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(54) **Method of forming a heat protective barrier.**

(57) To form a heat resistant and protective barrier a plurality of layers (2, 2', 2") of expanded aluminium foil are assembled together and then sprayed (6) with an intumescent material to coat each of the layers with the material to provide a barrier with a plurality of layers.

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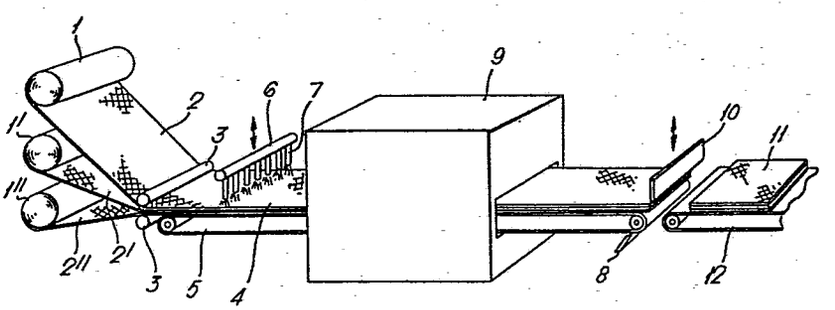
Fig.1.



BLEVEX LIMITED. GJE 5181/019

METHOD OF FORMING A HEAT PROTECTIVE BARRIER.

The present invention relates to heat protective barriers and more particularly to methods of forming such barriers.

In our European patent application No. 79302269.0 we describe and claim a heat resistant and protective barrier which includes a heat actuated and resistive intumescent coating, the barrier comprising one or more layers each formed by a substrate in the form of a sheet material comprising a plurality of spaced-apart strands which define therebetween a plurality of apertures, and a heat actuated and resistive intumescent coating disposed on the substrate. Preferably the substrate is formed by an expanded metal mesh such as expanded aluminium foil. In the European specification there are described methods of coating the foil with the intumescent material in which the foil is fed continuously past a spraying head or heads, through a drier and is then coiled, sections of the material being removed from the coil as required to be assembled together to form a barrier comprising one or more layers of the coated foil.

It will be appreciated that in such a spraying process a significant amount of intumescent material will pass through the apertures in the mesh and would be wasted. Intumescent paints are expensive materials and therefore any loss of material in the coating process

serves to increase the cost of the coated mesh. Whilst it is possible to collect sprayed material which passes through the mesh substrate, for re-use, clearly, the larger the amount of material which passes through the mesh the greater the collection problem and therefore the greater the energy waste in recycling the material. It will be appreciated that in a process where as much as sixty per cent of the sprayed material may have to be re-cycled there can be a considerable wastage.

In accordance with the present invention a heat resistant and protective barrier which comprises a plurality of layers each comprising a substrate in the form of a sheet material comprising a plurality of spaced-apart strands defining therebetween a plurality of apertures and a heat actuated and resistive intumescent coating disposed on the substrate, is formed by spraying the intumescent coating material at a plurality of layers of the substrate previously assembled together.

Preferably, the substrate is expanded aluminium foil as previously described and a plurality of layers of the foil are fed from individual coils to a point at which they are assembled one on top of another, the layered strip so formed being fed, in a continuous process, past one or more spraying heads, and thereafter through a drier. Preferably, the layered coated strip thus formed is then sheared into convenient sized packs for subsequent use. In an alternative process the layered strip may be sheared prior to coating taking place, so that individual packs of foil are fed through the spraying and drying equipment.

Due to the mesh nature of the layers of the substrate the assembly of sheets acts during the spraying process rather in the form of a filter, the strands of each layer receiving and being coated with the

intumescent material and allowing a certain amount of material to pass through onto the layers behind it. Thus, the first layer will receive a greater amount of intumescent material than the second layer which, in turn, will receive more than the third layer, and so on. It will be appreciated that wastage of intumescent material can be significantly reduced by this method so that only a very small amount of material passes through the pack or strip for collection and re-use.

In additional to reducing wastage of intumescent paint in the spraying process the method of the invention has the advantage that the intumescent coating material tends to form bridges between the individual layers of substrate, so that there is a degree of bonding between the layers which therefore helps to retain the layers together and eases subsequent transportation and use of the individual packs.

The invention also includes a heat resistant and protective barrier formed by the process of the present invention and also apparatus for carrying out the method, the apparatus comprising means for supporting a plurality of coils of foil, means for assembling together a plurality of layers of the foil fed from the individual coils, spraying means for spraying an intumescent material onto the assembled layers, and means for drying the coated assembly.

One example of method and apparatus according to the present invention will now be described with reference to the accompanying drawings in which:-

Figure 1 is a diagrammatic perspective view of a plant for producing heat resistant and protective barrier packs;

Figure 2 is a face view of a pack so formed; and

Figure 3 is a sectional view of such a pack.

In the example three layers of expanded aluminium foil are assembled together, but it will be appreciated

that the required number of layers in a particular barrier pack may be varied as required.

Figure 1 shows three coils 1, 1', 1'' of expanded aluminium foil of .003" thickness with diamond shaped apertures of about 14mm length and 16mm width, the width of the strands between the apertures being about 1.4mm. Strips 2, 2', 2'' of the aluminium foil mesh are fed from the respective coils through a pair of pinch rollers 3 where the three layers are assembled into a layered strip 4. The strip is fed on a conveyor belt 5 continuously underneath a spraying bar 6 on which are mounted a number of spraying heads 7 which spray an intumescent coating material onto the strip 4. Any of the sprayed intumescent coating material which passes completely through the assembled strip is collected on the belt 5, stripped off it by a knife 8 and re-sprayed immediately before it can dry. From the spraying bar 6 the strip 4 is fed through an oven 9 in which the coating on the assembled strip is dried, the emerging dried strip being severed by means of a suitable shear 10 into packs 11 of desired size, the packs 11 being conveyed by means of a second belt conveyor 12 or the like to a subsequent packing station (not shown) prior to storage or transport.

A typical coating process for coating a single substrate layer with intumescent material would deposit about 300 $g.m^{-2}$ and when spraying layered substrates a pro-rata amount of coating is supplied, so that for the three layer strip shown the total coating would be about 900 $g.m^{-2}$ (these figures being the weight of coating when dry.). However, a typical distribution would be

first layer	-	450$g.m^{-2}$
second layer	-	320$g.m^{-2}$
third layer	-	130$g.m^{-2}$

We have found that a three layer coated strip is still sufficiently flexible after coating to enable

wrapping for example around sharp corners on structural steel without cracking or other significant damage to the barrier strip and that the three layers are stuck together as a pack. Five layers can be coated, but are very much more rigid and may be suitable for protecting flat or only slightly curved surfaces. The distribution of the coating through the pack will of course depend on the number of layers, the viscosity of the coating when wet and the droplet size permitted by the spray heads, but we have found that if more than five layers of this particular expanded aluminium foil are coated very little coating passes onto the bottom layers. A typical distribution of coating on a five layer pack with a total coating of 1500 $g.m^{-2}$ would be

first layer	-	615$g.m^{-2}$
second layer	-	580$g.m^{-2}$
third layer	-	180$g.m^{-2}$
fourth layer	-	80$g.m^{-2}$
fifth layer	-	45$g.m^{-2}$

In an alternative process the shear 10 may be positioned in front of the spray bar 6, the packs so formed thus being fed through the spray bar and oven individually.

In a further alternative embodiment the shear may be dispensed with and the dried strip may itself be coiled for subsequent use.

Figures 2 and 3 show views of a three-layer pack coated by the method of the invention and it can be seen that the assembled layers overlap one another to enable coating of the second and third layers to be achieved satisfactorily. No special care has to be taken to overlap the layers in such a manner, as this tends to happen by virtue of the very nature of the expanded aluminium foil.

CLAIMS

1. A method of forming a heat resistant and protective barrier which comprises a plurality of layers each comprising a carrier in the form of a sheet material (2, 2' 2'') comprising a plurality of spaced-apart strands defining therebetween a plurality of apertures, and a heat actuated and resistive intumescent coating disposed on the carrier, the method comprising assembling a plurality of layers (2, 2', 2'') of the carrier and spraying the intumescent coating material onto the assembled layers.

2. A method according to claim 1, wherein a plurality of layers (2, 2', 2'') of the carrier are fed from individual coils (1, 1' 1'') to a point at which they are assembled one on top of another, the layered strip (4) so formed being fed, in a continuous process, past one or more spraying heads (7), and thereafter through a drier (9).

3. A method according to claim 2, wherein the layered strip (4) is thereafter sheared into packs (11) of given size.

4. A method according to claim 2, wherein the layered strip (4) is sheared into packs (11) of given size prior to spraying.

5. A method according to claim 1 or claim 2, wherein the layered strip (4) is thereafter coiled.

6. A heat resistant and protective barrier formed by a method according to any of claims 1 to 5.

7. Apparatus for carrying out the method of claim 1, the apparatus comprising means (3) for assembling together a plurality of layers of the carrier sheet material, spraying means (6, 7) for spraying an intumescent material onto the assembled layers, and means (9) for drying the coated assembly.

8. Apparatus according to claim 7, including conveyor means (5) for conveying the assembled layers (4) past a fixed spraying means (6, 7).

9. Apparatus according to claim 7 or claim 8, including means (10) for shearing the assembled layers into packs (11) of given size.

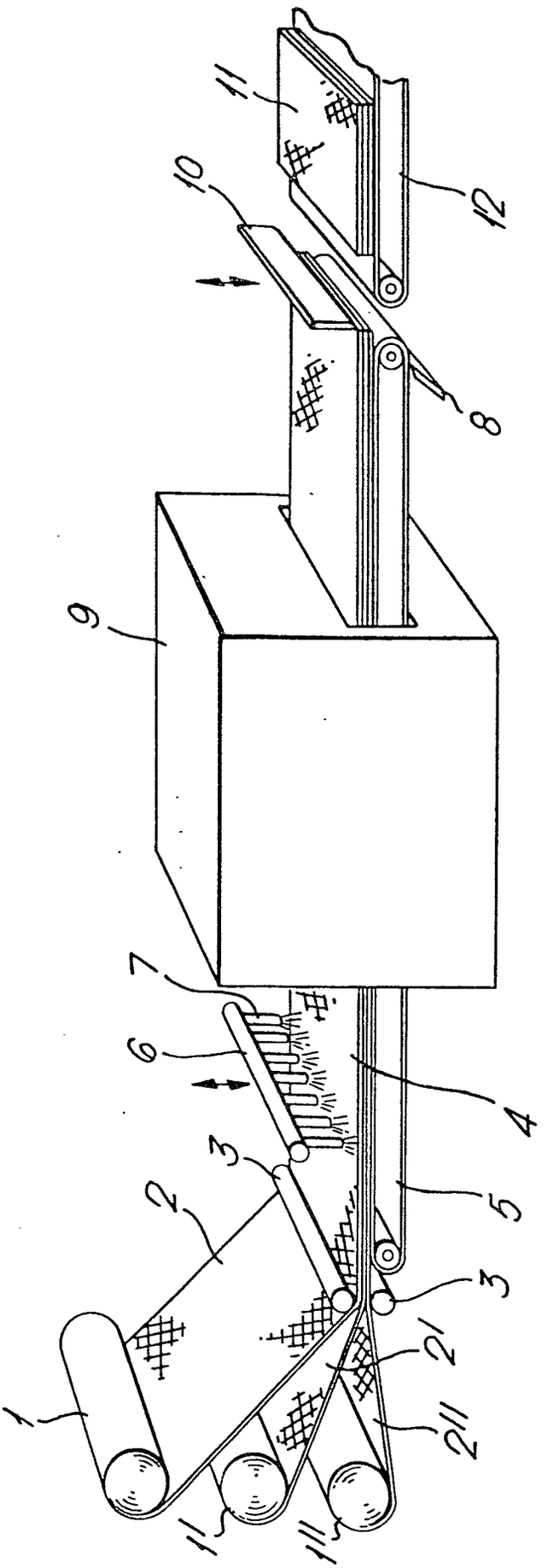


Fig.1.

Fig. 2.

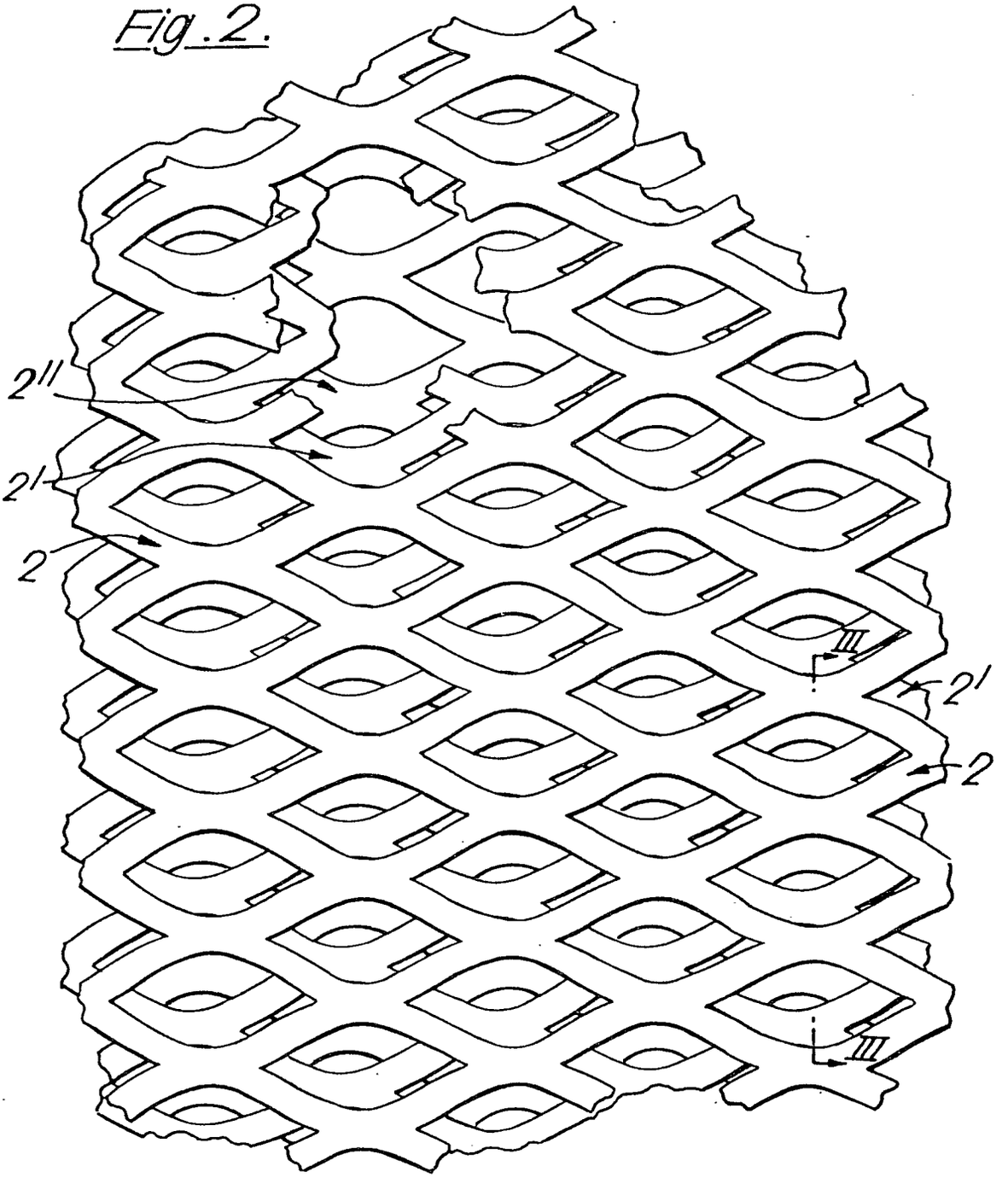


Fig. 3.