Sept. 14, 1954 G. E. HOUGHTON 2,688,895

INSULATING PIPE-COVERING TAPE

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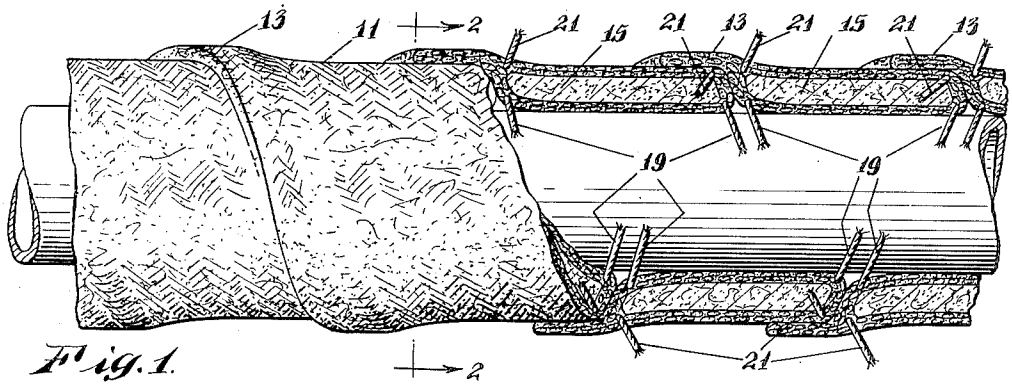


Fig. 1.

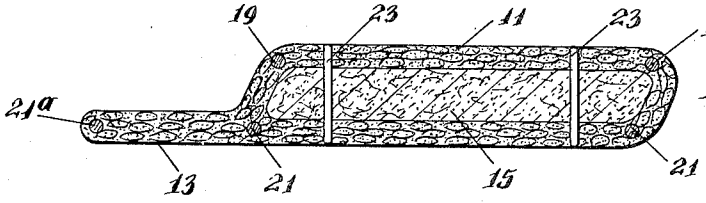
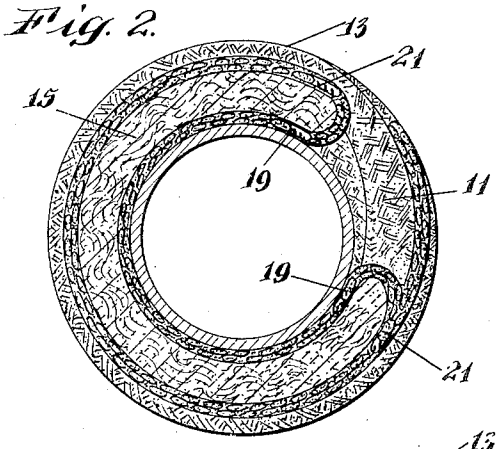


Fig. 7.

Fig. 2.



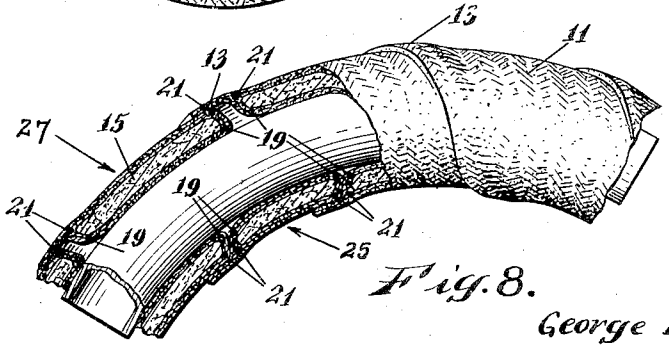


Fig. 8.

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Fig. 4.

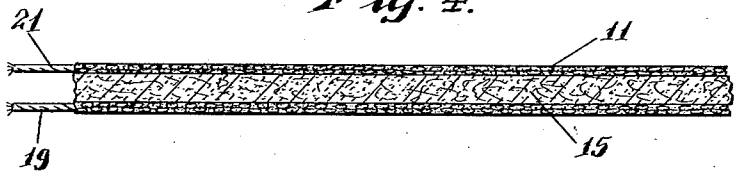


Fig. 3.

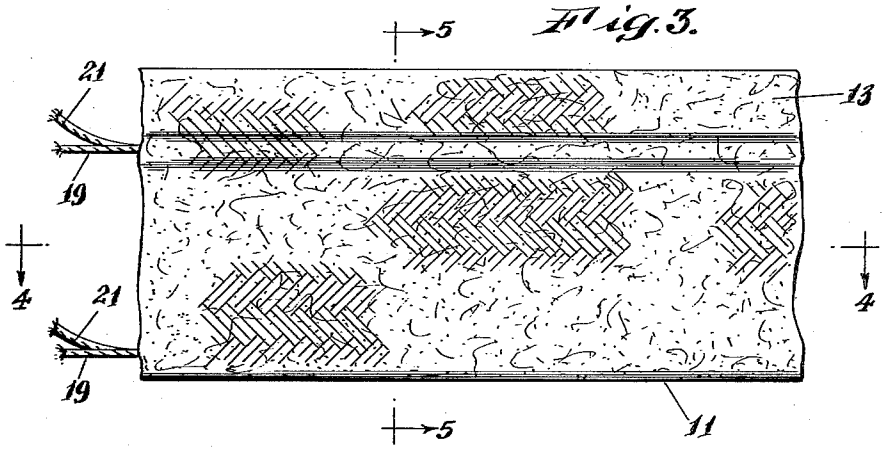


Fig. 5.

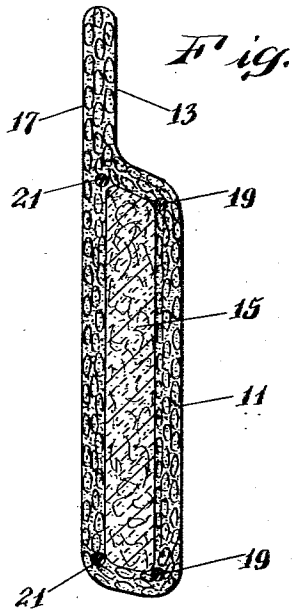
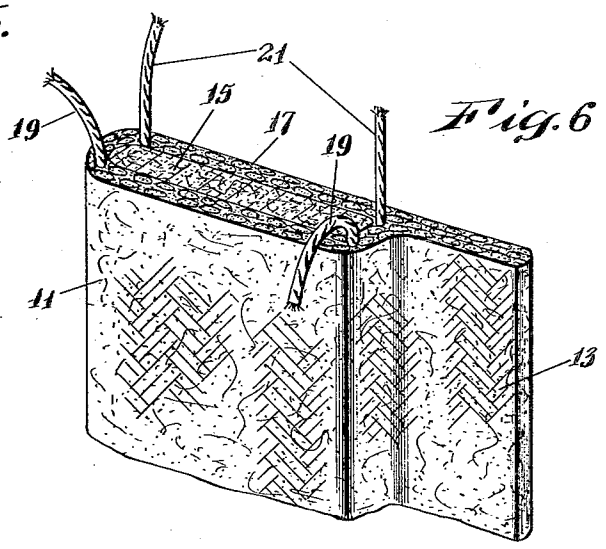


Fig. 6



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INSULATING PIPE-COVERING TAPE

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6 Claims. (Cl. 87—6)

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This invention is directed to an improved insulating pipe-covering tape, and, more particularly, to such tapes which are provided with a longitudinally extending body portion and a longitudinally extending flap fixedly associated with one side edge of the body portion so that the tape can be wound spirally upon a pipe with the flap, at each turn of the tape, in overlying relationship with the opposite marginal part of the body portion of an adjacent turn of the tape to provide an uninterrupted insulating covering for the pipe.

Many insulating pipe-covering tapes heretofore developed have been formed of woven material wrapped around and secured over a filler, and in such arrangements the woven threads have usually been disposed longitudinally of the tape and transversely of the tape at right angles to the length thereof. Such woven tapes have the very serious fault that when they are wound spirally upon a pipe, the inner surface of the tape becomes rumpled, puckered or bunched. This bunching effect is not localized at the inner surface of the tape but is communicated to the outer surface at various circumferential points, thereby making the outer surface of the pipe wrapping very irregular and unsightly. This condition obtains because of the fact that the outer and inner side face portions of the woven tape can neither expand nor contract longitudinally and, hence, cannot adapt themselves to different circumferential lengths when wrapped around a pipe.

Attempts have heretofore been made to avoid the above-mentioned disadvantage of woven tapes by forming them as an elongate braided sheath, on the theory that, as the braided threads or strands all extend on the bias with respect to the length of the sheath, the latter may expand and contract to some extent longitudinally.

The mere provision of a braided sheath, however, did not solve the problem, for, if the tape with such a braided sheath were wound very tightly upon a pipe, the sheath would become unduly narrowed and thus require an excessive number of turns to cover a given portion of pipe. Even then, after installation, time and vibration in service would cause additional elongation that would result in loosening of the braided insulation. On the other hand, if such a braided tape were wound rather loosely upon a pipe in order to avoid such excessive narrowing, the tendency of the braided tape to expand longitudinally would soon cause it to loosen upon the pipe and become excessively loose and bulky, and, in consequence, to be relatively inefficient as an insulation and to

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have an irregular and unsightly outer contour. The braid would slip and slough, thereby exposing the pipe to be insulated. In addition, any flaps that were provided for such braided tapes were usually separate flaps which were stitched or cemented in place, thus causing an unsightly and undesirable bulk at the point of the stitching or cementing.

An important object of the present invention is the provision of an insulating pipe-covering tape adapted to be spirally wound upon a pipe and to fit snugly thereon at all circumferential points, while at the same time presenting a suitably regular and otherwise neat outward appearance.

Another important object of the invention is the provision of an insulating pipe-covering tape which includes a flap and in which both the sheath or body portion of the tape and the flap thereof are braided integrally with each other.

Another important object of the invention is the provision of an insulating pipe covering with flexibility to conform smoothly and with compactness to a curved section of pipe.

Another important object of the invention is the provision of a braided insulating pipe-covering tape having means at its inner face for preventing any material elongation of the tape at that face.

Another important object of the invention is the provision of a braided insulating pipe-covering tape having means at its outer face for restraining it against excessive elongation at that face.

Another important object of the invention is the provision of a braided insulating pipe-covering tape which includes not only means for preventing any material elongation of the tape at its inner face, but also means for restraining the tape against excessive elongation at its outer face.

Another important object of the invention is the provision of a braided insulating pipe-covering tape including therein elongation-restraining means which, during the making of the tape, function in a braiding die to control accurately the cross-sectional dimensions of the tape being formed.

Another important object of the invention is the provision of a pipe-wrapping tape including a braided sheath having means preventing its excessive elongation so that it can be wrapped closely and neatly about a pipe and will remain in such close, neat condition; the sheath, however, being flexible transversely so that it may be compressed in width at the inner side of a curved section of pipe when wrapped therearound,

thereby providing a close and neat fitting insulation throughout the curve of the pipe.

The foregoing and other objects are accomplished by the present invention, of which several embodiments are disclosed herein for illustrative purposes, without, however, limiting the invention to the particular disclosed embodiments.

Referring to the drawings:

Figure 1 is a side elevational view of a preferred form of insulating pipe-covering tape according to the present invention, showing the tape wound spirally upon a fragmentary length of pipe, this view being partly in section to show details of the tape.

Fig. 2 is a cross-sectional view of the tape and pipe illustrated in Fig. 1, the section being substantially on the line 2—2 of the latter figure; this view illustrating the manner in which tape according to the present invention hugs the pipe at all circumferential points.

Fig. 3 is an elevational view of the inner side face of pipe-covering tape of the character disclosed in Fig. 1.

Fig. 4 is a longitudinal sectional view of the tape illustrated in Fig. 3, substantially on the line 4—4 of the latter figure.

Fig. 5 is a transverse sectional view of the tape illustrated in Fig. 3, substantially on the line 5—5 of the latter figure.

Fig. 6 is a perspective view of a fragment of tape of the character disclosed in Figs. 3 to 5, inclusive.

Fig. 7 is a transverse sectional view of the same general character as Fig. 5, but illustrating certain variations which either separately or collectively may be employed as other embodiments of the invention; and

Fig. 8 is a view somewhat like Fig. 1, but showing tape, according to this invention, wrapped around a curved section of pipe.

Except as otherwise clearly indicated by the context, the tape is hereinafter described and set forth in the claims as in its flat condition.

An insulating tape according to a preferred embodiment of this invention as illustrated in Figs. 1–6, inclusive, and 8 consists of a longitudinally extending, flattened-tubular body or sheath portion 11 and a flap 13 extending along and integral with one side edge of the sheath portion. The sheath portion and the flap are formed as a unitary or integrated structure by braiding strands or threads of material which preferably are of asbestos or contain a very high proportion of asbestos or other heat-resistant material.

Such strands of heat-resistant material may be braided in a braiding machine which is adapted not only to form the tubular sheath portion 11, but also to braid the flap 13 to include therein the same strands that run through and form the sheath portion. This can be done on a braiding machine which includes some strand-carriers which are arranged not only to carry the various strands being braided across and around the central portion of the braiding machine, sometimes called a die portion, but also to carry at least several strands across and around an appendix-like end of the die portion to produce, as an integrally braided article, the sheath and flap structure shown in the drawings.

Filling material 15, of suitable heat-resistant characteristics such as, for example, asbestos rovings or the like, is disposed within the sheath portion 11 to extend throughout the latter's entire length. As may best be understood from Figs. 5 and 6, the flap 13 preferably is so integrated with the sheath portion 11 that corresponding side faces of the two extend in a common plane, as indicated at 17. The said common planar side faces, in the preferable manner of using the tape, constitute the outer side face thereof. Thus, when the tape is spirally wound upon a pipe, as illustrated in Fig. 1, the flap 13, in each turn of the tape upon the pipe, overlies the opposite marginal portion of the tape's sheath in an adjacent turn thereof, thereby assuring against any breach in the protective coverage of the tape.

It should be readily understood that by utilizing a braided tape, the tape as a whole, and the inner and outer side faces thereof, may expand or contract longitudinally to some extent. In a structure as thus far specifically described, however, such expansion or contraction would be quite uncontrolled. That is to say, that if expansion to a given extent were to take place upon initial installation, the tape structure itself affords no means for preventing or restraining further expansion. Thus, if the tape, as thus far described, were to be wrapped spirally around a pipe, it would soon thereafter slacken or loosen to some extent, so that it would not be maintained in intimate non-slipping association with the pipe.

An important feature of the present invention resides in the provision, in the tape structure, of very effective means for preventing material elongation of the tape at its inner side face and for restraining the tape against excessive elongation at its outer side face. These means, as embodied in the structures illustrated in the drawings, include two cords 19 of glass yarn or other suitable substantially non-stretchable heat-resistant yarn, each of which cords extends longitudinally in a straight line within the braided material constituting the inner wall of the sheath portion, preferably toward opposite side edges of the latter. Said means may also include two cords 21 of somewhat stretchable material such as nylon, the latter cords extending longitudinally within the braided material constituting the outer side wall of the sheath portion, preferably toward opposite side edges of the latter.

Although it is advantageous to utilize both types of cords, such as cords 19 and 21, arranged as just described, nevertheless, it should be understood that the objects of this invention may be realized to a substantial extent if the tape includes only the substantially non-extensible cords 19 or the somewhat resilient cords 21, assuming, of course, that cords of the stated characters are disposed in the tape in the manner hereinbefore described.

It should be clear from the foregoing description that the cords 19 and 21 are not in any sense braided, but that they extend in a straight or unswerving line throughout the length of the tape. These cords may be inserted in the structure, as the braiding takes place, by being slowly passed straight through the die portion of the braiding machine as the braided strands pass around said cords into and through said die portion. An incidental advantage of thus inserting the cords in the braided material is that they may be suitably held at certain locations within the die portion, and, when thus held, will aid in forming the braided structure in the desired cross-sectional shape.

By referring to Fig. 1, it may readily be understood that the substantially non-stretchable cords 19 will cause the inner side face of the tape to

be maintained in intimate association with the pipe. As said cords are substantially non-stretchable, there will be no slackening of the tape which might cause it to loosen and slip upon the pipe. The cords 19, of course, have little or no direct effect toward restraining elongation of the outer side face of the tape. The cords 21, however, function to permit some longitudinal extension of the outer side face of the tape but exert sufficient contractile force to restrain said outer side face against radial distention to any material or objectionable extent. It will be understood, of course, that as the tape is wrapped around the pipe, the cords 21 will stretch to some extent and that, after having received such initial stretch, said cords very strongly oppose any further stretching and thereby hold the outer side face of the tape firmly in place.

It should be understood from the foregoing that because of the tape being braided, and because of the use of either or both types of the mentioned cords 19, 21 therein, the tape intimately and tightly engages the pipe at all circumferential points therearound, as best understood from Fig. 2; and, furthermore, the tape is permanently maintained in such intimate association with the pipe.

Fig. 7 serves to illustrate certain variations which may be utilized, either separately or collectively, in practicing the invention. For example, the sheath 11 may be longitudinally stitched, as by stitches 23 which may extend through the complete thickness of the sheath portion, to prevent excessive radial distention of the sheath when the latter is spirally wrapped around a pipe. Where the stitching 23 is employed, it may be feasible to forego the use of the nylon cords 21.

In another variation of the invention, which may be employed irrespective of whether or not the stitching 23 is employed, an additional straight nylon cord 21*a* may be disposed within the flap 13, preferably toward the free edge thereof, this cord serving to assure that the flap will lie flat when the tape is wrapped around a pipe.

It should also be understood that within this invention the glass cords 19 may be omitted, relying only upon the nylon cords 21, possibly including the nylon cord 21*a* as a means for holding the tape in proper intimate association with a pipe when wrapped about the latter. This arrangement, however, may not be fully effective in all installations, but may, nevertheless, be satisfactory for some purposes.

In another variation, the nylon cords may be omitted, but then the glass cords, preferably, should be disposed in association with the outer wall or face of the tape so that the glass cords may serve the dual purpose of holding the tape against undue radial distention and of holding the tape firmly against the pipe at all circumferential points. In this arrangement there will be little or no elongation of the tape, but its inner wall will contract to some extent as the tape is wrapped around the pipe.

Still another possible variation of the invention may reside in a tape structure in which glass cords, such as the cords 19 or their equivalents, may be utilized at the flap side of the tape and nylon cords, such as cords 21, may be utilized at the opposite side of the tape. In this arrangement the flap side of the tape will function as the inside wall thereof which would be in intimate association with the pipe, and the flap, instead

of being at the outer side of the wrapping, would be in an underlying position in firm contact with the pipe at all circumferential points.

Fig. 8 shows that when tape according to this invention is wrapped around a curved section of pipe, each turn of the tape, and particularly its sheath portion 11, is contracted or compacted in breadth at the inside curvature of the pipe as at 25, so that, while it there is flat and snug upon the pipe with its adjacent turns in side-edge abutting relationship, the sheath portions at the outer curvature of the pipe may be expanded somewhat in breadth as at 27 so that they either may actually abut at the side edges of adjacent turns, or at least lie quite close together. In either of the latter circumstances, the turns of the sheath portions of the tape, at the outer curvature of the pipe, are at least near enough that the flap 13 of one turn of tape overlies a portion of the sheath portion of an adjacent turn. The fact that the tape is braided, rather than woven, thus adapts it as a neat and effective covering when applied to a curved section of pipe.

Although several embodiments and possible variations of this invention have been hereinbefore described, no attempt has been made to enumerate all of them, for it should be obvious that the present inventive concept is susceptible of the foregoing and various other embodiments and variations without departing from the spirit of the invention as set forth in the following claims.

What I claim is:

1. An insulating, pipe-covering tape comprising a braided, flattened-tubular, longitudinally extending sheath, filling material within said sheath, a braided, longitudinally extending flap of less thickness than said sheath and braided integrally therewith, with one of its side faces in a common plane with one side face of said sheath, at least two substantially straight resilient cords extending longitudinally within the braiding at said one side of the sheath and toward opposite side edges thereof, and at least two pliant, non-stretchable cords extending longitudinally within the braiding at the opposite side of the sheath and toward opposite side edges thereof; the tape being adapted to be spirally wound upon a pipe with the said opposite side of the sheath in intimate contact therewith, the said non-stretchable cords serving to prevent elongation of the sheath at its said opposite side and to cause the tape to hug the pipe closely, and the said resilient cords being adapted to restrain the first-mentioned one side face of the sheath against excessive elongation and to prevent excessive radial distention of the sheath.

2. An insulating, pipe-covering tape comprising a braided, flattened-tubular sheath, means associated with one of the sheath's side walls for preventing material elongation of said wall, and means associated with the sheath's other side wall for yieldably opposing elongation of said other side wall.

3. An insulating, pipe-covering tape comprising a braided, flattened-tubular sheath, and elongation-inhibiting means comprising at least one cord extending longitudinally in a substantially straight line in association with each of the opposite side walls of the sheath and coacting with said walls to oppose material longitudinal extension thereof, the said cords being less readily stretchable than the sheath and the said cord associated with one of the walls being less

readily stretchable than the said cord associated with the other of the walls.

4. An insulating, pipe-covering tape comprising a braided, flattened-tubular sheath, elongation-inhibiting means associated with the side walls of the sheath for opposing material longitudinal extension of said walls, and a braided flap braided integrally along one side edge of the sheath and toward one of the side walls thereof, the elongation-inhibiting means comprising resilient cords extending longitudinally in substantially straight lines in association with the last-mentioned side wall of the sheath and substantially non-stretchable cords extending longitudinally in substantially straight lines in association with the opposite side wall of the sheath.

5. An insulating, pipe-covering tape comprising a braided, flattened-tubular sheath, elongation-inhibiting means associated with the side walls of the sheath for opposing material longitudinal extension of said walls, and a braided flap braided integrally along one side edge of the sheath and toward one of the side walls thereof, the elongation-inhibiting means comprising substantially non-stretchable cords extending longitudinally in substantially straight lines in association with the last-mentioned side wall of the sheath and resilient cords extending longitudinally in substantially straight lines in association with the opposite side wall of the sheath.

6. An insulating, pipe-covering tape comprising a braided, flattened-tubular sheath, and elongation-inhibiting means associated with the side walls of the sheath for opposing material longitudinal extension of said walls, the said elongation-inhibiting means comprising at least one cord extending longitudinally in a substantially straight line in association with each of the opposite side walls of the sheath, the said cords being less readily stretchable than the sheath and the said cord in one of the walls being less readily stretchable than the said cord in the other of the walls; the tape further including a braided flap extending along one side edge of the sheath with one of its side faces in the same plane with the outside face of one of the side walls of said sheath, and the said flap having a longitudinally extending straight cord associated therewith for opposing elongation of the flap, the latter cord and the cord associated with the sheath wall which is co-planar with the flap having substantially the same coefficient of stretchability.

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