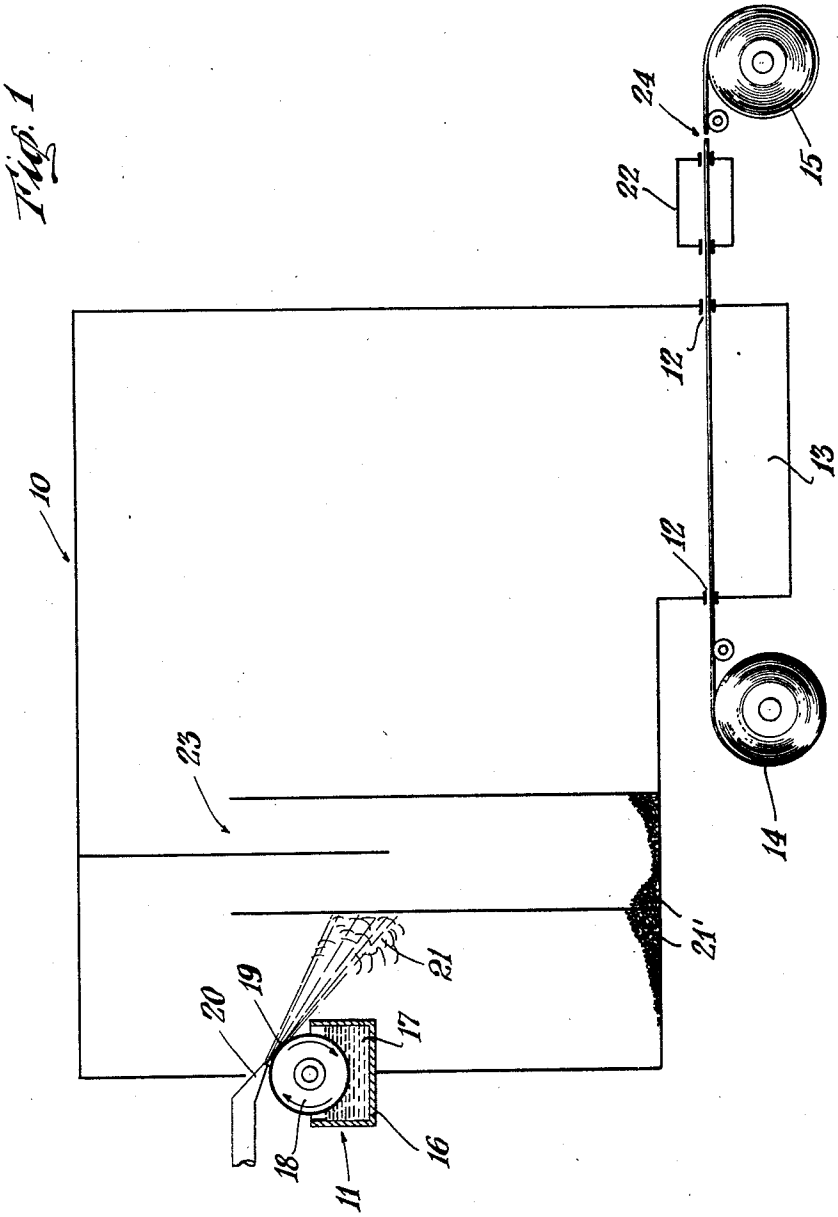
Sept. 8, 1936. F. H. REICHEL 2,053,782

PROCESS FOR MOISTUREPROOFING MATERIALS

Original Filed June 4, 1932 3 Sheets-Sheet 1

Fig. 1



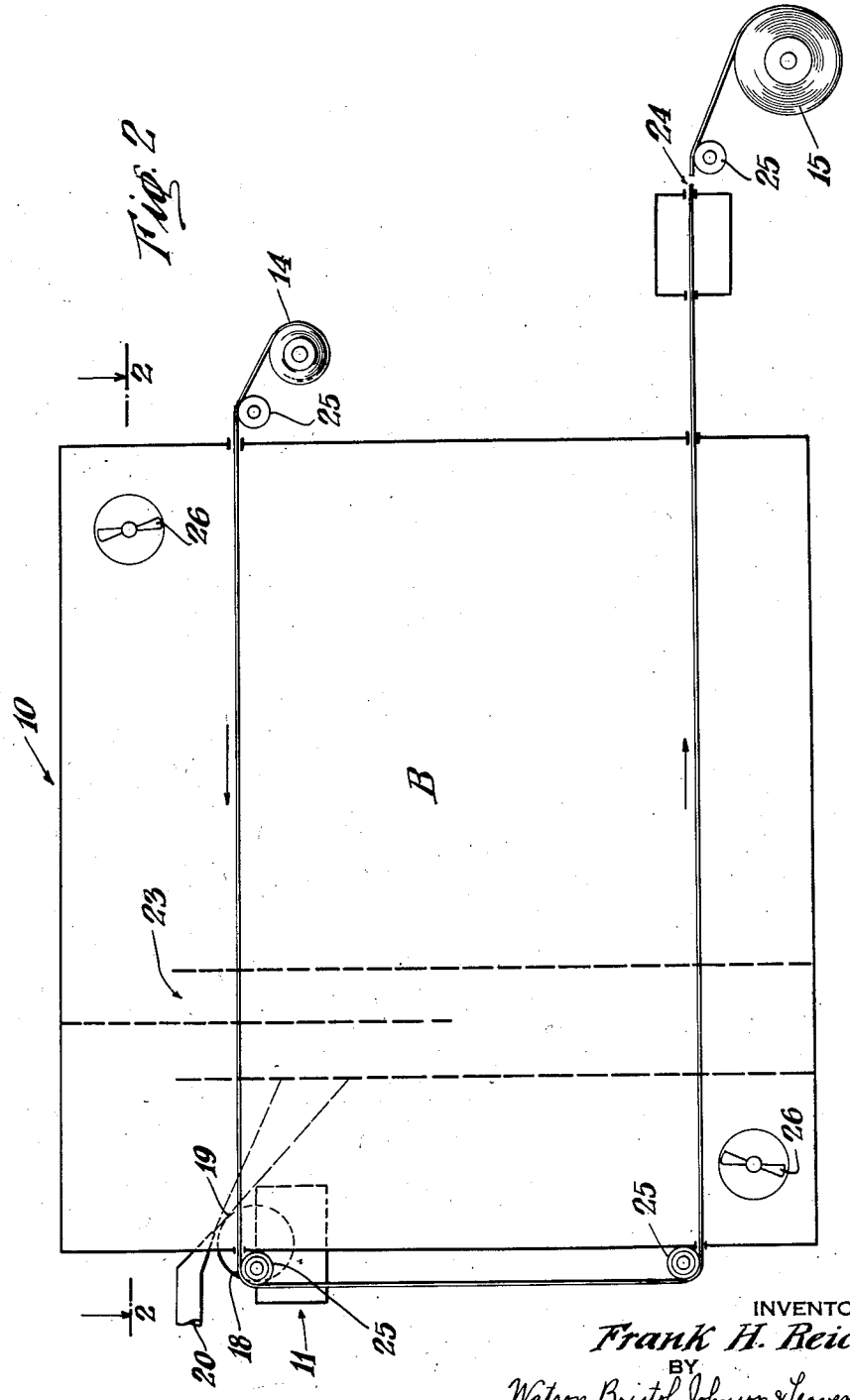
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PROCESS FOR MOISTUREPROOFING MATERIALS

Original Filed June 4, 1932 3 Sheets-Sheet 2

Fig. 2



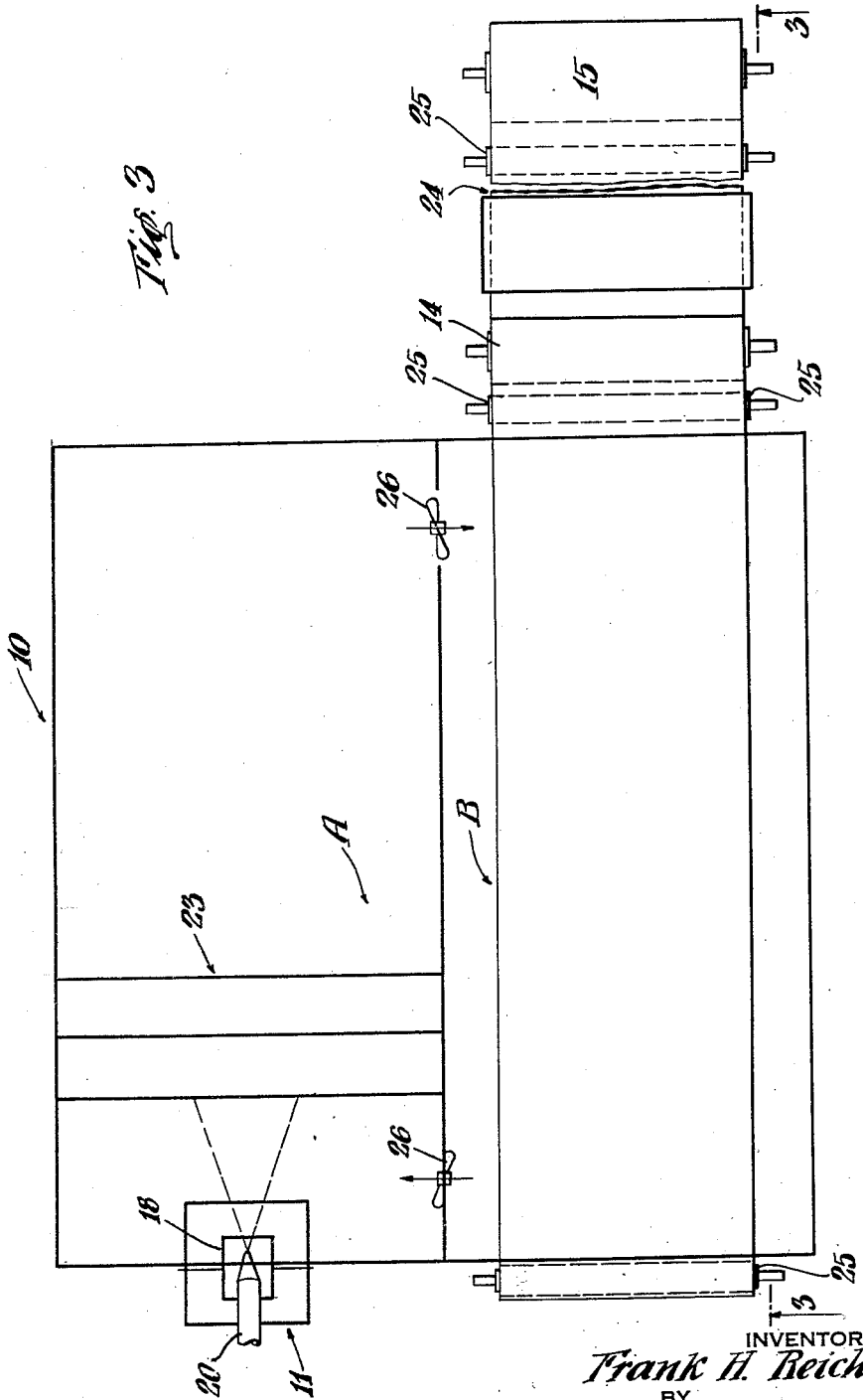
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PROCESS FOR MOISTUREPROOFING MATERIALS

Original Filed June 4, 1932 3 Sheets-Sheet 3

Fig. 3



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Patented Sept. 8, 1936

2,053,782

UNITED STATES PATENT OFFICE

2,053,782

PROCESS FOR MOISTUREPROOFING MATERIALS

Frank H. Reichel, Fredericksburg, Va., assignor to Sylvania Industrial Corporation, New York, N. Y., a corporation of Virginia

Original application June 4, 1932, Serial No. 615,353. Divided and this application May 13, 1933, Serial No. 671,012

22 Claims. (Cl. 91—70)

This invention relates to a process of moistureproofing materials and particularly flexible cellulosic sheet materials which are adapted to be used as wrapping materials and the like.

It is a general object of the present invention to provide a process of moistureproofing materials in a simple, efficient and economical manner and with the use of less expensive solvents and the like.

It is a further object of the invention to provide a method of rapidly and efficiently forming a very thin and continuous coating of wax whereby the coating will be transparent, flexible, and moistureproof, but not greasy or tacky.

It is a further object of the invention to provide a process for rapidly and efficiently forming a continuous coating on flexible sheet material or on articles supported upon a moving conveyor, whereby a transparent, moistureproof, wax coating is formed which is extremely thin and substantially uniform in thickness, without the necessity of resorting to mechanical manipulation of the coating.

It is a specific object of the invention to provide a process of coating a transparent, nonfibrous, homogeneous, flexible sheet material, with a flexible, transparent, moistureproof and extremely thin film of wax, which is not greasy or tacky.

A further specific object is to provide a process of moistureproofing a flexible base sheet material by treating or coating the material first with an intermediate coating and subsequently applying thereto a flexible, transparent, moistureproof and extremely thin film of wax which is not greasy or tacky; the intermediate coating being such as to cause the wax to spread and adhere thereto when fluxed.

A still more specific object is to provide a process of moistureproofing transparent, flexible sheet material such as regenerated cellulose, by coating the material with an intermediate coating of a cellulose derivative or other suitable lacquer compounded to cause the wax to spread and adhere thereto when fluxed and subsequently applying thereto a flexible, transparent, moistureproof and extremely thin film of wax, which is not greasy or tacky.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the several steps and the relation of one or more of such steps with respect to each of the others which are exemplified in the following detailed disclosure, and the scope of the application of which will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

Figure 1 shows diagrammatically a vertical longitudinal sectional view of a simple form of apparatus by which one modification of the process of the invention may be carried out in coating flexible sheet materials;

Figure 2 shows a similar view of another form of apparatus taken along the broken line 2—2 in Figure 3, looking in the direction of the arrows; and,

Figure 3 shows a horizontal sectional view thereof, taken along the broken line 3—3 in Figure 2, looking in the direction of the arrows.

Heretofore, in preparing moistureproof wrapping materials, either a multicomponent lacquer including wax has been applied, or the base sheet material has been waxed heavily by direct spraying, dipping or rubbing with wax. These latter products are known to the trade as "waxed paper", and consist of a sheet of paper stock, pulp, paper, glassine or the like which are provided with a relatively thick, opaque and waterproof coating consisting of wax. Among other reasons, these latter materials are not entirely satisfactory for wrapping purposes because of their relative opacity, inflexibility as evidenced by their thickness and their inability to resist the passage of moisture through creases or fissures after they have been folded during the wrapping operation. The application of wax in a thickness of the neighborhood of one micron, by hot direct spraying or rubbing followed by subsequent polishing or scraping has also been recently suggested; but principally for purposes other than moistureproofing, and the suggested amounts are much greater than are permissible to accomplish the ends of my present invention and, moreover the subsequent rubbing or scraping step is not desirable and in some cases indeed, is not permissible for the attainment of the correlated essential qualities characteristic of the present invention. Furthermore, when wax is thus applied directly to non-fibrous, homogeneous sheet materials, such as regenerated cellulose, the coating will interfere with their transparency, may rub off through lack of adhesion or may flake off in use and ordinary handling because of lack of flexibility.

On the other hand, the manufacture of those

prior moistureproof wrapping materials by coating with multicomponent lacquers including wax, a cellulose derivative and plasticizers, gums, etc., ordinarily necessitates the use of relatively expensive solvent mixtures and ingredients. Such solvent mixtures not only contain expensive components, but their elimination and recovery are likewise expensive, troublesome and tedious; and with the temperatures usually used in drying the coating, it is necessary to reimpart the flexibility otherwise impaired by the drying out of the base material; and even with all precautions it happens frequently that the wax present in such lacquers and coatings prevents the elimination of the last traces of the volatile solvents, giving a product which is not odorless and the uses of which are consequently limited.

The process of the present invention is designed to provide a moistureproof coating without the use of expensive solvents or high drying temperatures and the base material is moistureproofed without injuring the properties of flexibility, etc., which it may initially possess. Wrapping materials made in accordance with the present invention are also to be distinguished from the waxed papers of the prior art, not only by their flexibility, but also by their high transparency, moistureproofness, non-tackiness and non-greasiness.

In general, the present invention contemplates forming on a base material an extremely thin, continuous film of wax such as, for example, paraffin, beeswax, ozokerite, etc., or mixtures of such waxes with each other or with suitable modifying materials such as stearates, stearic acid, resins, etc., the wax being the major ingredient, and all being referred to hereinafter as "wax", in a manner such that the coating is uniformly disposed over the base material in a layer so thin that it is substantially invisible. In a preferred form of the invention, this is accomplished by subjecting the base material to an air borne cloud of finely comminuted wax, to distribute minute particles thereof uniformly over the surface, and then fluxing these particles together so that they spread to form a thin, continuous film which is effectively resistant to the passage of moisture and yet which is transparent and highly flexible, and is not tacky or greasy.

In most or all heretofore known moistureproof wrapping materials in which wax has been used as the moistureproofing substance, it has been impossible to utilize water soluble glues or adhesives in sealing them or in affixing revenue stamps, labels, etc. thereto. I have found, however, that when flexible base materials, which are water absorbent and are non-absorbent for waxes are moistureproofed in accordance with the principles of my invention, they exhibit not only all of the desirable characteristics above enumerated, but in addition, may be made to have the remarkable and commercially important property of permitting the use of water soluble adhesives therewith. For example, by proper selection of the wax, regenerated cellulose moistureproofed in this manner, may be readily sealed with ordinary animal or vegetable glue, or may thus have revenue stamps, etc. affixed directly thereto, without the use of organic solvents of any kind.

In order to obtain a good degree of moistureproofness, while retaining the flexible, transparent, non-tacky and non-greasy characteristics desirable in wrapping materials, my invention contemplates that the moistureproofing substance and the surface to which it is to be applied shall be of natures such that the former shall spread on the latter when the particles are fluxed and will sufficiently adhere to its surface after the film is formed. This may be controlled either by the selection of the wax which is to be deposited on the given surface, or by the treatment or coating of the base sheet material. I have found, for example, that a sheet of regenerated cellulose or other cellulosic sheet material such as, for example, glassine paper or the like, may be advantageously moistureproofed with ozokerite, or other suitable wax in accordance with the present invention without previous treatment.

In speaking of regenerated cellulose, I mean the flexible transparent sheet material which contains some water and usually a small percentage of hygroscopic material, such as glycerine or the like.

Certain materials such as, for example, the commercial grades of gelatin, cellulose acetate or the like whose surfaces may not permit the wax used to spread and adhere sufficiently may be first treated or coated with a suitable coating material, not itself necessarily significantly moistureproof. Suitable intermediate coatings may be formed from cellulose derivatives of polymerized vinyl compounds admixed with plasticizers, gums, resins, blown oils, or the like, which increase the adherence and the spreading of the wax, and the use of these latter materials alone on the base material, for this purpose, is not precluded. Small amounts of dyes, pigments, waxes, etc., may be added to the intermediate layer if desired. The coated or treated sheet is then subjected to the waxing treatment in the manner indicated below. Such procedure may also be used with sheet materials which otherwise would be too highly absorbent for the wax and would consequently tend to prevent the formation of the thin surface film desired.

The lacquer or other intermediate coating or impregnating substance, as aforesaid, may be applied in any convenient manner, as by passing the base material through a solution of the lacquer and then drying while recovering the solvents (if any) in the usual manner. The article produced by the use of an intermediate coating comprises a laminated sheet material composed of the base sheet material having a thin, intermediate layer of lacquer or the like and a thin, transparent and moistureproof surface film of wax.

I have found also that if materials such as regenerated cellulose are first coated in this way and then waxed as aforesaid, a product more adapted for some uses is obtained, particularly in cases when waterproofness is desired, in addition to a high degree of moistureproofness. By this means exceptionally high moistureproofness can be obtained with the use of much thinner films and consequently with the use of much smaller quantities of coating materials than in moistureproof coatings heretofore known. The product thus produced is superior to any wrapping material heretofore known, and I consider it a preferred embodiment of my invention, as it produces a product of very uniform all-over moistureproof value.

The ultimate moistureproofness of the finished article is substantially independent of the thickness of this layer of lacquer and hence it may be extremely thin. I have obtained satisfactory results with such a film of only 0.00025 millimeter in thickness on each side of the base material. The final covering film of wax is in all cases effective to impart the high degree of moistureproofness desired.

By way of illustration, but not by way of limitation, the following specific example of a suitable intermediate coating composition for application to regenerated cellulose to increase the adherence of the wax coating may be mentioned:

	Per cent
Nitrocellulose (5 to 6 seconds)	74.5
Dibutyl phthalate	25
Blown rapeseed oil	½

A suitable thickness of intermediate coating will be obtained if approximately 10 grams of this mixture is dissolved in approximately 300 cc. of a solvent mixture consisting of 40 parts ethyl acetate and 60 parts benzene, and the regenerated cellulose is coated therewith and dried in the usual manner well known in the art. After the coating is dried, such laminated sheet material may then be coated on one or both sides with paraffin or other suitable wax, in the manner indicated below, to the production of a highly moistureproof wrapping material which is transparent, flexible, non-tacky and waterproof.

By long experimentation and careful investigation I have found that the wax coating which is necessary to produce my commercially desirably moistureproof material, when applied to each surface of a regenerated cellulose sheet material, for example, should uniformly cover the sheet material and need not be of a thickness substantially greater than about one-tenth of a micron on each side. Such films, of a thickness of even as low as one one-hundredth of a micron, have very effective moistureproofing properties, and I prefer a thickness of one-twentieth to one-fiftieth of a micron, although on certain previously coated materials the thickness may be still further increased without impairing the desired qualities of the film.

While by my improved (and preferred) method slightly thicker coating may be applied, nevertheless there is no necessity for such added thickness for moistureproofing purposes and particularly with previously uncoated materials, and there is a tendency to the production of products of poorer quality in that they are greasy, tacky, smudgy and of reduced flexibility. With sheet materials which have first been coated with a lacquer as above suggested, the moistureproof coating is more adherent and therefore subsequent mechanical manipulation thereof is not precluded although it is not necessary for good results.

By measuring the diameter of and counting the spherical wax particles on the surface of the regenerated cellulose prior to the fluxing operation, and by calculation, I have determined the thickness of the film resulting when they are fluxed together. Stated another way, I have found that the operations should in general be so conducted that prior to the fluxing operation, the equivalent of from 500 to 2500 particles of wax having diameters not greater than about 40, and preferably not greater than about 20 microns, and of which preferably from 50% to 90% or above have diameters of less than 8 microns and preferably less than 5 microns should be uniformly disposed on each square millimeter of surface on each side of the sheet material. Further data as to size and number of particles which are used in a preferred form of my invention is given hereinafter.

Films produced by methods wherein the particles are larger than indicated and are not uniformly distributed are inclined to be opaque and smudgy in spots, and streak and smear through handling in use, and in general do not exhibit the improved correlated properties of the product made in accordance with my invention. With slightly absorbent substances, such as uncoated glassine, and with some previously coated materials, the time of exposure should be increased somewhat so as to give an exposed surface layer of wax of the character indicated.

In accordance with the processes disclosed in this application, such a microscopically thin coating of wax can be applied by forming a fine cloud of wax in a closed chamber, exposing the material to be coated in the chamber at a point sufficiently far removed from the source so that all particles larger than approximately 30 microns in diameter fall to the bottom of the chamber and do not lodge on the sheet; and after the surface has been uniformly and sufficiently covered with the fine particles of wax, it is heated by passing through a hot zone, or by other suitable means, so as to flux the wax particles together, whereupon it is cooled, giving a uniform and very thin film of wax over the entire surface. When moistureproofing sheet materials, one or both sides may be coated as desired.

A simple form of apparatus for carrying out my novel processes in coating sheet materials is shown diagrammatically in Figure 1 of the drawings in which the reference numeral **10** designates a closed elongated chamber, at one end of which there is provided a wax atomizing mechanism designated generally as **11**. At the other end, the chamber is provided with spaced slots **12**, in a well **13** through which the sheet material is passed from a mill roll **14** onto a finished roll **15**.

The atomizing apparatus may consist of a heated trough **16** containing paraffin **17**, which is in liquid condition, i. e. melted and, if desired, somewhat diluted with toluol or the like, and into which dips a slowly rotating feed wheel **18** which, as it rotates, carries on its periphery **19** a thin film of the paraffin. The mechanism is also provided with a tangentially disposed air blast nozzle **20** through which heated air is blown forcibly onto the periphery **19**, breaking the thin film of liquid wax and carrying it in atomized form, across the chamber **10**.

Even with the best atomizing apparatus thus far obtained, I have found that the cloud of wax normally contains particles which are too large, and contains too large a proportion of particles which are above the desirable size so that it is now necessary to eliminate these larger particles as, for example, by spacing the exposed material from the atomizer and by providing a baffle arrangement indicated generally at **23**, thus causing the larger particles to be separated from the cloud and to collect at the bottom in piles **21'**, and may be removed at intervals and re-used. The residual cloud of fine particles is air borne and deposits the desired particles on the material.

Upon leaving the chamber **10**, the material then passes through a heating zone **22**, in which the deposited particles of wax are fused together to form a uniform and moistureproof film, and which may be provided, if desired, with a suitable air conditioning means to prevent the loss of flexibility of the material during the fluxing of the wax particles. The coated sheet material then passes onto the finished roll **15** which is deposed at such a distance from the heater **22** as to permit the wax coating to cool before the sheet is again rolled or suitable cooling means is

provided. This cooling is indicated in the drawings by the broken away portion 24. To allow for changes in the diameters of the rolls 14 and 15, and to tension, guide and/or stretch the sheet material properly, there are provided a sufficient number of auxiliary rolls 25.

If toluol or the like is used to dilute the wax, a heated dryer (not shown) is preferably interposed before the heating zone 22 or the zone is made sufficiently long to drive off the solvents. When coating both sides of a base material in this form of apparatus, the wax, deposited separately on each side, may be fluxed simultaneously if desired, in which case the heating zone 22 is not used during the first passage of the base material through the chamber.

In Figures 2 and 3 is shown another and preferred form of apparatus in which the corresponding parts are similarly designated. A principal difference between this and the previously described form is that the cloud of air borne wax particles is positively circulated by suitable means such as fans 26. This feature may also, if desired, be incorporated in the form of apparatus shown in Figure 1, but in order to facilitate the differential separation of the larger wax particles, the atomizing and separating chamber A is preferably made distinct from the depositing chamber B, as shown in Figure 3, the fans 26 operating to introduce the cloud of fine wax particles into the latter preferably at the top of one end and withdraw the residual cloud at the other end for recirculation through the chamber A. Furthermore, by the use of the positive circulation, it is expedient to deposit wax particles on both sides of the sheet material at once and to this end the sheet material may have a double traverse of the chamber B before passing through the heater 22. By routing the sheet in the direction shown by the arrows, the deposited particles are not disturbed by the auxiliary rollers 25 prior to the fluxing operation, because the particles are deposited substantially only on the upper surface of the sheet during its traverse of the chamber B.

Apparatus for carrying out my process comprises the subject matter of my co-pending application, Serial No. 670,866 filed May 13, 1933.

By this means, I have found it possible rapidly and efficiently to coat a sheet material such as, for example, regenerated cellulose, by depositing on each side thereof approximately 2000 particles of paraffin wax per square millimeter of area for a 60 second exposure, and then fluxing both sides simultaneously to the production of a transparent, flexible, non-tacky, non-greasy and highly moistureproof wrapping material, which is devoid of odor. When using my preferred apparatus, a study of the deposited particles under a microscope shows also that they might be grouped with regard to size and percentage distribution as follows:

11% are ½ micron
31% are 1 micron
25% are 1½ microns
13% are 2 microns
9% are 3 microns
3% are 4 microns
2% are 5 microns or less

and 6% are between 5 and 20 microns.

I have found that when using such extremely fine particles as are last mentioned, from 1500 to 5000 particles thereof may be distributed per square millimeter of area on a sheet of regenerated cellulose with good results. Obviously with different apparatus, different percentage distributions of particle size may be obtained. Theoretically, if the particles were all of one size, the approximate number per square millimeter of area required to give a thickness of wax film of 1/10th and 1/100th of a micron would be as follows:

Diameter of particle micron	Number of particles per sq. mm. of area for film thickness of 1/10 micron	Number of particles per sq. mm. of area for film thickness of 1/100 micron
1	191,000	19,100
2	23,900	2,390
4	2,960	296
6	884	88
8	373	37
10	192	19
12	112	11
14	70	7
16	47	4.7
20	24	2.4
25	12.5	1.25
30	7.09	0.709
35	4.53	0.453
40	2.93	0.293

In using paraffin wax, I prefer to employ one having a relatively high melting point, e. g. 58°–60° C. I have also obtained very good results with a mixture of about 95% purified ozokerite and 5% purified beeswax applied to uncoated regenerated cellulose. In coating glassine, purified beeswax alone is preferable, but, as indicated above, the deposition period should be somewhat longer because of the slight absorption of the fluxed wax by the surface of the material. For example in the apparatus referred to above, the length of exposure for glassine should be about twice that for regenerated cellulose.

While I have illustrated mechanisms by which the desired coating operations may be accomplished, it is obvious that the thickness of film, as well as the size of the deposited particles, may be varied as above described by changing the distances or time of exposure, or by using other atomizing apparatus or means for applying the coating without departing from the invention.

In accordance with the process described above, I have been able to apply to a sheet of regenerated cellulose one-thousandth of an inch thick a thin coating of wax which is highly transparent, flexible, is not tacky or greasy, and which is moistureproof. That is to say, when it is exposed on one side to a dry atmosphere and on the other side to one saturated with water vapor, less than 60 grams of water vapor will permeate per square meter of area, during 24 hours at a temperature of about 40° C.

While I have referred frequently above to wrapping and flexible sheet materials, it is to be understood that my invention is not limited thereto, as the process is applicable to coating any suitable material. For example, materials such as packages, containers and cans, as well as other articles or substances of many kinds, can thus be readily rendered moistureproof, either with or without the intermediate coating step. By such means the seams and overlaps of cans and packages of tobacco or the like may be closed effectively and the material per se may be moistureproofed if it is gas pervious. As will be obvious to one skilled in the art, the apparatus may be appropriately modified when treating small or individual articles so as to substitute a moving conveyor for the sheet materials shown

in the drawings, without departing from the spirit of the invention.

This method of moistureproofing may also be advantageously used in sealing the cut edges and the outside layer of coated or uncoated hygroscopic sheet materials such as cut rolls of ordinary or moistureproofed regenerated cellulose in order to protect them from changing in moisture content, especially at the edges with consequent swelling of the film and resultant distortion thereof, or from drying out during storage.

It will thus be seen that by means of the present invention there have been provided novel moistureproofing processes for the production of improved and technically important products which may be economically and easily prepared, and since certain changes in carrying out the above process may be made without departing from its scope, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that in said claims ingredients recited in the singular are intended to include compatible mixtures of such ingredients wherever the sense permits.

This application is a division of my co-pending application, Serial No. 615,353, filed June 4, 1932.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of moistureproofing materials which comprises forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud, and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing a multiplicity of residual particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a flexible, transparent, moistureproof film which is not greasy.

2. A process of moistureproofing materials which comprises forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud, and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing a multiplicity of residual particles of wax on the material and thereafter fluxing said particles so that they spread to form a thin, continuous film, comprising a flexible transparent, moistureproof and non-greasy coating on the surface of the material, the number and mass of said deposited particles being equivalent to from 500 to 2500 particles per square millimeter of area and the diameter of the majority of said deposited particles being less than about 8 microns.

3. A process of moistureproofing transparent flexible base sheet material which comprises forming a cloud of wax particles, conveying the wax particles in an air current through a tortuous route to a treating point whereby there are separated from the cloud substantially all particles having diameters greater than about 40 microns, depositing a multiplicity of air-borne particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, flexible, moistureproof film which is not greasy.

4. A process of moistureproofing a sheet of regenerated cellulose which comprises forming a cloud of wax particles, conveying the wax particles in an air current through a tortuous route to a treating point whereby there are separated from the cloud substantially all particles having diameters greater than about 40 microns, depositing a multiplicity of air-borne particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film, the spacing and number of the particles being correlated to their average masses as to produce, when fluxed, a transparent, flexible, moistureproof film which is not greasy.

5. A process of moistureproofing a sheet of regenerated cellulose which comprises forming a cloud of wax particles, conveying the wax particles in an air current through a tortuous route to a treating point whereby there are separated from the cloud substantially all particles having diameters greater than about 40 microns, depositing a multiplicity of air-borne particles of wax on the material, and thereafter fluxing said particles, so that they spread to form a thin, continuous film, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, flexible, moistureproof and non-greasy coating on the surface of the material, said deposited particles having diameters not substantially greater than 40 microns and a majority having diameters of less than about 8 microns.

6. A process of moistureproofing a sheet of regenerated cellulose which comprises forming a cloud of wax particles, conveying the wax particles in an air current through a tortuous route to a treating point whereby there are separated from the cloud substantially all particles having diameters greater than about 40 microns, depositing a multiplicity of air-borne particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film, comprising a transparent, flexible moistureproof and non-greasy coating on the surface of the material, the number and mass of said deposited particles being equivalent to from 500 to 2500 particles per square millimeter of area, the diameter of which particles does not exceed 40 microns and the diameters of the majority of which are less than about 8 microns.

7. A process of moistureproofing materials which comprises providing the material with a surface upon which wax will spread and adhere when fluxed, forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing a multiplicity of residual particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a flexible, transparent, moistureproof film which is not tacky or greasy.

8. A process of moistureproofing transparent, flexible base sheet materials which comprises coating the materials with a flexible composition upon which wax will spread uniformly when fluxed, forming a cloud of wax particles, conveying the wax particles in an air current to a treat-

ing point at a distance from the point of formation of the cloud, and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing a multiplicity of residual particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film of wax, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, moistureproof, flexible, non-tacky and non-greasy coating on the surface and a majority of said deposited particles having diameters of less than about 8 microns.

9. A process of moistureproofing a sheet of regenerated cellulose which comprises coating it with a flexible composition upon which wax will spread uniformly and adhere, when fluxed, forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing a multiplicity of residual particles of wax on the material, and thereafter fluxing said particles so that they spread to form a thin, continuous film of wax, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, flexible, moistureproof film which is not tacky or greasy.

10. A process of moistureproofing a sheet of regenerated cellulose which comprises applying a composition comprising a lacquer base, a plasticizer, and a volatile solvent thereto, evaporating the solvent, forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing on the coated material a multiplicity of the residual particles of wax, and thereafter fluxing said particles so that they spread to form a thin, continuous film of wax, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, flexible moistureproof, non-tacky and non-greasy coating on the surface of the coated material.

11. A process of moistureproofing a sheet of regenerated cellulose which comprises applying a composition comprising a lacquer base, a plasticizer and a volatile solvent thereto, evaporating the solvent, forming a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of formation of the cloud and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing on the coated material a multiplicity of the residual particles of wax, and thereafter fluxing said particles so that they spread to form a thin, continuous film of wax, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a transparent, flexible, moistureproof, non-tacky and non-greasy coating on the surface of the coated material, the number and mass of said deposited particles being equivalent to from 500 to 2500 particles per square millimeter of area and the diameter of the majority of said deposited particles being less than about 8 microns .

12. A process of moistureproofing a sheet of regenerated cellulose which comprises applying a composition comprising a lacquer base, a plasticizer, and a volatile solvent thereto, evaporating the solvent, and forming thereon a thin, transparent, moistureproof, flexible, non-tacky, non-greasy and continuous surface film of wax having a thickness not substantially greater than $\frac{1}{5}$ of a micron, said film being formed by producing a cloud of wax particles, conveying the wax particles in an air current to a treating point at a distance from the point of production of the cloud and while conveying said cloud separating therefrom substantially all particles having a diameter greater than about 40 microns, depositing on the lacquered sheet a multiplicity of the residual particles of wax and thereafter fluxing to form the film.

13. A process of moistureproofing materials which comprises forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter circulating the residual finer particles in an air current and depositing said particles on the material to be moistureproofed and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is transparent and not greasy.

14. A process of moistureproofing materials which comprises forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter depositing the residual particles on the material to be moistureproofed and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is flexible, transparent and not greasy.

15. A process of moistureproofing roll ends of rolled hygroscopic sheet materials which comprises forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter depositing the residual particles on the roll ends to be moistureproofed and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is flexible, transparent and not greasy.

16. A process of moistureproofing materials which comprises providing the material with a surface upon which wax will spread and adhere when fluxed, forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter circulating the residual finer particles in an air current and depositing said particles on the material to be moistureproofed and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is transparent and not greasy.

17. A process of moistureproofing transparent, flexible base sheet material which comprises coating the materials with a flexible composition upon which wax will spread uniformly and adhere when fluxed, forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter circulating the residual finer particles in an air current and depositing

said particles on the coated material and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is transparent and not greasy.

18. A process of moistureproofing a sheet of regenerated cellulose which comprises applying a composition comprising a lacquer base, a plasticizer and a volatile solvent thereto, evaporating the solvent, forming a cloud of fine particles of wax, separating therefrom substantially all particles having a diameter greater than about 40 microns, and thereafter circulating the residual finer particles in an air current and depositing said particles on the coated material and fluxing the particles, the spacing and number of the particles being so correlated to their average masses as to produce, when fluxed, a thin, continuous and moistureproof film which is transparent and not greasy.

19. As an article of manufacture, the product produced by the process recited in claim 14.

20. A sheet of regenerated cellulose moistureproofed by the process of claim 14.

21. As an article of manufacture, the product produced by the process recited in claim 16.

22. A sheet of regenerated cellulose moistureproofed by the process of claim 16.

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