April 22, 1941. W. F. ASTLEY 2,239,281

HEAT INSULATING TAPE

Filed Oct. 19, 1939 2 Sheets-Sheet 1

Fig. 1.

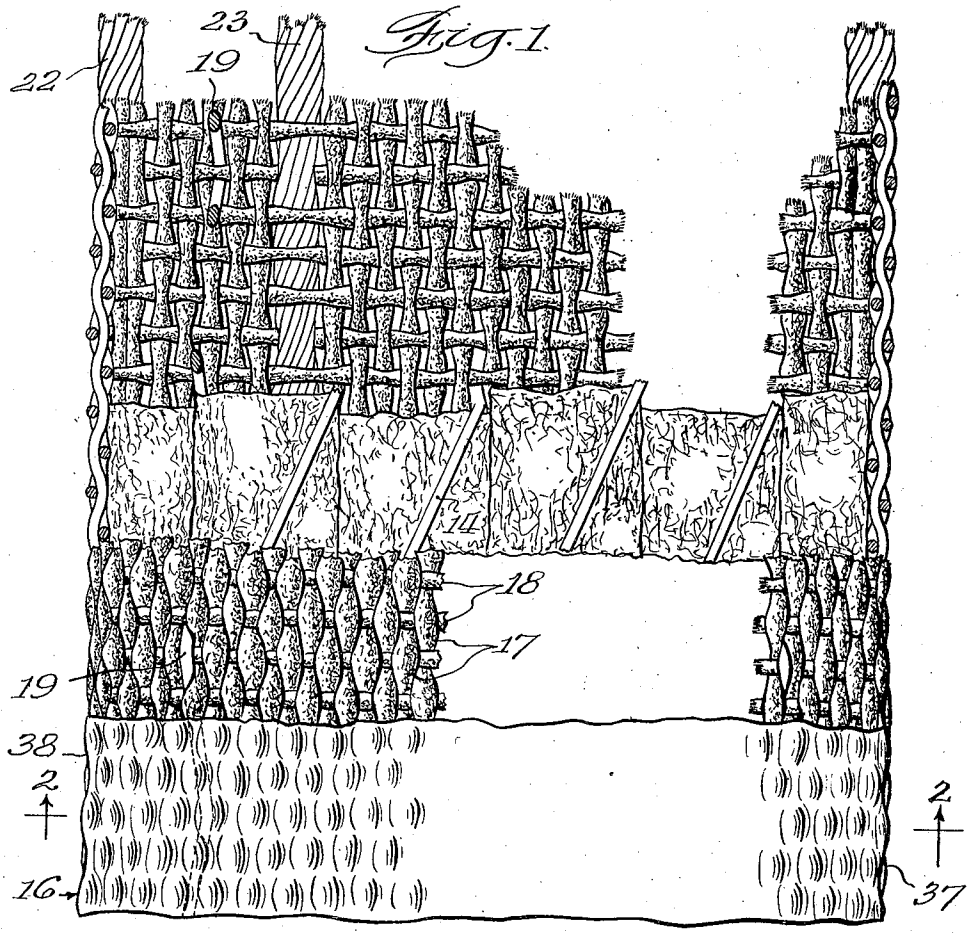
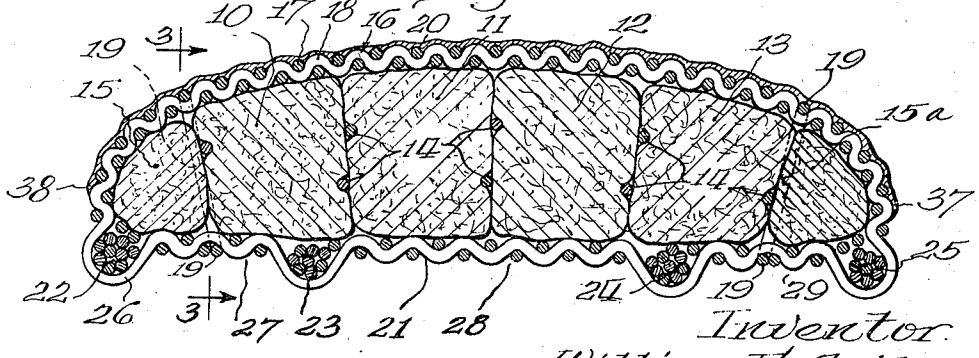


Fig. 2.



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Fig. 3.

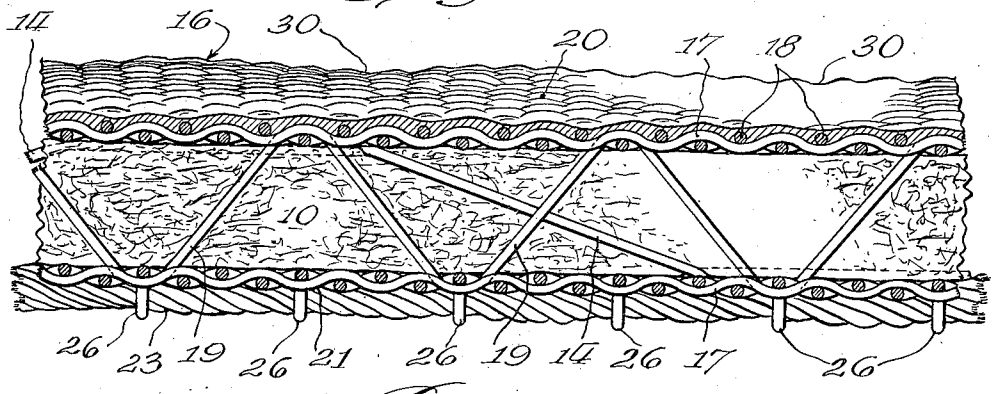


Fig. 4.

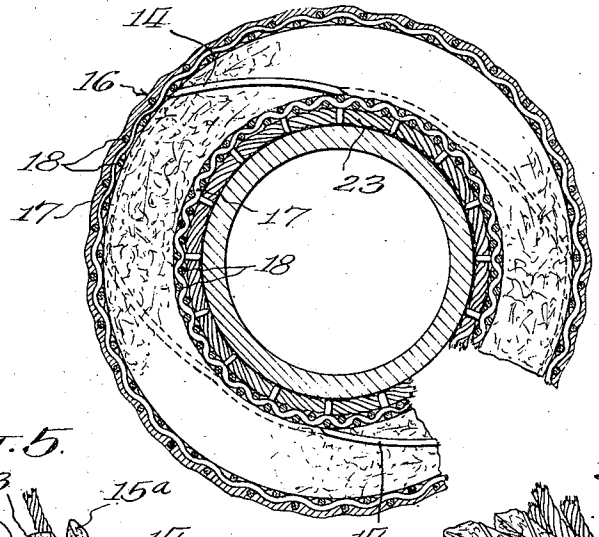


Fig. 5.

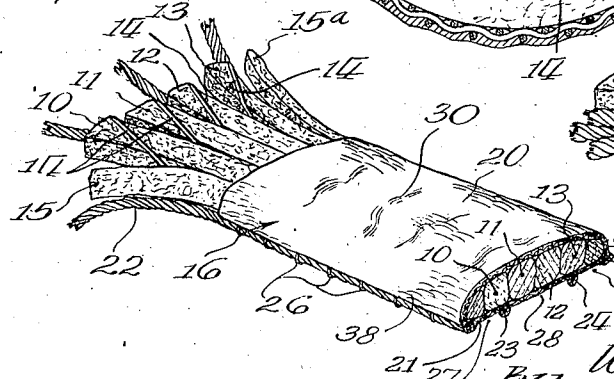
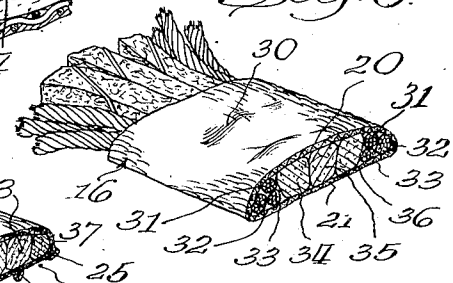


Fig. 6.



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UNITED STATES PATENT OFFICE

2,239,281

HEAT INSULATING TAPE

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Application October 19, 1939, Serial No. 300,104

5 Claims. (Cl. 139—420)

The present invention relates to heat insulating tape and methods of manufacture of tape of the character having an external woven sheath and a filling comprising a plurality of large, loose, soft insulating members or rovings.

The methods of manufacture of heat insulating tapes of this type of the prior art included the separate weaving of the tape, and thereafter the tape was filled according to various methods, but this mode of manufacture was subject to the disadvantage that it required considerable manual labor, special equipment for filling the tape, etc.

One of the objects of the present invention is the provision of an improved tape and method of manufacturing the same which includes the weaving of the sheath about the fillers.

When the fillers of the prior art are drawn into the sheath, there is a tendency for the filler to get out of place, and naturally there is a tendency for elongation of the filler and flattening.

According to the present method, in which the sheath is simultaneously woven with the placing of the filler, the fillers cannot get out of place, and the filler units may be maintained in large, loose, and soft condition, without any tendency toward flattening or elongation because they are not subject to the same kind of tension as is necessary in the devices of the prior art.

Another object of the invention is the provision of an improved structure of insulating tape, in which one side of the sheath, which is intended to be on the outside when the tape is wrapped spirally about a pipe, is purposely made longer, as evidenced by a wavy or puckered condition of the sheath, so as to compensate for the increased peripheral length required in the fabric which is disposed at a greater radius from the center of the pipe, in order to prevent the tendency of the tape to flatten out the filler by virtue of the increased tension in the outer wall of the sheath.

Another object of the invention is the provision of an improved insulating tape in which the woven sheath has threads extending from one side of the sheath to the other between predetermined of the fillers so as to hold the fillers in definite position wtihin the sheath.

Another object of the invention is the provision of an improved insulating tape of the type having a sheath and an insulating filler in which the edges of the sheath are provided with relatively hard filler members for the purpose of effecting a bridge around which the sheath may extend, to prevent the two flat sides of the sheath from pressing against the filler and tending to flatten it.

Another object of the invention is the provision of an improved tape of the class described, having a plurality of longitudinally extending relatively hard ropes on one side of the sheath for engagement with the pipe upon which the tape is wrapped, in order to form a plurality of spirally extending chambers of dead air between the tape and the pipe, to increase the insulation value of the tape.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the two sheets of drawings—

Fig. 1 is a plan view of a piece of the insulating tape, with various parts of the tape broken away to show the construction at various levels in the tape;

Fig. 2 is a sectional view, taken on the plane of the line 2—2 of Fig. 1;

Fig. 3 is another sectional view, taken on the plane of the line 3—3 of Fig. 2;

Fig. 4 is a sectional view through a pipe upon which the tape have been wrapped;

Fig. 5 is a diagrammatic view in perspective, showing the structure of the tape and its filler;

Fig. 6 is a view similar to Fig. 5, showing another modification.

Referring to the drawings,

Figs. 1 and 2 illustrate the structure of the tape which is made according to my present method of weaving the sheath about the filler.

The filler comprises a plurality of large, loose, soft rovings 10 to 13, each of which has a thread 14, spirally wrapped about it for the purpose of increasing the tensile strength and maintaining the roving as a unit.

The rovings comprise units made of asbestos fibers which may include a small percentage of cotton, and the thread is likewise of asbestos fibers with a small percentage of cotton. The size and shape of the rovings at the center of the tape vary from the center toward the outer edges, but the four center rovings 10 to 13 may be of substantially the same size.

The edges of the tape preferably include a pair of small rovings 15 and 15a, and the rovings may be pre-shaped to provide a tape of predetermined cross-section.

The sheath, indicated in its entirety by the numeral 16, comprises a tubular member woven

out of asbestos threads, which may include a small percentage of cotton to increase the tensile strength, and in some conditions may include fine copper or brass wires. The sheath may be woven of the warp threads 17, and the weft threads 18, and any type of weave may be used, such as a plain weave, a granite weave, a diagonal twill or a herringbone twill.

The sheath is preferably provided with certain warp threads 19, which extend from the outer wall 20 of the sheath to the lower wall 21 of the sheath, for the purpose of locking certain of the rovings in predetermined position and preventing the shifting of the rovings within the sheath.

The lower or inner wall 21 of the sheath is preferably provided with a plurality of longitudinally extending ropes 22, 23, 24, and 25, which are woven in and secured by predetermined weft threads 26 at regularly spaced intervals.

The ropes 22 to 25 are twisted quite tightly and made of twisted asbestos threads, and two of the ropes 22 and 25 are preferably located adjacent the outer edges of the sheath. The spaces 27, 28, and 29 between the ropes 22 to 25 form spirally extending dead air spaces when the tape is wrapped on the pipe, substantially as shown in Fig. 4.

One of the most important features of the invention is the provision of a definite crimp, or what may be described as wrinkles, or a wavy formation at 30 (Fig. 5) in the outer surface of the sheath for the purpose of giving the outer wall 20 of the sheath an additional length which it requires when it is wrapped on the pipe because the outer wall is disposed at a greater distance from the center of the pipe, where the circumference is greater.

This crimp gives the outer wall sufficient length so that the outer wall does not tend to flatten the filler members 10 to 15*a*, as would be the case when the inner and outer walls are of the same length. The crimp or additional length in the outer wall is provided by feeding an additional length of warp fibers to the middle of the outer wall of the sheath, such as, for example, twenty percent more of length of warp. This may be done by providing a feeding drum for these particular warp strands, which feeding drum is of greater diameter at the middle, where these warp strands pass about it.

In other embodiments, twenty-two to twenty-four percent of crimp has been provided, and in one embodiment sixteen percent of crimp has been provided.

Referring to Fig. 6, this embodiment of the invention is provided with three ropes 31, 32, and 33, at each edge of the tape, the rope 31 being disposed above and below the tapes 32, 33.

This provides a hard filler of definite thickness at the edge of the tape, which acts as a bridge for the outer wall 20 and the inner wall 21 of the sheath. The outer and inner walls may, in a way, be tensioned across the bridging ropes 31 to 33 from one side to the other, without tending to flatten the inner fillers 34 to 36.

In addition to providing the warp fibers of the outer wall of the sheath with additional warp length, the method preferably includes a feeding device, such as a toothed wheel, which engages that portion of the sheath and draws it out of the machine step by step at a greater speed than the speed at which the main part of the tape emerges.

This provides a definite crimp 30 or an excess in the outer wall of the sheath so as to prevent thinning of the tape when it is wrapped about a pipe.

There is no flattening of the middle of the tape, the ropes at the edge taking the pressure and providing a bridge for the sheath, and thinning of the edge is also prevented.

The method of weaving the tape includes the use of reeds of such a coarse structure that the fillers may be passed between them, and the fillers 10 to 15 are protected by being passed through the metal tubes which guide them and protect them inside the reeds.

The structure can be woven either as a tape or a blanket, and tapes are customarily made in the sizes of 2⅜ by ⅜, 1⅛ by $\frac{3}{16}$, and 2 by $\frac{1}{16}$ inches. A blanket of the same structure has been woven in the dimension of 19½ by ¼ inches.

It should be understood that the external wall 20 of the sheath, extending over to and around the abutting edges at 37 and 38, may be covered with a layer of waterproofing material, such as an initially plastic asphalt composition. This makes the external surface of the tape not only waterproof, but air-tight, and prevents convection currents of air from passing through the insulation of the tape on account of the air-tight outer wall, when the tape has been wrapped on the pipe.

My method comprises the feeding of the large, loose, and soft rovings side by side through protective tubes passing through a coarse reed and the weaving of the sheath simultaneously about the fillers. The warp threads at the center, outside wall of the sheath are fed in greater length than the warp threads of any other part of the sheath, so as to give the outer wall greater length, and the outer wall of the sheath is drawn from the loom by a feeding device which forms a definite wave or crimp in this outer wall of the sheath.

The finished tape may go directly from the weaving machine to pass over rollers which dip into the waterproofing compound and apply the waterproofing compound to the outside and edge only of the tape, the rollers being of complementary shape to the tape, and the tape may thereafter pass into an electric heater for drying the waterproofing compound and evaporating the solvent from it.

Thereafter the tape may be immediately wrapped in rolls in condition to be placed on the market.

It will thus be observed that I have invented an improved method of making insulating tape of the type having a sheath and a filler of asbestos rovings or fibers and an improved structure of the tape, having better insulating qualities.

The improved structure at the edge of the filler is adapted to prevent thinning of the edge and permit the bridging of the fillers by the inner and outer walls of the sheath. The additional length provided in the outer wall of the sheath prevents the tendency toward the flattening of the filler by the tension which would be placed in the outer wall due to its greater distance from the center of the pipe.

The simultaneous placing of the fillers side by side and weaving of the sheath about them effects a considerable saving in the cost of the tape, and eliminates much manual labor and additional operations in the manufacture of the tape.

The complete process of waterproofing the tape as it emerges from the weaving machine effects

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further economies and increases the heat insulating value of the tape.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

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

1. A heat insulating tape comprising a plurality of large, loose, soft rovings located side by side to form a filler, and a sheath woven about said rovings, said sheath being of substantially tubular form, said sheath including warp and weft strands and having an outer and inner wall, and the warp strands of the outer wall of the sheath being of greater length than those of the inner wall for the purpose of providing a sheath having an outer wall of sufficient length to wrap about a pipe without compressing the filler.

2. A sheath for heat insulating tape, comprising a woven tubular member consisting of warp threads and weft threads adapted to receive an insulating filling, said tubular member being oval in shape and formed with an outer face having its warp threads of predetermined greater length than the other warp threads of said sheath whereby the sheath may be applied to a curved surface and the increased length of the warp threads in the outer face will provide sufficient length for that part of the sheath to prevent compression of the filler, due to tension of the outer face.

3. A sheath for heat insulating tape, comprising a woven tubular member consisting of warp threads and weft threads adapted to receive an insulating filling, said tubular member being oval in shape and formed with an outer face having its warp threads of predetermined greater length than the other warp threads of said sheath whereby the sheath may be applied to a curved surface and the increased length of the warp threads in the outer face will provide sufficient length for that part of the sheath to prevent compression of the filler, due to tension of the outer face, said sheath being provided with a plurality of longitudinally extending cords located on the other face of said sheath and adapted to engage the curved surface to which the sheath is applied.

4. A sheath for heat insulating tape, comprising a woven tubular member consisting of warp threads and weft threads adapted to receive an insulating filling, said tubular member being oval in shape and formed with an outer face having its warp threads of predetermined greater length than the other warp threads of said sheath whereby the sheath may be applied to a curved surface and the increased length of the warp threads in the outer face will provide sufficient length for that part of the sheath to prevent compression of the filler, due to tension of the outer face, and a filler comprising a plurality of large, loose, soft rovings of insulating material inside said sheath, said rovings being disposed side by side and effecting a substantial filling of said sheath.

5. A sheath for heat insulating tape, comprising a woven tubular member consisting of warp threads and weft threads adapted to receive an insulating filling, said tubular member being oval in shape and formed with an outer face having its warp threads of predetermined greater length than the other warp threads of said sheath whereby the sheath may be applied to a curved surface and the increased length of the warp threads in the outer face will provide sufficient length for that part of the sheath to prevent compression of the filler, due to tension of the outer face, and a filler comprising a plurality of large, loose, soft rovings of insulating material inside said sheath, said rovings being disposed side by side, and a hard rope assembly at each edge of said filling inside said sheath, said hard rope assembly being adapted to serve as spacers for spacing the opposite walls of said sheath and bridging the filling with a minimum amount of compression on the rovings.

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