

# UNITED STATES PATENT OFFICE

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## WATERPROOF INSULATING BODY

No Drawing.

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This invention relates to the production of heat insulating, water-proof bodies, having little or no resonant quality and it is among the objects: to produce such bodies which are tough and strong; to produce a fiber board in which at least one surface is smoothed and made suitable for graining, decorating and painting; to provide bodies of the above nature adapted for wall finish, paneling work, furniture manufacture, display and sign work, etc; to produce water-proof bodies by incorporating asphalt with cellulosic or other suitable material; to obtain products having the qualities mentioned by submitting asphalt-containing material to heat and pressure; to produce heat insulating, water-proof bodies by the use of raw wood and asphalt; and to produce bodies of the above nature which simulate ply board. Features and advantages of the invention will be also set forth herebelow.

The invention herein is partly based upon the discovery that an asphalt with a comparatively high melting point when powdered and added either as a powder or as an emulsion to a pulped batch of cellulosic or equivalent material, will, when the material is formed into a sheet and submitted to heat and pressure, cheaply produce a body which has superior moisture resisting properties, as well as superior heat insulating and sub-resonant properties.

For many years search has been made for a cheap material having low sub-resonant properties, along with a high degree of water-proofness, and the discovery and teachings of the present invention give a series of cheaply producible products having the qualities mentioned.

In carrying out the new process for producing the new products of this invention, any suitable fiber such as wood, including poplar, spruce, jack pine or any sawmill waste or forest waste is fiberized or reduced to pulp preferably by mechanical means using any of the usual devices now employed for producing ground wood pulp. Preferably there is produced a pulp having a long coarse fiber. The best results are

secured by use of raw wood, as distinguished from chemically treated pulp.

The next step is to introduce into the pulp either an emulsion composed of asphalt, or dry ground asphalt flour, and to then thoroughly mix this asphalt with the cellulosic or equivalent material. The amount of asphalt content may be varied within certain limits, the best results having thus far been obtained by using amounts varying substantially from two to fifteen per cent of the weight of the finished product.

Dry or powdered asphalt with comparatively high melting point is necessary herein to obtain the best results. In order that asphalt can be powdered at ordinary temperatures it should have a melting point above 200° F. That is, the melting point must not be so low that flowing under heat and pressure is prevented, or so high that such a temperature will have to be applied as will scorch or burn the wood, or cellulosic material, before the asphalt can be melted and thoroughly flowed, and distributed to obtain proper bonding of the material with which it is associated.

If liquid (low melting point) asphalt is mixed with pulp the batch it sticky and adheres to screens and pipes. With liquid asphalt a stiff board cannot be produced because the asphalt is always soft and pliable at ordinary temperatures. Another great advantage in using asphalt for the purposes herein is that it has a negligible co-efficient of expansion, in relation to moisture.

In some instances rosin size (for example rosin soap) is added (in addition to the asphalt), which size is later precipitated with alum. In carrying out this step, it has been found that from 12 to 14 pounds of rosin size to 1000 square feet of finished board-like product having a thickness of one-half an inch, produces a satisfactory water-proofing. It has also been found that from 12 to 14 pounds of rosin emulsion (in addition to the asphalt) per 1000 square feet of finisher board-like product one-half an inch thick produces a satisfactory water-proof-

ing. It has further been found that from 18 to 110 pounds (approximately 2 to 15 per cent) of asphalt having a melting point of from 200° to 212° produces one thousand 5 square feet of board-like product, approximately one-half an inch thick, which is strong and water-proof. Equally good results are obtained by the use of asphalt either as an emulsion or in a powdered flour-like form. The use of asphalt which is not 10 pliable at ordinary temperatures is an important feature and is separately claimed in combination with raw cellulosic pulp and/or chemical pulp.

15 The next step in the manufacture of improved product or products herein, is to felt this mixture or combination of asphalt-containing pulp into sheets of the desired thickness. The felting may be accomplished 20 by any suitable equipment which will form separate sheets or which will form a continuous blanket or web approximately one-half to three-fourths inch thick, depending upon the density and strength required in 25 the finished board. The web may be cut into sheets of suitable length. The felting process may be carried out in the manner set forth in United States Patent No. 1,672,249, issued June 5th, 1928.

30 As the board or web leaves the felting machine, it contains from 60 to 80 per cent of water. This wet, thick sheet is delivered to a suitable high temperature drier, preferably of the roller type, in which the water is 35 evaporated. The dry, soft, light weight, spongy board leaving the dry kiln has a water content varying substantially from 1 to 6 per cent by weight. The sheets may be cut into suitable lengths while wet and fed 40 to the roller drier. The sheets after leaving the drier are comparatively light weight having a density of about 16 pounds and are soft, and may be either stored, or may be at once made into a harder board by being 45 placed in a hydraulic hot plate press, or its equivalent, the surface of one of the press platens being polished so that the board may be correspondingly suitably surfaced for graining, decorating, and painting 50 of various kinds as above mentioned. The board as it leaves the drier kiln contains substantially from 2 to 10 per cent of moisture. If it has less than 5 or 6 per cent, and is stored before being made into the harder 55 board, it absorbs from the atmosphere enough moisture to bring the moisture content up to substantially 5 or 6 per cent depending upon the atmospheric humidity (sometimes as high as 10 per cent during 60 periods of greater atmospheric humidity). The product thus far described is considered to be another product of this invention, as is also the product obtained by the steps now to be described. This is so because all 65 of the products resulting from the incor-

poration of asphalt (having a melting point above a certain temperature) into the pulp, raw wood or other kind, are claimed herein.

Additional steps produce a harder board 70 which is a feature of the invention. To continue: the substantially dry sheets are placed in a suitable press such as a hydraulic press having steam heated plates, and 75 are submitted to pressures ranging from 150 to 300 pounds per square inch, to cement the fiberized material by action by the asphalt. Press temperatures ranging from 80 approximately 250° to 375° F. are maintained during the time that the material is under pressure. It has been found that various grades of stiff products may be produced by varying the pressure within the 85 range of 300 pounds to 400 pounds per square inch. Excellent results have been obtained by maintaining the pressure and temperature for from ten to thirty minutes. 90 By this pressure the board is reduced from approximately one-half an inch to three-sixteenths of an inch in thickness. The temperature is sufficient to melt and flow and 95 thoroughly incorporate and evenly distribute the asphalt within the cellulosic base and upon cooling, a welding or cementing action results, producing a dense, grainless, 100 hard, water-resisting body having a specific gravity of substantially one. Where rosin size is used, it is also melted and commingled with the fiber and asphalt during the process of pressing and heating and increases the resistance of the product to the absorption 105 of moisture. The resultant board as before stated, has a specific gravity of substantially one, is water-proof and its coefficient of expansion, due to moisture, is substantially zero. Excellent results are obtained when 110 the moisture in the board before the final step of placing and heating under pressure is 10 per cent.

The products are not only water-proof but can be much more cheaply produced 115 than any synthetic water-proof bodies known to me.

It is believed that the presence of rosin acts as a sort of flux for the asphalt, to 120 assist in the even distribution of the asphalt. The melting point of asphalt may be about 211° F. but a higher temperature is seemingly necessary to make it sufficiently plastic for the purposes herein, that is to obtain 125 even and thorough penetration into or mixing with the pulp, and to produce a stiff-strong board-like body.

The following is an example of the process of making one of the products of the present invention; the cellulosic material is first 130 suitably pulped; pulverized asphalt having a melting point within the range of 200° to 211° F., is next introduced in quantity ranging from two and one-half to four per cent. A suitable quantity of size is then

added. The mixture is then formed into sheets, the sheets are then dried to contain moisture within the range of from 2 to 6 per cent by weight. Pressure is then applied within the range of 150 to 200 pounds per square inch, while a temperature of approximately 375° F. is maintained substantially throughout the pressing period.

I claim as my invention:

10 1. A process for producing hard wood-like bodies which consists in preparing raw wood pulp and mixing therewith pulverized asphalt, manipulating the batch to form a felted sheet, drying, and then submitting  
15 to a pressure within the range of from one hundred fifty to two hundred pounds per square inch at a temperature of approximately three hundred fifty degrees Fahrenheit for from fifteen to thirty minutes.

20 2. A process for producing hard wood-like bodies which consists in preparing wood pulp, and mixing therewith high melting point pulverized asphalt, adding rosin size, precipitating the size with alum, manipulating the batch to form a felted sheet, drying,  
25 and then submitting the sheet to heat and pressure.

3. A process for producing wood-like bodies which consists in pulping cellulosic material, mixing therewith from two per cent to fifteen per cent by weight of asphalt to the weight of the finished product, manipulating the batch to form a sheet, drying,  
35 then applying pressure within the range of three hundred to four hundred pounds per square inch, at temperatures within the range of substantially approximately two hundred fifty to three hundred seventy-five degrees Fahrenheit.

40 4. A process for producing wood-like bodies which consists in pulping cellulosic material, mixing therewith from two per cent to fifteen per cent by weight of asphalt to the weight of the finished product, manipulating the batch to form a sheet, then  
45 simultaneously applying pressure within the range of three hundred to four hundred pounds per square inch, at a temperature of substantially approximately three hundred seventy-five degrees Fahrenheit.

5. A process for producing wood-like bodies which consists in pulping cellulosic material, mixing therewith from two per cent to fifteen per cent by weight of asphalt to the weight of the finished product, manipulating the batch to form a sheet, then heating while applying pressure within the range of three hundred to four hundred pounds per square inch.

60 6. The products resulting from mixing with pulped cellulosic material from two per cent to fifteen per cent by weight of asphalt to weight of finished product, manipulating the batch to form a sheet, drying,  
65 ing, then applying pressures within the

range of three hundred to four hundred pounds per square inch at temperatures within the range of approximately two hundred fifty to three hundred seventy-five degrees Fahrenheit and for lengths of times within the range of from fifteen to thirty minutes.

7. A process for producing water-proof bodies which consists in preparing pulp, mixing therewith from two to fifteen per cent by weight of asphalt having a melting point of substantially two hundred and twelve degrees Fahrenheit to weight of the finished product, adding rosin size and forming the mixture into a sheet.

8. A process for producing water-proof bodies which consists in preparing wood pulp, mixing therewith from two to fifteen per cent by weight of asphalt having a melting point of substantially two hundred and twelve degrees Fahrenheit to weight of the finished product, adding rosin size in an amount ranging from twelve to fourteen pounds to one thousand square feet of finished product, and forming the mixture into a sheet.

In witness whereof, I have hereunto set my hand this 13th day of November 1929.

GEORGE H. ELLIS.