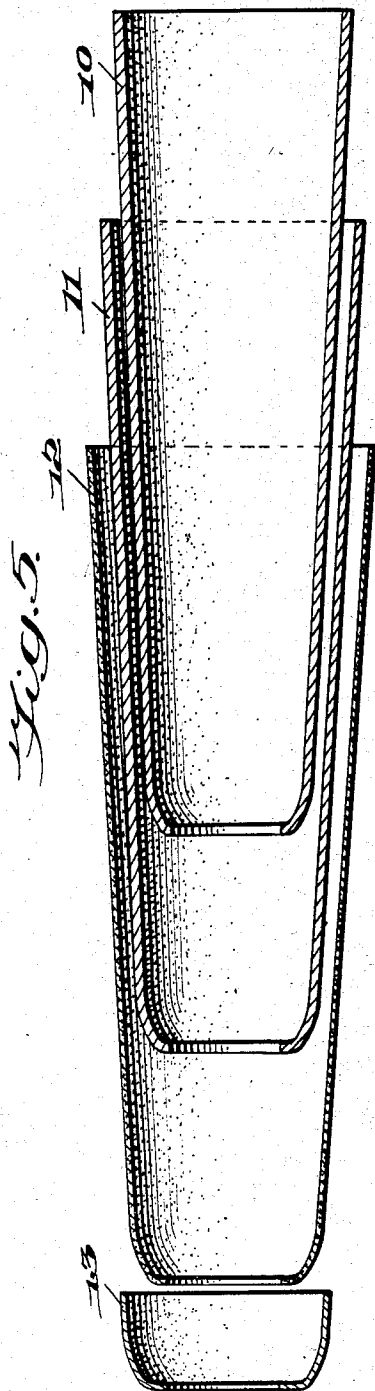


Fig. 7.

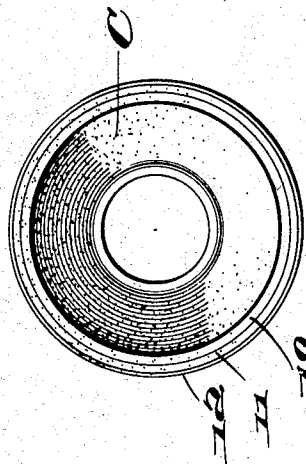
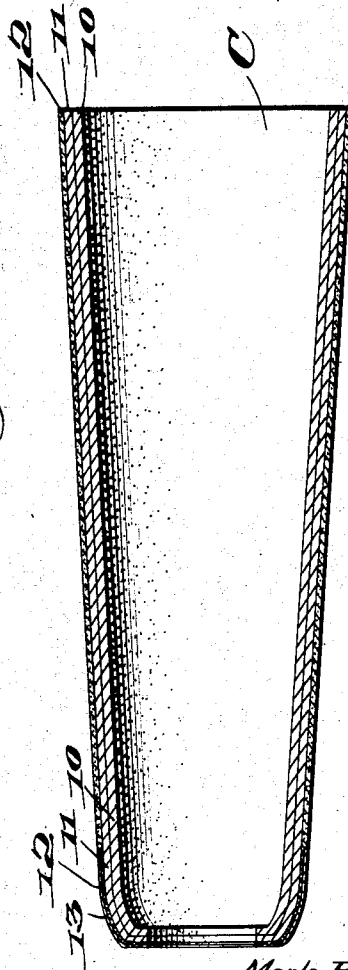


Fig. 6.



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2,195,240

MOLDED PULP ARTICLE

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Application October 26, 1937, Serial No. 171,155

7 Claims. (Cl. 242—122)

This invention relates to articles formed and molded from pulp and pulp fibers, and more particularly to textile cones or cops such as are used in the textile industry for storing or transferring thread or yarn from one machine to another, and for other purposes. These cones or cops are of generally cylindrical conformation, being usually made slightly tapering to enable them to be placed on mandrels or arbors, both for winding and unwinding purposes.

In the manufacture of articles of this nature many considerations arise; it is necessary that the article be light in weight, uniform in thickness and size, and be reasonably strong and stiff so that in use, when the cone or cop is removed from its arbor after being wound, it will hold the thread or yarn thereon firmly and without danger to becoming loosened, due to collapse or shrinkage of the cone itself, or by slippage along the taper.

It is desirable, along with strength and rigidity, to have at least a portion of the outer surface of certain types of cone velvety in texture, that is, relatively soft and yielding to provide a surface which the first layers of thread or yarn may grip, whereby to obviate any danger of loosening by slippage on the taper of the cone.

In unwinding the thread or yarn on conventional machinery, the strands are drawn over the small end of the cone, and during the latter part of unwinding come in contact with the tip of the cone. This tip, after continued use, is apt to become worn and roughened, thereby interfering with the proper unwinding of the thread, and it is necessary that the tip of the cone be smooth and hard, and have a surface which will resist abrasion or roughening due to contact with the thread of the yarn during such unwinding process.

Previous expedients have been either to make the cone structure of a soft material, with reinforcements of metal or other hard material at such portions of the cone surface as are subject to wear. This is undesirable, both from a cost standpoint and from a structural standpoint, since the reinforcing material is apt to become loosened from the main body of the cone thereby defeating the very purposes for which it is intended. Further, a cone structure made up of a soft material does not have the necessary strength and rigidity to properly support the thread or yarn when the cone is removed from the winding arbor.

Another expedient of the prior art is to make the cone of a strong, hard material wound up in layers, with an adhesive to secure the layers together and to stiffen the cone structure, the

entire structure being placed in an oven to dry and harden the adhesive. After drying, such cone is placed on an arbor and its surface abraded, ground and brushed up to raise a nap of fibers on its surface, thereby producing a surface which will assist in retaining the thread or yarn in position. The tip or small end of the cone is then softened, and rounded or burnished by a special operation which includes the application of hardening and stiffening materials effective to produce the necessary hardness and smoothness in the finished tip.

Difficulties have been experienced with such laminated articles, which are usually made from paper wound and held together by adhesives, e. g., since the tip of the cone is reshaped or reformed by burnishing, it is almost impossible to maintain same in its new shape. The cone as originally wound from paper has a straight uniform taper, but in rounding the uniform tip to facilitate removal or unwinding of the threads or yarns, the paper material of the cone is distorted, bent and generally disrupted. Hence the material has a greater tendency to spring back, or return to its original condition, particularly due to dampness or other unfavorable conditions under which the cones may be stored or used.

These cones, as stated, are usually formed of tapered sections, and the makeup of the article from sheets of paper not only involves expensive operations, use of adhesives, etc., but what is even more objectionable, there is a very large waste of material, because the cone cannot be wound from straight edged sheets, but must be wound from sheets cut on a circle or arc; all of the material outside of the particular shape of sheet is waste.

Such prior practices, and the various operations entering into the building up of a cone structure as described are slow and expensive, and fall short of providing an ideal structure, even after all the additional work and processes have been performed.

Accordingly, a primary object of the present invention is the production of an article which not only meets the requirements set forth and obviates the stated objections, but which is also of greater utility than any article of this nature at present available.

It is another and important object of this invention to provide in such an article, a structure having an inherent strength and rigidity coupled with an external surface of sufficient softness, and velvety characteristic as to gently grip delicate threads or yarns without detriment

thereto, and without sacrificing any of the required strength, hardness and rigidity of the complete article.

It is a further object to provide in such an article, smooth, hard, wear-resisting areas as part of an integral structure, and without the use of any foreign reinforcing matter.

An additional object contemplates an article which may be built up from sections of varying hardness, rigidity, strength, compactness, and density, which sections however are compacted into a single, integral whole such that the final product is but a single, non-laminated structure, the fibers of the initial sections being blended, integrated and consolidated into a mass of proper density throughout.

The article is made of pulp, integrally molded and finished in a series of automatic operations, to the exact shape and size required in the finished product, thereby eliminating all waste of material. Incorporated in the product, as a unitary structure, are pulp materials which render the article hard, stiff, rigid and strong internally, but of a softer fibrous nature externally, thus providing the necessary character of surface for retaining threads in place, regardless of taper. The tip or end of the cone, which receives the greatest wear in use, is molded and finished to the exact required shape with its smooth, hard surface merging integrally and unbroken into the softer thread gripping surface.

A cone structure thus molded and finished as an integral unitary article having incorporated therein pulp materials fulfilling all requirements as regards structure and surface characteristics, overcomes the objections to prior art practices and articles made up from sheets of paper or other materials, any deformation or change in the shape of the tip is avoided as the article is integrally molded to its final form and there is no tendency of the fibers in any part of the cone structure to change position; waste is avoided as operations of manufacture are simplified, and time and labor are minimized, all of which reduce the cost, while producing a superior product.

In a copending application, Ser. No. 171,156 filed of even date herewith, there is described and claimed a preferred process, and apparatus for making such an article, and reference may be made thereto for details of manufacture.

To the attainment of the foregoing objects and other objects which will appear as the description proceeds, and as illustrative of several forms which these articles may assume, reference may be made to the accompanying drawings, in which:

Fig. 1 is a section through a finished cone;

Fig. 2 is an end view thereof;

Fig. 3 is an elevation of a slightly modified, finished cone;

Fig. 4 is an end view thereof;

Fig. 5 is a disassembled section showing component sections of the cone prior to consolidation thereof into an integral unit and finishing thereof;

Fig. 6 is a section through the cone after assemblage of the component sections prior to consolidation and finishing; and

Fig. 7 is an end view of the structure shown in Fig. 6.

Referring now more particularly to the drawings in which like reference numerals designate like parts, it will be observed that the cone generally is built up from a series of separately formed or molded sections of pulp which are as-

sembled, compacted and integrated under heat and pressure to consolidate them into a non-laminated integral structure. The several sections vary relatively in compactness and hardness, and will be separately formed, and assembled while in a moist condition for subsequent complete drying during finishing steps of the process.

The production of certain articles of the nature contemplated herein can frequently be most economically produced by molding them to the approximately desired shape from a liquid pulp mixture, the articles, after molding and assemblage of component parts, being finished, dried, and compacted by compression between smooth, heated finishing dies.

With ordinary pulp molding methods, where the pulp fibers are deposited on a foraminous die by suction, the fibers collect rapidly and compactly until a certain thickness of deposit is attained over the die, after which deposit is relatively slow, or ceases altogether. During the latter part of this deposit the fibers are not compacted as firmly together as initially, and any extra thick molded pulp article or sheet does not have the density, hardness or strength throughout as is usually required for particular conditions and results.

Where, as in the present instance, it is desired to provide a strong dense wall in the molded pulp structure, which wall is both thicker and stronger than ordinary methods and apparatus will produce, and wherein certain portions of the wall are extremely hard and rigid, while external surfaces of a soft velvety texture are desired, special means are necessary to secure the desired result and it is found that formation of the article in separate sections which may later be assembled, compacted and consolidated under heat and pressure into a single integral structure, is the most feasible way to produce an article which is of proper density throughout.

With these thoughts in mind, there is first formed on a suitable foraminous, inside forming die such as described in the aforementioned copending application, a tubular, preferably conical section 10 in which the fibers are densely compacted, and of a character which when dried will be of sufficient hardness and rigidity to provide necessary strength in the finished cone.

The deposit is not permitted to build up to a thickness where the outermost fibers are loosely deposited or improperly felted because of loss of suction, which will necessarily occur as the thickness increases. It will be readily understood that the vacuum or suction behind or within a foraminous molding die and a screen results in a corresponding pressure being applied on the outside of the molding screen, either to the liquid passing through or to the fibers retained on the screen, or to the complete fiber deposit on the screen after it has been removed from its original liquid mixture.

At the same time, or subsequently, a second section of pulp 11 is formed on a suitable foraminous, outside forming die, this section being of substantially the same compactness and strength, but of slightly greater diameter whereby to fit externally of the section 10. These two sections or component parts (the number may be varied) provide the main body or strengthening portion of the pulp article.

An additional section 12 formed separately on another outside forming die, and of a different fiber compactness from the harder sections 10 and 11, furnishes a surface of soft, velvety tex-

ture, effective to adequately retain threads or yarns against slippage along the tapered walls of the cop.

These three sections may be nested or assembled as indicated in Fig. 6. The smooth surfaced, hard, compacted tip section 13, also separately formed, for receiving wear during use of the cone may then be assembled over the entire assemblage of nested sections 10, 11 and 12. In addition to its own compactness, the compression of assemblage of the tip portion over the other three sections to a position where the outer surface of the tip 13 merges smoothly into the outer surface of the cone section 12 adds an increased hardness or compactness of compression at this point, thus increasing the wear-resistant qualities of the article.

The molded cone, made up of a plurality of separately molded sections, assembled, partially compacted together and ready for finishing into an integral article, is illustrated in Fig. 6. It will be observed that the hard, stiff, strength giving portion has been formed in two parts, i. e., sections 10 and 11 (although the number of sections may be varied to accommodate requirements) located within a soft surfaced portion 12 and a hard tip portion 13, whereupon the finished product is hard internally, and soft externally, except for the exterior of the tip portion.

After the several dense, compact sections have been formed separately, and assembled they are finally compacted, dried, consolidated and integrated in suitable pressure applying finishing dies which are heated to evaporate any moisture left in the molded article, and to accurately finish both inside and outside surfaces of the molded cone C, in addition to consolidating and integrating all portions into a single unit of proper density throughout.

In some constructions it may be found desirable to form ribs 14 internally of the cone C, and this can be readily effected in the finishing dies by providing grooves to receive the pulp as it is compressed, compacted and consolidated from a moist composite structure into a single dry, integral or non-laminated structure. These ribs serve the purpose of a seat for gripping the driving arbor upon which the cone will be mounted when in use. The ribs 14 are not essential and may be eliminated if desired.

The finished molded pulp article shown in Fig. 1 as the cone or cop C has an external surface which is soft and velvety in nature except for the tip portion which is of course very smooth, hard and rigid, and this cone is desirable for use with the finer or more delicate threads or yarns which must be prevented from slipping down over the cone surface, but which threads will not stand being wound upon a rough or serrated surface.

Coarser threads or yarns may require a rough or semi-rough type of surface, as contrasted with that shown exteriorly of the cone C, and such a surface, in prior practice is made by running the material of the cone over corrugated rollers or by corrugating the cone surface after the cone has been formed.

A modified type of textile cone C' is shown in Figs. 3 and 4, this cone being formed with small recesses 15 substantially parallel to the axis of the cone, and produced by milled recesses in the exterior finishing die, during the finishing steps.

The foregoing embodiments are, of course, but illustrative and modification may be made further without departing from the spirit of this

invention. Such modification might include the production of a straight tube, or a tube having a straight cylindrical portion with a tapered base or end portion. So far as is known, no methods or apparatus are at present available for molding a tube, cylinder or cone except by means of a split die and one of the inherent manufacturing advantages of the present construction is the elimination of split dies.

Even with split dies, there is no method of forming cones or tubes of this general nature with a central hole of uniform diameter throughout its length, such as is possible by the present method and apparatus.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A hollow textile cone or cop of molded pulp having its wall formed as a single, integrated, non-laminated mass varying in compactness from a hard rigid self-supporting interior to a soft velvety exterior surface and having a portion of its exterior surface hardened and smooth to a greater degree than the remainder thereof, said hard smooth portion and said soft velvety surface merging unbrokenly into each other.

2. A hollow textile cone or cop of molded pulp having its wall formed as a single, integrated mass varying in compactness from a hard rigid self-supporting interior to a soft velvety exterior surface, said cone or cop being composed of a plurality of separately formed, nested sections of relatively varying compactness and hardness, consolidated into a single integral non-laminated structure and having a portion of its exterior surface hardened and smooth to a greater degree than the remainder thereof, said hard smooth portion and said soft exterior surface merging unbrokenly into each other.

3. A hollow molded pulp article of the class described comprising an integrated, non-laminated body portion of greater hardness, compactness and rigidity at its internal surfaces than at its external surfaces and having an external surface which is relatively soft and velvety by comparison with its internal surfaces, and an external tip portion having a surface of greater smoothness and hardness than said soft surface, said tip and soft external surfaces merging evenly into each other.

4. A hollow tubular article of molded pulp composed of a dense, compact, hard, rigid, molded tube encased by a softer, less compact molded tube of velvety external surface characteristics and a hard compact, smooth surface tubular tip encasing an end portion of said soft tube, said tubes and tip being integrated and compacted into a single, non-laminated integral structure.

5. A hollow tubular article of molded pulp having its wall formed as a single, integrated, non-laminated mass varying in compactness from a hard rigid self-supporting interior to a soft velvety exterior surface, and of greater smoothness, compactness and density at one end than in the remainder of the mass.

6. A hollow molded pulp article of the class described having its wall formed as a single, integrated, non-laminated mass varying in compactness from a hard rigid self-supporting interior to an exterior of lesser hardness and compactness, and having a portion of its exterior surface hardened and smooth to a greater degree than the remainder thereof and merging unbrokenly into said remainder.

7. A hollow molded pulp article of the class described having its wall formed as a single, integrated, non-laminated mass varying in compactness from a hard rigid self-supporting interior to a roughened exterior surface of lesser hardness and compactness, and having a portion of its exterior surface hardened and smooth to a greater degree than the remainder thereof and merging unbrokenly into said remainder.

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