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COMPOSITION CORK AND METHOD OF MAKING SAME

Filed May 5, 1926

Fig. 1.

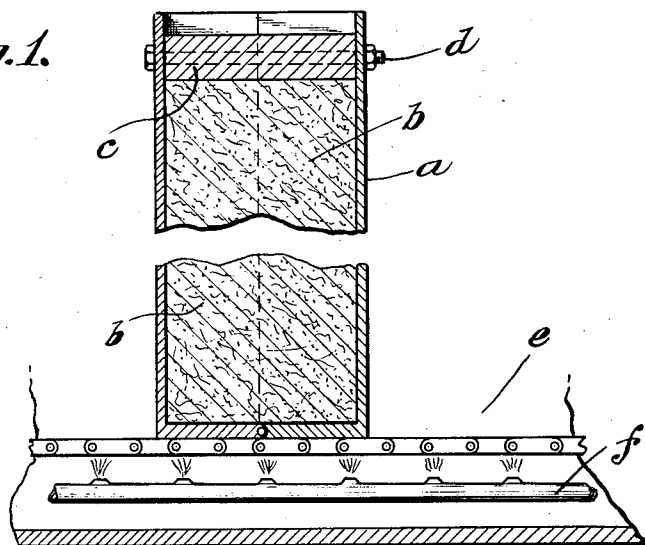


Fig. 2.

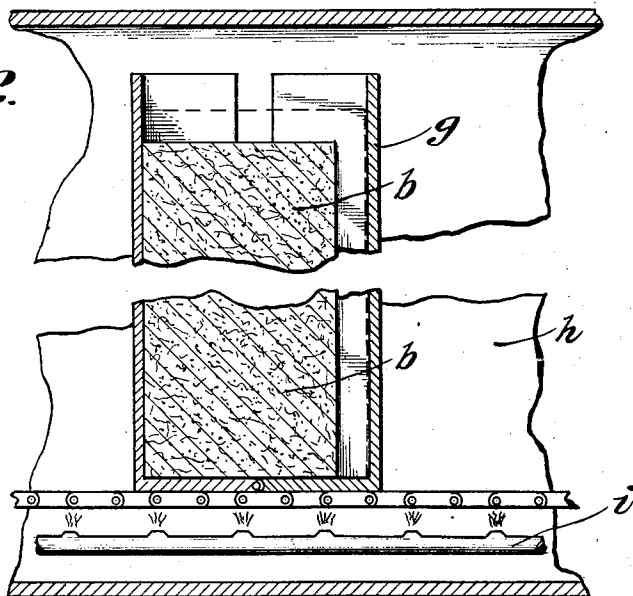
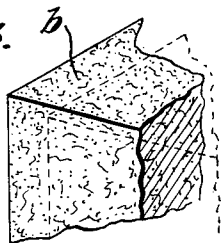


Fig. 3.



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COMPOSITION CORK AND METHOD OF MAKING SAME

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My invention relates to composition cork and the method of making same, and more particularly to a composition cork composed of granular cork and a binder uniting the granules of the cork, and to the method of producing such cork.

Heretofore in the production of composition cork, and particularly of slabs of such cork for slicing into sheets to be used in making large gaskets or for other purposes, the cork composition, consisting of granular cork and a binder (which may vary largely in its composition) is mechanically compacted in a metallic mould in successive charges, and the compacted mass confined in the mould by means of a plug closing the opening in the mould through which the charges of cork composition are introduced and compacted. Thereafter the mould with its contents is passed through a baking or vulcanizing oven for a sufficient time interval to cause the binder to set sufficiently to firmly unite the granules of cork, the bonding action being assisted by the tendency of the cork composition to expand when heated, and while restrained by the mould and the plug closing the mould cavity.

It has heretofore been my practice to use a mould having one narrow dimension through which the successive charges of the cork composition are delivered to within the mould and through which the compacting plunger acts upon the succeeding charges, the smallest dimension of the slab forming material within the mould, facilitating the penetration of heat throughout the compacted mass of cork composition.

While cork slabs made in the manner above described, after leaving the mould are highly resilient, and possess substantially uniform density throughout, I have found in actual practice that when these slabs are cut into thin sheets there is a tendency toward an uneven shrinkage of the sheets and a tendency toward expansion of some of the larger grains of cork due to excessive compression of these grains during mechanical compaction and baking.

From the foregoing conditions it would appear that composition cork slabs produced

in the manner above described, while possessing sufficiently uniform density to meet most of the requirements of the uses to which this material is put, do not have uniform elasticity, or sufficiently uniform elasticity throughout, to meet the requirements of some uses. I have found by experience that there is apt to be variation in the quality of different sheets produced from such slabs as well as variations in the dimensions of such sheets.

With the above conditions in mind, I have produced composition cork slabs wherein the larger cork granules will be free from compression, and all of the cork granules will possess a resiliency approximating that of natural cork, the mass of cork and binder being of substantially uniform density and resiliency notwithstanding the heavy pressure applied thereto in compacting the mass of composition cork and the development of pressure during the setting of the binder necessary to maintain that intimate relation between adjacent granules for a proper action of the binder in cementing or bonding the granules together.

The application of heavy pressure upon small charges of cork composition is essential in order to cause readjustment of the various granules of cork with the thin coating of cement or binder thereon with relation to each other, not only to ensure a proper bonding together of contiguous granules, but to avoid the presence of voids in the completed article. During the application of the compacting pressure, compression of the larger granules of cork is unavoidable, and the conditions within the mould and during the filling of the mould by, and the compaction of, successive charges, subsequent expansion of such larger granules is impossible. The application of heat for conditioning the cement while permitting a readjustment of the granules of cork and causing substantially uniform density throughout the mass, does not relieve the condition of excessive compression of some of the larger cork granules, and even tends to aggravate this condition.

I have found in actual practice that when slabs of composition cork are cut into thin slices, there occurs considerable shrinkage in

the sheets, so that great difficulty has been experienced in controlling the size of the sheets, since this shrinkage is variable.

To meet the above conditions, and to avoid the production of over-sized slabs to compensate for this shrinkage, I employ certain steps and practices in the production of composition cork slabs to be cut into sheets, which will not only relieve the condition of variable elasticity throughout different portions of sheets cut from the slabs by relieving the larger granules from the effects of excessive compression, but will counteract the effects of shrinkage without that wastage due to the production of over-sized slabs as compared with the dimensions of the required sheets.

The methods I employ permit an effective bonding action of the binder, cement, glue or adhesive with relation to adjoining granules of cork, which bond is not effected as a result of the expansion of the compressed cork granules. The method does not require any material increase of time in the production of the slab, and the expense involved would not be materially increased since it involves merely one re-handling of the product, and the time intervals are practically the same.

By the method of producing the composition cork, the over-all dimensions of a slab are increased to an extent in excess of the maximum shrinkage of sheets sliced from the slab, and the material of these sheets will be of substantially uniform resiliency throughout, which resiliency will closely approximate that of natural cork. So far as I have been able to determine, the quality of such cork sheets as to imperviousness to liquids and gases, equals cork sheets heretofore made by other methods, and the aging of these sheets does not result in irregularity in the surfaces thereof due to the expansion of larger grains of cork relieved from compression as a result of the slicing of slabs of composition cork.

The invention consists primarily in the herein described method of making composition cork consisting in subjecting a compacted mass of granular cork and a binder while held under compaction by a mould, to a temperature sufficiently high to cause a secure bonding action by the binder, removing the slab of cork composition from the mould and again subjecting it to an elevated temperature while not held under compaction, whereby the adhesive material is again softened and expansion of any cork granules under compression is permitted; and in such other novel steps and practices, and in the product of the method, all as hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,
Fig. 1 is a sectional view of a mould and

its contents during the first stage of the binding operation;

Fig. 2 is a similar view of the final stage of this operation, the dotted lines indicating the extent of the expansion of the material of the slab; and

Fig. 3 is a view of a fragmentary portion of the product.

Like letters refer to like parts throughout the several views.

In the accompanying drawings, I have shown at *a*, a metallic mould structure of the usual construction, containing a compacted mass of cork composition indicated at *b*, confined within the mould by a metallic plug *c* held in position by means of removable bolts *d*. Said bolts also serve to hold the opposite sides of the mould against separation as a result of the tendency of the composition cork to expand when subjected to heat. The mass *b* of composition cork consists of cork granules, each of which is provided with a very thin coating of an adhesive or binder, and the mechanical compaction of the composition, when filling the mould, has the effect of securing a density throughout the mass *b* which will ensure that intimate relation of contiguous granules of cork, necessary to secure the proper bonding action, and also the desired density throughout the mass.

The manner of filling these moulds is old and well known in this art, the mould shown in the drawing being filled through a narrow open top of the mould, and by means of an automatically acting machine, although it is not my intention to limit the invention to moulds filled in the manner described, since it is apparent that the manner of forming the mass *b* and the type of mould used, is not material to the invention.

When a mould has been filled and closed so as to confine the compacted mass of cork composition, it is subjected to a continuing elevated temperature for a time interval sufficient to permit the heat to penetrate throughout substantially the entire mass of the cork composition and act upon the adhesive or binder to make it sufficiently tacky to form a secure bond between the different granules of cork. No specific temperature is required, and in fact, this temperature will vary with different adhesives or binders, and the time interval will also be controlled by the character of the binder and the temperatures to which the mould and its contents are subjected.

The various temperatures and time intervals for properly bonding cork granules together, are familiar to all workers in the art, and vary in different plants.

Various adhesives or binders are now commonly used in the production of composition cork. That most commonly used consists of glue and glycerine in solution with or

without a chemical re-agent such as formaldehyde for quickening the final setting of the adhesive or binder. Egg and blood albumen and casein are also sometimes used in connection with glycerine and an accelerator, the same as with the glue. The glue used is ordinary animal glue. The adhesive used, however, is subject to wide variation.

With albumen and casein binders or adhesives the temperature employed is usually about 140° F. With the glue adhesives or binders, however, higher temperatures may be used.

No particular time interval is required beyond that the first stage of the method requires sufficient time to cause the adhesive to be so conditioned as to develop binding action without the final setting, and the second stage requires sufficient time to ensure a practically complete setting of the adhesive. With a glue-glycerine adhesive, the two stages may be of substantially the same time duration, which may be of about thirty minutes to each stage.

When using albumens or caseins, however, the time interval may be reduced, although I have found that the final setting is largely a matter of cooling after heating.

When the adhesive or binder has been so conditioned as to have formed a secure bond between contiguous granules of cork, the mould *a* is removed from adjacent the source of heat, which ordinarily is a baking or vulcanizing oven *e*, heated by gas jets *f*, the mould is opened and the formed slab removed therefrom and positioned in a carrier *g*, the inside dimensions of which are relatively greater than the dimensions of the formed slab. In actual practice, these dimensions are approximately a quarter of an inch wider, and slightly more than a quarter of an inch longer than those of the mould *a*, and the slab formed therein.

The carrier *g*, with the slab therein, is then subjected to heat, as in an oven or vulcanizer *h*, having gas burners *i*, and is subjected to an elevated temperature for a length of time about equal to that to which the mass *b* was subjected to heat while in the mould *a*.

While the mass *b* of cork composition is being subjected to heat while within the mould *a*, there is a tendency of the mass to expand which will result in a readjustment of the various cork granules in a manner which will more or less equalize the pressure conditions throughout the mass, and will at the same time, supplement the pressure conditions developed during the filling of the mould. The walls of the mould *a*, and the plug *c*, prevent any expansion of the mass, however, during this stage in the method, so that the cork granules, particularly as to the larger granules, are placed under heavy compression, the degree of compression ex-

ceeding that to which they were subjected during the filling operation of the mould. In fact, the compression of the larger granules, results in a marked distortion thereof.

By previous methods, when the baking or vulcanizing was continued until the adhesive or binder was fully set, the bonding action throughout the slab served to hold the compression in these granules, and with the subsequent complete cooling of the material of the slab, there was a still further compression due to shrinkage of the material entering into the slab, which became more pronounced when the slabs were cut into thin sheets. In fact, in slabs of a dimension of an inch and a half to two inches wide, sixteen inches high and thirty inches long, the shrinkage in the width and length of the slab might be as much as an eighth of an inch, although it would vary in different slabs. The resultant difficulty was that when slabs were made to produce sheets of certain dimensions to be cut up into different articles, this shrinkage would occasion great wastage because of the special layout of the dies for cutting the sheets.

By removing the slabs from the moulds *a* before the adhesive or binder has become set beyond a point which forms merely a secure bond between the different granules of cork, and while the adhesive is still soft, subjecting the slab to heat while in a carrier having dimensions in excess of those of the slab, the ingredients of the mass *b* are caused and permitted to expand. The heat has the effect of further softening the adhesive or binder in a manner to permit not only that expansion of the cork resulting from the application of heat thereto, but an expansion resulting from the freeing of the compressed cork granules from all restraint, thus permitting them to assume their normal shapes and to be substantially free of all that compression thereon developed during the filling of the mould, or developed during the first stage of the baking or vulcanizing.

I have found in actual practice, that a slab of the dimensions above referred to, will, during this second stage in the baker or vulcanizer, expand in all directions approximately a quarter of an inch without disturbing the bond between contiguous granules.

While subsequent shrinkage of the material of the slab will occur, I have found that this expansion of the mass of the slab does not materially increase the quantity of shrinkage, and that by the practice of the method of my invention, with the same quantity of cork composition, I can secure slabs, the dimensions of which, after the maximum shrinkage has been had, will be approximately an eighth of an inch greater than the dimensions of the cavity in the mould *a*. Furthermore, when these slabs are cut into sheets, the sheets themselves, as to all parts thereof,

will retain their form and dimensions, and will, so far as I have been able to determine, have throughout, a resiliency closely approximating that of natural cork.

5 The adhesives or binders used, may be of the ordinary gelatin-glycerin type, or any other desired formula may be used. The temperatures within the oven may range from 200° to 400° F., and the time interval may
10 range from one to three hours according to the adhesive used, and the dimensions of the cavity of the mould *a*. The temperatures in both the first and second stages, are approximately the same, although if desired, there
15 may be a gradual lowering of the temperatures toward the point of delivery of the finished product, when the moulds are conveyed upon carrier chains by a continuous motion through the oven or baker. The time inter-
20 val in both stages may be equal, or may vary with the character of adhesive or binder used.

By limiting the dimensions of the opening in the carrier *g* to slightly less than the maximum thickness and length of the slab after
25 full expansion of the material thereof, irregularities in the top and bottom finish of the slabs may be avoided, although this is not material, since these surfaces may be readily ground off to ensure smoothness in this finish.

30 No plug is used in the carrier *g*.

The finished product is characterized by the presence of cork granules, varying in sizes, but all substantially free of compressive stresses thereon from either the binder de-
35 veloping same, or the firmly bonded mass of cork granules. In such a slab, and in sheets cut therefrom, the composition cork throughout will have substantially the same elasticity as natural cork, and articles made therefrom
40 will not be subject to likelihood of surface irregularities due to expansion of the cork granules.

It is not my intention to limit the invention to an adhesive or binder made in accordance
45 with any particular formula; to the particular temperatures, or to the particular time intervals herein stated, since such are subject to wide variation with different conditions of manufacture and different formulæ.

50 Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. The herein described method of making composition cork consisting in subjecting a
55 compacted mass of granular cork and a binder while held under compaction by a mould, to a temperature sufficiently high to cause a secure bonding action by the binder, removing the slab of cork composition from the mould
60 and again subjecting it to an elevated temperature while not held under compaction, whereby the adhesive material is again softened and expansion of any cork granules under compression is permitted.

65 2. The herein described method of making

composition cork, consisting in subjecting a compacted mass of granular cork and a binder while held under compaction in a mould, to a temperature sufficiently high, and for a time interval sufficient to cause only a secure bonding action by the binder, removing the slab of cork composition from the mould while it is still hot, and again subjecting it to an elevated temperature while not held under compaction, whereby the expansion of cork gran-
70 ules under compression is permitted while the adhesive is still soft.

In witness whereof I have hereunto affixed my signature this 23d day of April, 1926.

CHARLES E. McMANUS.

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