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C. DREYFUS

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BRAID

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Fig. 1.

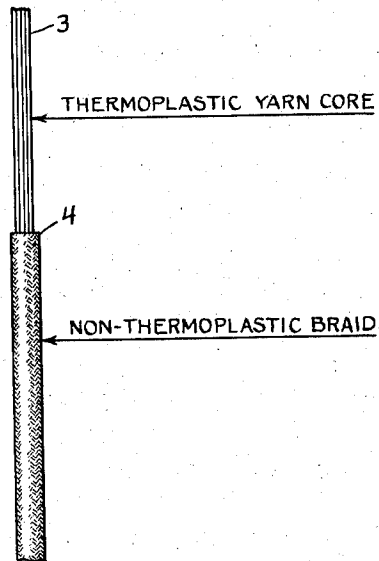
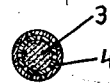


Fig. 2.



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BRAID

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19 Claims. (Cl. 96—26)

This invention relates to textile materials and relates more particularly to yarns woven in the form of braids.

An object of my invention is the preparation of braids of compact structure.

Another object of my invention is the preparation of braids of compact structure which are strong, flexible and which retain their compact structure under conditions of service wherein they are subjected to stresses such as flexing and tensioning.

Still another object of my invention is the preparation of compact braids woven from yarns of artificial, as well as natural, textile materials and containing a bonding core yarn of a thermoplastic material.

Other objects of my invention will appear from the following detailed description.

Braids of a high degree of strength and elasticity may be prepared by weaving yarns of natural textile fibers such as cotton, linen, silk, wool, yarns of regenerated cellulose and yarns having a basis of an organic derivative of cellulose. In the usual braided structure, the yarns are woven together somewhat loosely and when any tension is applied to the braid it becomes elongated with a decrease in diameter. When the tension is released, the braid reassumes its fairly voluminous structure. Where strength is the primary consideration the voluminous character of the braided yarn constitutes no disadvantage, but where both a compact structure and strength are essential the ordinary braid leaves much to be desired.

The voluminous braids are especially undesirable where they are subjected to wind stresses as in the case where they are used as lines for such equipment as meteorological observation balloons, balloon-supported radio antennae, etc. Since the voluminous braids have a high degree of wind resistance over the entire length of the line, the horizontal drift or distortion of path of such equipment, as compared to the net altitude obtained, is quite excessive. Attempts have been made to obtain braids of compact structure but close braiding, weaving or otherwise fabricating has the effect of reducing the strength of the yarn.

I have now discovered that braids of high strength and flexibility, and having a permanently compact structure, may be obtained when braids of non-thermoplastic materials are woven about a core yarn of a thermoplastic material such as an organic derivative of cellulose or a synthetic linear polyamide condensation product, and the resulting structure is subjected to the action of heat and pressure or is treated with agents which have a solvent or softening action on the core yarn so as to cause the surrounding yarns to adhere or bond to the core and form a

unitary structure. The braids may be woven from yarns of cotton, linen, silk, from fibers of staple length and having a basis of organic derivatives of cellulose blended with cotton, linen and silk fibers, from yarns of cotton, linen or silk fibers doubled with yarns of an organic derivative of cellulose or from strong yarns of stretched saponified organic derivatives of cellulose. Braid made in this manner and followed by the bonding treatment results in a braid of high strength and permanent compactness and offers an extremely low wind resistance.

The organic derivative of cellulose yarns which may be used as a core may be cellulose esters such as cellulose acetate, cellulose propionate, cellulose butyrate and mixed esters such as cellulose acetate-propionate and cellulose acetate-butyrate, or cellulose ethers such as ethyl cellulose and benzyl cellulose. The synthetic linear polyamide condensation products may be derived from diamines and dicarboxylic acids or from amide-forming derivatives of said dicarboxylic acids. While yarns of cotton, linen, silk or other natural fibers may be woven about the thermoplastic core to form suitable braids, I prefer to employ yarns formed of stretched organic derivative of cellulose yarns, which are substantially completely saponified, for this purpose.

In order to facilitate the formation of a proper bond between the core and the surrounding woven yarns, the yarn forming the core may be treated with a plasticizer prior to the braiding operation. The plasticizer may be applied to the core yarn in any suitable manner as by dipping, spraying or by passing the yarn over a roller immersed in a trough containing the plasticizer. In this way from about 20 to 120% of plasticizer based on the weight of the yarn may be applied. Any suitable plasticizer may be employed in accordance with my invention, such as, for example, dimethyl phthalate, diethyl phthalate, dimethoxy ethyl phthalate, triethylene glycol, ethyl phthalyl ethyl glycolate, dibutyl tartrate, dibutyl phthalate, triphenyl phosphate, tricresyl phosphate and mono-ethyl-p-toluene sulfonamide. The plasticized core thread may be aged prior to the weaving of the braid, or the woven braid containing the plasticized core yarn may be aged to ensure proper penetration of the plasticizer in the organic derivative of cellulose of the yarn forming the core.

The core yarn, with or without plasticizer, and the surrounding yarns which are woven about it to form the braid may be bonded by passing the braided structure through a bath containing liquids which exert a softening or solvent action on the organic derivatives of cellulose, by padding the liquids thereon, or by subjecting the woven braid containing the thermoplastic core yarn to the action of heat, to pres-

sure, or to both. Where a fairly heavy braided structure is being bonded it may be necessary to use a solvent liquid and to follow the liquid treatment by treatment with heat and pressure. The braided structure may be suitably subjected to heat and pressure by passing it through a heated die of slightly smaller diameter than the braid itself, or by passing it between a pair of grooved rotating rollers fitting about the braided structure and causing the outer layers to be bonded to the inner core as the braid is compressed by the rollers. The core yarn may be plasticized with a liquid which is a solvent for organic derivatives of cellulose at elevated temperatures but exerts no solvent action at ordinary temperatures. In such a case the action of heat and pressure produces a very satisfactory bonded braid. Among the above-mentioned plasticizers which are latent solvents of this kind are dimethyl phthalate, dibutyl tartrate and monoethyl-p-toluene sulfonamide.

The liquids, or mixtures of liquids, exerting a solvent or softening action on the organic derivatives of cellulose which may be used for obtaining a bonded braid are, for example, acetone, aqueous acetone, mixture of acetone and methyl or ethyl alcohol, ethylene dichloride and mixtures of ethylene dichloride with methyl or ethyl alcohol, tetra methylene oxide, and mixtures of methyl chloride and ethyl or methyl alcohol. These liquids may be applied at room temperature but higher or lower temperatures may be employed. The duration of the treatment will generally vary from a few seconds up to about 20 seconds.

When the braided structure contains a plasticized core wherein the plasticizer used is a latent solvent for the organic derivative of cellulose and becomes an active solvent at elevated temperatures, the temperature to which it may be raised in order to obtain a bonding effect will, of course, vary with the particular latent solvent being used and the particular organic derivative of cellulose forming the core. Ordinarily, a suitable bond may be obtained by heating the braided structure to temperatures of from 250 to 320° C. and subjecting it to slight pressure.

As illustrative of my invention, reference is had to the accompanying drawing.

Fig. 1 is a view, on an enlarged scale, of a textile braid prepared in accordance with my invention; and

Fig. 2 is a cross-section of the textile braid shown in Fig. 1.

In the drawing, 3 is a core of coalesced thermoplastic yarns, surrounded by a braid 4 of non-thermoplastic material. As is seen in Fig. 2 the core 3 is bonded to the walls of the non-thermoplastic braid 4 so as to form a compact unitary structure.

In order further to illustrate my invention the following examples are given:

Example I

An eight-carrier circular braid having 12.8 picks per inch is woven from eight ends of a yarn obtained by saponifying and stretching a yarn having a basis of cellulose acetate having a denier of 1100, 0.4 denier per filament, and having 2.5 turns per inch of twist. During the braiding operation an end of 300 denier acetone-soluble cellulose acetate yarn is run up through the center of the braid to form a core. The braid is then run through a solvent mixture of 80 parts by weight of acetone and 20 parts by

weight of water at a speed of 60 feet per minute, with an immersion length of one foot. The running tension on the braid is maintained at 2 pounds. This treatment causes the cellulose acetate core of the braid to be partially dissolved. The braid is then carried upward in a chamber through which air heated to 75° C. is passed, the vertical path of the treated yarn in the chamber being 6 feet. The braid after leaving the chamber is solvent-free and well bonded and is wound on a suitable holder. The breaking strength of this bonded braid is 80.5 pounds and the compactness is excellent for a braid of such low pickage.

Additional braids woven about a cellulose acetate core, treated in like manner and tested, give the following results:

Picks per inch	Breaking strength	Compactness
	<i>Pounds</i>	
16.9	75.0	Excellent.
21.0	68.0	Do.
24.1	60.4	Do.
28.2	53.0	Do.

Braids of the same stretched, saponified yarn are woven without a bonding core, and the following results are obtained:

Picks per inch	Breaking strength	Compactness
	<i>Pounds</i>	
12.8	80.3	Poor.
16.9	75.0	Do.
21.0	65.7	Fair.
24.0	59.9	Fairly good.
28.2	52.7	Good.

Thus the results show that only the unbonded braid of the highest pickage, 28.2, is of a desirable compactness, but it is obvious that this compactness is only obtained at a serious sacrifice of breaking strength.

Example II

Eight-carrier circular linen braids are woven from linen thread of 12.84 lea in varying densities about a core of 300 denier acetone-soluble cellulose acetate yarn and the resulting braids bonded to the core as described in Example I. Braids having the following characteristics are obtained:

Picks per inch	Breaking strength	Compactness
	<i>Pounds</i>	
12.8	71.8	Excellent.
16.9	69.8	Do.
21.0	69.6	Do.
24.0	69.5	Do.
28.2	64.8	Do.

Braids of the same linen yarn are woven without a bonding core and braids having the following properties are obtained:

Picks per inch	Breaking strength	Compactness
	<i>Pounds</i>	
12.8	71.6	Poor.
16.9	70.0	Do.
21.0	69.5	Fair.
24.0	69.6	Fairly good.
28.2	64.0	Good.

Accordingly, only the unbonded braid of the highest pickage was of desirable compactness. However, such compactness is obtained only at a sacrifice of breaking strength.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising a thermoplastic textile material and then bonding the braided outer yarns to the core yarn by coalescing substantially the entire core yarn.

2. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire core yarn.

3. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose containing a plasticizer and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire core yarn.

4. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for said organic derivative of cellulose.

5. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose containing a plasticizer and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for said organic derivative of cellulose.

6. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose containing a plasticizer which is a latent solvent for the organic derivative of cellulose and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire core yarn by subjecting the braided assembly to elevated temperatures.

7. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising an organic derivative of cellulose containing a plasticizer which is a latent solvent for the organic derivative of cellulose and then bonding the braided outer yarns to the organic derivative of cellulose core yarn by coalescing substantially the entire

core yarn by subjecting the braided assembly to pressure at an elevated temperature.

8. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn.

9. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for the cellulose acetate core yarn.

10. Process for the production of a compact textile braid, which comprises braiding yarns of a non-thermoplastic textile material about a core consisting of yarn comprising cellulose acetate and a plasticizer for the cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for the cellulose acetate core yarn.

11. Process for the production of a compact textile braid, which comprises braiding yarns of a textile material about a core consisting of yarn comprising cellulose acetate and a plasticizer for the cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by subjecting the braided assembly to pressure at an elevated temperature.

12. Process for the production of a compact textile braid, which comprises braiding yarns of a textile material about a core consisting of yarn comprising cellulose acetate and a plasticizer which is a latent solvent for the cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by subjecting the braided assembly to pressure at an elevated temperature.

13. Process for the production of a compact textile braid which comprises braiding yarns of stretched, saponified regenerated cellulose about a core consisting of yarn comprising cellulose acetate and a plasticizer for the cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for the cellulose acetate core yarn.

14. Process for the production of a compact textile braid, which comprises braiding yarns of linen about a core consisting of yarn comprising cellulose acetate and a plasticizer for the cellulose acetate and then bonding the braided outer yarns to the cellulose acetate core yarn by coalescing substantially the entire core yarn by treating the braided assembly with a solvent for the cellulose acetate core yarn.

15. A compact textile braid comprising a braided tube made of yarns of non-thermoplastic textile material, the inner walls of said tube being bonded to a central core comprising coalesced yarns of a thermoplastic material by the coalescence of said thermoplastic material.

16. A compact textile braid comprising a braided tube made of yarns of non-thermoplastic textile material, the inner walls of said tube be-

ing bonded to a central core comprising coalesced yarns of an organic derivative of cellulose by the coalescence of said organic derivative of cellulose.

17. A compact textile braid comprising a braided tube made of yarns of non-thermoplastic textile material, the inner walls of said tube being bonded to a central core comprising coalesced yarns of cellulose acetate by the coalescence of said cellulose acetate.

18. A compact textile braid comprising a braided tube made of yarns of non-thermoplastic

textile material, the inner walls of said tube being bonded to a central core comprising coalesced plasticized yarns of an organic derivative of cellulose by the coalescence of said organic derivative of cellulose.

19. A compact textile braid comprising a braided tube made of yarns of non-thermoplastic textile material, the inner walls of said tube being bonded to a central core comprising coalesced plasticized yarns of cellulose acetate by the coalescence of said cellulose acetate.

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