UNITED STATES PATENT OFFICE.

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WALL-BOARD SIZE.

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To all whom it may concern:

Be it known that I, BENJAMIN WILSON SIDWELL, residing at Buffalo, in the county of Erie, State of New York, have invented certain new and useful Improvements in Wall-Board Size; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to a size suitable for use on articles formed from wood fiber, wood pulp, or the like, such, for instance, as wall board.

Wall board may be made from wood fiber or wood pulp, either ground wood pulp, waste paper or cooked pulp, used alone or intermixed, and ordinarily is marketed in substantially rigid sheets. The wall board may consist of a single layer of material or of a plurality of piles pasted or cemented together. Generally it is used as a building material by nailing or tacking it directly to the studding of a room, so that it may serve in place of lath and plaster as the inner wall of the room, being usually ornamented with paint, or the like, as desired.

Wall board, as manufactured, contains a certain percentage of moisture and also has the characteristic of changing in its moisture content in accordance with the humidity of the surrounding air; these changes ordinarily being slow but nevertheless appreciable. Such changes in moisture content are sometimes very troublesome in new buildings where the moisture initially present in the lumber, particularly green lumber, gradually works through into the wall board, causing expansion and sometimes warping and buckling. The characteristic of wall board to absorb moisture extends also to paints, stains and similar decorative liquids, and if not counteracted leads to excessive waste of the decorative agent, as well as to unsatisfactory effects.

The absorption of moisture and paint by wall board can be reduced by surface sizing. Thus, it has heretofore been customary to surface size wall board by applying a solution of gums, resins, and other materials. As far as I am aware, however, an entirely satisfactory size for wall board has not heretofore been available, and the principal object of the present invention is the provision of an improved size particularly adapted to be satisfactorily applied to wall board, and the like, under commercial manufacturing conditions.

The manufacture of wall board, as commercially carried out, is more or less of a continuous process. Thus, in the customary sizing operation, the wall board panels are passed through a suitable sizing machine or apparatus and placed one upon another on a truck until several hundred panels are in one pile. Under these conditions the sizing liquid is given insufficient time to dry or oxidize in a film on the surface of the wall board, but on the other hand continues to penetrate instead of remaining on the surface of the board. The improved size of the present invention is designed to overcome these objections, and can be applied to panels, which are piled one on the other directly after coming from the sizing machines, without endangering the proper functioning of the surface coating as a satisfactory size.

Most sizing compounds are essentially resins, gums, or similar substances, treated for various purposes, and cut in some suitable solvent or solvents. The function of the solvent in most cases is simply to get the protective material on the surface to be treated, whereupon, by volatilization or oxidation of the solvent, the protective material dries into a film coating. It has heretofore been customary in sizing wall board to use a sizing material which is a liquid at ordinary temperatures, and in such a size the solid ingredients are reduced to the desired liquid consistency at ordinary temperatures by means of suitable solvents. In contradistinction to such sizing materials, the improved size of the present invention is solid at ordinary temperatures and is heated to a temperature of from about 300 to 450° F., in order to obtain the desired fluid consistency for application to the wall board or other product to be sized. For these reasons, I have found it desirable to designate the size of the present invention as a "hard size," in order to distinguish it from the customary liquid sizes heretofore used.

In the case of wall board, the protective material, which dries into the film coating, must not only be moisture proof to a very large extent, but must, in addition, present

a surface suitable for decoration by paints and similar decorative agents. The improved size of the present invention is a compound or mixture of various substances in suitable proportions, which, when applied under proper conditions to wall board or other wood fiber products, satisfactorily fulfils the aforementioned requirements of a practical wall board size.

The protective or film coating material of the improved size comprises a suitable resin, such as ordinary rosin, or the like, and a waxy substance, such, for example, as paraffin wax. Ordinary rosin, at a temperature of from 400 to 450 degrees Fahrenheit, is a fairly thin liquid, and, when properly spread on a suitable surface, hardens, at ordinary temperatures, into a film coating. Such a film coating of rosin, however, is very brittle and soon dusts off; neither is it moisture proof. The brittleness of rosin can be reduced by the addition of oil, such, for example, as linseed, China wood, or similar oils. However, too much oil added to rosin makes a tacky coating, which is decidedly objectionable in a wall board size, since it results in the sticking together of the panels when piled one above another. Moreover, the addition of oil to rosin, while acting as a binder, does not render the rosin film moisture proof. It has been found, however, that by adding paraffin, or some other satisfactory wax, to a mixture of rosin and oil a practical moisture proof film can be obtained.

In compounding the improved size of the present invention, I take, for each 100 parts of resin, up to 15 parts of wax. I have found that for most cases a satisfactory mixture is produced by using about 5 parts of wax for each 100 parts of resin. Besides improving the moisture proof properties of the resultant film coating, the wax lowers the melting point of the sizing compound. This is a very desirable result, since a satisfactory hard size, while solid at ordinary temperatures, should have a fairly low melting point, while at the same time containing sufficient binders and driers.

The amount of paraffin or other wax admixed with the resin is dependent upon the degree of moisture proofness desired. However, if too much wax is added the sized surface will be too greasy for the proper application of painting or decorative materials. For this reason the sizing compound should not contain over 10% by weight of wax, or as stated above, not more than about 15 parts of wax should be mixed with each 100 parts of resin. Ordinarily, I prefer to use a smaller percentage of wax, and I have found a sizing compound containing approximately 4% by weight of wax well adapted for wall board.

I have found that the addition of manganese dioxid up to about 5 parts for each 100 parts of rosin, or equivalent resin, materially improves the properties of the size. Manganese dioxid is a powerful drying agent, and its use, within the proportions herein contemplated, does not increase the melting point of the size compound. I have found about 3 parts of manganese dioxid with about 100 parts of resin and about 5 parts of wax to give good results.

I have further found the addition of lime up to about 3 parts for each 100 parts of resin to be beneficial. Lime (calcium oxid), or calcium hydrate, acts both as a drier and hardener. Its use raises the melting point of the size compound, and as a result of this property it is advantageous to use a larger proportion of lime in warm weather. Such an increase in the amount of lime in the size compound increases the hardness of the composition at ordinary temperatures, and thereby prevents the production of a tacky film.

Any oil having the faculty of binding resins, gums, or the like, into compositions which will form films on drying or hardening can be used as the binder in my improved size. I prefer, however, to use China wood oil. The amount of oil to be used will depend upon the conditions under which the size is to be used. Generally, I have found that from one to three gallons of China wood oil for each 100 lbs. of resin give good results. The amount of oil used may be raised or lowered according to the temperature of the atmosphere at the time of applying the size. The toughness of the film coating may also be controlled to some extent by the amount of oil used.

A portion of the oils hereinbefore mentioned may be replaced by kerosene oil, or equivalent saturated hydrocarbon. Kerosene oil acts as a thinner and also reduces the melting point of the size compound. The use of kerosene oil, of course, affects the binder of the resin, and in this respect it is inferior to the siccative oils. Up to about one and one-half gallons of kerosene or equivalent thinner for each 100 lbs. of resin may be used to advantage.

In the foregoing description, I have indicated the general proportions of the various ingredients of my improved sizing compound. For application to wall board, I have found a size containing these ingredients in about the following proportion to give good results:

Resin	100.0 pounds,	approximately 75%	by weight.
Calcium hydrate	1.5 "	" 1%	" "
Manganese dioxid	3.0 "	" 2%	" "
China wood oil	2.0 gallons	" 12%	" "
Paraffin wax	5.0 pounds	" 4%	" "
Kerosene oil	1.0 gallons	" 6%	" "

Classing manganese dioxid, lime, and equivalent substances, as driers and hardeners, the general percentages of the various

ingredients in my improved size are represented in the following table:

Resin	65 to 85%	by weight.
Wax	1 to 10%	" "
Hardeners and driers	1 to 5%	" "
Binder	10 to 25%	" "

The improved size of the present invention is solid at ordinary temperatures. Its melting point can be controlled to a considerable extent by suitably proportioning the various ingredients, as hereinbefore indicated. As a size for wood fiber products, the sizing compound should melt at a temperature below about 300 degrees Fahrenheit, so that at or slightly above this temperature the compound is a liquid suitable for the sizing operation. As applied to wall board, I prefer to maintain the sizing compound at a temperature from about 300 to 450 degrees Fahrenheit, and I have found that the specific formula hereinbefore mentioned gives substantially the desired degree of penetration to successfully seal and waterproof the wall board when applied at a temperature between these limits.

The size of the present invention possesses excellent moisture repellent properties. This is largely due to the wax, but at the same time it should be noted that the presence of the wax does not result in the production of an unpaintable sized surface. This is in large part due to the relatively small amount of wax employed, and also to the fact that the relatively greater proportion of resin together with the driers and hardeners used render the wax content hard, and thus counteract its inherent greasy characteristic.

The improved size has no injurious effect upon the fiber, and is of such transparency and color that the original appearance of the surface to which it is applied is little changed. The size dries readily and without the necessity of racking or air drying the articles treated, and furthermore enhances the painting and decorating possibilities of the sized surface.

It is to be understood that the size may be applied in any convenient manner. I wish it also to be understood that while I have made particular reference to the use of the size for wall board, the size is of such a composition that it may be used extensively in the art, more particularly in connection with products made from wood fiber, wood pulp, and the like.

I claim:

1. A size for wood fiber products and the like, containing from about 65 to 85% by weight of resin, from about 1 to 10% by weight of wax, and from about 10 to 25% by weight of a binder.

2. A size for wood fiber products and the like, consisting essentially of resin, wax, a binder, and hardeners and driers in about the proportion by weight of 65 to 85% resin, 1 to 10% wax, 10 to 25% binder, and 1 to 5% hardeners and driers.

3. A size for wood fiber products and the like, containing resin, wax and China wood oil in about the proportions by weight of 65 to 85% resin, 1 to 10% wax, and 10 to 25% China wood oil.

4. A size for wood fiber products and the like containing resin, wax, and a binder in about the proportion by weight of 75% resin, 4% wax, and 15 to 20% binder.

5. A size for wood fiber products and the like, containing resin, wax, manganese dioxid and a binder.

6. A size for wood fiber products and the like, containing resin, wax, manganese dioxid, lime and a binder.

7. A size for wood fiber products and the like, containing resin, wax, and from about 10 to 25% by weight of China wood and kerosene oils as a binder.

8. A size for wood fiber products and the like, containing resin, wax, a binder, and from 1 to 3% by weight of manganese dioxid.

9. A size for wood fiber products and the like, containing resin, wax, a binder, and from 1 to 5% by weight of manganese dioxid and lime.

10. A size for wood fiber products and the like, containing about 75% by weight of resin, about 2% by weight of manganese dioxid, about 1% by weight of lime, about 4% by weight of wax, and about 18% by weight of a binder.

11. A size for wood fiber products and the like, containing about 75% by weight of resin, about 4% by weight of wax, about 18% by weight of a binder, and about 3% by weight of hardeners and driers.

12. A size containing about 75% by weight of resin and about 4% by weight of wax and a binder.

In testimony whereof I affix my signature.

BENJAMIN WILSON SIDWELL.