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(54) **Heat-insulated plastic hall.**

(57) An air or frame supported hall made of plastic sheeting, especially a hall comprising an elongate portion having an arched section, said hall having an outer heat insulation comprising a number of adjacent lengths or mats (1) covering substantially the entire hall, each length consisting of an approx. 5-50 mm thick and approx. 1-2 m wide core (2) of a heat-insulating material, each flat side of said core being laminated with an unreinforced, soft, flexible plastic sheet (3), said heat-insulating material of the lengths (1) consisting of a porous fibre core member built up from organic polymer fibres united to a felt or wadding.

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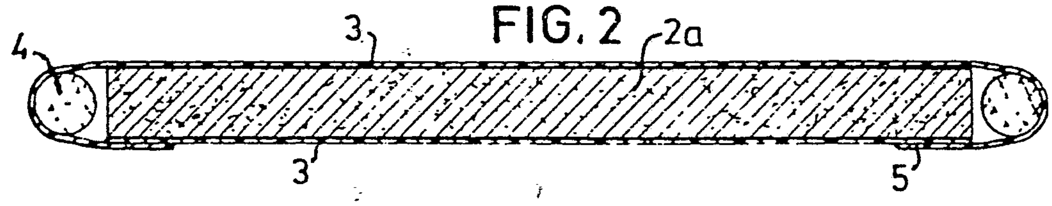
FIG. 2



Erecta AG

Heat-insulated plastic hall

The invention relates to an air or frame supported hall made of plastic sheeting, especially a hall comprising an elongate portion with an arched section and having an improved outer heat insulation.

From Swedish Patent No. 7614428-6 a plastic hall is known which has an outer heat insulation consisting of lengths or mats of soft cellular plastic, laminated on each flat side with an unreinforced, soft, flexible plastic sheet and provided with ropes in passages along the edges.

According to the present invention it has now been found that the insulation of such a plastic hall can be improved if the porous polymer member constituting the cellular plastic is replaced, according to the invention, with a porous fibre core member formed by polymer fibres which have been united to a felt or a wadding e.g. by carding, or in the same way as by the production of non-woven fabric, said porous fibre core member being impregnated with a binder at least on its two flat surface layers. The two flat sides of a porous fibre core member produced in this manner are then laminated with an unreinforced, soft, flexible plastic sheet material. If said fibres have been pretreated to the effect that they bind themselves to the plastic sheet material, the latter can be used instead of the above-mentioned surface impregnation, which makes the porous fibre core member stable.

According to a preferred embodiment of the invention, the mats are designed so that the reinforced sheets extend a distance beyond the edges of the porous fibre core member and form grooves through which ropes, preferably of plastic material, run. The unreinforced sheet can for instance extend beyond the edges of the porous fibre core member and be welded together around the rope, or a separate strip of e.g. fabric-reinforced plastic sheet can be welded around the rope against the two sheets of the mat along the edge, the fabric-reinforced plastic sheet and the edge of the mat thus forming a sleeve around the rope.

The invention is illustrated by the enclosed drawing figures. Fig. 1 is a plan view of an insulation component 1 for a plastic hall according to the invention, and Fig. 2 is a sectional view of the same component. The porous fibre core member is designated by the numeral 2, and the plastic sheet laminated thereto by the numeral 3. Plastic ropes are designated by the numeral 4, and the numeral 5 indicates a glued or welded seam.

Fig. 2 illustrates how the bottom side of the porous fibre core member has first been covered with a plastic sheet, whereafter the upper side has been covered with another, similar plastic sheet which has been drawn out a distance beyond the edge of the actual core and has then been welded to the plastic sheet on the bottom side of the porous fibre core member.

Fig. 3 is a schematic side elevation view of the long side of a plastic hall, the continuous, central section as well as the end sections of which being covered with lengths 1. This figure also indicates how the lengths are anchored at the bottom by means of ropes. Fig. 4 is a horizontal view of the same plastic hall.

The fibre material used for insulation can be an organic thermoplastic material such as polyester fibre, polyamide fibre, polyacrylic fibre, high-strength rayon fibre, polyvinyl chloride fibre, polyvinylidene chloride fibre, etc. Inorganic fibres such as glass and mineral fibres, however, are not suitable. Fibres having an ordinary thickness of 5-9 µm are brittle and are broken to pieces by the movements to which the material is exposed on handling and wind loading. Finer fibres having a thickness of about 2 µm should certainly stand said strains but would probably not be safe from the viewpoint of the silicosis and asbestos hazards, and besides, they would be too expensive to manufacture.

The plastic sheet material used for lamination to the fibre core member is of the unreinforced, soft, flexible type of polyvinyl chloride, polyethylene, polyurethane or another kind of flexible plastic sheet material. The thickness of the sheet should be between 0.1 and 0.6 mm, and the material should stand temperatures as low as -30°C without stiffening. If desired, that side of the length which is to make contact with the plastic sheeting of the hall can be thinner than that facing outwards and directly exposed to weather and winds. For improved flame resistance, the sheet can be treated with e.g. antimon oxide.

The porous fibre core member gives a better reinforcement of the soft, unreinforced plastic sheets than the previously used cellular plastic core.

The fibre core member together with the unreinforced plastic sheet provides a structure which is strong enough to withstand the stretching forces to which this structure is exposed when used as intended. Compared to a cellular plastic material, a fibre wadding or the like should at least theoretically render a less effective reinforcement due to the inferior inner unity or binding between the fibres. Experiments have, however, shown the opposite effect. Furthermore, the weight of the insulating mat can be reduced. Due to the demands on flame resistance and strength, an insulating mat based on a cellular plastic core will be substantially heavier than an insulating mat containing a porous fibre core member according to the invention. The porous fibre core member of the insulating mat can have a weight as low as about 10-12 kg/m^3 and still fulfill the requirements on sufficient flame resistance and strength. A further advantage with a porous fibre core member is that it can be made self-extinguishing even at the above-mentioned low weights. Therefore, on ignition from an unknown fire source, the fibre core member in the insulating mat has a much smaller amount of combustible material than has a cellular plastic core. The advantage thereof is that in case of a fire from the interior of the hall, the flame will not be forced in between the mat and the plastic hall sheeting. This would however happen with a cellular plastic core member which in case of fire causes the formation of combustible gases in said space between mat and sheeting, said gases being accumulated and ultimately ignited, resulting in a rapid, bang-like overall combustion. With the new insulation the flames, in case of a fire from the inside of the hall, will not be retarded by the mat but eat their way throughout without giving rise to the mat catching fire. Furthermore, the fibres contract so rapidly on melting that the combustible material so to speak is snatched away from the fire, which is not the case with a cellular plastic core insulation material such as urethane cellular plastic. These fire retardant properties of the insulation are most essential in the specific conditions prevailing in case of fire in a plastic hall, especially in an air supported plastic hall, caused by an unknown fire source.

The invention is further illustrated below with reference to an example of a preferred embodiment.

Example

A fibre wadding consisting of about 20 μm thick, highly ruffled polyester fibres of terephtalate type, 2/3 thereof having a main weight of 6 dtex and 1/3 having a mean weight of 16 dtex, was impregnated predominantly in its surface area with a binder in the form of a polyvinyl chloride latex containing antimon oxide as a flame retarder. After impregnation and drying the wadding had a density of 13 kg/m^3. A 27 mm thick and 150 mm wide web of this impregnated wadding was laminated by melting with a 0.3 mm PVC foil on one side and a 0.2 mm PVC foil on the other side in the way illustrated in Figs. 1 and 2. The foil used was of a type which could withstand a temperature of about $-30^{\circ}C$ and was pretreated with antimon oxide. 8 mm polypropene ropes were running along each longitudinal edge.

22 equal lengths, 48 m long and manufactured as above, were used for heat insulation of a plastic hall provided with a sheeting having a thermal conductivity (λ-value) of 0.025. Disregarding the insignificant improvement of the heat transfer coefficient (K-value) provided by the applied foils, the length as a whole had a K-value of

$$\frac{0.025 \cdot 1}{0.027} \approx 0.93 \quad kcal/m^2, h, {}^oC.$$

When the lengths had been applied to the hall, the sheeting of which had a K-value of 6, the covered portion of the hall had a K-value of $\frac{1}{\frac{1}{0.93} + \frac{1}{6}} \approx 0.8$

Thus, the heat transfer coefficient of the covered portion of the hall was improved by a factor 7.5 (from 6 to 0.8) in relation to the uncovered portion of the hall.

CLAIMS

1. An air or frame supported hall made of plastic sheeting, especially a hall comprising an elongate portion having an arched section, said hall having an outer heat insulation comprising a number of adjacent lengths (1) (mats) covering substantially the entire hall, each length consisting of an approx. 5-50 mm thick and approx. 1-2 m wide core (2) of a heat-insulating material, each flat side of said core being laminated with an unreinforced, soft, flexible plastic sheet (3), characterized in that said heat-insulating material of the lengths (1) is a porous fibre core member built up from organic polymer fibres united to a felt or wadding.

2. A hall according to claim 1, characterized in that said porous fibre core member of organic polymer fibres at least on each flat side thereof is impregnated with a binder.

3. A hall according to claim 1 or 2, characterized in that the fibres of the porous fibre core member consist of an organic thermoplastic material.

4. A hall according to claim 3, characterized in that said fibres are polyester fibres, polyamide fibres, polyacrylic fibres, high-strength rayon fibres, polyvinyl chloride fibres or polyvinylidene chloride fibres.

5. A hall according to any one of claims 1-4, characterized in that said lengths (1) have grooves arranged along the longitudinal sides thereof with ropes (4) running in said grooves, said grooves being formed by the unreinforced plastic sheet used as lamination to the porous fibre core member being drawn out a distance beyond the longitudinal edges and folded about the edge and glued or welded onto the plastic sheet on the opposite side.

FIG. 1

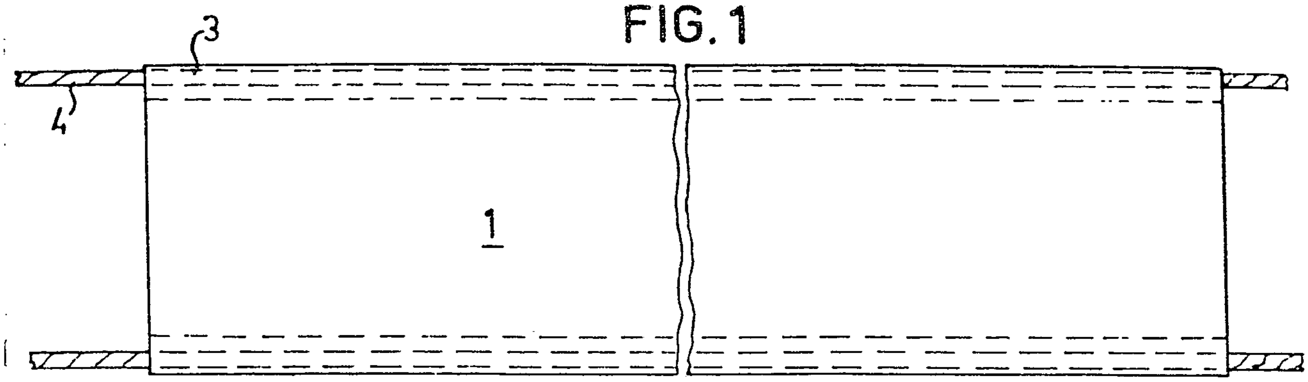


FIG. 2

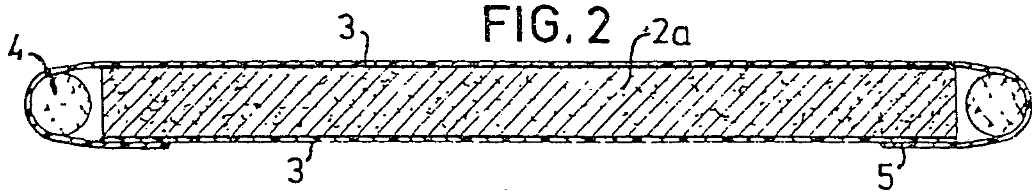


FIG. 3

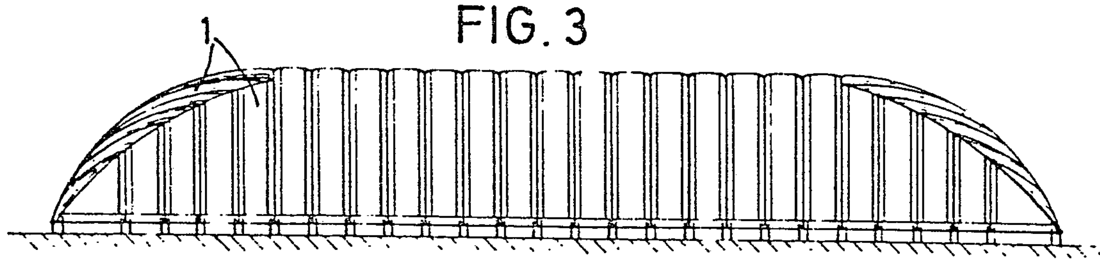


FIG. 4