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Barnett

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[54] **GASKETING TAPE WOVEN OF STAPLE GLASS FIBER**

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[52] **U.S. Cl.** ..... **139/420 C,** 57/140 G

[51] **Int. Cl.** **D03d 15/12**

[58] **Field of Search** ..... 139/383, 384 R, 420 R, 139/420 C, 425, 426; 57/140 G, 144

[56] **References Cited**

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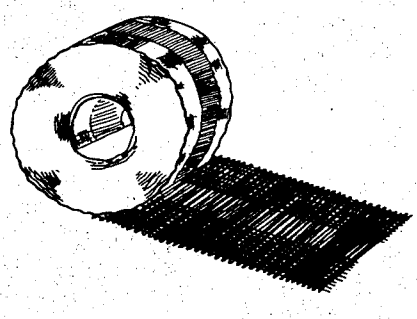
[57] **ABSTRACT**

A soft resilient gasketing tape of woven glass yarn comprises yarn of random length staple glass fibers. Due to the random length of the fibers and a high degree of fiber disarray in the yarn, the yarn is lofty and compressible. To strengthen the yarns, reinforcing strands such as PVA yarn are helically wrapped about the glass yarns. The tape is made with both a solid construction and a drop-warp construction wherein a longitudinally extending void is provided in the tape.

7 Claims, 3 Drawing Figures



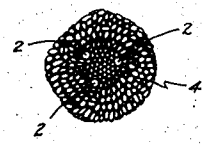


Fig. 1.

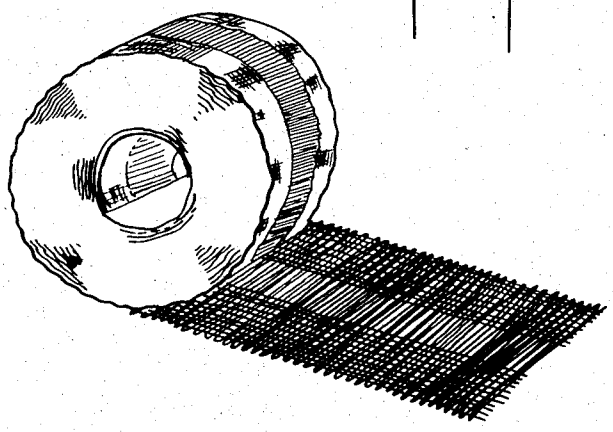


Fig. 2.

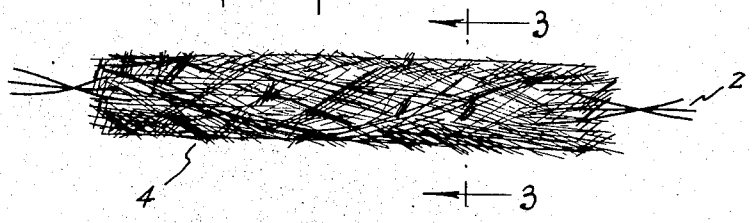
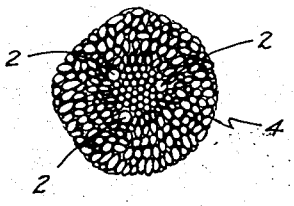


Fig. 3.



GASKETING TAPE WOVEN OF STAPLE GLASS FIBER

BACKGROUND OF THE INVENTION

The present invention is related to gasketing tape of woven staple glass yarn, and in particular to gasketing tapes adapted for many services where mechanical or economical reasons preclude the use of preformed gaskets.

Gasketing tapes are particularly suitable where the service may not be critical enough to justify the cost of preformed gaskets, the opening flange is too large and irregular for a gasket, or the installation is such that it is impossible to install a gasket. In addition, due to their loftiness and compressibility, such gaskets serve effectively where only light pressure can be applied against the gasket. Some typical applications of gasketing tapes are in light metal flanges in oven construction; between structural sections of bridges; on marine or aircraft equipment; and on oil refinery bubble trays.

Heretofore such gasketing tape has been commonly made of asbestos fibers. However, because of the uncertain supply of uniform quality asbestos fiber, the relatively high cost of manufacturing such fiber into tape, the problems associated with textile processing of asbestos and the need to employ different types of asbestos for regular and chemical service, the need has arisen to replace asbestos with a material which also has the necessary loftiness and compressibility required for such tapes.

OBJECT OF THE INVENTION

Accordingly, it is an object of the present invention to provide tape made of staple glass yarn which has a sealability (loftiness and compressibility) comparable with or better than asbestos tape. It is a further object of the invention to provide a tape made from material which is economical, has a uniform quality, a higher temperature resistance than asbestos, a wider chemical resistance than asbestos, and requires a minimum amount of textile processing to prepare it into yarn.

Accordingly, the present invention provides a gasketing tape suitable for both regular and acid service which comprises a soft resilient strip of woven glass yarn. The yarn comprises random length staple glass fibers such as those produced by the Schuller process. Due to the random length of the fibers and a high degree of fiber disarray in the yarn, the yarn is both lofty (i.e., bulky and springy or resilient) and compressible. The yarns may also include reinforcing strands which are helically wrapped about the peripheries of the glass yarns to keep the staple glass fibers from separating. The gasketing tape is made with a solid construction and a drop-warp construction with the second embodiment being known as bolt hole tape.

DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the structure of a dropwarp bolt hole tape typical of one form of the present invention.

FIG. 2 is a side view of a section of the lofty and compressible random length staple glass fiber yarn of this invention.

FIG. 3 is a cross-sectional view of the yarn of this invention taken on plane 3—3 of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to two types of gasketing tape. One gasketing tape has a solid construction, while the other tape has a drop-warp construction. The tape having the drop-warp construction, or bolt hole tape, is manufactured with a longitudinally extending void to permit bolts, rivets or other fasteners to pass through the tape without the need to punch holes through the tape. The tape generally ranges in width from 1–4 inches and has a thickness of one-sixteenth to one-eighth of an inch in a single ply construction. However, these dimensions are merely exemplary and both the width and the thickness of the tapes can vary somewhat from these dimensions.

In the preferred embodiment, the tape comprises in approximate percentages by weight 92 percent staple glass sliver, 3 percent antistatic and lubricating agent and 5 percent PVA yarn. The staple glass fibers in the yarn have random lengths generally ranging from 4 to 20 inches in length with some of the fibers being as short as 1 inch. Due to the random length of the fibers and the high degree of fiber disarray in the yarn, the yarn is lofty (i.e., possesses bulky and springy or resilient qualities) and compressible. Consequently, the tape manufactured from this yarn is soft, compressible and resilient. Thus, the glass tape has a sealability, compressibility and resilience comparable to asbestos while having a higher temperature resistance and a wider chemical resistance. The wider chemical resistance is due to the fact that the staple glass fibers are made from a "C" or chemical grade glass. Thus, the tapes of the present invention can be used both for normal and acid service.

The structure of the present yarn is illustrated in FIGS. 2 and 3. Reinforcing strands run axially through the yarn, being loosely intertwined. The random fibers forming the bulk of the lofty body show a generally random orientation along the length of the yarn, with the randomness being more pronounced with the shorter fibers. In FIG. 3 the randomness can be detected by the non-circular cross-section of many of the fibers, particularly those closer to the outer edge of the yarn. This elliptical or oval shape is of course due to the fact that the transverse cutting plane cuts the randomly oriented fibers on the bias due to their non-alignment with the axis of the yarn.

The yarn is impregnated with an antistatic and lubricating agent during the manufacturing process to facilitate the twisting and weaving of the yarn. The antistatic and lubricating agent is retained in the finished product and improves the handling qualities and feel of the tape. While it is contemplated that other antistatic and lubricating agents could be used, the present invention employs an alcohol phosphate marketed by E. I. DuPont de Nemours under the trademark, Zelec NK.

To hold together the otherwise loosely packed random length staple glass fibers of the yarn, the glass yarn is helically wrapped with one or more reinforcing yarns or strand which function both to strengthen the yarn and hold the yarn together. The preferred embodiment, a PVA yarn or strand, is employed such as the yarn or strand marketed under the trademark Kuralon. However, cotton, rayon and filament glass yarns or strands can also be used.

The tape is manufactured by first obtaining a sliver of staple glass fiber and preferably staple glass fiber

made by the Schuller process. Such slivers are lofty and compressible due to the random length of the fiber and the high degree of fiber disarray in such slivers. In addition, since such slivers are made from C-glass they are chemically resistant. The slivers utilized in nominal weights generally run from 440 to 550 yard pounds. The slivers are first treated with the antistatic and lubricating agent as the sliver passes from bobbins of a creel bank to a winder for winding the treated sliver into cones (e.g., a Lesona winder).

The sliver is then taken from the cones and passed through a twister such as a Prince-Smith twister where the yarn is generally given a twist of from about 1½ to about 2 twists per inch. At the same time the sliver is being twisted in the twister, one or more ends of PVA yarn or strand are applied to the glass sliver in a manner to cause the PVA yarns or strands to helically wrap around the glass sliver. In yarn for the 1/16-inch thick tape, two ends of PVA yarn are wrapped about the glass sliver. In yarns for ⅛-inch thick tape, four ends of PVA yarn or strand are wrapped about the glass sliver. While the sliver can be twisted in either the "S" or "Z" direction, the PVA yarns or strands are wrapped in the opposite direction. The following table is illustrative of typical sliver weights and twists imparted to the sliver.

	Sliver Wt. yds/lb-Nominal	Twist TPI	Direction
1/16 in. tape	Warp&Fill 550	2.1	"S"
⅛ in. tape	Warp 140	1.6	"S"
	Fill 280	1.8	"S"

The sliver which has now been formed into a lofty and compressible yarn comprising random length staple glass fibers having a high degree of fiber disarray, now passes to a loom such as a four-space or eight-space Tex-nova shuttleless loom wherein the yarn, as prepared above, is used for the warp and fill. For the solid construction, the tapes typically are woven with about 16 warp yarns per inch of width, while there are seven double fill yarns per inch of length for the 1/16-inch thick tape. The same number of warp and fill threads are used per inch for the drop-warp construction with the exception that a number of ends are dropped in the center of the tape to provide a longitudinally extending void or gap which is transversely crossed by the fill yarns This structure is the FIG. **1**. To maintain a tight selvage on both sides of void, two ends of 150–2/2 filament glass are drawn in warp on each side of void. The void, which can vary in width, permits the use of bolts or rivets to hold the tape in place without having to punch holes through the tape. The following tables detail the construction for typical 1/16-inch thick tapes of both the solid and drop-warp construction.

Solid Construction — 1/16 in. thick

Width	Total Ends	Reed	Picks/inch (double fill)	Bobbin Yarn
1 in.	18	7/2	7	150-2/2 filament glass
2 in.	32	7/2	7	150-2/2 filament glass
3 in.	50	7/2	7	150-2/2 filament glass
4 in.	64	7/2	7	150-2/2 filament glass

Drop-Warp Construction — 1/16 in. thick

Width	Total Ends	No. ends dropped in ctr.	Reed	Picks/in. (dbl. fill)	Bobbin Yarn
1 in.	14	4	7/2	7	150-2/2 filament glass
2 in.	24	8	7/2	7	150-2/2 filament glass
3 in.	40	10	7/2	7	150-2/2 filament glass
4 in.	54	10	7/2	7	150-2/2 filament glass

The ⅛-inch tapes are made with a weave having about 14 warp yarns per every inch of width, and five double fill yarns per inch. For the drop-warp construction, as in the 1/16-inch tape, a number of ends are dropped in the center of the tape. To maintain a tight selvage on both sides of the void formed by dropping the center ends, two ends of 150-2/4 filament glass are drawn in warp on each side of the void. The following tables give the details of the tape construction for both the solid construction and drop-warp construction of the ⅛-inch tape.

Solid Construction — ⅛ in. thick

Width	Total Ends	Reed	Picks/inch (double fill)	Bobbin Yarn
1 in.	14	6/2	5	150-2/2 filament glass
2 in.	28	6/2	5	150-2/2 filament glass
3 in.	42	6/2	5	150-2/2 filament glass
4 in.	56	6/2	5	150-2/2 filament glass

Drop-Warp Construction — ⅛ in. thick

Width	Total Ends	No. ends dropped in ctr.	Reed	Picks/in. (dbl. fill)	Bobbin Yarn
1 in.	10	4	6/2	5	150-2/2 filament glass
2 in.	22	6	6/2	5	150-2/2 filament glass
3 in.	34	8	6/2	5	150-2/2filament glass
4 in.	48	8	6/2	5	150-2/2 filament glass

Thus, the typical 1–4 inch wide tapes of 1/16 and ⅛ inch thickness made in accordance with the present invention are single-ply plain weave with filling inserted in double pick manner. The weight in foot pounds ± 10 percent for both the solid and drop-warp constructions are given in the following table.

	Solid:				Drop-Warp			
	1"	2"	3"	4"	1"	2"	3"	4"
Weight ft/lb								
1/16 in.	53.5	26.5	17.8	13.5	56.0	28.0	19.6	14.5
⅛ in.	23.0	12.0	7.7	6.0	12.0	12.5	8.3	6.2

The tape thus produced has a minimum glass fiber content of 92 percent. The tensile strength in PSI is 3,500 minimum. The soluble chloride content in parts per million is 100 maximum and the acid resistance is good.

The sealability of the tape of the present invention was compared with asbestos style 122 Underwriter's Grade tape and asbestos style AAA Grade tape which are marketed by Johns-Manville Corporation. The tests were conducted on a 300,000 pound Southward Emery Compression Tester which exerted pressures of 50 psi, 100 psi, 200 psi and 300 psi on the 2 inch by 3 inch flat specimens of tape. For each test, the gas was introduced under a pressure of 1 inch of water through a hole over which the tape was centered and the amount of gas leakage was measured at the perimiter of the tape.

Property		THERMO-CHEM (glass)	Asbestos Style 122 Underwriters Grade	Asbestos Style 122 AAA Grade
Nominal Size, in.		2×1/16	2×1/16	3×1/16
Thickness, in.		0.062	0.065	0.066
Weight, lb/100 ft.		3.8	4.8	7.0
Sealability, cm^3/min Load on Gasket				
50 psi	avg	53	360	119
	range	45–64	150–540	108–130
100 psi	avg	42	294	64
	range	35–46	150–390	63–64
200 psi	avg	21	131	21
	range	16–25	100–160	20–22
300 psi	avg	17	56	10
	range	13–21	47–74	—

Thus, the present invention provides a tape having the required loftiness, compressibility, sealability, heat-resistance and acid-resistance. While a preferred embodiment of the present invention has been illustrated and described, it is contemplated that equivalents can be resorted to without departing from the spirit and scope of the presnt invention.

I claim:

1. A gasketing tape consisting essentially of a soft, resilient strip of woven glass yarn, said yarn comprising random length staple glass fibers, and said yarn being lofty and compressible due to the random length of the fibers and a high degree of fiber disarray in said yarn, and said yarn having wrapped thereabout reinforcing strands.

2. The gasketing tape as defined in claim **1** wherein said reinforcing strands are individually wrapped helically about each of said yarns.

3. The gasketing tape as defined in claim **1** wherein said reinforcing strands are PVA yarn.

4. The gasketing tape as defined in claim **1** wherein a plurality of warp yarns are omitted from said strip to provide a longitudinally extending gap in the center of said strip with fill yarns passing through said gap to join lateral portions of said tape.

5. The gasketing tape as defined in claim **1** wherein said glass is C-glass.

6. A gasketing tape for both normal and acid service comprising:

a. a compressible resilient strip of woven yarns,

b. said yarns comprising at least about 92 percent by weight random length staple glass fibers, said yarns being lofty and compressible due to the random length of the fibers and a high degree of fiber disarray in said yarns, said yarns including reinforcing strands wrapped about said yarns and said staple glass fibers being a chemical grade glass.

7. The gasketing tape as defined in claim **6** wherein a plurality of warp yarns are omitted from said strip to provide a longitudinally extending gap in the center of said strip with fill yarns passing through said gap to join lateral portions of said tape.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,814,142 Dated June 4, 1974

Inventor(s) Irvin Barnett

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 48, delete "the" after is and insert in lieu thereof --illustrated in--. Column 5, line 6 of table, under Drop-Warp 1" delete "12.0" and insert in lieu thereof --25.0--. Column 6, line 3, delete "presnt" and insert in lieu thereof --present--.

Signed and sealed this 29th day of October 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents