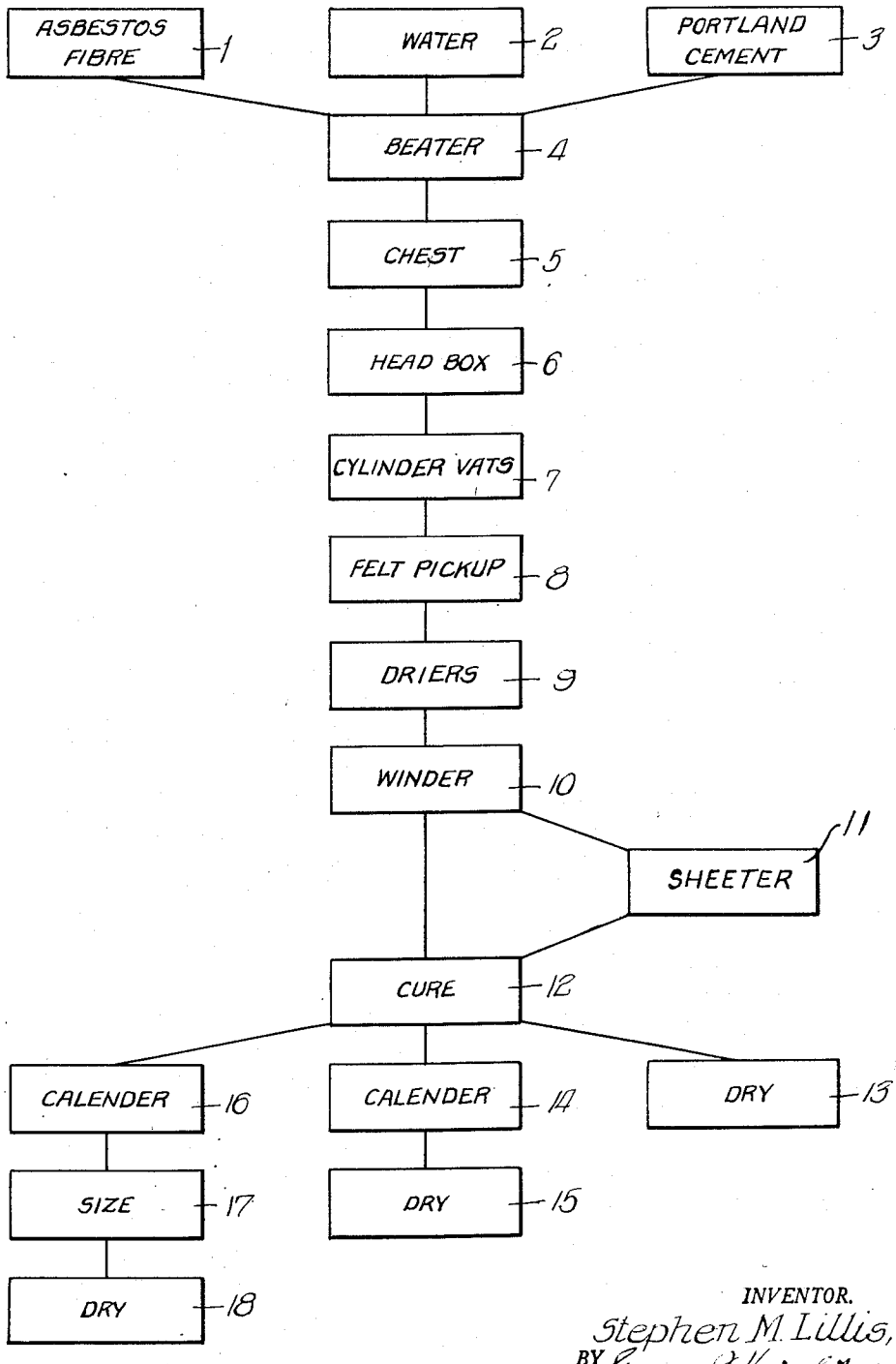
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METHOD OF MAKING CEMENT BOUND ASBESTOS PAPER

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METHOD OF MAKING CEMENT BOUND ASBESTOS PAPER

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This invention relates to a process for forming cement bonded asbestos paper on a continuous web type paper-making machine, and has for its principal object the provision of a new and improved process of this kind.

It is a main object of the invention to provide a process whereby cement bonded asbestos paper may be made in a continuous web on ordinary cylinder or multi-belt paper-making machines.

Another object of the invention is to provide a process for making cement bonded asbestos paper which includes the step of adding a sizing material to the paper prior to final drying thereof.

Still another object of the invention is to provide a process for making cement bonded asbestos paper which can be carried out economically to produce the paper at low cost.

Further objects of the invention not specifically mentioned here will be apparent from the description and claims which follow, reference being had to the accompanying drawing in which the process is diagrammatically illustrated.

Asbestos papers bonded by inorganic binders such as Portland cement have many uses, particularly as gaskets in internal combustion engines and the like. Because of the nature of the binding agent such papers have heretofore necessarily been made upon wet type machines which are capable of forming only comparatively small sheets which are relatively thick and consequently the cost of manufacture of such inorganic binder papers has been greater than the cost of papers bonded with organic fillers such as starch, since these latter papers have been made upon continuous web type machines.

The present invention provides a method whereby asbestos papers bonded with inorganic binders such as Portland cement may be made in a satisfactory and economic manner upon paper-making machines of the continuous web types. This type of paper-making machine has not been used heretofore in the manufacture of asbestos paper incorporating such inorganic binding material due to the fact that the dry paper emerges from the machine in about two or three minutes after it has entered the drying section of the machine as a wet web. An interval of two or three minutes is insufficient for the cement to hydrate properly; and without this hydration and in the presence of little or no moisture, the cement serves merely as a filler and not as a binder.

The present invention, through the use of a continuous web type paper machine, permits making cement bound asbestos paper of lighter gauge than has been possible heretofore and also at a cost that is lower than heretofore. The invention may be practiced on a cylinder type machine in which the fibers are picked up from the slurry by one or more cylinders, depending upon the thickness of the paper to be made, and transferred to the belt of the machine which is then run over squeeze rolls and vacuum elements to remove a part of the water from the web. If desired, in the formation of light gauge cement bound paper, shaker screen machines of the Fourdrinier type may advantageously be used.

In accordance with the present invention, the asbestos fibers and cement are brought together in the beater, together with sufficient water to form a slurry of solids content required for the successful operation of the paper machine. When the slurry in the beater is reduced to the desired condition, it is fed into the chest and from there to the head box and cylinder vats of the machine. The cylinders pick up the fibers from the slurry and transfer them to the belts of the machine to form a web of the required thickness. Water is drawn from the web by the usual mechanisms in the machine and the web passed over drying rolls which are arranged to lower the moisture content of the web to a point in the range of from 10 to 15%. With a moisture content in this range, the web is reasonably strong and can be rolled on the winding apparatus at the outgoing end of the machine to form rolls of convenient weight and size.

The web thus formed is allowed to stand for a period of time sufficient to permit complete hydration of the cement from the moisture contained in the web. If desired, this curing period may be conducted while the web is in the rolled up form or preferably the web may be cut into sheets of desired size which are stacked and allowed to stand under ordinary atmospheric conditions usually regarded as temperatures between 50 and 85° F. and humidity between 20 and 50%.

At the end of the curing period the sheets may be finished in a number of different ways depending upon the specifications to be met in the manufacture of the paper.

Referring now to the drawing in more detail, asbestos fibers indicated at **1**, water indicated at **2**, and Portland cement indicated at **3**, are brought together in the beater **4** in desired proportions. In one instance the slurry thus formed in the beater contained from 96 to 98% water and from 2 to 4% solids, the solids consisting of from 80 to 88% asbestos fibers, and from 12 to 20% Portland cement of grade having high initial strength. After the slurry is completed, it is transferred to the chest **5** in which it is maintained in a state of agitation until needed. From the chest **5**, the slurry is conducted to the head box **6** of the paper machine and from there, in the case of a cylinder machine, to the cylinder vats **7**. The cylinders pick up the fibers in the slurry and transfer them to the felt **8** to build up thereon a web of thickness depending upon the specifications of the paper being made. It will be understood that the number of cylinders employed will vary as required to produce the desired web thickness.

The felts and web are run over the usual instrumentalities of the paper machine to remove water therefrom by squeezing and by suction, after which the web passes off of the belt into the driers, as indicated at **9**. Paper-making machines of this type are provided with a plurality of heated drier rolls over which the web is passed and moisture removed therefrom by evaporation. Ordinarily the driers of a paper machine dry the web down to a very low moisture content and if the machine is operated in an ordinary manner the moisture content of the web at the output end of the machine will be so low that the cement will not hydrate and as a result, when the web is dried down to final moisture content, the cement will powder and be wholly incapable of bonding the fibers together in the manner desired.

To eliminate this trouble, I propose either to by-pass a part of the driers in the machine, passing the web over only a sufficient number of driers to reduce its moisture content down to a desired value, preferably in the range of from 10 to 15%. If desired, a larger number of driers may be used and the heating medium therein toned down

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so that the roll operates at a lesser temperature and consequently removes a smaller portion of the moisture from the web that passes over it. In any event, the machine must be operated so as to produce a web at the output end thereof which contains from 10 to 15% moisture.

This partially dry web ordinarily will be taken up on the winder mechanism at the output end of the machine, as indicated at **10**, and, if desired, can be cured in the roll thus formed. Preferably, however, the partially dry web is fed from the roll into a suitable sheeting mechanism **11** which cuts it up into sheets of a desired size, which are stacked on suitable skid platforms and the stacks thus formed stored under ordinary atmospheric conditions to provide for a cure of the cement therein, as indicated at **12**. It has been found that with a moisture content of from 10 to 15% in the thus partially dried web, a curing time of not less than 48 hours is sufficient to cause complete hydration of the cement, with the result that when the web is dried down to a final moisture content the cement will securely bind together the fibers therein.

At the end of the curing period the paper thus formed may be finished in a number of different ways, depending upon the desired specification to be built into it. In one instance the paper may be immediately dried down to a moisture content preferably below 1%, as indicated at **13**. Another finishing operation consists of calendering the paper, as indicated at **14**, and then drying it down to a less than 1% moisture content, as indicated at **15**. Still another finishing operation consists of calendering the paper, as indicated at **16**, and then applying thereto, preferably by spraying, a sizing solution, as indicated at **17**. A sizing solution suitable for this purpose consists of 91½% water and 8½% sodium silicate, and sufficient quantities of the solution are applied to the partially dried paper to increase the moisture content thereof up to approximately 35%. As a result of this treatment, when the paper is ultimately dried down to the final moisture content, as indicated at **18**, approximately 4½% of dry sodium silicate solids will be added thereto. The addition of this sizing material enhances the ability of the paper to repel water, and although the chemical reaction between the sodium silicate and the cement is not definitely set out in the printed literature, the results of the treatment are quite definitely set out and generally well known.

Paper made in accordance with the foregoing process can be held accurately to final dimension within the limits of commercial tolerances, and possesses characteristics equal to those possessed by paper made in the slower and consequently more expensive processes used heretofore. Furthermore, the process permits making cement bonded asbestos paper of lighter gauge than has been possible heretofore. Upon final drying, the fibers in the paper are found to be securely bound together, indicating that the hydration of the cement during the curing period has been satisfactorily completed and that there is no appreciable dusting off of the cement from the product.

Throughout the foregoing description, I have referred to the fibrous material as asbestos and the bonding agent as cement, these being elements commonly employed in the gasket-making industry. The teachings of the present invention are not limited to the particular ingredients mentioned by way of example, as other fibrous materials may be bonded together with inorganic binders other than Portland cement within the teachings of the process herein disclosed. The particular proportions of ingredients mentioned by way of example may likewise be varied to meet varying specifications within the teachings of the invention.

Having thus complied with the statutes and shown and described a preferred embodiment of my invention, what I consider new and desire to have protected by Letters Patent is pointed out in the appended claims.

What is claimed is:

1. The method of forming a thin cement bonded asbestos paper on a continuous web paper machine which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise 80 to 88% asbestos fibers and 12 to 20% Portland cement of high initial strength grade; forming from the slurry a continuous web of the desired thickness; applying heat to reduce the moisture content of the web to the range of from 10 to 15%; allowing the web to cure under ordinary atmospheric conditions for a period sufficiently long to cause the cement to hydrate completely; calendering the web; sizing the web to enhance the ability of the paper to repel water; and drying the web to a final moisture content of less than 1%.

2. The method of forming a thin cement bonded asbestos paper on a continuous web paper machine which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise 80 to 88% asbestos fibers and 12 to 20% Portland cement of high initial strength grade; forming from the slurry a continuous web of the desired thickness; applying heat to reduce the moisture content of the web to the range of from 10 to 15%; allowing the web to cure under ordinary atmospheric conditions for a period sufficiently long to cause the cement to hydrate completely; calendering the web; spraying the web with a sizing solution comprising 91.5% water and 8.5% sodium silicate to enhance the ability of the paper to repel water; and drying the web to a final moisture content of less than 1%.

3. The method of forming a thin cement bonded asbestos paper on a continuous web paper machine which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise 80 to 88% asbestos fibers and 12 to 20% Portland cement of high initial strength grade; forming from the slurry a continuous web of the desired thickness; applying heat to reduce the moisture content of the web to the range of from 10 to 15%; allowing the web to cure under ordinary atmospheric conditions for a period sufficiently long to cause the cement to hydrate completely; calendering the web; spraying the web with a sizing solution comprising 91.5% water and 8.5% sodium silicate to add sufficient solution thereto to bring the moisture content of the web up to 35%; and drying the web to a final moisture content of less than 1%.

4. The method of forming on a continuous web paper machine a continuous thin asbestos paper web bonded with Portland cement, which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise 80 to 88% asbestos fibers and 12 to 20% Portland cement; forming from the slurry a continuous web of the desired thickness; applying heat to reduce the moisture content of the web to the range of from 10% to 15% cutting the web into sheets; storing the sheets under ordinary atmospheric conditions for a period long enough to cause the cement to hydrate completely; and finishing the thus cured web to desired physical characteristics and moisture content of less than 1%.

5. The method of forming on a continuous web paper machine a continuous thin asbestos paper web bonded with Portland cement, which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise 80 to 88% asbestos fibers and 12 to 20% Portland cement; forming from the slurry a continuous web of the desired thickness; applying heat to reduce the moisture content of the web to the range of from 10 to 15%; cutting the web into sheets; storing the sheets under ordinary atmospheric conditions for a period of not less than 48 hours to cause the cement to hydrate completely; and finishing the thus cured web to desired physical characteristics and moisture content of less than 1%.

6. The method of forming a continuous web of cement bonded asbestos paper on a continuous web paper ma-

chine, which comprises: forming a slurry having from 96 to 98% water, the solids of which slurry comprise from 80 to 88% asbestos fibers and 12 to 20% Portland cement of high initial strength grade; forming from the slurry a continuous web of desired thickness; applying heat to rapidly reduce the moisture content of the web to the range of from 10 to 15%; cutting the web into sheets; storing the sheets under ordinary atmospheric conditions for a period long enough to cause the cement to hydrate completely; and thereafter finishing the web to desired physical characteristics and moisture content of less than 1%.

7. A process as claimed in claim 6, in which the finishing of the cured web includes calendering and sizing.

8. A process as claimed in claim 6, in which the finishing of the cured web includes calendering.

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