Oct. 29, 1935. F. W. KING 2,019,417

METHOD OF MANUFACTURE OF HEAT NONCONDUCTING COVERINGS FOR PIPES AND THE LIKE

Filed March 7, 1933 2 Sheets-Sheet 1

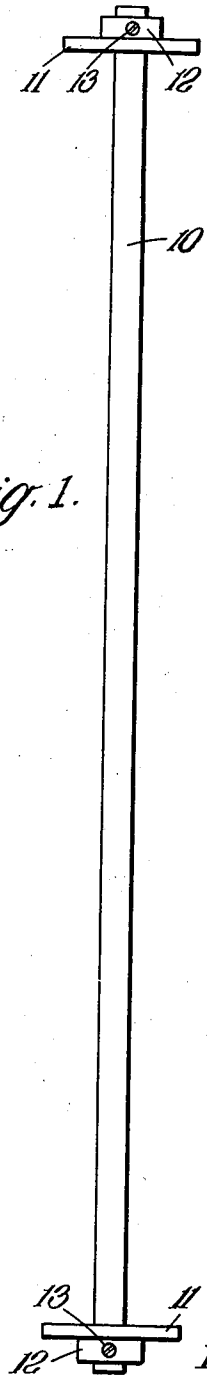


Fig. 1.

Inventor
Frederick W. King
by Wilkinson & Mawhinney
Attorneys.

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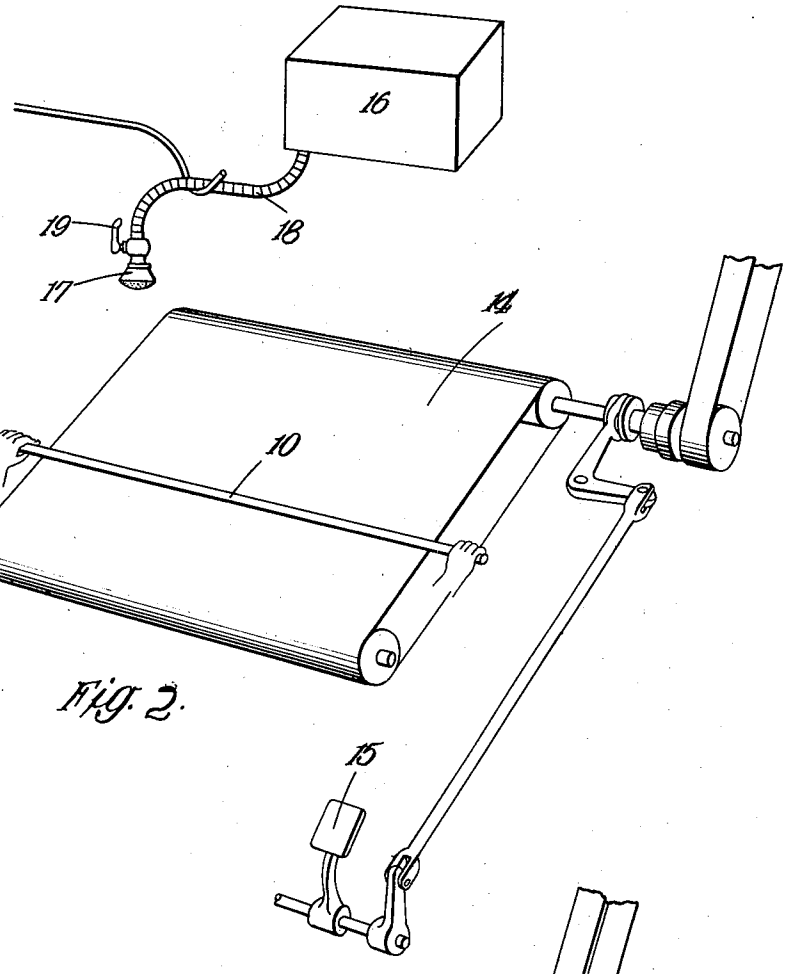


Fig. 2.

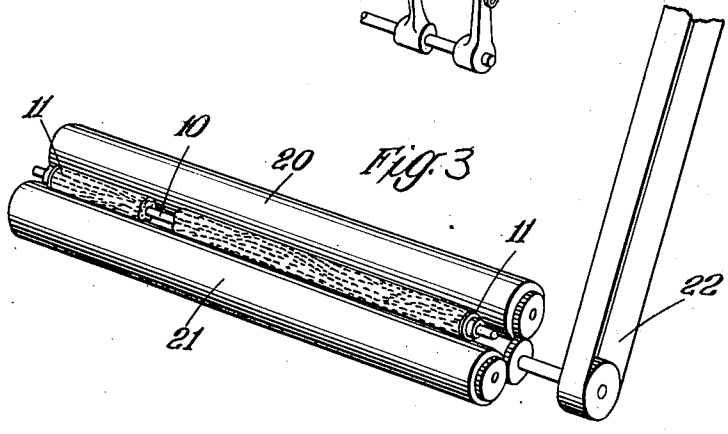


Fig. 3

Inventor
F. W. King
by Wilkinson & Mawhinney
Attorneys.

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UNITED STATES PATENT OFFICE

2,019,417

METHOD OF MANUFACTURE OF HEAT NON-CONDUCTING COVERINGS FOR PIPES AND THE LIKE

Frederick William King, Barking, England, assignor to The Cape Asbestos Company Limited, London, England, a joint-stock company of England

Application March 7, 1933, Serial No. 659,964

8 Claims. (Cl. 154—28)

This invention consists of a method and means for the manufacture, from "Amosite" asbestos or other asbestos, of heat non-conducting coverings for pipes or the like, of round, oval or other suitable shape in cross section. This invention will hereinafter be described as carried into practice for the manufacture from asbestos of heat non-conducting coverings for pipes or tubes of circular shape in cross section; it being understood that heat non-conducting coverings may be manufactured from asbestos according to this invention for application to pipes or tubes of other than circular shape in cross section as desired.

Further, this invention will hereinafter be described as carried into practice for the manufacture of such coverings from "Amosite" asbestos.

The preliminary treatment and preparation of the raw "Amosite" asbestos, in readiness to be used in the process of this invention, is such that the fibre of the "Amosite" asbestos is thoroughly opened and screened so that the fibre is in a suitable state (i. e. in a well "lofted" condition) to be formed into coverings by the process and apparatus hereinafter described; and this preliminary treatment may be effected in the manner and by the means described in the specification of United States Patent No. 1,617,803; and it may be emphasized here that the more thorough the preparation of the fibre in this preliminary treatment the more efficient will be the covering, the better the appearance of the finished article, and the more economical will be the process of the present invention as less fibre will be used.

The present invention consists in various features of the improved method, either severally or together or any combination thereof, as herein set forth and particularly described with reference to the accompanying drawings and as defined in the appended claims and includes such modifications as will occur to those skilled in the art within the scope of said claims.

In the drawings:—

Figure 1 shows a mandrel with gauging flanges in place.

Figure 2 shows somewhat diagrammatically the apparatus for building up a tubular mass of moist asbestos fibre on a mandrel.

Figure 3 shows also somewhat diagrammatically the apparatus for rolling and gauging said tubular mass on the mandrel to the required diameter.

The process and means of the present invention is as follows:—

The "Amosite" asbestos fibre—opened and thoroughly prepared as aforesaid—is fed on to and spread in a layer of suitable depth (e. g. about two inches in depth) on an endless travelling band or belt 14 in a fibre feeding machine (Fig. 3) (the speed of travel of which band or belt is slow—and can be regulated) which thus slowly advances this layer of loose fibre on said band or belt towards the operative attending this feeding machine.

As will be seen hereafter the process requires the frequent starting and stopping of the travelling belt and for this purpose a pedal 15 may conveniently be provided on said feeding machine, said pedal being suitably positioned for the use of the operative.

In the process according to this invention of forming a length of pipe cover, hereinafter referred to as a "sectional covering," I employ a mandrel 10 adapted to be held in contact with the asbestos fibre and free to revolve or to be rolled on the fibre as the latter moves slowly forward on the travelling belt, the said fibre having been previously damped with an adhesive solution.

The adhesive solution used to bind together the asbestos fibre is a dilute solution of silicate of soda. For this purpose the ordinary commercial silicate of soda is suitable. This material may be obtained in varying strengths and varying ratios of silica to soda. A convenient strength for the purposes of this invention is from 70° to 80° Twaddell (specific gravity from 1.35 to 1.40) and a convenient silica to soda ratio lies between 3 to 1 and 3.5 to 1.

For the purposes of the present invention this solution must be further diluted with water to a strength of about 9° Twaddell (specific gravity 1.045), the volume of water required for this being about eight times the original volume of the strong solution of silicate of soda. The exact strength of the dilute solution may be varied within small limits about the mean value of 9° Twaddell according to the required character of the finished sectional covering; a stronger solution than the normal being used to produce a specially hard covering, while a softer covering than the normal can be obtained by using a somewhat weaker solution.

A simple direct reading hydrometer may be used for testing the strength of the solution.

The silicate of soda solution diluted as aforesaid is stored in a tank or tanks 16 raised above the level of the travelling belt and is delivered to a sprinkling device through a convenient pipe

system. The sprinkling device preferably comprises a rose 17 mounted on the end of a short length 18 of armoured flexible hose having a spring or the like cock 19 arranged close to the rose. The rose and cock can be conveniently manipulated by the operative.

The operation of the process proceeds as follows:—

The travelling belt 14 is run until the exposed part thereof is covered with a layer of fibre. It is then stopped and the layer of fibre is sprayed or spread with the silicate of soda solution until it is damped all over. The belt is then started again and the mandrel brought in contact with the damped fibre. The mandrel is made to rotate in contact with the damp fibre so that it licks up the fibre which is thus collected upon the mandrel. The rotation of the mandrel is conveniently obtained by rolling it on the travelling belt as the latter advances towards the operative. No special apparatus is necessary for this, the ends of the mandrel being supported by the operative's hands. When the wetted part of the fibre has thus been collected on the mandrel, the belt is again moved forward with a further part thereof covered with fresh dry fibre and when sufficiently moved the belt is again stopped and the fresh surface of fibre thereon is sprayed or spread with solution as before. The belt is then started again and the mandrel further rolled thereon, whereby it licks up or collects a further layer or layers of damp fibre.

This series of operations is continued until the mandrel has collected and accumulated thereon approximately the desired thickness of fibre. In order to allow for the effect of the finishing process the thickness of the material should be made up to a somewhat greater thickness than will finally be required; a suitable allowance being about one-quarter of an inch additional for every inch of thickness required in the finished sectional covering.

The mandrel used in this process may be solid or hollow and is preferably of solid drawn steel tube and a convenient thickness for the tube walls is 16 S. W. G. For making sectional coverings of a standard length of 36 inches the mandrel should be about 42 inches long and the outside diameter of the mandrel should correspond to the inside diameter of the sectional covering it is required to make. Since the sectional covering is subsequently split longitudinally into two half-sleeves for assembling purposes, an allowance is made for the material removed in the splitting process, that is the diameter of the mandrel is slightly greater than the eventual inside diameter of the sectional covering. The longitudinal splitting of the sectional covering may conveniently be performed with a saw and the allowance on the diameter of the mandrel would depend on the width of the saw cut. If a band saw is used the allowance will be practically negligible, but if a circular saw is employed an allowance of about one-eighth of an inch on the diameter is suitable.

For mandrels of the larger diameters it is convenient to provide a pair of holes arranged diametrically opposite one another near one end of the mandrel for the insertion of a tommy bar for use in withdrawing the mandrel from the sectional covering. In order to prevent adhesion of the damp fibre to the mandrel and to enable the latter to be withdrawn, the mandrel must first be well oiled with waste oil or soft soap before beginning to build up the damp fibre on it.

When a sufficient thickness of fibre has been built up on the mandrel it is removed from the travelling belt. The ends of the accumulated fibre are then blocked up or packed up by means of flanges threaded over the ends of the mandrel, said flanges being rammed up against the ends of the accumulated fibre. These flanges may conveniently be in the form of steel or wooden discs bored to slip easily over the mandrel. Alternatively, gauging flanges which are hereinafter described may be used for this purpose. During the blocking up or packing up of the ends of the partly formed sectional covering the mandrel may conveniently be placed in a tray of larger size than the outer diameter of the sectional covering.

When the ends have been blocked up or packed as aforesaid; the gauging flanges above referred to are fitted on the ends of the mandrel. These flanges are in the form of flat discs of wood or metal having a central hole which is a good fit on the mandrel. Their outside diameter corresponds exactly to the outside diameter of the finished sectional covering. A pair of these flanges having been fitted on the ends of the mandrel (against the ends of the fibre accumulated thereon), they are secured in position on the mandrel by any convenient means provided for holding them in position.

In Figs. 1 and 2; the mandrel is shown at 10 and the gauging flanges at 11. Each flange comprises an integral collar 12 which is provided with a set screw 13 for securing it to the mandrel. In the example illustrated the proportions of the mandrel and the gauging flanges correspond to a mandrel of one inch diameter and gauging flanges of four inches diameter, such as will be used in forming a sectional covering of one inch internal diameter and four inches external diameter, i. e. having a thickness of one-and-a-half inches.

The next stage in the process (see Fig. 3) consists in placing the mandrel, carrying the accumulation of damp fibre and with the gauging flanges in position on the ends of the mandrel, on a pair of wooden rollers 20, 21 arranged parallel and close to one another. The length of these rollers exceeds that of the sectional covering in formation plus the thickness of the gauging flanges, so that when the mandrel with the flanges in position thereon is placed on the rollers the gauging flanges are supported by the rollers. The latter are provided with any convenient drive means 22 for rotating them at a fairly rapid rate in the same direction. These wooden rollers are first damped with silicate of soda solution and the mandrel with the partly finished sectional covering is placed on them before they are set in rotation. The mandrel with its load of damp fibre rests in the trough-like depression formed between the adjacent faces of the rollers and the diameter of the rollers should be sufficiently great to provide a reasonably wide arc between the lines of contact of each roller with the sectional covering on the mandrel, even when operating on sectional coverings of the largest diameter it is proposed to work with.

When the rollers are started up the partly finished sectional covering is rapidly rotated by the rollers and its external surface is smoothed off to a true circular form and rapidly reduced to the diameter of the gauging flanges, the damp fibre of which it is composed being slightly compacted in the process. In general the weight of the mandrel and its flanges and the fibre thereon is

sufficient to provide the necessary contact pressure on the surface of the sectional covering. While the latter (on its mandrel) is revolving on the rollers any holes or depressions in the surface thereof may be made up with fibre thrown on by hand by the operative, for which purpose a bin of loose fibre is conveniently provided alongside the roller apparatus. The initial wetting of the rollers with silicate of soda solution must be sufficiently thorough to give a smooth damp finish to the sectional covering.

The production on the roller device of the required smooth damp finish, gauged to the diameter of the gauging flanges, only occupies a short time. The rollers are then stopped and the mandrel with the damp but otherwise now formed sectional covering is then removed and placed in a tray for drying purposes. The drying tray is preferably in the form of a semi-circular iron trough, a convenient thickness being 16 S. W. G., which may be suitably strengthened by means of an iron band round each end and a longitudinal strengthening strip of iron arranged centrally along its underside. Convenient proportions for the strengthening bands and strip are one inch wide by one-quarter of an inch thick.

It is important that the semi-circular trough be made of the correct radius to fit the sectional covering, since the accuracy of shape in the finished article depends very largely on its being adequately supported at all points during the drying operation. It is therefore convenient to have a large supply of drying trays of varying sizes to fit any size of sectional covering which it is proposed to manufacture.

The damp sectional covering having been placed in the drying tray one gauging flange is removed and the mandrel is then drawn out through the other flange, a twisting motion being employed to enable the mandrel to be drawn out. Great care must be exercised in performing this operation in order to prevent distortion of the sectional covering, but if the mandrel has been sufficiently greased originally the operation can be performed without difficulty.

In the case of sectional coverings of large internal diameter the large and heavy mandrel can be more easily removed with the assistance of a tommy bar inserted through the holes provided for the purpose as hereinbefore described.

The drying of the sectional coverings is carried out in a coke or oil fired oven with external heating. The oven is preferably provided with heating flues arranged along the side walls and underneath the floor. The flues lead into a chimney in the ordinary way and in order to introduce a current of drying air through the oven a secondary chimney communicating with the interior of the oven is preferably provided surrounding the flue chimney, the heat of which provides the draught for ventilating the oven. In order to conserve heat the secondary chimney is preferably well lagged. Air ports are provided round the sides of the oven for the ingress of the ventilating draught.

The duration of the drying operation should be about eight hours, during the last two hours of which the temperature in the oven should be about 450° F.

After the drying operation the sectional coverings should be allowed to cool naturally in the outside air.

For the drying operation it is convenient to load the sectional coverings in their drying trays on to trucks which are run into the oven, the floor of which may be of iron and provided with rails for this purpose. The following dimensions for the oven are given merely by way of example as convenient for ordinary practice:—

18 feet x 10 feet x 6½ feet high

An oven of this size would conveniently accommodate eight trucks.

In order to conserve heat and economize fuel it is desirable to work the drying operation as a continuous process, three charges being dried in each twenty-four hours.

After drying and cooling the sectional coverings are subjected to a cutting operation for which a power saw may conveniently be used. The cutting operation consists in trimming and cutting the ends to correct length followed by splitting the sectional coverings centrally along their length into two halves. For the cutting operations a band saw is preferably employed but this must have a wide bench for easy manipulation. Alternatively a circular saw may be employed having a tooth-pitch of about one centimetre and a tooth-depth of about the same measurement. This type of saw will give a cut about one-eighth of an inch wide, for which reason it is necessary to make the internal diameter of the sectional covering about one-eighth of an inch greater than the diameter finally required, as hereinbefore mentioned.

The sectional covers as made by the process herein described may be sold for use in two halves as they come from the cutting operation without further treatment, but it is usual to carry out a further step of "canvassing" the sectional covers. The two halves are placed together and a canvas cover cut to the required size is wrapped round and adhered by any suitable adhesive and finally secured by band clips. The canvas thus applied forms a convenient hinge between the two halves of the covering when it is required to assemble or fit it on a pipe or the like.

What I claim is:—

1. In the method of producing insulating coverings for pipes or the like the process which comprises smoothing and finishing to gauge diameter, a tubular mass of the fiber moistened with a binding solution and which has been accumulated by a revolving mandrel and which involves placing said tubular mass with the mandrel inside on a pair of parallel rolls revolving in the same direction and gauging the diameter by means of flanges mounted on the ends of the mandrel, said flanges engaging with the rolls when the mass of fibres has been reduced to the desired diameter and preventing any further reduction in said diameter.

2. The method as claimed in claim 6 in which the binding medium comprises silicate of soda.

3. The method as claimed in claim 1 in which the surfaces of the rolls are moistened with silicate of soda to provide a smooth damp surface to the insulating covering.

4. The method as claimed in claim 7 in which the surface of the mandrel is lubricated before accumulating the mass of the fibres so that said mandrel can be withdrawn from the finished covering while the covering is still wet.

5. The method of producing insulating coverings for pipes or the like from asbestos fibre to which a disintegrating or lofting treatment has previously been applied; which method comprises, applying a binding agent to the fibres and causing them to come into contact with a rotating cylindrical mandrel, whereby said man-

drel is formed with a coating of the desired depth of the fibers, applying a finishing operation to the cylindrical mass of moist fibers which comprises supporting the mandrel and its accumulated mass on closely spaced parallel rollers rotated in similar directions and automatically gauging the final diameter of the insulating covering during the rolling and smoothing operation, removing the mandrel from the finished covering and finally baking the covering in an oven until it is quite dry.

6. In the method of producing insulating coverings for pipes or the like the process which comprises building up on a revolving mandrel a tubular mass of preliminarily treated asbestos fibre which has been moistened with a binding solution, said moist fibre being picked up by the mandrel from a slowly moving conveyor and the tubular mass thereof subsequently brought to a predetermined external diameter by a rolling operation which comprises supporting the mandrel with its accumulated mass in contact with at least one smooth surfaced rotating roller.

7. In the method of producing insulating coverings for pipes or the like the process which comprises accumulating a tubular mass of asbestos fibres, previously moistened with a binding medium on a revolving mandrel, rotating said moistened tubular mass by contact with at least one continuously rotating roller while still on the mandrel to bring said tubular mass to a predetermined external diameter and to smooth the outer surface thereof of the covering, placing said covering in a trough-shaped tray shaped to fit the external diameter of the covering and adapted to support the same without applying pressure and withdrawing the mandrel from the wet covering while in the trough-shaped tray, and finally drying the covering while in the tray in an externally fired oven.

8. The method as claimed in claim 6 in which the binding medium consists of a dilute solution of silicate of soda of about nine degrees Twaddell.

FREDERICK WILLIAM KING.