Feb. 5, 1924. 1,482,626

J. WHITING

DESICCATING APPARATUS

Filed Sept. 14, 1922

Fig. 1.

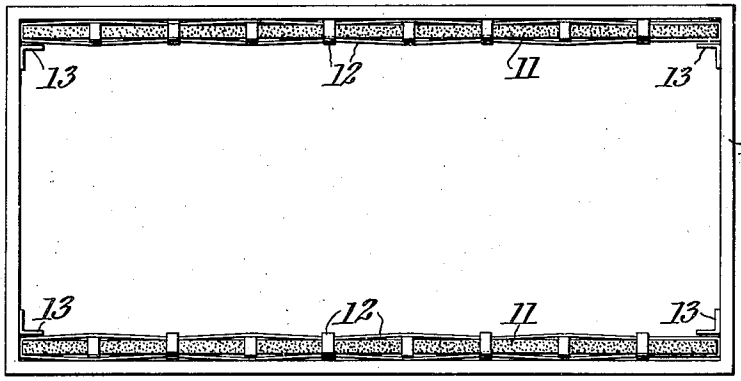


Fig. 2.

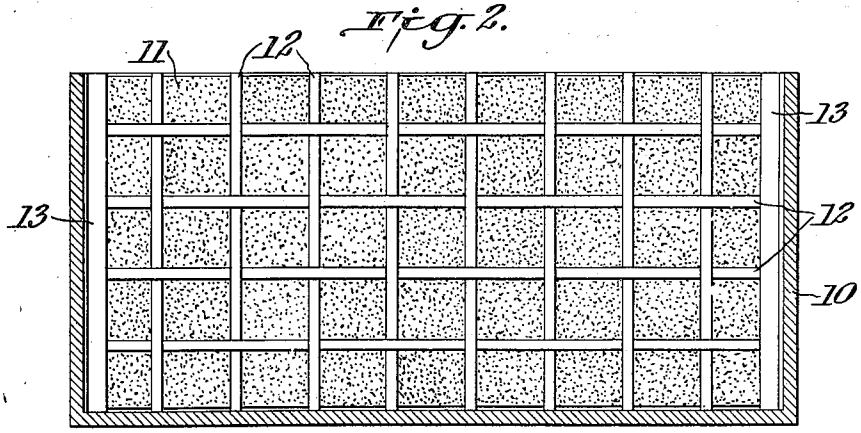
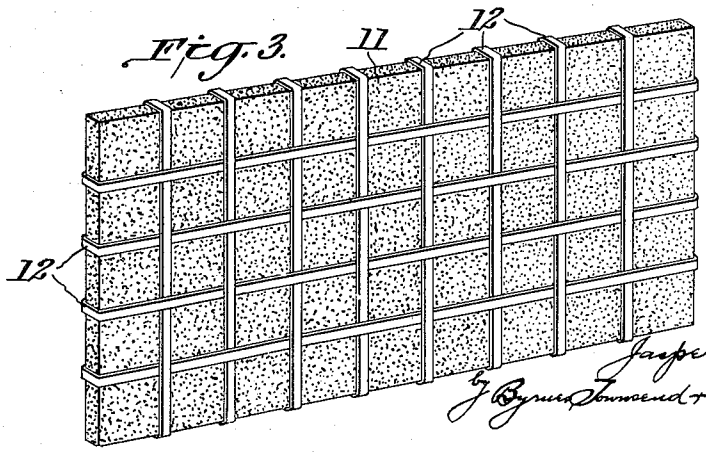


Fig. 3.



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UNITED STATES PATENT OFFICE.

JASPER WHITING, OF BOSTON, MASSACHUSETTS.

DESICCATING APPARATUS.

Application filed September 14, 1922. Serial No. 588,293.

To all whom it may concern:

Be it known that I, JASPER WHITING, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Desiccating Apparatus, of which the following is a specification.

This invention relates to apparatus for desiccating purposes.

Apparatus of this character are generally based upon the property of certain materials to absorb moisture. The use of hygroscopic salt for the purpose of absorbing moisture has been resorted to for a long time.

The development, however, has taken place entirely along a single line, governed by the tendency to use as much of the hygroscopic salt as possible.

It has been proposed in the past to use a porous body as a carrier of the hygroscopic material, but also in this case efforts have been made to crowd a maximum of hygroscopic salt into the pores of the body, the principal consideration being the application of as much of the salt as possible to make the absorptive capacity as large as possible.

In contradistinction to the prior art just referred to I propose to construct dehydrating or desiccating units along entirely different lines governed by a specifically different principle. I propose to use a porous body as a carrier of the hygroscopic salt or absorbing material in general, but instead of merely using the body as a carrier of the hygroscopic material I propose to simultaneously take advantage of the capacity of the porous body to hold liquids.

In devices of the prior art, the greater part and in fact nearly all of the available pore space in the porous body has been taken up by the hygroscopic material, leaving correspondingly little pore space for the water absorbed. The result has been that the device could hold only a limited amount of water and that as soon as this limit was reached, water began to drip. While the absorptive capacity continued, there was no provision for holding the additionally absorbed water and the continued absorption was accompanied by release of water from the body, the rate of release being substantially equal to the rate of further absorption.

It is the principal object of this invention to provide a device of the character referred to which will not drip under ordinary atmospheric conditions.

It is a particular object to so proportion the amount of hygroscopic material and the available pore space of the porous body that a maximum absorptive capacity and holding capacity combined, according to the law of maxima and minima, is obtained.

The invention, generally and briefly stated comprises a suitable porous body and a hygroscopic material disseminated throughout the pores of the body in such quantity that water considerably in excess, by weight, of the hygroscopic material may be retained in the available pore space of the body.

For a full understanding of the invention, its principle of operation and its advantages reference is had to the accompanying drawings in which

Fig. 1 is a plan view of a dry-box for protecting food or other materials against the action of moisture, the cover being removed;

Fig. 2 is a vertical section therethrough; and

Fig. 3 is a perspective view of a slab or plate forming a lining for the walls of the box.

The box 10 may be of any suitable shape and size dependent upon the particular use for which it is intended.

Some or all the walls or internal surfaces of the box are lined with slabs or plates 11 consisting of a suitable inert heat-resisting porous material such as asbestos products, porous clay bodies, filtros, infusorial earth or the like. These various materials are merely mentioned as representative of a large class of materials available for the purposes of the invention.

As desiccating material there may be selected any neutral or nearly neutral hygroscopic salt. For special reasons, however, to be more fully pointed out, I prefer a hygroscopic salt which is non-volatile at relatively high temperatures, such as calcium chloride, for instance, etc.

I avoid the use of acids or acid salts since they are likely to attack any metal with which they come into contact, and I avoid

alkalies or alkaline salts since they are likely to take CO_2 from the air and thus lose their desiccating property.

A desiccating unit corresponding to slabs 11 in the drawings may be made in one of two ways:

1. A suitable porous mass, for instance asbestos board, may be impregnated with a solution of a suitable salt.

2. The unit may be formed synthetically from a mixture of a suitable salt, water and porous material of the character referred to.

The distinguishing feature in either case is the proportion of water and the hygroscopic salt in question.

In the first of the ways proposed, the porous mass may be impregnated with a solution containing approximately 35% of calcium chloride, whereupon the water is driven off.

In the second method proposed, the proportion of the chloride and water may be approximately 1:2 so that the resulting unit when dried can take up twice as much water as there is calcium chloride present, assuming no shrinkage on drying and rewetting. This is obviously the equivalent of impregnating the porous body with a $33\frac{1}{3}\%$ solution according to the first method.

After drying the slabs are preferably encased in non-corroding or non-corrodible metal coverings or screen cloth of gratings 12. These coverings serve to protect the slabs from abrasion and to prevent direct contact with the container and its contents. They also permit the expeditious handling of the slabs, acting as a reinforcing frame.

The slabs may be held in place by flanges 13.

The heat-resistive material and the salts non-volatile at relatively high temperatures are chosen for combination so that the slabs may be subjected to heat to drive off the water and thereby regenerate the material for further use. While within the range of materials available for this purpose various substances come under consideration, it is advisable to select such materials and substances which withstand a temperature of say 300° C. without decomposition, disintegration or impairment of the normal function of the apparatus of which they form a part. Dehydration, however, should take place considerably below this critical temperature, preferably at about 100° C.

As previously pointed out, devices of this character have heretofore been based almost entirely upon the absorptive capacity of the hygroscopic material without regard to the holding capacity. I propose to combine the holding capacity or sponge action of a porous body with the absorptive capacity of a hygroscopic material in such a way as to obtain according to the law of maxima and minima a maximum of absorptive capacity and holding capacity combined.

Desiccating units made according to my invention will not drip even if exposed for an indefinite time to atmosphere containing 60% humidity or less, since a solution containing calcium chloride and water in the proportion of 1:2 by weight is in equilibrium with 60% humidity, which is the maximum relative humidity existing in most localities over any considerable period of time. By equilibrim is meant that no moisture will be given up to or taken from the hygroscopic material if exposed to a gas containing 60% relative humidity.

When hygroscopic salts other than calcium chloride are used the optimum proportion will vary somewhat from the above mentioned of one to two, but that ratio of water to salt should be selected which will be in equilibrium with about 60% relative humidity and therefore not drip until after prolonged exposure to humidities exceeding this.

While I have specifically referred to the proportion of 1:2 for $CaCl_2$, and to solutions in equilibrium with about 60% relative humidity for other salts, the invention is in no wise limited thereto. The proportion in question has been particularly mentioned because it approaches the limits coincident with the combined maximum effect above referred to and probably represents the best mode of or form for carrying out the objects of the invention.

It is readily apparent that a device of the character described is particularly adapted for periodical regeneration and in fact the arrangement has had its inception in the idea of regeneration. However, the invention in its broader aspect is generally useful inasmuch as it provides a non-dripping unit of high capacity as previously explained.

I claim:

1. A desiccating unit comprising a porous body and a hygroscopic salt disseminated throughout the porous body and partly filling the pore space, the arrangement being such that the amount of salt and the amount of water adapted to be contained in the remaining pore space are in equilibrium in an atmosphere of about 60% relative humidity.

2. A desiccating unit consisting of a porous mass of inert heat-resistive material and a hygroscopic salt disseminated throughout the pore space of the mass but occupying only a relatively small part thereof, said salt being non-volatile at temperatures below 300° C.

In testimony whereof, I affix my signature.

JASPER WHITING.