Aug. 22, 1939. C. MOSIER ET AL 2,170,207

INSULATING TAPE AND METHOD OF MAKING THE SAME

Filed June 14, 1937 2 Sheets-Sheet 1

Fig. 1.

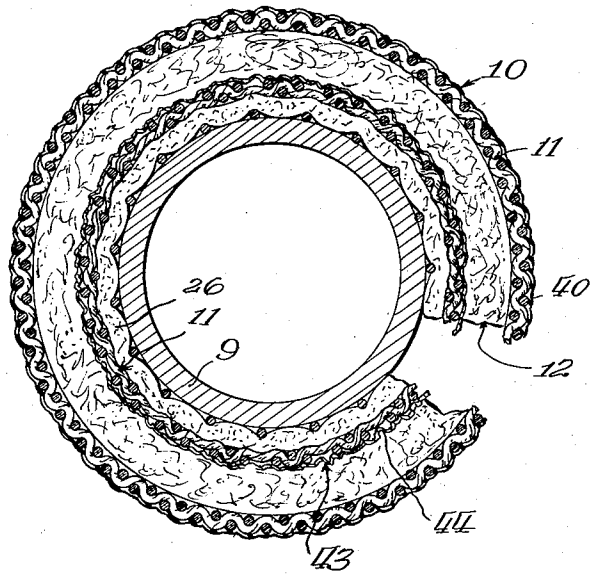


Fig. 2

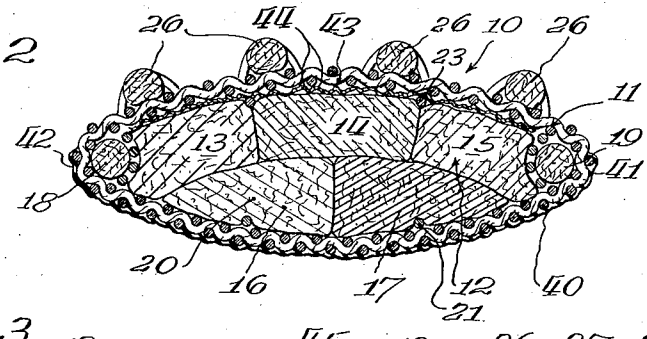
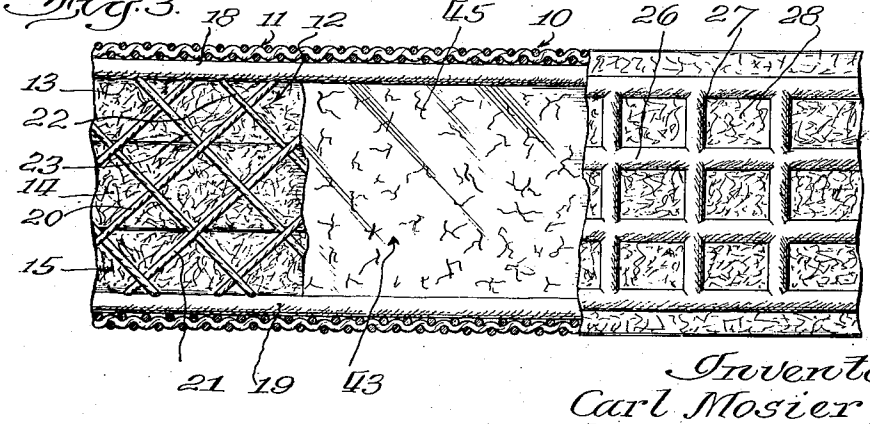


Fig. 3.



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Fig. 4.

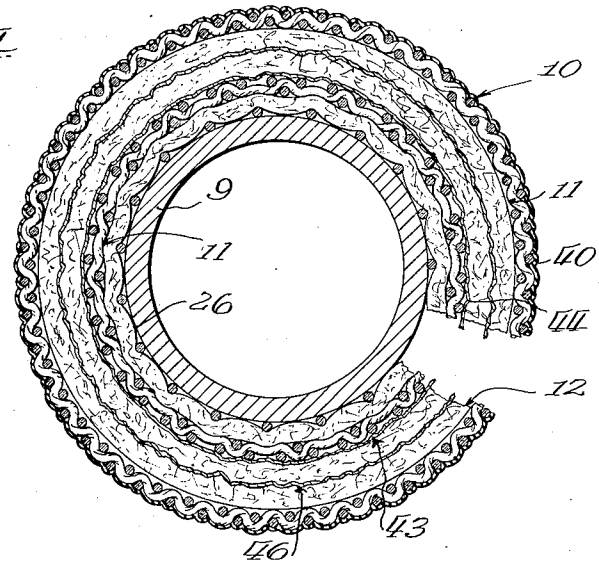


Fig. 5.

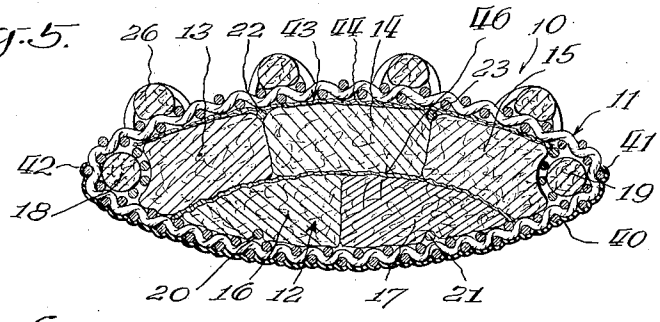
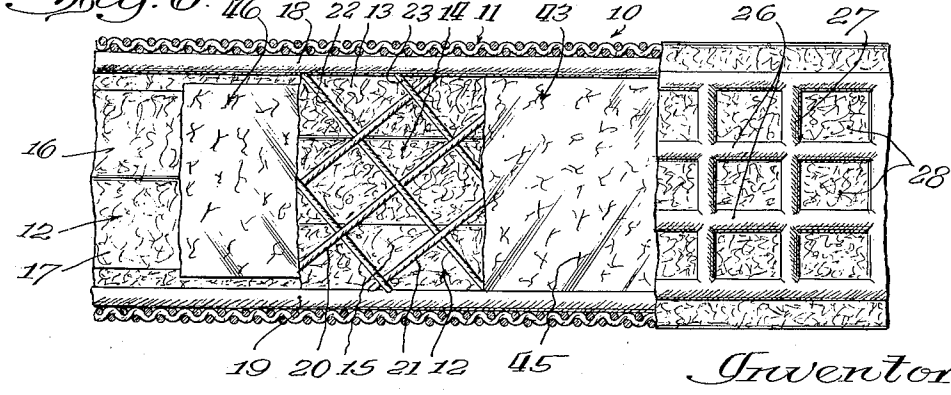


Fig. 6.



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Patented Aug. 22, 1939 2,170,207

UNITED STATES PATENT OFFICE

2,170,207

INSULATING TAPE AND METHOD OF MAKING THE SAME

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Application June 14, 1937, Serial No. 148,045

7 Claims. (Cl. 154—28)

The present invention relates to insulating tape, and is particularly concerned with insulating tape of the type which may be spirally wound about a pipe in order to insulate it.

One of the objects of the invention is the provision of an improved tape having a greater heat insulating value; that is, a greater efficiency, than the tapes of the prior art.

Another object is the provision of an improved insulating tape which utilizes to the greatest advantage the air spaces and insulating value of the filler and sheath by effectively sealing within the tape the air and preventing infiltration or seeping of air through the tape when it is applied to the pipe.

Another object is the provision of an improved form of insulating tape which is adapted to be more efficient than the devices of the prior art, not only due to the sealing of the air spaces within the tape, but due to the reflection of radiated heat by the tape toward the insulated body.

Another object is the provision of an improved insulating tape having such a reflection characteristic, in which the reflecting element is so disposed that it is protected by suitable coverings and yet so that it is nearest to the insulated body, thereby meeting and checking radiation of heat from the body at a point as close to the body as is consistent with the proper protection of the reflecting element.

Another object is the provision of an improved insulating tape having one or more reflecting and/or air sealing laminations mentioned above, in which provision is made in the structure of these elements for spiral winding of the tape about the pipe without the tearing of the reflecting or sealing material.

Another object of the invention is the provision of an improved tape in which the loss due to the thinning of the edge of the tape is reduced and the losses due to leakage of air or convection are reduced.

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 drawings, of which there are two sheets,

Fig. 1 is a transverse sectional view taken on a plane at right angles to a pipe covered by the insulation constructed according to the present invention;

Fig. 2 is a transverse sectional view taken at right angles to the length of a tape constructed according to the present invention;

Fig. 3 is a fragmentary elevational view of the inside of the tape with parts of the tape broken away to show the internal structure;

Fig. 4 is a view similar to Fig. 1 of a modification employing a plurality of sealing and reflecting elements;

Fig. 5 is a view similar to Fig. 2 of this modification;

Fig. 6 is a view similar to Fig. 3 of this modification.

The present invention is an improvement in the insulating tape covered by our prior application, Serial No. 108,170, filed October 29, 1936, Insulating tape, and the disclosure of that application is hereby incorporated by reference thereto.

Referring to Figs. 1 to 3, the insulating tape may, therefore, be indicated in its entirety by the numeral 10, and it preferably comprises the woven insulating sheath 11, which is tubular in shape, and which is provided with an insulating filler indicated in its entirety by the numeral 12.

The filler preferably consists of a plurality of large, loose and soft rovings of asbestos fibers, the rovings being indicated in their entirety by the numerals 13, 14, 15, 16, and 17.

It should be understood, however, that other types of filler may be employed, including a plain batting of asbestos fibers, and perhaps in inferior embodiments of the invention other vegetable fibers of insulating characteristics, but not being heat-resistive, such as cotton, might be employed. Vegetable, animal or mineral fibers may thus be substituted for the rovings.

In the preferred embodiment of the invention, the rovings have very little or practically no tensile strength, although a slight amount of vegetable fibers may be included to increase the tensile strength of the rovings to facilitate handling of the rovings during the manufacture of the filler 12.

These rovings are preferably so arranged that they overlap each other; that is, the rovings 16 and 17 are disposed over the crack between the rovings 12 and 14, and 14 and 15, respectively. When the filler is complete, the rovings flatten out to an elongated structure, which may be substantially rectangular in cross section.

The filler 12 also preferably includes at each edge an asbestos rope 18, 19, which comprises asbestos or other fibers tightly twisted together, for the purpose of giving the filler a greater tensile strength.

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The rovings 13—17 may be connected together by a plurality of threads 20—21 extending spirally around the assembly in a left hand direction, as viewed in Fig. 3, and by a plurality of other threads 22, 23, and others extending spirally around the assembly 13—17 in the opposite or right hand direction. These spiral threads 20—23 and others form a basket weave about the rovings and ropes and hold the parts of the filler together so that it may be drawn into the sheath.

When the spirally extending threads 20—23 are subjected to longitudinal tension with the rest of the filler, they tend to contract, so that it can be readily inserted in its sheath.

Referring to Fig. 3, this shows the outside of an improved form of sheath or of a tape which has on its rear side, that is, the side which is innermost to the pipe when the tape is spirally wound on a pipe, a plurality of insulating ropes or large threads 26 extending longitudinally of the sheath, and a plurality of relatively large thread formations 27 extending transversely of the sheath and intersecting the thread formations.

For example, as described in our prior application, above mentioned, every fourth weft thread may pass around the large ropes or large threads a 26 to bind them to the sheath and form the longitudinal ribs 26.

The transverse ribs 27 comprise the outwardly curved and projecting warp threads of the sheath which are caused to project beyond the plane surface of the fabric by tightening of each of the fourth weft threads, just mentioned. By using special tension on every fourth weft thread to make it tighter, the warps outside of that weft thread are drawn out to the plane of the longitudinal ribs 26, thus forming transverse ribs 27.

This forms depressed rectangular spaces 28 between the thread formations 26, 27, and the depressions 28 are adapted to entrap air between the sheath and the pipe when the sheath is spirally wound on a pipe or when it is applied to any other surface. This greatly increases the insulating value of the sheath and causes this increase at a slight additional cost, which is not proportionate to the increased value of the tape.

The structure of Fig. 3 may be accomplished in different ways, one example being the addition to the sheath of longitudinally and transversely extending relatively large threads or ropes of asbestos.

In the embodiment of Fig. 1, however, additional longitudinally extending large threads or ropes have been used, located on the lower outside of the sheath and equally spaced from each other.

The outer surface of the sheath 11, that is, the bottom of Fig. 2, or that on the outside of the tape when wrapped on a pipe, is provided with a water-tight coating 40, which may consist of an impregnation with rubber latex or other suitably initially plastic water sealing compound. This rubber latex extends to the edges of the tape sheath at the point 41, 42, so that these edges of rubber contact each other when the tape is spirally wound on the pipe, forming a water-tight outer coating for the tape. This water-tight outer coating also seals the assembly against the access of air.

In spite of this rubber sealing layer, we have discovered that additional sealing elements increase the efficiency of the tape considerably, and one of the most important features of the invention is the provision of an additional sealing layer 43, shown in Figs. 1, 2, and 3. This sealing layer may consist of a layer of heavy air-tight paper, or fabric impregnated with a sealing compound adapted to withstand heat, or it may consist of a bright metal foil.

The metal foil should have as high a melting point as possible, or at least as high as is necessary to insure absence of physical changes in the foil in the environment in which it is used. For example, the melting point of aluminum foil is about 1215 degrees F., but it is recommended that such foil be not used at temperatures greater than 700 or 800 degrees F., as some physical changes might otherwise take place.

The aluminum foil is provided with a bright surface which is adapted to reflect radiated heat, and it is also air-tight and capable of providing a further seal to retain the air in the dead air spaces of the tape, and to prevent circulation of air within the tape which might dissipate heat by convection.

The insulating and reflecting foil 43 is preferably placed as near to the inner surface of the tape as possible in order that it may check the radiation of heat from the pipe 9, as close to the pipe as possible. Thus the foil 43 is placed on the inner side of the filler 12—17, just inside the sheathing, so that it will be protected by the sheathing.

The foil 43 is adapted to automatically adjust itself to the conformation of the inner woven surface of the sheath, thereby producing a multiplicity of slight corrugations 44 or indentations 45, which provide slack in the foil, to insure against its tearing when the tape is stretched or subjected to tension. The aluminum foil may be provided with sufficient slack by feeding an excess of foil over the length of filler, the slack taking the form of transverse, wavy portions, wrinkles, or irregularities; or the foil may be transversely corrugated previous to its assembly or during its assembly with the other parts of the tape. Thus the spiral winding of the tape, which stretches one edge more than the other, does not tear the sealing and reflecting layer of aluminum foil or other paper, and tension may be placed on the tape to wind it tightly on the pipe, and without any possibility of tearing.

It is found that an insulating tape not having such a sealing layer 43 has very nearly a 31 percent greater B. t. u. loss than insulating tape which is provided with a seal of the structure shown in Figs. 1–3. Thus it is apparent that the efficiency of the tape is greatly increased.

The present sealing and reflecting layer may also be used in sheet insulation in the same manner, and the piece of tape illustrated in Fig. 2 may be regarded as a small piece of insulation in the shape of a sheet.

Referring to Figs. 4 and 5, in this embodiment of the invention the sheet material in the form of the tape has been provided with an additional reflecting and sealing layer 46 located between the rovings 13, 14 and 15 and the rovings 16 and 17. An additional layer may also be provided between the rovings 16 and 17 and the outer layer of the sheath 11, if desired.

It will thus be observed that we have invented an improved insulating material, the efficiency of which is considerably increased over the devices of the prior art. Anything which looks toward increase of efficiency, effects a saving of material or renders the same material more effective for the same price, is greatly desired.

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The present arrangement, utilizing paper or foil, is so constructed that the paper or foil does not tear, and sufficient slack is present in the non-flexible element or nonextensible element of the tape, so that it is not destroyed by tension or wrapping. The tape is still provided with its flexible characteristic, due to the corrugations and slack in the non-extensible sealing and reflecting elements.

It will be observed that by means of the corrugations 44 the non-extensible or non-stretchable foil or paper may be provided with a predetermined amount of slack so that when the tape is actually extended by tension the slack may be taken up. The tension ropes 18, 19 of each edge of the tape not only prevent the thinning of the tape at its edges, thereby preventing loss of heat at that point, but they are adapted to positively prevent extension of the tape beyond a predetermined amount which is less than the slack provided in the paper or foil. Thus the ropes positively prevent tearing of the foil.

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

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

1. In an insulating material, the combination of a covering of woven insulating material with a filler body of loose, soft asbestos fibers and a layer of air sealing material located between said filler and said covering at one side thereof whereby the convection of air currents within the filler is diminished, said air sealing layer being provided with slack and being of non-extensible material whereby the slack is taken up partially when the top is extended by tension.

2. In an insulating tape, the combination of a sheath of woven insulating material with a filler of soft, loose asbestos fibers, and an air sealing layer of non-extensible material, said air sealing layer being provided with a predetermined amount of slack permitting its extension when the tape is extended, and a pair of tension ropes located at the edges of said tape to prevent extension of the tape beyond the predetermined slack of said air sealing layer.

3. The method of making insulating tape which comprises weaving a tubular fabric sheath of insulating material with transversely and longitudinally extending ribs on one of the outer sides of said sheath, assembling a plurality of rovings of insulating material in overlapping relation to form a filler for said sheath, and covering one side of said filler with a layer of heat reflecting material, interlacing a tension resisting netting about said rovings and layer, and drawing said filler into the sheath to form a tape.

4. An insulating tape comprising a woven sheath of insulating material and a filler comprising a plurality of large loose soft rovings of insulating material, said rovings being assembled in overlapping relation to form a relatively flat filler, and provided at each edge with a pair of relatively hard ropes engaging the edges of said filler, and a spirally extending network of tensioned threads for securing said overlapping rovings and ropes together, said ropes and rovings all being located inside of said woven sheath in the form of a unitary filler.

5. An insulating tape comprising a woven sheath of insulating material and a filler comprising a plurality of large loose soft rovings of insulating material, said rovings being assembled in overlapping relation to form a relatively flat filler, and provided at each edge with a pair of relatively hard ropes engaging the edges of said filler, and a spirally extending network of tensioned threads for securing said overlapping rovings and ropes together, said ropes and rovings all being located inside of said woven sheath in the form of a unitary filler, and a layer of heat reflecting material located between said rovings and said spirally extending threads, said heat reflecting material being provided with a predetermined amount of slack whereby the tape may be lengthened by tension applied thereto without tearing the reflecting layer.

6. An insulating tape comprising a woven sheath of insulating material and a filler comprising a plurality of large loose soft rovings of insulating material, said rovings being assembled in overlapping relation to form a relatively flat filler, and provided at each edge with a pair of relatively hard ropes engaging the edges of said filler, a spirally extending network of tensioned threads for securing said overlapping rovings and ropes together, said ropes and rovings all being located inside of said woven sheath in the form of a unitary filler, a layer of heat reflecting material located between said rovings and said spirally extending threads, said heat reflecting material being provided with a predetermined amount of slack whereby the tape may be lengthened by tension applied thereto without tearing the reflecting layer, and said sheath having a plurality of interwoven transversely and longitudinally extending ribs on the same side as said heat reflecting layer for providing air spaces between said tape and a pipe to which it is applied.

7. The method of making insulating tape which comprises forming a filler of insulating material which is provided with oppositely spiralled tension threads, weaving a tubular fabric sheath of insulating material, covering one side of said filler with a layer of heat reflecting material provided with excess length, whereby the heat reflecting layer has a predetermined amount of slack, and drawing said filler and reflecting layer into said sheath, the spirally extending threads compacting the filler to effect a reduction in its size during the operation of drawing in the filler.

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