Dec. 31, 1946. C. G. MUNTERS 2,413,331

HEAT INSULATION

Filed April 5, 1941

Fig.1

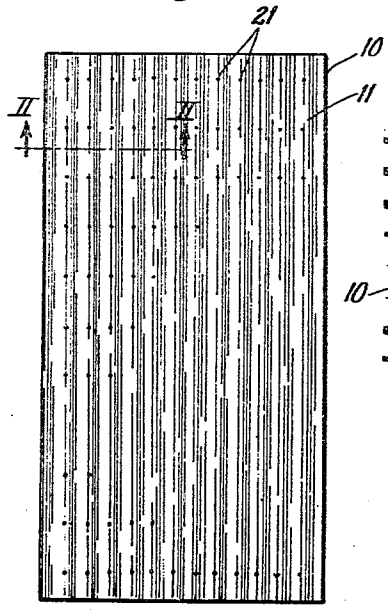


Fig.2

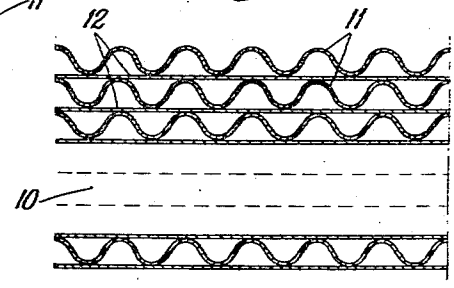


Fig.3

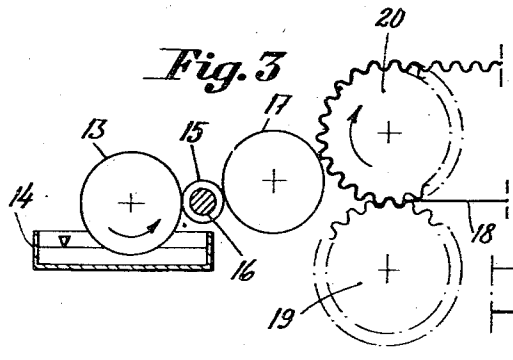


Fig.4

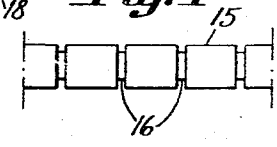


Fig.5

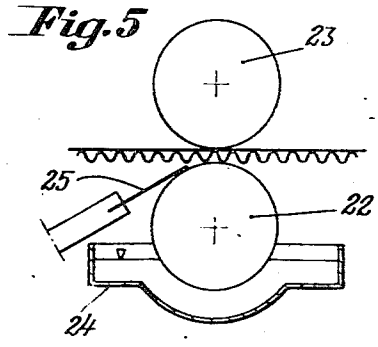
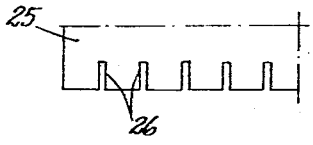


Fig.6



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HEAT INSULATION

Carl Georg Munters, Stockholm, Sweden

Application April 5, 1941, Serial No. 386,998
In Sweden April 8, 1940

3 Claims. (Cl. 154—45)

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This invention relates to heat insulation, and more particularly to heat insulating units formed of a plurality of paper sheets. It is the main object of the invention to provide a novel insulation of this type, which is adapted to be manufactured at a low cost on a commercial scale while answering at the same time high demands with respect to moisture-proofness and insulating capacity.

Further and more detailed objects of the invention and the manner in which these objects are attained will become apparent from the following description of a preferred embodiment of the invention illustrated in the accompanying drawing forming a part of this specification.

In the drawing:

Fig. 1 shows a view of an insulating unit according to the invention;

Fig. 2 is a section on the line II—II of Fig. 1 on an enlarged scale;

Fig. 3 is a diagrammatic view of a device for applying adhesive onto the paper;

Fig. 4 is a view of a detail of this device;

Fig. 5 shows another device for applying adhesive onto the paper; and

Fig. 6 is a view of a detail of that device.

In the drawing, 10 designates an insulating unit, consisting of a plurality of paper sheets, alternate sheets being corrugated and intermediate sheets being plane, as indicated at 11 and 12, respectively. The corrugations of the paper sheets 11 extend in the same main direction and preferably are parallel to one another throughout the unit.

In the manufacture of the heat insulation according to the invention, two paper plies are moved in known manner between the rollers of a corrugating machine, one of the plies being then corrugated. After that, the sheets are united by means of an adhesive which preferably contains water, such as water glass. The water glass may be applied to the corrugated paper ply by means of the device shown in Figs. 3 and 4. This device consists of a smooth roller 13 which is immersed into a bath 14 of water glass. Bearing on the roller 13 is a roller 15 which is preferably of smaller diameter. The roller 15 is provided with annular recesses 16 spaced apart at comparatively great distances (2–6 centimetres). Bearing on the roller 15 is another roller 17. The paper ply 18 is corrugated between two toothed rollers 19, 20, the roller 20 being adjacent the roller 17. Through the contact between the rollers 13, 15 the water glass is wiped off the cylindrical external surface of the roller 15, so that only the recesses 16 will contain water glass. This

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water glass is transferred onto the roller 17 and then onto the paper ply, the ridges of which will thus be wet by water glass at spaced points, said water glass being then dried in the corrugating machine in known manner. The binding points between the foils are indicated by the reference character 21 in Fig. 1.

After the plane and corrugated paper plies are united in the manner above described, they are conducted between two rollers 22 and 23 (Fig. 5) spaced apart a distance approximately equal to the thickness of the combined paper ply. Bearing on the roller 22 which is immersed in a bath of water glass 24 is a resilient plate 25 (Fig. 6) provided with slots 26 suitably spaced from each other. The plate wipes the water glass off the roller 22 so that the latter will be coated with narrow stripes of water glass corresponding to the ridges of the corrugated paper. The combined paper ply is cut into suitable pieces which are laid on each other so that a unit of the desired thickness is obtained.

The insulating unit thus produced is not moisture-proof in regard to either the paper material proper or with respect to the binding material. Adhesive of the kind above described is advantageously used, however, inasmuch as it is rapidly dried under heat in the corrugating machine and does not stick to the rollers or the like thereof. An insulating unit is now formed, the various parts of which are kept together in a sufficient degree to permit impregnation of the unit. This impregnation is effected by dipping the insulating unit into a bath containing molten asphalt. The dipping is undertaken in a manner such that the unit is moved down into the bath with the corrugations extending substantially parallel to the direction of movement of the unit. The impregnating agent will then penetrate into the cells of the unit. When the unit is raised out of the bath, the surplus of the impregnating agent will easily flow off by reason of the unidirectional arrangement of the corrugations. Inasmuch as a plurality of layers are united with one another, the major portion of the unit is well heat insulated during the flowing off of the impregnating agent so that the latter will not have time to set or to become viscous before it forms a protective layer on the paper sheets of the desired thinness. Furthermore, the flowing off of the impregnating agent may take place in heated air or while heated air is blown through the same, so as to counteract too rapid a solidification of the impregnating agent. The impregnating agent, after setting, forms a moisture-proof layer pro-

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tecting the paper sheets proper as well as the binding points, whereby the unit will be exceedingly moisture-proof while also showing the proper rigidness.

Water glass is per se very water proof. When, however, it forms the binding agent between the paper sheets, it becomes porous, whereby water due to capillary forces is gathered in the pores of the water glass and dissolves the same. It has proved that asphalt in a very effective manner cooperates with the water glass so as to close its pores and prevent the water glass from being dissolved.

The quantity of asphalt in the finished insulation amounts to 35–60% of the weight of the insulation. Moreover, the asphalt is of such kind that its softening point is at 95–150° C. and even still higher, determined by means of the known ring and ball method. In this way, the paper sheets of the insulation are given bright or shiny surfaces by which, among other things, heat transfer by radiation through the insulation is reduced to a certain extent.

The impregnating agent should have a low viscosity in its liquid state so as to penetrate easily into and off the interior of the unit. The insulating capacity of the unit is highly dependent on the quantity of impregnating agent on the paper. Molten asphalt is too viscous and is therefore mixed with oil, petrol or the like to reduce the viscosity of the asphalt bath in a sufficient degree. Two or more kinds of asphalt having different softening points may be mixed with one another.

In certain cases, there may be added to the above-mentioned impregnating agent substances such as acetylic acid, which effectively prevent the formation of mould and the development of bacteria.

In the impregnating procedure, the paper units may be placed on a track, which conveys the same down into the bath and then up into a chamber which is insulated and/or heated.

In waterproofed insulating material of this nature, a special advantage results from applying the water soluble adhesive at spaced points only, rather than in continuous lines along the crests of the corrugations. In the latter case, if the material is cut across the corrugations, the waterproof coating surrounding the line of adhesive on each crest will be cut, and hence water may enter at the cut end and in time progressively dissolve the entire line of adhesive. With the adhesive at spaced points only, on the other hand, a cut across the corrugations can damage at the most only one point on each crest, the waterproof coating around the other spaced points remaining unbroken. Hence, progressive dissolving of the bonds along the crests is prevented.

What I claim is:

1. Multi-ply insulation unit which is composed of paper sheets which are alternately plane and corrugated, the corrugated sheets having the corrugations extending substantially parallel throughout the unit, the sheets being interconnected at spaced points only along the crests of the corrugated sheets by means of a water soluble binding agent and being impregnated with asphalt, which coats the binding agent so as to prevent it from being dissolved under the action of moisture.

2. An insulation unit according to claim 1, in which the asphalt amounts to 35–60% of the weight of the insulation.

3. Insulation of the character described comprising a corrugated and a plane sheet of paper joined together by a water soluble binding agent only at spaced points of contact between the sheets along the crests of the corrugations, and waterproof bituminous material applied to the joined sheets, said material covering said binding agent and the remainder of the surfaces of said sheets, the spaced locations of the binding agent along said crests limiting maximum exposure of the binding agent to moisture to isolated points if the insulation is cut across said crests.

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