Dec. 15, 1942. R. E. PARRY 2,305,488

ASBESTOS PRODUCT

Filed Jan. 5, 1938

Fig. 1.

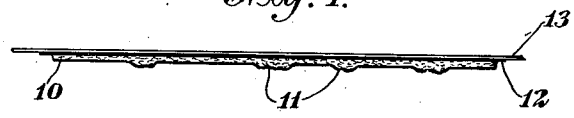


Fig. 2.

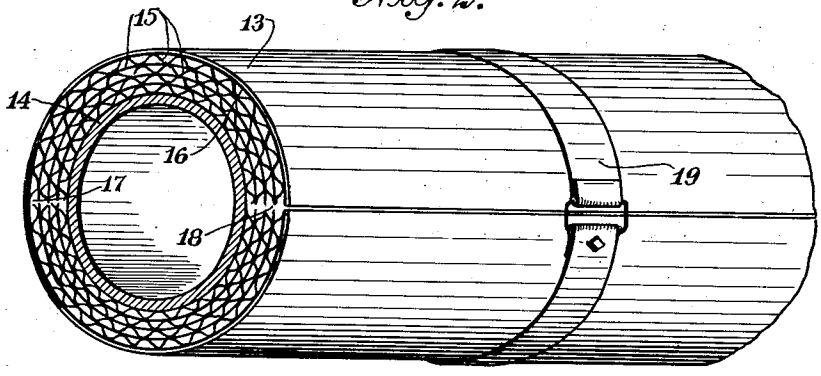
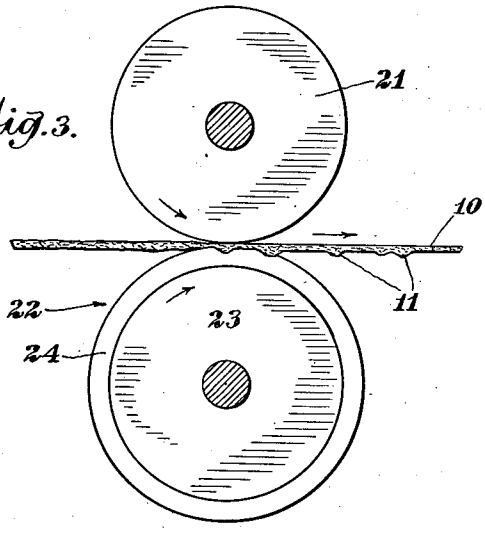


Fig. 3.



INVENTOR.
ROBERT E. PARRY.
BY Virgil C. Kline
ATTORNEY.

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UNITED STATES PATENT OFFICE

2,305,488

ASBESTOS PRODUCT

Robert E. Parry, Manville, N. J., assignor to Johns-Manville Corporation, New York, N. Y., a corporation of New York

Application January 5, 1938, Serial No. 183,426

4 Claims. (Cl. 154—44)

This invention relates to an asbestos product and the method of making the same. More particularly the invention relates to an article including asbestos paper, millboard, or the like and a coloring composition, of kind to be described, extending over a face of the asbestos article.

In the preferred embodiment, the invention comprises the method of forming a relatively smooth-faced asbestos sheet by calendering in special manner. The invention comprises, also, the application to asbestos paper of a flexible coloring composition permitting flexing of the paper during use, as well as applying a protective film over the said composition. Further, the invention comprises the product resulting from the method described herein.

The product of the present invention is useful for a variety of purposes requiring a smooth-surfaced or decorative asbestos product, as, for example, wall covering, other building material, or heat insulation. Because of the special desirability of the product for heat insulation, the invention will be illustrated by detailed description in connection therewith.

It is an object of the invention to provide an insulating, decorative, washable, and preferably grease/resistant article, such as covering for hot water tanks, steam pipes of relatively low temperature, water lines, or the like. Other objects and advantages will appear from the description of the invention.

For the purpose of illustration, the invention will be described in connection with the attached drawing.

Fig. 1 shows in elevation an edge view of an asbestos paper product made in accordance with the invention.

Fig. 2 is a perspective view of my improved heat insulation partly assembled around a pipe to be insulated.

Fig. 3 shows diagrammatically a side elevational view of apparatus used in the calendering step of my method.

There is shown a sheet of paper 10 containing matted asbestos fibres and, interspersed therewith, fibrous clots or other lumps 11, individually of thickness greater than the thickness of the finished paper. The clots or lumps on one side, lie approximately flush with the plane of the face of the paper and, on the other side, extend beyond the plane of the back of the paper.

Applied to the relatively smooth face of the paper is the coating 12 of coloring composition over which there preferably extends a continuous film 13 of protective material of kind to be described later.

The heat insulating assembly of Fig. 2 includes the pipe 14 and tubular insulation thereabout. The insulation comprises a composite of sheets 15 of asbestos paper or the like. The several sheets of paper are, suitably, spaced apart, as by alternating corrugated sheets with sheets of regular surface.

The outer layer of the insulating material is the asbestos paper 16 of generally regular surface (as distinguished from corrugated or indented).

The tubular insulation is provided with a hinge-like joint 17 formed by the saw kerf extending longitudinally of the section and nearly but not quite through the layer of insulating material, from the inside towards the outside thereof. At a longitudinal position that may be approximately opposite the joint, there is discontinuity of the layer of insulating material, at position 18, so that the tubular material may be opened upon the joint 17 and then closed by being brought together at 18, after insertion around the pipe. Bands 19 may be used to hold the insulation around the pipe.

In making my product, I first form an asbestos paper by methods and machinery that are conventional, except as noted.

Care is taken to disperse well the fibres, as, for instance, by passage of ordinary, commercially milled asbestos through an additional willow machine of usual type, in which the milling action is caused by a series of rapidly rotated, pivotally mounted metal bars or hammers. The machine is provided with a grating below the rotating hammers and with means for forcing a draft of air upwardly through the grating and the hammer chamber. Unmilled asbestos particles tend to move downwardly through the grating and to be eliminated, whereas the well dispersed fibres are carried upwardly and out of the mill, by means of the air stream.

The well dispersed asbestos fibres so produced are then made into paper. Admixtures may be made to the dilute aqueous suspension of the fibres in the paper beater. Thus, there may be added a binder, organic fibres, and a water-repellent material, all in proportions that are usual in asbestos paper manufacture for heat insulation.

Water repellence may be imparted as described in U. S. Patent 1,972,500 issued to Toohey and Williams on September 4, 1934.

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The proportion of water-repellent material should be small, so as to preserve the penetrability of the paper to liquid water but make such penetration very slow. A typical proportion of such added ingredients is as follows: starch binder 2 to 4%, sulfite wood pulp 12 to 20%, and well dispersed, emulsified paraffin wax 2 to 5%, the percentages being parts dry weight of the several ingredients on the dry weight of the paper. One or more of the admixtures may be omitted if its function is not desired.

The mixture is felted (matted) and finished into paper. The paper is then formed into range boiler covering, pipe covering, or the like by usual methods and machines. For example, a portion of the paper may be corrugated or indented and then composited with alternating sheets of the paper of plane surface, so that adjacent sheets are spaced apart by the irregularities of surface of the indented or corrugated paper. The composited sheets are adhered by a suitable adhesive, as, for instance, sodium silicate. Tubular pipe covering may be made from my special paper generally as described in United States Patents 1,444,395; 1,444,396, and 1,444,397, to Seigle. The hinge joint 17 and severance at the zone 18 may be formed as described in United States Patent 2,051,076 to Deakin. However, the outer insulating sheet, of generally regular surface, is decoratively coated preferably before being applied, as a part of the tube or other insulating article.

In spite of the care used in obtaining well dispersed fibres, by the extra willow treatment described in a previous paragraph, fibrous clots (pencils of imperfectly milled asbestos) or lumps remain in a certain proportion. They appear in the finished paper as irregularities of surface. These irregularities are exaggerated in conspicuousness when the paper containing such irregularities is given a relatively smooth coating of coloring composition.

To obviate this difficulty, a special method and calender have been devised, to smooth the face of the paper to which the coloring composition is to be applied. The calender includes a hard calender roller 21, suitably of chilled iron or hardened steel, having a carefully ground and regular surface of cylindrical shape. Coacting with this roller is a juxtaposed roller having an exterior portion that is relatively soft and resiliently yieldable. This roller 22 has suitably an iron or steel core 23. Its exterior is rubbery and, suitably, is composed of a layer 24 of vulcanized rubber composition, neoprene composition, or the like. This layer is of substantial thickness, say, one-fourth to one inch, so that it may be dented, but only temporarily, by the clots, grit, or lumps found in the asbestos paper. The rubbery composition used should be one that feels hard to the touch but which may be dented readily by the finger nail. In a typical calender assembly, the rolls may be each about 12–16 in. in diameter. Usual calender pressures are applied, under which pressure the rubber-surfaced roller is flattened or dished slightly at the bight between the two rollers. The paper to be calendered is passed between the rollers. On issuing from the calender, the paper has a relatively smooth surface formed by the roller 21 and a rough back, clots and lumps having been forced backwardly in the paper.

In contrast with this result, calendering in ordinary manner presses the clots, developing holes or shiny spots that do not take a coating properly.

The paper is next coated over its smooth face by the coloring composition applied in fluent, hardenable condition. The composition is then hardened, after which there is applied the protecting film 13 of lacquer or the like which extends continuously over the coating composition 12.

Because the finished article ordinarily is flexed during use or during installation in the position of use, the coating composition selected is one that, when dry, will be flexible without cracking. This requirement is particularly severe; the pipe covering shown in Fig. 2, when being installed around the pipe, must be opened at a sharp angle along the joint 17, without cracking or marring the appearance of the coating.

I have found that a suitable coating is one containing an intimate mixture of a binder and a flexibility-imparting agent (flexibilizing agent).

This agent should be one that can be mixed intimately with the fluent binder composition and that will provide a high degree of flexibility to the finished coating. Such an agent is rubber. Another is polymerized chloroprene of rubbery consistency (neoprene). When the binder is used in an aqueous composition, the flexibilizing agent is added to the said composition in the form of an aqueous dispersion, of which latex is an example.

Various binders, that is, vehicles may be used in the coloring composition. The binder should be one that will become anchored properly to the asbestos paper to which it is applied and that will not deteriorate at an appreciable rate during use of the insulation with the coating in place on the outside thereof. Also, the binder is preferably one that, in conjunction with the other ingredients, imparts a fair degree of viscosity to the finished composition for coating, so that the composition will bridge over minor irregularities on the face of the asbestos paper to which the composition is applied.

Of the vehicles having these general properties, the preferred one is casein. When casein is used, it is dispersed in water, advantageously with the aid of a small proportion of an alkaline salt, in accordance with usual practice. Starch or glue may be used when water-resistance of the binder is not necessary; they may be dispersed in warm water, for being mixed with the other ingredients and applied to the paper.

The flexibilizing agent, such as latex or a similar dispersion of neoprene in water, is mixed with binder solution or dispersion. Usual compounding ingredients may be present, as, for instance, vulcanizing and/or antioxidation agents. Into the aqueous composition there are also admixed fillers or pigments to establish the desired opacity or color.

For decorative effect, the coating composition should include pigmentary material, this term including fillers and pigments. Such materials that may be used are satin white (a white powder including lime and alum as raw materials), fine clay, titanium oxide pigment, and/or zinc oxide. If a color other than white is desired, then there are used pigments of desired color that are non-reactive with the other ingredients of the composition.

Also, there may be used a smoothing agent, such, for example, as a small proportion of a high boiling mineral oil or paraffin wax, this

agent in addition to its smoothing effect on the film, giving, also, some waterproofing.

In a typical coating composition there have been used about 2 to 4 parts by weight, preferably 3 parts, of rubber in the form of latex to 1 part of casein, in conjunction with about 25 to 35 parts of fillers and pigments, the pigments of high coloring capacity, such as titanium oxide, being about 2 to 5 parts to 1 of the casein. Into this composition, before application to the asbestos paper, there was also admixed about 2 parts of paraffin wax, as the waterproofing and smoothing agent, and 20 to 25 parts of water in addition to the water in the latex.

In another coating composition there were present, for each part of casein, about 5 parts of rubber, in the form of a 60% latex solution, 0.1 part soda ash, and 0.04 part ammonium hydroxide, along with 4 parts of water in addition to the water in the latex.

In making the composition, the casein is suitably dissolved first. Thus, it is soaked for a half hour or so with a part of the water that is to be present in the finished composition along with the selected alkaline material to increase the solubility of the casein, as, for instance, in the presence of the sodium carbonate and ammonium hydroxide above specified. The mixture is then heated to a moderately elevated temperature, say, to about 140 to 160° F., and stirred until the casein is dissolved or dispersed. Then there are added the remainder of the water, the dispersion of the flexibilizing agent, and fillers and pigments to establish the opacity and color. The smoothing agent is then added and the whole thoroughly mixed.

The coloring composition, made, for example, as described above, is applied to asbestos paper. In using asbestos paper that has been calendered on one side against the hard roller and on the other against a yieldable backing, the coating is applied to the face that has been smoothed by contact with the hard roller.

The coating may be made by a conventional machine and method. Thus, it may be spread continuously upon the paper by means of a reverse roller coating machine. In such a machine, the coloring composition is supplied as a layer of regulated thickness to a roller which is rotated counter to the direction of movement of the paper, while the paper is being drawn against the roller in generally tangential relationship.

The thickness of coating is such as to form a relatively smooth film that fills minor irregularities of the paper and gives adequate covering and coloring power, to make a finished article of color of the exterior that is not influenced appreciably by the color of the paper which is coated.

The coating on the paper is then hardened, as by evaporation of the volatile extender therein. Using the aqueous casein coating composition, hardening is effected by evaporation of water. This evaporation may be effected at a moderately elevated temperature, in a typical paper drier, say, of the festoon type, in which the coating is kept free from contacts until after it is dried.

Other methods of application of the coating include the use of revolving or oscillating brushes or of a coating knife, each in a conventional assembly.

The coated paper is then composited into the insulating article, so that it constitutes the outer insulating element of the insulating article when the article is in use. Thus, the coated paper may serve as the outside layer of asbestos paper of the articles described in the said patents to Seigle and to Deakin or of flexible composites of spaced sheets of asbestos paper of large area and design adapting them to be shaped around cylindrical tanks, such as range boilers.

In such use, however, there is difficulty due to spotting off the otherwise attractive colored coating, when the coating is handled with the hands or otherwise subjected to soiling conditions.

To obviate this difficulty when it exists, the coloring composition should be protected by a film of lacquer or the like which is substantially impermeable to grease or to acidic material present in perspiration. When the coating composition includes an ingredient that deteriorates in the presence of air, as, for instance, rubber, then the protective film should also be substantially air-impermeable, so as to minimize the access of air to the said ingredient. The film should be water-washable without injury.

I have used to advantage a protective film of pyroxylin lacquer of the kind ordinarily used in coating paper. Other protective films may be used, as, for instance, one containing as the chief film-forming ingredient vinylite or cellulose acetate, dissolved for application in usual solvent mixtures for the said ingredient of selected kind.

The lacquer may be applied to advantage with a reverse roll coating machine or as is described above, for the coating.

After the lacquer is applied, hardening is produced by the evaporation of the volatile extenders or solvents originally present.

In addition to the calendering that has been described, the article may be calendered additionally, either after the application and hardening of the coloring composition or after the application and hardening of the protective film. The greatest smoothness of the finished article is obtained when calendering is done before the coating with the coloring composition, after the coating, and also after the lacquering. Calendering the paper bearing the hardened coloring coating tends to smooth the coating and force it firmly into the outer portions of the paper. Calendering after the hardening of the protective film serves to smooth and polish the film.

The asbestos paper, to which the coating described is applied and which constitutes the outer insulating element of my finished article, is preferably relatively stiff, as distinguished from papers that are limp. The stiffness of the paper should be such that it will preserve its generally regular shape, whether cylindrical or plane, when applied over portions of an insulating article that are not smooth. Illustrating the degree of stiffness of the paper which carries the coating is the fact that there is best used asbestos paper weighing 7 to 12 pounds to 100 square feet of the paper, the paper including the starch binder and admixed wood pulp in about the proportions illustrated numerically above.

The coating composition containing casein as the vehicle or binder adheres particularly well to asbestos paper. While the invention is not limited to any theory of explanation of the results obtained, it is considered probable that the adherence of the casein to the asbestos is improved to a large extent by chemical reaction of the casein with the basic ingredients of the asbestos fibres and the consequent integral union of that part of the casein with the fibres of the paper.

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After the insulating article, containing rubber or neoprene in the coating composition, has been applied around a normally warm object to be insulated and flexibility is no longer particularly necessary, the subsequent warming, to which the insulation is subjected during use, causes hardening of the rubber or neoprene. The degree of hardening is larger when the flexibilizing agent is rubber used initially in unvulcanized condition but in the presence of a vulcanizing agent or mixture.

For some purposes, the rubber used as flexibilizing agent may be prevulcanized. Thus, there may be used, as the source of rubber, a prevulcanized latex, such as Vultex.

The product so made is attractive in color, gloss, and regularity of the exposed face. Particularly because of the use of the small proportion of water-repellent material in the asbestos paper, the aqueous coating composition during application and drying does not sink into the paper excessively but stands up on the surface, with the production of a substantially smooth, continuous film. Because of the flexible nature of the coating, in final, hardened form, an article containing the coating may be flexed repeatedly and sharply, without cracking.

The details given are for the purpose of illustration, not restriction, and variations within the spirit of the invention are intended to be included in the scope of the appended claims.

What I claim is:

1. A flexible tubular heat insulating article of generally regular outer surface, the tube being severed longitudinally along one side so that it may be opened and applied around a curved surface to be insulated and then closed around said surface, comprising a composite of a plurality of sheets of asbestos paper, and a coating of coloring composition applied over the exposed face of the outer one of the sheets, the said composition including an intimate mixture of casein, a flexibility-imparting agent, and a pigmentary material.

2. Heat insulating pipe covering comprising a tube of composited sheets of asbestos paper, a hinge-like joint extending longitudinally of the tube, the tube being severed longitudinally at a position approximately opposite the said joint so that the tube may be opened for insertion around a pipe and then closed, and a flexible pigmented casein composition extending as a coating over the said outer sheet and joint.

3. Heat insulating pipe covering comprising a tube having a generally regular outer surface and including composited sheets of asbestos paper, a hinge-like joint extending longitudinally of the tube, the tube being severed longitudinally at a position approximately opposite the said joint so as to permit the tube to be opened for insertion around a pipe and then to be closed, a flexible composition containing an intimate mixture of casein and rubber extending as a coating over the outer asbestos sheet and joint and a film of substantially air-impermeable, grease-impermeable, and water-washable material extending continuously over the flexible coating.

4. An article of manufacture as described in claim 3, the said coating composition including rubber and casein in the proportion of approximately 3 parts of rubber to 1 of casein.

ROBERT E. PARRY.