(12) UK Patent Application (19) GB (11) 2591974 (13) A

(43) Date of A Publication 18.08.2021

(21) Application No: 1812616.9

(22) Date of Filing: 02.08.2018

(71) Applicant(s):
Phoenox Textiles Limited
Spring Grove Mills, Clayton West, Huddersfield, West Yorkshire, HD8 9HH, United Kingdom

(72) Inventor(s):
Adrian Charles Mosley

(74) Agent and/or Address for Service:
Mohun Aldridge Sykes Limited
12 Park Square East, Leeds, West Yorkshire, LS1 2LF, United Kingdom

(51) INT CL:
D06N 7/02 (2006.01)

(56) Documents Cited:
GB 2072578 A
EP 0248602 A2
JP 2006016729 A
GB 2067576 A
WO 2000/022226 A1
US 4186230 A

(58) Field of Search:
INT CL **D06N**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Floor covering and method of manufacture**
Abstract Title: **Sound-absorbent backing for floor covering**

(57) The floor covering comprises a textile base fabric 120 and a noise attenuating backing 150. The acoustically deadening backing 150 comprises rubber and plastic. The preferred acoustic insulation 150 comprises plastic particles and calcium carbonate in a rubber latex. The particles comprise granules, grains and powder of various sizes of recycled thermosetting material. The preferred backing 150 comprises 25-40 (32%) wt.% rubber, 7-15 (11%) wt.% plastic and 45-60 (57) wt/% calcium carbonate filler. The floor covering is formed by coating the textile with the noise absorbing latex 150.

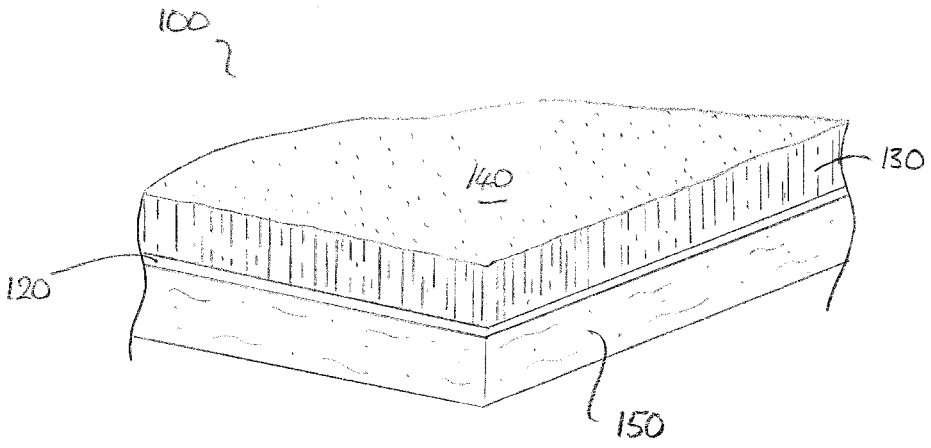

Fig 1.

GB 2591974 A

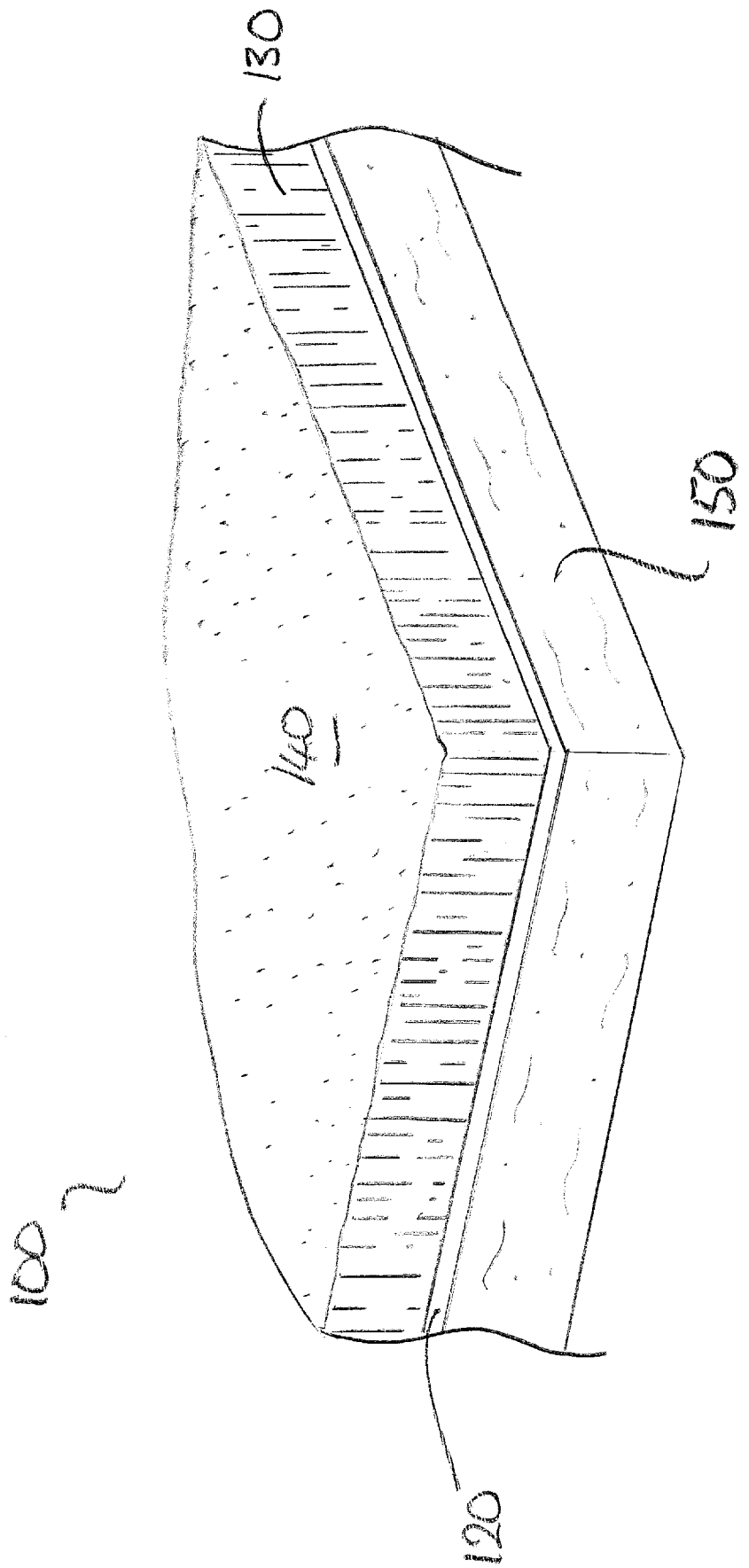

Fig 1

Floor Covering and Method of Manufacture

The present invention relates to a floor covering, and to a method of manufacturing a floor covering, and is concerned particularly, though not exclusively, with a rug, and a method of manufacturing a rug which has improved acoustic properties.

It is well known that the use of a floor covering can provide some sound insulation between floors of a building. For example, if an apartment has a floor covering, such as a rug or carpet, the level of noise transmitted to an apartment directly below is reduced, when compared with the case of a hard floor. Also, within the apartment itself, ambient noise levels are reduced with a carpet or rug, as are the sounds caused by objects falling on the floor.

Many floor coverings, such as rugs in particular, are made by tufting yarn into a primary substrate material, such as woven or non-woven fabric, and then coating the back of the substrate with a backing material typically comprising rubber. In some rugs the yarn may be printed and/or sheared prior to coating the substrate with rubber.

In general, the thicker the floor covering, the greater is the effect of noise reduction. However, it is not always convenient to have a particularly thick floor covering, and in any case it may prove to be expensive to provide one.

Embodiments of the present invention aim to provide a floor covering, and a method of manufacturing a floor covering, in

which acoustic performance, and in particular sound absorption, is improved.

The present invention is defined in the attached independent claims, to which reference should now be made. Further, preferred features may be found in the sub-claims appended thereto.

According to one aspect of the present invention, there is provided a floor covering comprising a textile base portion and a sound-absorbent backing, wherein the backing comprises rubber and plastics.

Preferably the backing comprises a mixture of rubber and plastics.

The plastics may be granular material and may comprise grains in a range of sizes. The plastics may be in powder form.

In a preferred arrangement the plastics comprises a thermoset material, and more preferably comprises a recycled material.

The rubber may comprise latex and may be a natural rubber, a synthetic rubber or a combination of natural and synthetic rubber.

In a preferred arrangement the sound absorbent backing comprises rubber in the range 25% - 40% by weight and may include plastics in the range 7% - 15% by weight. The backing may also include a filler, which may comprise calcium carbonate, the proportion of which may be 45% - 60% by weight. A particularly preferred composition includes

approximately 10%, more preferably 11% plastics, approximately 55%, more preferably 57% calcium carbonate and approximately 30%, more preferably 32% latex rubber.

According to another aspect of the present invention, there is provided a method of forming a sound absorbent floor covering, the method comprising coating a textile portion with a sound absorbent backing comprising rubber and plastics.

The invention may include any combination of the features or limitations referred to herein, except such a combination of features as are mutually exclusive, or mutually inconsistent.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 shows in perspective view an edge portion of floor covering, according to an embodiment of the present invention.

Turning to Figure 1, this shows generally at 100 a portion of floorcovering, in the form of a rug, in accordance with an embodiment of the present invention.

The rug comprises a primary fabric base 120 into which yarn 130 is tufted to form a pile 140. On an opposed side of the base 120 is a sound-absorbent backing layer 150.

Rug is made in stages: Firstly, the yarn is tufted into the primary fabric base to form the pile. Then, depending upon the material of the yarn, a pattern may be printed onto the pile. The fabric may be washed at this stage and may be sheared to form a surface profile on the pile 140. The fabric is then coated with material to form the sound absorbent backing, before being cut to the required size.

The material used to form the sound absorbent backing includes a mixture of rubber and filler. In a preferred embodiment the backing comprises latex rubber, mixed with calcium carbonate and plastics. The plastics material used in this example is a thermoset material that is ground into a powder.

Tests

Samples A and B were examined for their ability to absorb sound in impact tests. Samples A and B were from a previously considered mat having a textile upper surface and a rubber backing. Samples B were of the same dimensions as Samples A and comprised identical textile components but had a backing which was part rubber and part plastic material including 32% latex rubber, 57% calcium carbonate and 11% plastic filler comprising thermoset plastic ground into a powder and added to the molten backing material prior to forming the backing on the textile samples. For each of Samples A and Samples B:

Three samples, each 1000 x 500 mm, were cut from the roll of floor covering material supplied. These were laid directly onto a concrete test floor and submitted to impact testing.

Samples A

Mass per unit area:	2.2 kg/m^2 (measured)
Thickness:	10.0 mm (average measured)

Samples B

Mass per unit area:	1.4 kg/m^2 (measured)
Thickness:	6.7 mm (average measured)

The measurements were made in a large reverberation chamber. The walls of the test room are 330 mm thick and are constructed from Accrington Brick. The floor plan of the room has the shape of a truncated wedge with one pair of parallel walls and one pair of non-parallel walls. The floor and ceiling are parallel and the room surfaces are painted throughout. The test sample was placed on a 3.4 m x 3.4 m x 140 mm thick reinforced homogeneous concrete floor slab which is inserted into the roof of the chamber. The chamber contains eleven randomly orientated plywood diffusing elements to provide a uniform diffuse sound field.

The procedure followed that detailed in BS EN ISO 10140-3 : 2010 "Acoustics, Measurement of sound insulation in buildings and of building elements - Part 3: Measurement of impact sound insulation". A standard tapping machine with metal tipped hammers and conforming to Annex E of BS EN ISO 10140-5 : 2010 was used as the impact sound source. The impact sound pressure levels (L_i) produced by the tapping machine in the reverberant room below were measured both with and without the test specimen installed, as detailed in Annex H of BS EN ISO 10140-1. The measured sound pressure levels were normalised according to:

$$L_n = L_i + 10\log\frac{A}{A_0} \qquad \text{dB} \qquad (1)$$

where L_n is the normalised impact sound pressure level

A is the measured equivalent absorption area of the receiving room (m^2)

A_0 is reference equivalent absorption area ($A_0 = 10m^2$)

A is evaluated from the reverberation time using Sabine's formula:

$$A = \frac{0.16V}{T} \qquad m^2 \qquad (2)$$

where V is the receiving room volume (M^3)

T is the reverberation time (secs)

The improvement in impact sound insulation IISI (ΔL) is obtained from the equation:

$$\Delta L = L_{n0} - L_n \qquad \text{dB} \qquad (3)$$

where L_{n0} is the normalised impact sound pressure level in the receiving room in the absence of floor covering

L_n is the normalised impact sound pressure level when the floor covering is in place

The sound pressure levels produced by the tapping machine in the receiving room were measured at six microphone positions for each of three different positions of the tapping machine and an average level was obtained at each of the one-third octave frequency bands in the range 100 Hz to 5000 Hz. An

averaging time of 16 seconds was used at each microphone position. The microphone positions were chosen such that the distance between positions and between any microphone and a room boundary or sound source exceeded 1.0 m. The distance between any microphone and diffusers exceeded 0.7 m. The microphones were distributed around the room so as to cover the space uniformly.

Five reverberation time measurements were also made at each of the 6 microphone positions and at each of the 2 loudspeaker positions and the results averaged.

Receiving room volume:	221m^3
Mass of tapping machine:	10kg
Dimensions of tapping machine:	600mm x 140mm x 260mm
Hammer material:	Metal
Number of tapping machine supports:	3

Environment Samples A (Samples B):

Temperature "source" room:	22.6 ± 0.3 °C	(23.3 ± 0.3 °C)
Humidity "source" room:	29.4 ± 3.0 %	(34.2 ± 3.0 %)
Temperature receiver room:	20.9 ± 0.3 °C	(20.7 ± 0.3 °C)
Humidity receiver room:	29.4 ± 3.0 %	(39.6 ± 3.0 %)
Static pressure	98.5 ± 0.2 kPa	(101.4 ± 0.2 kPa)

Sample thickness:	10.0mm (6.7mm)
Sample size:	Three samples of 1000mm x 500mm
Sample description:	See individual results sheet for details
Sample supplied by:	Client

Method of mounting: Loose laid on concrete floor

Significant damage observations: Hammer witness marks were present on the sample

The test samples were loose laid directly on the bare concrete test floor and were not loaded.

For Samples A the average measured sound absorption figure ΔLw was measured as 26Db. In contrast, for the Samples B the figure was 23dB, even though Samples B were thinner and less massive.

The plastics filler material improves the sound absorbency of the floorcovering. In a preferred example, the proportion of rubber is in the range 25% - 40%, the proportion of plastics filler is in the range 7% - 15% and there is also calcium carbonate, the proportion of which is 45% - 60%. A particularly preferred composition includes approximately 10%, more preferably 11% plastics, approximately 55%, more preferably 57% calcium carbonate and approximately 30%, more preferably 32% latex rubber.

Advantageously the plastics material is provided from recycled material, thereby helping to reduce the quantity of waste plastics being dumped in the environment.

The backing composition may be made by adding the plastics and calcium carbonate to molten rubber and mixing, before applying in molten form to the back of the textile base.

The yarn may comprise any of a range of materials, including but not limited to cotton, nylon, polypropylene or polyester. The fabric base may be of woven or non-woven polypropylene or polyester, for example.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance, it should be understood that the applicant claims protection in respect of any patentable feature or combination of features referred to herein, and/or shown in the drawings, whether or not particular emphasis has been placed thereon.

CLAIMS

1. A floor covering comprising a textile base portion and a sound-absorbent backing, wherein the backing comprises rubber and plastics.

2. A floor covering according to Claim 1, wherein the backing comprises a mixture of rubber and plastics.

3. A floor covering according to Claim 1 or Claim 2, wherein the plastics comprises granular material.

4. A floor covering according to Claim 3, wherein the plastics comprises grains in a range of sizes.

5. A floor covering according to any of the preceding claims, wherein the plastics is in powder form.

6. A floor covering according to any of the preceding claims, wherein the plastics comprises a thermoset material.

7. A floor covering according to any of the preceding claims, wherein the plastics comprises a recycled material.

8. A floor covering according to any of the preceding claims, wherein the rubber comprises latex.

9. A floor covering according to any of the preceding claims, wherein the rubber comprises a natural rubber, a synthetic rubber or a combination of natural and synthetic rubber.

10. A floor covering according to any of the preceding claims, wherein the sound absorbent backing comprises rubber in the range 25% - 40% by weight.

11. A floor covering according to any of the preceding claims,

wherein the sound absorbent backing includes plastics in the range 7% - 15% by weight.

12. A floor covering according to any of the preceding claims, wherein the backing includes a filler of calcium carbonate as 45% - 60% by weight.

13. A floor covering according to any of the preceding claims, wherein the backing comprises approximately 10%, more preferably 11% plastics, approximately 55%, more preferably 57% calcium carbonate and approximately 30%, more preferably 32% latex rubber.

14. A method of forming a sound absorbent floor covering, the method comprising coating a textile portion with a sound absorbent backing comprising rubber and plastics.

Intellectual Property Office

Application No:	GB1812616.9	**Examiner:**	Mr Robert Black
Claims searched:	1-14	**Date of search:**	17 January 2019

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X = 1, 2, 8-11 and 14; Y = 12	US 4186230 A (SINCLAIR) See especially column 2 lines 6-15, column 2 line 44 to column 3 line 2 and column 3 line 10 to column 4 line 2
X	1, 2, 7-9 and 14	EP 0248602 A2 (POLYSAR) See especially page 1 lines 1-10 and 29-36, page 2 lines 18-25, and page 6 line 26 to page 7 line 33
X	1, 2, 8, 9 and 14	JP 2006016729 A (EMULSION) See especially the EPODOC abstract and WPI abstract 2006-095615
X,Y	X = 1, 2, 9 and 14; Y = 12	GB 2067576 A (EXXON) See especially page 2 lines 40-54, page 5 line 54 to page 6 line 8 and page 9 table III
X,Y	X = 1, 2 and 9; Y = 12	GB 2072578 A (TOA) See especially page 1 lines 14-21 and 34-38, page 3 lines 29-32 and example 2 run 7
Y	12	WO 00/22226 A1 (DOW) See especially page 21 lines 18-25, page 27 lines 8-16, page 28 lines 23-28, page 29 line 16 to page 30 line 12 and page 70 line 10 to page 71 line 6 (example 22)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

D06N

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI

Intellectual Property Office

International Classification:

Subclass	Subgroup	Valid From
D06N	0007/02	01/01/2006