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MANUFACTURE OF PIPES OR HOLLOW WARE OF FIBROUS CEMENT MORTAR OR THE LIKE

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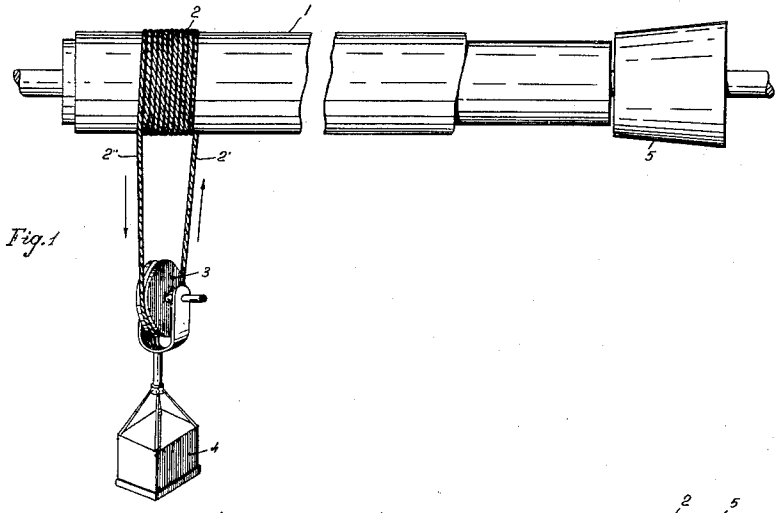



Fig. 1

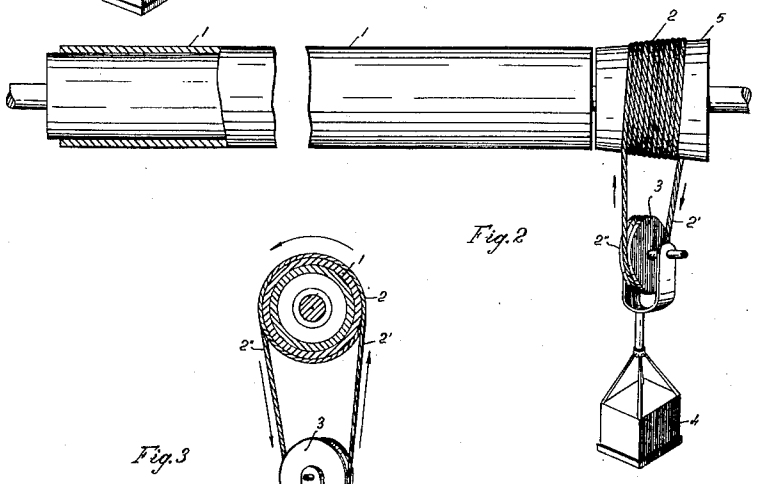



Fig. 2




Fig. 3

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## MANUFACTURE OF PIPES OR HOLLOW WARE OF FIBROUS CEMENT MORTAR OR THE LIKE

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3 Claims. (Cl. 25—30)

This invention relates to a new and improved method for manufacturing and compressing tubes or pipes made of a plastic concrete mortar either fibrous or not.

The manufacturing of pipes of concrete either fibrous or not, has been based heretofore on the same processes and effected with the same mechanical means as used for the manufacture of sheeting of paper or pasteboard, such sheeting being successively rolled round a cylindrical mould or core and subjected to compression by means of rollers that pressed the pipe on the mould.

Such method of manufacture of pipes requires however cumbersome and highly expensive plants. Besides, the resistance to crushing, as well as to flection and internal pressure of the so produced pipes is exclusively afforded by the small fibres of the asbestos or other fibrous material and by the quality of the binding material with which the small fibres are mixed. And it is because of these conditions that special and great care must be given in the manufacturing of such pieces as well as with regard to the direction of the asbestos fibres as with respect to the uniformity and exactness of thickness of the wall of the pipes and also to the amount of compression of the individual sheet of paste out of which said wall is to be formed.

In spite however of any possible care the pipes made of artificial slate stand but low amounts of pressure and it is not possible to surely rely on the resistance of each individual pipe, as any small defect in the manufacture of the pipe is sufficient to cause its breaking.

Such inconvenience derives from the varying quality of the fibrous material and also from the method of manufacture, and specially from the method of compression of the wall of the pipe, owing to the fact that as said compression is applied by means of a rotating roller or rollers along one of the generatrices of the cylindrical mould on which the sheet of slate is being wound, said compression diminishes instead of increasing as the thickness of the pipe increases. This will be apparent when considering that the sheet to be wound always contains a large amount of water and is very plastic and therefore subject to greatly reduce its volume as the water is expelled. The first layer of sheet can be strongly compressed with no bad consequence as its becoming thinner results in a lengthening of the sheeting; but the same fact does not occur with the successive layers. If the compression is kept constant, an increase of the diameter of the pipe actually being formed will take place owing to the fact that, as the compression is exclusively applied along a generatrix of the pipe being formed, and as the material is plastic and not enclosed in a closed mould, the pipe will expand. To be more clearly understood, I shall say that the wall of the pipe becomes thinner along the line of actual compression whilst it thickens beyond said line. In other words, a real phenomenon of lamination of the material takes place, thence the necessity of reducing the amount of compression as the thickness of the pipe increases in order to attenuate the inconvenience of lamination above referred to. I have said here "to attenuate the inconvenience" because it cannot be eliminated altogether; nay, this phenomenon is utilized to facilitate the extraction of the mould or core, which would otherwise strongly adhere to the pipe.

It is the general object of this invention to provide a method of production of pipes of artificial slate, or of pipes made of cement mortar either fibrous or not, which is more simple and economical as compared with the methods now used, and which does away with the above mentioned over fastidious necessary care and attention, which are little conciliable with an industrial production, and particularly an object of this invention is to adopt a simple and reliable method of compressing the pipes such as to permit it to be exactly previously calculated and constantly controlled during the manufacturing and brought to its higher or maximum value even when the thickness of the pipe be considerable.

A further object of this invention is to provide a method of production of said pipes which will allow to use the mortar in a plastic condition in order to avoid the inconveniences and difficulties both of a technical as well as of an economical character, which are met with when mortar in a fluid condition is used.

Still another object of this invention is to provide a method of production which permits of the provision of a metallic or other reinforcement of the tube's wall, the resistance of which might exactly be calculated and which allows the pipe to stand to considerably high stresses of both internal pressure, flection or crushing, without the necessity of unduly increasing the thickness of the pipe.

This new method of production of pipes or other hollow bodies, does away with the use of all the costly machinery necessary to the preparation of the sheeting of paste of a fibrous material mingled with a binding material of any kind

whatever. The method of manufacture of pipes according to this invention starts directly from a mortar made of a binding material and a fibrous aggregate the fibers of which are carefully separated from one another, which pipe can thus be made up, either in a single layer or in a plurality of successive adjacent layers such as to attain the desired thickness by simply adjusting the mortar on the mould in any suitable manner which I shall not describe or set forth here as I do not wish to claim any special method of arrangement of the mortar, the substance of the invention consisting in the method I have invented for compressing the layer or layers of plastic material in such a way that it can be constantly controlled and regulated as desired.

Generally speaking this method of compression avails itself of a flexible cord or rope either metallic or not which is coiled under a given tension on the layer of mortar previously arranged on the outer surface of the mould, said method being quite peculiar and such that whilst the coiling involves but a short distance of the length of the tube, it permits the whole length of said tube to be submitted to a gradual compression, the value of which compression may be graduated as desired and applied again and again at will in a rapid way.

A method of compressing the plastic tube by means of a rope coiled around the tube under a tension has truly already been proposed (see for instance the British Patent No. 262.046) but in that method the flexible rope or cord was wound as a continuous coil or as a plurality of spirals adjacent to one another all over the length of the tube, and it was proposed that the cord be left coiled around the tube until complete setting of the mortar. This method implies the necessity of keeping for several hours a cord on each compressed tube, and necessitates a long and fastidious work. It ensues clearly that by this method the compression cannot be graduated as desired and consequently that the inconvenience of the laminating effect above mentioned with respect to the other methods, far away from being attenuated, is highly increased. According to this latter method, as the mortar on which the cord coiled under a tension has to effect its action is still in a plastic condition, said cord will sink into the mortar and as the mortar cannot expand towards the already compressed portion of the tube, it will expand towards the portion of said tube towards which the coiling is proceeding. At each new coil the cord will lie down upon a thicker body of mortar, so that the above mentioned inconvenience of lamination will be increased. Therefore the thickness of the tube cannot result uniform, and at the same time as it becomes thinner in the middle of the length of the tube, it will become thicker and thicker as the coiling advances towards the pipe's end. Furthermore, the operation of winding a flexible cord in one to another adjacent coils around the surface of a tube of a considerably large diameter can proceed but very slowly, and in case the tube had to be formed of a plurality of layers each of which had to be submitted to compression in the aforesaid manner, the compression of one layer could not be effected if the preceding layer had not been freed of its winding, so that the operation would require a very long time without eliminating the inconvenience of deformation of the tube.

The method of compression according to the present invention substantially differs not only from the above mentioned method but also from all the methods known so far for the following characteristics:

1.—The tube is not covered by adjacent spirals of a flexible cord all over its length, but the coiling extends only a short distance;

2.—the compression applied by the cord can be rapidly and easily repeated as many times as desired, each time in a direction contrary to the preceding one;

3.—in each operation of compression the tension of the cord may be varied causing said compression to pass from a minimum to a maximum degree, so that the excess of water contained in the mortar will gradually be eliminated and the mortar gradually condensed so as to be less and less subject to deformation as the compression increases;

4.—a single device may be successively and immediately used on a plurality of tubes, so that there will be no idle material;

5.—the above mentioned operations can all be automatically and therefore rapidly effected.

All the above mentioned operations are effected in the manner that will be now set forth, reference being made to the accompanying drawing which is a diagrammatic illustration of the device and method for the application of compression of the wall of tubes of cement according to this invention. In the drawing:

Fig. 1 shows a mould on which a portion of the already formed pipe may be seen, and in which the operation of compression is at its starting point;

Fig. 2 is a fragmentary partly sectional view of an already finished tube all over which the compression has already been effected and actually suspended; and

Fig. 3 is a sectional end view of a tube under compressing operation.

In all of these figures, 1 is the wall of the tube laying on its cylindrical form or mould, which wall is made of cement mortar in a proper plastic condition and on which tube a number of coils or spirals of an endless flexible cord 2 have been wound, said number of spirals as well as the size of the cord being determined in a convenient relation with the diameter of the tube and with other practical conditions upon which it is not necessary to dwell.

The endless cord 2 operates over a free pulley 3, the diameter of which is slightly less than the distance of the tube which is covered by the spirals of cord in order that, on winding, the various coils or spirals keep adjacent to one another.

4 is a bucket or other container which is loosely suspended to the bolt of pulley 3, which container may be filled up with any convenient material as water, small lead shot, quicksilver or the like which is adapted to give the cord any desired tension and to vary the latter as desired.

After having arranged everything as set forth, the tube to be compressed is rotated, the rotation obviously causing the cord to wind up in a direction and unwind in the opposite one: and if this winding and unwinding is such that whilst the branch 2'' of the cord unwinds the branch 2' winds up, the whole group of spirals will travel from left to right when looking at the drawing, at the same time that a compression of the mortar will obviously be effected. If however at the end of the travel the direction of rotation of the tube be reversed, so that branch 2' of the cord unwinds whilst branch 2'' winds up, the whole

group of spirals will travel reversely, that is from right to left.

An automatic device, not shown, for causing the reversion of the direction of rotation of the supporting mould can be placed at each end of travel. A free revolving pulley 5 of a diameter corresponding to the diameter of the tube can be provided at one end of the mould that supports the tube under compression, on which pulley the group of spirals of the compressing cord may be caused to run every time it may be desired to interrupt the operation of compression in order to permit of withdrawal of the finished tube and proceed to the manufacture of a new one.

With this method the operation can be executed at a high speed, the reversing of the travel being made automatically if desired.

It has been said hereinabove that the weight which determines the tension of the compressing cord, and consequently the value of the compression, can be varied according to desire. I add here that such variation of tension can also take place automatically by coupling with the travel reversing device a device for pouring into the bucket 4 a given quantity of a liquid or other material. By this means the compression of the mortar can be graduated and varied according to desire and be passed from a minimum to a maximum value as the mortar, owing to the gradual expulsion of the water contained, assumes a greater density such as to stand the increase of compression without that any undesirable effect occurs. And even when, due to an irregular graduation of the compression caused by any irregularity in the increase of the cord stretching weight, a slight deformation of the tube towards one of its ends would take place during one of the travels of the cord coils along the tube, said deformation would soon be corrected in the next reverse travel of the group of spirals or coils.

If desired, the tube can be formed of a plurality of successive layers, each layer being compressed in turn. To attain this result it will be sufficient to cause the coils of cord to be passed, after the compression of any layer, on the idle pulley 5 and then re-set into action as soon as the new layer will have been formed.

In case the tube had to be reinforced, then, after having placed the reinforcement in its place on the tube, a protective layer must be laid on it; and in case such protective layer should consist of fibrous cement, the latter will be applied and compressed according to the process set forth in connection with the formation of the tube.

It will be noted that this method of compressing plastic tubes acts in the same way both on the coils of the reinforcement as on the mortar existing between said coils, so that it will cause said mortar to fill up all the hollow spaces that happen to exist.

Owing to the rapidity with which the manufacture of tubes takes place according to this method, an intimate union between the layers of cement that include the reinforcement is attained, so that said reinforcement may be considered as really embedded in the pipe's wall.

The above referred method of compression may be also used to compress a plastic coating on a metallic pipe or on pipes made of any other substance or material beside the cement mortar or other fibrous material.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A method for compressing the wall of pipes made of suitable plastic material applied on the outside of a cylindrical rotatable mold consisting in applying pressure about a limited portion of the material on the mold, rotating the mold and simultaneously causing the pressure to be applied over succeeding portions of the material, and reversing the direction of rotation of the mold simultaneously reversing the direction of travel and the application of pressure to the material on the mold and graduating the tension of the pressure applying means at each reversal of travel and application of pressure to effect compression of the tube and to graduate the value of compression so as to pass by degrees from a minimum to a maximum value and eliminate the effect of lamination of the wall of the pipe.

2. An apparatus for manufacturing hollow plastic pipes comprising a reversely rotatable and horizontally disposed cylindrical mold about which plastic material is applied in a plastic state, a pressure applying device including an endless flexible element comprising a number of spirals surrounding a portion of the material on a mold and the suspended portion, a variably weighted pulley associated with the suspended portion, the said spirals embracing a small portion of the material and frictionally contacting each other and traveling due to the taut and frictional contacting spirals during rotation of the mold successively over immediately succeeding portions to compress the material and traveling in a reverse direction upon the reversing of rotation of the mold to complete the compressing of the material.

3. Apparatus as claimed in claim 2, wherein a conical roll is loosely mounted adjacent one end of the mold for receiving the coils of the endless element to permit of withdrawal of the completed pipe or the arrangement of a reinforcement of another layer of plastic material thereon.

GUIDO VIANINI.