

## VANDAL RESISTANT MATERIAL

The present invention relates to a vandal resistant materials, in particular vandal resistant materials for use in covering seats used in public places or public or other transport vehicles, and to methods of manufacture of such materials. The invention also relates to methods of manufacture of vandal resistant seats from the materials of the invention.

Attempts have been made to overcome the problem of damage caused to seats used in public places and in public or other transport seating by slashing, cutting or otherwise tearing of seating with knives, razors or other implements, sharp or otherwise. To date these attempts have concentrated on the vandal resistance of the various products and have not been concerned with providing an acceptable comfort level in the end product for the user or occupier of the seat. Furthermore, in recent times seats and cushions used in public places or public or other transport vehicles, are typically being formed with contours in order to provide additional support and comfort to the occupier. It is therefore necessary for the vandal resistant material to conform to the many contours of the seat or cushion to which it is to be applied.

Known vandal resistant materials have been unable to provide a vandal resistant covering which is easy to fit to a wide variety of seats such as bus, train or tram seats by known upholstery techniques.

Danton, for example, in GB Patent No. 2,041,472 (and US Patent No. 4,423,102), discloses a furniture covering utilising an outer covering formed of a relatively thick, pliable plastics material, and which is reinforced through the use of a network of tear resistant fibres such as for example, metallic fibres. Danton provides for an upholstery covering for a seat including an outer flexible cover layer of solid plastics material and a network of metallic spiral coil springs attached to the outer layer by an intermediate connection layer of foamed plastics material on the underside of the cover layer, in which the turns of the springs are only partly embedded in the intermediate layer of foamed plastics material.

Danton, in US Patent No. 5,165,556 utilises the above material and moulds the material into a rigid moulded seat frame. The user comfort of this

seat is reduced by having rigid moulded edges around the seat cushion.

Park et. al., in US Patent No. 4,828,908 disclose a vandal resistant seating material in which a layer of flexible metal or non-metal matrix material is embedded within a compressed plastics foam material, produced by introducing  
5 a plastics material in a mould containing a metal or non-metal matrix, allowing the plastics material to foam and then compressing the combination to substantially remove all gas produced during the foaming step.

Clements, in AU Patent No. 639,972 (PCT/AU90/00585) discloses a method of manufacturing a vandal resistant seat material which includes  
10 placing a wire mesh in a mould, closing the mould to form a cavity with a predetermined volume, injecting a foamable plastics material into the cavity in which the volume of the unfoamed foamable plastics material is at least 50% of the volume of the mould cavity and in which the volume of the mould cavity is up to 50% of the volume of the fully expanded foam (that is, the volume of the foam  
15 if it were permitted to foam and expand unfettered to maximum foamed volume).

Enlow et. al. in US Patent 3,647,608, discloses vandal resistant articles that comprise or contain a low density foam structure characterised by having a cut resistant surface including a layer of metal wires, selected from the group consisting of unconnected, randomly oriented, flexible metal fibres and wire  
20 mail ("wire mail" being a mesh of wires or a flexible mesh of small metal rings or squares), embedded in the foam immediately beneath the surface of the foam. The foam material on it's cut resistant surface, may be covered with a thin layer of a wear-resistant material adhered thereto. Enlow discloses that a wide range of rigid, semi-rigid, or flexible, organic or silicone plastic foams, having a density  
25 of from 1 to 50 lb ft<sup>-3</sup> (i.e. about 16 to 800 Kg m<sup>-3</sup>) may be used to produce a large variety and diversity of products including:- Automobile seats, bus seats, theatre seats, wall padding, furniture, automobile dashboards, tractor seats, stadium seats, sport and recreation cushions, sofa cushions, reinforcing, supporting and rigidifying structures, wheels, sun visors, instruments, decorative  
30 buttons and knobs. It is particularly to or in the foam structure portion of these articles that Enlow desires to place or form a cut-resistant surface. The foam density range indicates a foam material which is expanded, from it's original

unexpanded volume with a density of about 63.5 lb ft<sup>-3</sup>, by a factor of from 1.3 to 65. The depth to which the metal fibres are embedded is from 0.030 to 0.200 in. (i.e. about 0.75 to 5.0 mm.). Depths of less than 0.030 in. (0.75 mm.) permit the layer of wires to "strike through" the surface of the foam. The thickness of the  
5 layer of metal wires is from 0.05 to 5.0 mm and the thickness of the wear resistant material is from 0.030 to 0.200 in. (i.e. about 0.75 to 5.0 mm.).

Ward, in Australian Patent No. 594037 discloses a laminated article which may be used as a covering for a seat to provide increased resistance to puncture or slashing. The article includes a moulded non-cellular thermosetting  
10 polymeric support member and a reinforcing wire mesh fully embedded within the moulded support member. However the material disclosed by Ward is focussed on improving the vandal resistance of seats and does not address the problem of providing an acceptable level of comfort in the covered seat or cushion. Vandal resistant materials made in accordance with Ward have been  
15 found to possess a rigidity and inflexibility which is higher than desirable in order to provide desired levels of comfort in the covered seat or cushion. It has also been found that it is difficult to apply vandal resistant materials made in accordance with Ward to seats and cushions, particularly to contoured seats and cushions, by known upholstering techniques.

20 Drouin, in EP 0190064 discloses a covering for seats, in particular seats used in public places or public transport vehicles, for providing protection against vandalism. Drouin discloses a vandal resistant covering for seats, the covering being of a composite nature including at least three separate superimposed layers. The first layer is a decorative layer of thin material; the  
25 intermediate layer is a vandal resistant layer; and the third layer is of a flexible, thin material which is preferably fire proof. The material thus includes at least three distinct layers which are then bonded together by means of a flexible adhesive. One disadvantage with this material is the need to assemble the respective layers of the material and then adhere the layers to form a length of  
30 covering. Such manufacturing steps are less than desirable for mass production.

The present invention therefore seeks to provide a relatively thin, flexible, vandal resistant material which is drapeable (i.e. able to be "draped") and which overcomes or alleviates a number of problems existing in known vandal resistant materials and which provides a higher degree of user comfort and is readily able to be applied to seats by known upholstering techniques.

To this end the present invention provides a flexible, drapeable vandal resistant material including a flexible high density synthetic plastics, organic or silicone, elastomer or foam material, said vandal resistant material having a length and a predetermined width and having embedded therein a non-woven, knitted or crocheted, metal or synthetic plastics reinforcing material extending along and across the full length and width of the material, said vandal resistant material being relatively thin and flexible and/or drapeable in both the lengthwise and widthwise directions of the material.

The present invention also provides a method of manufacturing a relatively thin, flexible, vandal resistant material which is able to be draped, and is able to be applied to a seat or cushion by known upholstering techniques.

To this end the present invention provides a method of manufacturing a vandal resistant material including a flexible, high density synthetic plastics, organic or silicone, elastomer or foam material having embedded therein a non-woven, knitted or crocheted, metal or synthetic plastics reinforcing material, said vandal resistant material having a length and a predetermined width and in which the reinforcing material extends along and across the full length and width of the vandal resistant material, said vandal resistant material being relatively thin and flexible and/or drapeable in both the lengthwise and widthwise directions of the material, in which the said method is characterised by placing the reinforcing material in a mould, introducing the synthetic plastics, organic or silicone, elastomer or foam mixture into the mould, closing the mould so as to force the mixture to flow into and through the reinforcing material and allowing the resultant material to cure to form the drapeable vandal resistant material.

In another form the present invention provides a method of manufacturing a vandal resistant material including a flexible, high density synthetic plastics,

organic or silicone, elastomer or foam having fully embedded therein a non-woven, knitted or crocheted, metal or synthetic plastics reinforcing material, said vandal resistant material having a length and a predetermined width and in which the reinforcing material extends along and across the full length and width of the vandal resistant material, and in which the thickness of the vandal resistant material is no more than 5 mm, said vandal resistant material being flexible and/or drapeable in both the lengthwise and widthwise directions of the material, in which the method is characterised by placing the reinforcing material in a mould, introducing an elastomer or foam mixture into the mould, closing the mould so as to force the elastomer or foam mixture to flow into and through the reinforcing material and to form a mould cavity of no more than 5 mm thickness, and allowing the elastomer or foam material to cure to form the vandal resistant material.

The vandal resistant material according to the present invention will be better understood and appreciated from the following discussion of the preferred features of the material.

Preferably the reinforcing material of the vandal resistant material is moulded into the elastomer or foam material so as to be fully embedded in the material.

It is also preferable that the thickness of the vandal resistant material measures up to 5mm from the thickness of the reinforcing material. Preferably the thickness of the elastomer or foam material is from 1 to 3.5 mm, with about 3 mm most preferred. Preferably the thickness of the reinforcing material is from 0.5 to 2 mm and most suitably about 1 mm.

Preferably, in the case of a foam material, the foam is expanded to a volume of no more than 1.3 times the original unfoamed volume and preferably the density of flexible synthetic plastics organic or silicone foam after foaming is from 720 to 1120 Kg m<sup>-3</sup>, more preferably about 800 Kg m<sup>-3</sup>.

The reinforcing material may be a non-woven crocheted metal reinforcing wire, known as omega wire, with a thickness of between 0.5 to 2 mm. Omega wire is typically produced by a knitting or crocheting process in tubular form. The wire may be used directly in a "double thickness" tubular form or alternatively

may be cut and used in a single thickness. The reinforcing material is in the form of inter-engaging loops in the form of the greek letter "omega" with a preferred repeat loop unit being 0.6 by 0.6 mm.

Alternatively the reinforcing material may be in the form of a knitted or  
5 crocheted synthetic plastics material.

The reinforcing material, be it metal or synthetic plastics material, may be of monofilament construction or may be knitted or crocheted from a number of monofilaments. The diameter of the monofilaments in the reinforcing material is not critical and may be about 0.275 mm. The particular composition of the  
10 monofilament, be it metal or synthetic plastics material, is not of particular importance. Polypropylene and stainless steel wire have both been found to produce acceptable vandal resistant materials.

The reinforcing materials should not significantly effect the flexibility of the final vandal resistant material as compared to an non-reinforced material made  
15 from the same foam formulation, although it will be apparent that the inclusion of the reinforcing material must have some effect in reducing the flexibility of the material.

In a particularly preferred form of the invention, the vandal resistant material is moulded in a substantially flat sheet no more than 5 mm thick over  
20 the majority of the area of the material, with the material including a tapered or stepped portion at or near or towards one or more of edges of the material, the thickness of the vandal resistant material in the tapered or stepped portion being as low as the thickness of the reinforcing material.

The vandal resistant material of the invention may also be moulded in a  
25 mould to produce shapes conforming to the final desired shape of a seat or seat cushion to which the vandal resistant material is to be applied, such that when covered by the vandal resistant material all the exposed faces of the seat or seat cushion are covered by the reinforcing material of the vandal resistant material so as to provide vandal resistance. Those exposed areas of the vandal resistant  
30 material, other than the area of the direct contact face of the seat, may be formed having a thickness which is less than the thickness of the direct contact face. This variation of the thickness of the material is possible whether the material is

moulded flat or in a particularly desired shape. The direct contact face may be moulded having a thickness of, as indicated above, up to 5 mm, whereas the other eventual exposed faces of the seat material may be moulded having a thickness of as little as the thickness of the reinforcing material. The change in thickness may be accomplished by a distinct step formed during moulding or by tapering the material from a particular point from the maximum thickness to the thickness of the reinforcing material. The change in the thickness of the vandal resistant material may be effected by the inclusion of a masking plate placed in the mould on top of the reinforcing material which controls the thickness of the material in one area to, say, 5 mm and to the thickness of the reinforcing material, eg. 1 mm in other areas. In the case of a vandal resistant material moulded to a particular configuration, the dimensions of the parts of the mould are such that, for example, the direct contact face of the material may be from 3 to 5 mm in thickness whereas the other exposed or "side" faces of the material may be, for example, from 1 to 1.5 mm in thickness.

Preferably the vandal resistant material includes an outer covering of a protective, decorative or wear resistant woven or non-woven fabric or synthetic plastics sheet material integrally moulded to the flexible foam with the inner surface of the outer covering against the reinforcing material and the outer surface against the mould surface. It is also possible to glue the outer covering to the vandal resistant material. It is also possible, in the case of a woven woollen outer covering, to glue a thin flexible compatible sheet material or to apply a thin layer of a compatible plastics or other barrier material between the outer covering and the reinforcing material if the foam material is likely to "strike through" the weave of the woollen material. Preferably the thickness of the material is from 2 to 3.5 mm.

To highlight the improved flexibility and drapeability of the vandal resistant material according to the present invention, tests were conducted in accordance with Australian Standard AS 2001.2.9, with the details of the Australian Standard being incorporated herein by reference. Australian Standard AS 2001.2.9 provides a standard method for determining the stiffness of cloth materials. The Standard describes the procedure for determining the

bending length of a cloth by means of a fixed-angle flexometer and for calculating the flexural rigidity and bending modulus of the sample based upon the bending length of the sample. Flexural rigidity is a measure of the resistance of a material to bending by external forces, such that where a material with a high flexural rigidity is stiff whilst a material with a low flexural rigidity is easily flexed.

Tests in accordance with AS 2001.2.9 were conducted on eight different materials in total. Tests were conducted on both longitudinal (lengthwise) and transverse (widthwise) samples of each material. The term longitudinal indicates that the sample was taken along the principal or lengthwise axis of the material, whilst the term transverse means that the sample was taken in a perpendicular (widthwise) direction to that of the longitudinal sample.

A non-reinforced woollen fabric, referred to as Sample 1, was tested to provide an indication of the comparative flexibility of the vandal resistant material made in accordance with the present invention.

Four versions of vandal resistant material made in accordance with the present invention were tested, these being referred to as Samples 2, 3, 4 & 5.

Three prior art vandal resistant materials, referred to as Samples 6, 7 & 8, were also tested to highlight the improved flexibility and drapeability of the vandal resistant material according to the present invention when compared to the prior art materials.

Details of each of the materials tested are given below. In the descriptions of the test samples given below, the term "base material" refers to the material into which the reinforcing material is set (for example an elastomer, rubber or foam), whilst the term "reinforcing material" indicates the reinforcing material used.

The details of the samples tested were as follows:

**SAMPLE NO. 1**

Woven woollen fabric only, 100 % wool, supplied by Norwellan Mills, Stawell, Victoria, Australia. No reinforcing material.

**SAMPLE NO. 2**

Base Material: Polyurethane formulation no. EVA-93, Hardness 50, Shore A

| <u>Constituent</u>                 | <u>Part by Weight</u> | <u>Supplier</u>           |
|------------------------------------|-----------------------|---------------------------|
| Polyol 4701 (polymer polyol)       | 50                    | Dow Chemicals Ltd.        |
| 5 Polyol HS 100 (polymer polyol)   | 50                    | Union Carbide Chemicals   |
| Suprasec VM 25 (isocyanate)        | 10                    | ICI Polyurethane Group    |
| Thorcat 535 (phenyl mercury ester) | 1                     | Thor Chemicals (UK) Ltd.  |
| Alumina Hydrated                   | 50                    | Alcoa Australia Pty. Ltd. |

Reinforcing Material: Polypropylene knitted shade cloth, 70% shading, supplied  
10 by Gale Industries, Sandringham, Victoria, Australia.

**SAMPLE NO. 3**

Base Material: Silicone rubber, Elastosil™ LR 3001/35 A/B, supplied by Wacker Chemicals Australia Pty. Ltd., Melbourne, Victoria, Australia

Reinforcing Material: Stainless steel omega wire (single braid), supplied by  
15 Wire Mesh Industries, Sydney, Australia.

**SAMPLE NO. 4**

Base Material: Polyurethane formulation, Hardness 45, Shore A

| <u>Constituent</u>                                               | <u>Part by Weight</u> | <u>Supplier</u>           |
|------------------------------------------------------------------|-----------------------|---------------------------|
| Polyol 4701 (polymer polyol)                                     | 50                    | Dow Chemicals Ltd.        |
| 20 Polyol HS 100 (polymer polyol)                                | 50                    | Union Carbide Chemicals   |
| Cereclor AS52 (chlorinated -<br>long chain paraffin hydrocarbon) | 50                    | ICI Chemicals             |
| Alumina Hydrated                                                 | 25                    | Alcoa Australia Pty. Ltd. |
| Antimony Trioxide                                                | 15                    | M & T Chemicals, Inc.     |
| 25 (99.5% antimony oxide)                                        |                       |                           |
| Thorcat 535 (phenyl mercury ester)                               | 1                     | Thor Chemicals (UK) Ltd.  |
| Suprasec VM 25 (isocyanate)                                      | 10                    | ICI Polyurethane Group    |

Reinforcing Material: Polypropylene knitted shade cloth, 70% shading, supplied  
by Gale Industries, Sandringham, Victoria, Australia.

**SAMPLE NO. 5**

Base Material: As per Sample No. 2 (increased thickness)

Reinforcing Material: As per Sample No. 2

**SAMPLE NO. 6**

Constructed as per Danton.

Base Material: Compin silicone rubber.

Reinforcing material: reinforcing wire - diameter 0.70mm, coil diameter 6mm.

**5 SAMPLE NO. 7**

Constructed as per Danton

Base Material: Compin silicone rubber

Reinforcing Material: reinforcing wire - diameter 0.90mm, coil diameter 15mm.

**SAMPLE NO. 8**

10 Constructed as per Ward

Base Material: Hardness 85, Shore A

| <u>Constituent</u>                 | <u>Part by Weight</u> | <u>Supplier</u>          |
|------------------------------------|-----------------------|--------------------------|
| Polyol HS 100 (polymer polyol)     | 100                   | Union Carbide Chemicals  |
| Thorcat 535 (phenyl mercury ester) | 1                     | Thor Chemicals (UK) Ltd. |
| 15 Suprasec VM 25 (isocyanate)     | 15                    | ICI Polyurethane Group   |

Reinforcing Material: 304 stainless steel standard wire mesh, supplied by Lockers Pty. Ltd., Moorabbin, Victoria, Australia

The results of the tests conducted in accordance with AS 2001.2.9 are given in Table 1 overleaf.

INSERT P. 11 TABLE HERE - see floppy disk inside file. Due to a bug in word perfect, the table will not print out when incorporated into this document.

ML 29/9/94

Referring to Table 1 it can be thus be appreciated that vandal resistant materials made in accordance with the present invention exhibit low flexural rigidity, which corresponds to high flexibility and drapeability. Typically the flexural rigidity of the vandal resistant material of the present invention is less  
5 than  $100 \times 10^3$  micronewton-metre. In preferred embodiments of the present invention the flexural rigidity of the vandal resistant material is less than  $30 \times 10^3$  micronewton-metre. This represents a significant improvement over known vandal resistant materials such as those according to Danton and Ward.

It is also notable that preferred embodiments of vandal resistant materials  
10 according to the present invention exhibit low bending modulus, preferably less than 10 micronewton per square metre.

It should also be noted that vandal resistant materials made in accordance with the present invention exhibit excellent flexibility in both longitudinal (lengthwise) and transverse (widthwise) directions of the material. It  
15 can be understood that the flexibility of a reinforced material such as a vandal resistant material may vary according to plane and direction in which the material flexed. However with preferred embodiments of the vandal resistant material according to the present invention the ratio of greatest flexural rigidity of the material (i.e. least flexibility) to the least flexural rigidity of the material (i.e.  
20 greatest flexibility) is typically less than 2. Also in preferred embodiments of the vandal resistant material as per the present invention the ratio of the highest bending modulus of the material to its lowest bending modulus is typically less than 2.

Preferred methods of manufacturing the vandal resistant material in  
25 accordance with the present invention will now be described.

A non-woven crocheted metal reinforcing wire, known as omega wire, having a thickness of about 1 mm. is placed on one face of a flat mould. The reinforcing wire is held flat on the mould face either by magnetic force or by stretching between holding clamps. A flexible high density polyurethane foam  
30 mixture, having a final expansion of no more than 1.3 times it's original unfoamed volume, is poured into the mould and the mould closed to cause the foam mixture to flow through and surround the reinforcing wire. The flow of the

foam material through and around the reinforcing wire is assisted by the small expansion of the foam as it reacts. The mould is set to provide a thickness of foam material of 5 mm. Once the material has cured sufficiently the product is removed from the mould and cured further as is necessary depending on the  
 5 specific foam formulation which is used. A soft, flexible, foldable and /or capable of being draped vandal resistant material is produced which can be trimmed, if necessary, to size and applied to a seat by known upholstery techniques.

In an alternative method, the same procedure as above is used but a metal mask of 3 mm. thickness is placed on top of the reinforcing material. The  
 10 mask is in the form of a metal plate having a cut out portion of a shape approximating the direct contact face of the seat to which the vandal resistant material is to be applied with the remainder of the plate approximating to at least the area and shape of the remainder of the seat including additional areas to enable attachment of the vandal resistant material to the seat. A foam mixture is  
 15 introduced into the mould and the mould closed as above. The mask results in a vandal resistant material having a reinforcing material fully embedded therein in which the thickness of the material corresponding to the cut-out being about 4 mm. and the remaining thickness being about 1 mm.

In a further alternative the thickness of the mask is tapered from the cut-  
 20 out portion towards the edge of the mask to provide for a tapering of the thickness of the vandal resistant material from a thickness in the area of the cut-out (which corresponds to the direct contact face of the seat) of 4 mm. to a thickness at the edges (corresponding to the extremities of the other exposed faces of the seat) of about 1 mm.

In a further alternative the mould may be of a specific three dimensional configuration to provide a vandal resistant material having a "cup" shape designed to fit to a particular seat. The mould pieces are dimensioned to mould a vandal resistant material either having a uniform thickness of e.g. about 4 mm. over the exposed faces of the seat or having a thickness of 4 mm. at the direct  
 30 contact face area of the material and having a thickness stepped or tapered to e.g. about 1 mm. (i.e. the thickness of the reinforcing material) at the other "exposed faces" area of the material.

In all of the above alternatives the omega wire reinforcing material may be replaced by a knitted or crocheted synthetic plastics material. Either of the reinforcing materials may be of monofilament construction or may be knitted or crocheted from a number of monofilaments. The diameter of the monofilaments

5 in the reinforcing material is not critical and may be about 0.275 mm. The omega wire is produced by a knitting or crocheting process in tubular form. the wire may be used directly in that "double thickness" tubular form or cut along it's length and used in a single thickness. The wire is in the form of inter-engaging loops in the form of the greek letter "omega" with a preferred repeat loop unit

10 being 0.6 by 0.6 mm. The particular composition of the monofilament be it metal or synthetic plastics material is not of particular importance. Polypropylene and stainless steel wire have both been found to produce acceptable vandal resistant materials.

In manufacturing the vandal resistant material it is preferable that an

15 outer covering of a protective, decorative or wear resistant woven or non-woven fabric or synthetic plastics sheet material is placed in the mould between the mould and the reinforcing material with the inner surface of the outer covering against the reinforcing material and the outer surface against the mould surface so that the vandal resistant material is moulded directly on to the outer covering.

20 It is also possible to glue the outer covering to the vandal resistant material. It is also possible, in the case of a woven woollen outer covering, to glue a thin flexible compatible sheet material or to apply a thin layer of a compatible plastics or other barrier material between the outer covering and the reinforcing material if the elastomer or foam is likely to "strike through" the weave of the

25 woollen material.

Thus the vandal resistant materials of the present invention are soft, flexible and/or drapeable so that they are capable of attaching or fitment to a wide variety of seat configurations by known seat upholstering methods. The vandal resistant materials may be fitted to the seats in one or more pieces

30 depending on the specific characteristics of the seat which is to be made vandal resistant. The vandal resistant materials may be made as a covering material to be placed over an existing seat or may be made as a covering material to

protect any spring or flexible low density foam cushioning material. The vandal resistant materials according to the present invention permit the materials to be fabricated to fit a variety of different and complex seat shapes by known upholstery techniques whilst providing vandal resistance over the entire  
5 exposed seat cushion area and additionally providing an improved degree of user comfort, particularly by avoiding the necessity of including moulded rigid plastics or other rigid materials in contact with the user of a seat upholstered with or otherwise made from a vandal resistant material made in accordance with this invention .



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A flexible, drapeable vandal resistant material including a flexible high density synthetic plastics, organic or silicone, elastomer or foam material, said vandal resistant material having a length and a predetermined width and having embedded therein a non-woven, knitted or crocheted, metal or synthetic plastics reinforcing material extending along and across the full length and width of the material, said vandal resistant material being relatively thin and flexible and/or drapeable in both the lengthwise and widthwise directions of the material.
2. The vandal resistant material as claimed in Claim 1 wherein the said reinforcing material is fully embedded in the vandal resistant material.
3. The vandal resistant material as claimed in Claim 1 or 2 wherein the flexural rigidity of the said material is less than  $100 \times 10^3$  micronewton-metre in both the lengthwise and widthwise directions of the material.
4. The vandal resistant material as claimed in any one of Claims 1 to 2 wherein the flexural rigidity of the said material is less than  $100 \times 10^3$  micronewton-metre in all directions of the material.
5. The vandal resistant material as claimed in any one of Claims 1 to 4 wherein the density of the flexible synthetic plastics, organic or silicone, elastomer or foam material is in the range 720 to 1120 kilogram per cubic metre.
6. The vandal resistant material as claimed in Claim 5 wherein the density of the flexible synthetic plastics, organic or silicone elastomer or foam material is approximately 800 kilogram per cubic metre.
7. The vandal resistant material as claimed in any one of Claims 1 to 6 wherein the thickness of the said vandal resistant material is less than 5 millimetre.



8. The vandal resistant material as claimed in Claim 7 wherein the thickness of the said vandal resistant material is between 1 to 3.5 millimetre.

9. The vandal resistant material as claimed in any one of Claims 1 to 8 wherein the flexible high density material is a foam material, said foam material being expanded to a volume of no more than 1.3 times the original unfoamed volume of the material.

10. The vandal resistant material as claimed in any one of Claims 1 to 9 wherein the said vandal resistant material includes a tapered or stepped portion at or near or towards one or more of the edges of the vandal resistant material, the thickness of the vandal resistant material in said tapered or stepped portion being as low as the thickness of the reinforcing material.

11. The vandal resistant material as claimed in any one of Claims 1 to 10, wherein the said vandal resistant material is moulded in a mould into a shape conforming to the shape of the seat or seat cushion to which the vandal resistant material is to be applied, such that when covered by the vandal resistant material all exposed faces of the seat or seat cushion are covered with the vandal resistant material.

12. A method of manufacturing a vandal resistant material including a flexible, high density synthetic plastics, organic or silicone, elastomer or foam material having embedded therein a non-woven, knitted or crocheted, metal or synthetic plastics reinforcing material, said vandal resistant material having a length and a predetermined width and in which the reinforcing material extends along and across the full length and width of the vandal resistant material, said vandal resistant material being relatively thin and flexible and/or drapeable in both the lengthwise and widthwise directions of the material, in which the said method is characterised by placing the reinforcing material in a mould, introducing the synthetic plastics, organic or silicone, elastomer or foam mixture



into the mould, closing the mould so as to force the mixture to flow into and through the reinforcing material and allowing the resultant material to cure to form the drapeable vandal resistant material.

13. The method as claimed in Claim 12 wherein the thickness of the vandal resistant material is from the thickness of the reinforcing material up to 5mm, in which the method is characterised by placing the reinforcing material in a mould, introducing an elastomer or foam mixture into the mould, closing the mould to force the elastomer or foam mixture to flow into and through the reinforcing material and to form a mould cavity of no more than 5mm thickness, and allowing the elastomer or foam material to cure to form the vandal resistant material.

14. The method as claimed in Claim 12 or 13 wherein the reinforcing material is fully embedded in the foam.