Aug. 9, 1960 R. H. JACKSON ET AL 2,948,650

RESILIENT CUSHION AND METHOD OF MANUFACTURE

Filed June 28, 1955

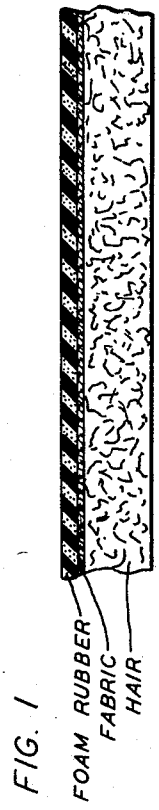


FIG. 1

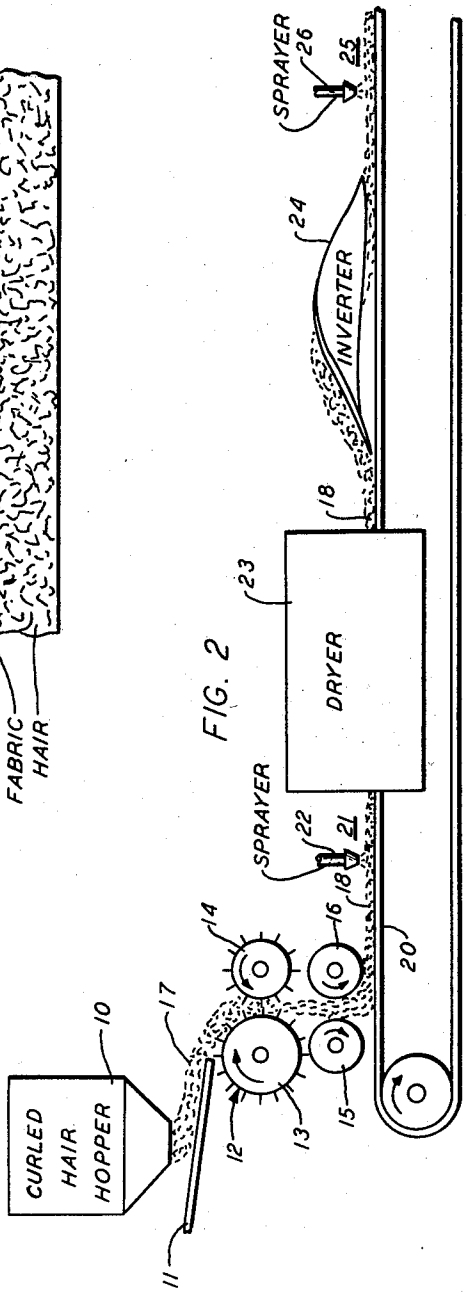


FIG. 2

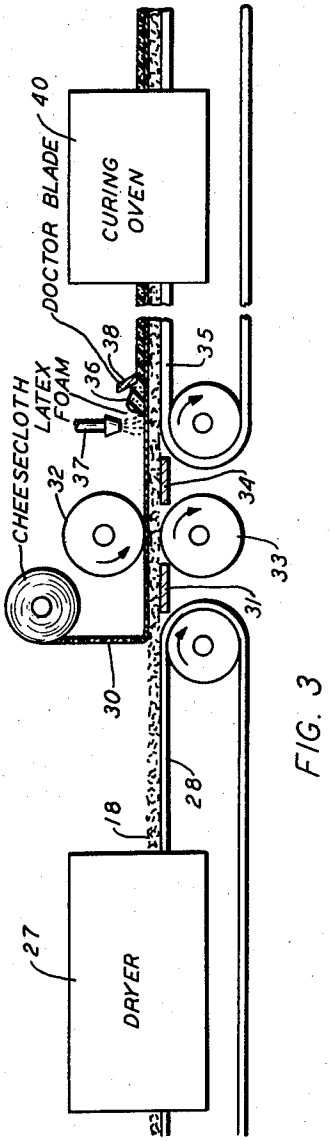


FIG. 3

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United States Patent Office 2,948,650
Patented Aug. 9, 1960

2,948,650

RESILIENT CUSHION AND METHOD OF MANUFACTURE

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Filed June 28, 1955, Ser. No. 518,632

5 Claims. (Cl. 154—100)

This invention relates to an improved resilient cushion material and to a method for its manufacture.

Rubberized curled hair is a commercially available product that is commonly used as a cushioning material, especially in the furniture industry for upholstering. Most applications require that some shield be placed between the curled hair and the upholstering fabric. This is necessary to prevent the hair ends from protruding through the fabric. The conventional shielding material employed is a layer of cotton batting. More recently, however, resilient foam material such as rubber and other plastics has been employed as shielding in the form of a thin layer cast upon the hair.

The advantage of casting a foam layer on the curled hair surface, as an integral part of the pad, is the elimination of the extra operations in upholstering of adding the shielding material. Several difficulties arise in casting a foam in the form of a thin sheet directly on to curled hair. Due to the open structure and irregular surface of the curled hair some of the foam penetrates into the curled hair mass and its shielding effect is lost. Therefore, a uniform foam surface and thickness is not obtained and often individual hairs sticking up from the curled hair mass protrude through the foam surface. Another shortcoming of a cushion in which the foam is applied directly to a hair pad is that compression of such a cushion results in an undesirable noise caused by the scraping of hair ends against the foam layer interface.

It is, therefore, an object of the present invention to provide an improved hair-foam cushioning material not subject to the above mentioned shortcomings and difficulties.

It is a further object of this invention to provide a process for producing a hair-foam cushioning material which has a smooth, uniform surface and thickness of foam shielding.

Further and additional objects of this invention will become apparent from the following specification and the accompanying drawings in which:

Figure 1 is a sectional view of our improved hair-foam cushioning material;

Figure 2 is a partial diagrammatic view of a production line for producing hair-foam cushioning material; and

Figure 3 is the rest of the production line of which the first portion is shown in Figure 2.

In accordance with the present invention, rubberized curled hair is produced in a continuous web. Before curing this web a loosely woven fabric, such as cheesecloth, is laid upon the surface of the curled hair web. This fabric gives a relatively smooth surface on which a foam layer is doctored. As the foam is highly viscous as spread, very little penetrates the fabric. After the foam is doctored on to the fabric, the resulting laminate is cured in a vulcanizing oven.

The hair used as a starting material in accordance with the present invention includes the common types of

commercial animal hair, such as horse hair, cattle hair, and hog hair. Specifically desirable types of hair from both an economic and functional standpoint are relatively short hairs, such as hog hair and cattle body hair. However, long types of hair, such as cattle tail hair, horse mane hair, etc. can be employed. Excellent results are obtained with hog hair which can contain a percentage of other types of hair, such as cattle tail hair. The hair filaments employed preferably have a three-dimensional curvature impressed upon them by a curling process. For example, the hair can be curled by the well known mechanical curling process, or it can be curled by the more recently developed chemical curling processes. It is not absolutely necessary that curled animal hair be exclusively employed, although this is desirable. Synthetic fibers or fibers of vegetable origin can be used.

As indicated above, the curling of hair by either mechanical or chemical processes introduces a three-dimensional curl in the hair filaments so that a random distribution of the hair on a flat surface produces an approximate stereoreticulate mass thereon which will produce a hair web of approximately the same density for the same kind of hair having about the same degree of statistical curl. The curling of the hair is a well known process and does not constitute a part of the present invention. Processes and machines for effecting mechanical curling of hair are described in U.S. Patents Nos. 480,605, 1,658,813, and 2,529,647. Chemical processes for curling hair are described in U.S. Patents Nos. 2,261,094, 2,351,718 and 2,410,248.

The initial step in the production of hair pads involves the spreading of the curled animal hair in a layer of the desired thickness. This can be accomplished either manually or mechanically, and preferably the hair is allowed to fall on a horizontal surface so that it assumes a random distribution and forms a hair mat or web of a predetermined bulk density. For the preparation of hair pads used in upholstering a hair web or mat between 1 to 2 inches is preferred.

Referring to Fig. 2 of the drawing, there is shown in somewhat diagrammatic form mechanical apparatus for carrying out the production of rubberized hair pad. The curled hair in hopper **10** is fed downwardly on to a slide **11** from which it is discharged into a hair spreader **12**. In the illustration given, hair spreader **12** is equipped with wire-tooth carding cylinders **13** and **14**, which separate the fibers as they are discharged from slide **11**. Hair spreader **12** also includes two lower spreading rolls **15** and **16**. The fluffy mass of hair **17** is discharged downwardly by the carding rolls **13** and **14** and spreading rolls **15** and **16** on to a continuous conveyor belt **20** where it is formed into a web **18** of the desired thickness.

Following the formation of the flat hair mat or web, it is sprayed with an elastomer for the purpose of bonding the air filaments together. One or both sides of the web can be sprayed, and a plurality of spraying on both sides can be used if desired. With webs of about 1 to 2 inches in thickness, it has been found desirable to spray the web a single time from each side. This gives excellent penetration by the liquid elastomer dispersion and prevents the dispersion from collecting on the conveyor or other supporting surface because the bottom half of the web acts as a filter during each spraying operation.

Referring again to Fig. 2 to the drawing, the web **18** is shown being carried toward the right from hair spreader **12** by conveyor belt **20** to a spraying station or zone **21** wherein one side of the web is sprayed with the liquid elastomer dispersion. In the illustration given, there is shown a spray head **22**, which is preferably of the oscillating type so that it moves back and forth across the web during the spraying operation. Sufficient elastomer is applied to spray station **21** to penetrate the upper half

of the web. Immediately thereafter conveyor belt **20** takes the partially elastomer-coated web through a drying zone **23** wherein the elastomer coating is dried to an indispersible but unvulcanized condition so as to increase the tensile strength of the mat so that it can be inverted without tearing the mat, and also so that the elastomer coating will not drain downwardly upon the conveyor belt when the web is inverted and cause the web to stick. Ordinarily, the time required in drying zone **23** will be between about 15 to 20 seconds when a dryer of the hot air blast type is employed. The partially coated web **18** is then taken over an inverter **24** which turns over the web so that the uncoated portion of the web or mat is now uppermost on the conveyor **20**. The mat is then conveyed through a second spraying zone **25** similar to spraying zone **21**. If desired, it can be equipped with oscillating spray head **26** of the same type as spray head **22**. Sufficient elastomer is applied in spray station **25** to penetrate to the center of the web and thus complete the distribution of the elastomer throughout the web.

When elastomer is applied by spraying as preferred, it is found that not only are the individual filaments coated with films or sheaths of the elastomer, but also that the elastomer tends to accumulate at the cross-points or intersections of the hair filaments and to form nodules which effectively lock the hair filaments together. Both the distribution of the elastomer on the hair filaments and the forming of nodules at the intersections of the hair filaments is desired, but it is believed that the nodules are of greater importance in imparting the desired mechanical properties to the hair mat.

Various types of elastomer dispersion can be employed. However, it is preferred to employ an aqueous dispersion of a vulcanizable elastomer. The specific elastomer employed can be either a natural rubber latex, a synthetic elastomer latex, or a reclaimed rubber dispersion. The rubber or synthetic elastomer dispersion is compounded with well known ingredients to facilitate the application and curing of the elastomer. Water may be added to secure the required consistency for application. Specific examples of elastomers which can be employed include natural rubber, butadiene-styrene dispersions, Neoprene rubber dispersions, etc.

In Fig. 3 of the drawing the completely impregnated web **18**, after the completion of the operations illustrated in Fig. 2 of the drawing, is shown being carried into a drying zone **27**. Here the web or mat is subject to less severe drying conditions than those described with respect to drying zone **23**, so that the elastomer coating will emerge in a tacky but unvulcanized condition. As web **18** leaves drying zone **27**, carried by means of conveyor belt **28**, the upper exposed surface is in a tacky condition and thereby adapted due to the inherent adhesivity of the elastomer, to receive a layer of a loosely woven fabric, such as cheesecloth **30**. The layer of hair and cloth are taken from conveyor belt **28** by means of an apron **31** and passed between two compression rolls **32** and **33** where the fabric and hair are compressed slightly to effectuate a bonding of the cheesecloth to the hair pad. The compression effected by rolls **32** and **33** is not sufficient to put any permanent set or compression in the hair pad but is merely sufficient to effectuate the bonding of the cheesecloth to the hair pad.

The hair pad-fabric laminate is passed over apron **34** on to a conveyor belt **35** where a layer of a viscous foam material **36** is applied on top of the fabric by means of a sprayer **37**. The fabric **30** applied to the hair pad **18** is loose woven so that there is a slight penetration of the fabric by the foam **36**. This is to provide a better bonding of the foam to the fabric.

After application of the foam **36** to the fabric hair laminate, the foam is smoothed by means of doctor blade **38** and the resulting laminate allowed to proceed along conveyor **35** for a period of time sufficient for the foam latex to gel. This usually occurs in a period of from 2 to 5 minutes. After the foam has gelled it is passed through a curing oven **40** where both the elastomer used to bond the hair fibers together and the latex foam applied to the fabric are cured. The temperatures obtaining in curing oven **40** are in the range of 260° F. to 290° F., and the operation is effected in about 40 to 60 minutes.

The resilient foam material employed as a shielding in accordance with the present invention can be a natural or synthetic latex foam or can be made of some of the more recent resilient plastic foams, as for example a polyurethane foam. The following are some examples of the resilient foam material which can be employed:

I

A typical rubber foam can be formulated as follows:

	Dry parts
Deammoniated natural latex	100.00
Potassium oleate soap	1.50
Ethyl zimate [1]	1.00
Sulfur	2.00
Setsit 5 [2]	0.50
Agerite spar [3]	1.00
Zetax [4]	1.00
Potassium castor oil soap	0.25
Trimene base [5]	0.80

[1] Zinc diethyldithiocarbamate (supplied by R. T. Vanderbilt Co.).
[2] Dithiocarbamate type ultra accelerator (supplied by R. T. Vanderbilt Co.).
[3] Styrenated phenol antioxidant (supplied by R. T. Vanderbilt Co.).
[4] Zinc salt of mercaptobenzothiazole (supplied by R. T. Vanderbilt Co.).
[5] Foam sensitizer (supplied by Naugatuck Chemical Co.).

The above components are continuously mixed with air in a machine, as the Oakes M14 continuous foamer, E. T. Oakes Corporation, and 5.00 parts of zinc oxide and 1.50 parts of sodium silicofluoride added.

II

A typical flexible polyurethane foam can be formulated as follows:

	Dry parts
Selectrofoam 6201 [1]	100.00
Emulphor EL–719 [2]	0.20
Water	2.50
N-methyl morpholine	1.50
Hylene TM [3]	40.00

[1] Polyester resin (supplied by Pittsburgh Plate Glass Co.).
[2] Polyoxyethylated vegetable oil (supplied by Antara Chemicals Division of General Dyestuffs Corporation).
[3] Toluene diisocyanate (supplied by E. I. du Pont de Nemours & Co.).

The above ingredients are intimately mixed giving a viscous liquid which starts foaming in about 15 seconds. After 20 to 30 minutes at room temperature the foam is sufficiently cured to permit handling.

Referring to Fig. 1 of the drawing, there is shown in cross-section the laminate cushioning material of the present invention. It will be seen that a thin layer of foam rubber is bonded on a fabric which is in turn bonded to a hair pad.

While this invention has been described and exemplified in terms of its preferred embodiments, those skilled in the art will appreciate that modifications can be made without departing from the spirit and scope of this invention. For example, an alternate method for application of the cheesecloth is to lay it on the unsprayed surface of the inverted web at a point between drying zone **23** and spraying station **25**. At spray station **25** the elastomer dispersion can be sprayed into the hair mass through the cheesecloth. The web with the

cheesecloth then passes into dryer **27** and through squeeze rolls **32** and **33**.

An alternate method for curing is to pass the rubber foam-topped web into a steam filled chamber at atmospheric pressure for about 30 to 40 minutes where curing is effected, and then into a drying chamber for 20 to 30 minutes where the hair mass and foam are dried at 180° to 220° F. Some of the foams which are included in the scope of this invention, as for example, the flexible polyurethane foams, do not require the curing conditions for natural or synthetic rubbers. These can be applied to the web after curing oven **40** and passed through a smaller oven for 5 to 10 minutes at 120 to 160° F.

We claim:

1. A continuous process for the production of hair-foam rubber cushion material which comprises spreading curled animal hair in an approximate stereo-reticulate mass in the form of a pad of substantially uniform thickness, partially dispersing through one surface of said pad a latex of a vulcanizable elastomer, drying the elastomer to a vulcanized condition, partially dispersing through the opposite surface of said pad a latex of a vulcanizable elastomer, drying the elastomer to a tacky but unvulcanized condition, applying a woven fabric to said opposite surface of said pad, continuously spreading and levelling a substantially homogeneous foam latex onto said fabric to form a layer of foam rubber of desired thickness thereon, and vulcanizing the resulting laminate.

2. An improved cushioning material comprising a laminate of curled animal hair in the form of an approximate stereoreticulate mass bonded at the interstices by a vulcanized elastomer, a woven fabric bonded to at least one surface of said mass by said elastomer, and a substantially uniform layer of desired thickness of a foamed resilient homogeneous material bonded to said fabric.

3. An improved cushion material comprising a laminate of curled animal hair in the form of an approximate stereoreticulate mass bonded at the interstices by a vulcanized elastomer, cheesecloth bonded to at least one surface of said mass by said elastomer, and a substantially uniform layer of desired thickness of a foamed resilient homogeneous material bonded to said cheesecloth.

4. In a continuous process for the production of cushioning material wherein a hair pad composed of a stereoreticulate mass of hair fibers bonded at their interstices by vulcanizable elastomeric material is provided with a shielding layer of foam material, the steps comprising bonding a woven fabric to at least one side of a hair pad with a latex of a vulcanizable elastomer, and continuously forming and bonding a layer of a resilient substantially homogeneous foam material of desired thickness onto said fabric.

5. A process according to claim 4, wherein cheesecloth is the fabric and foam rubber is the resilient substantially homogeneous foam material employed.

References Cited in the file of this patent

UNITED STATES PATENTS

1,872,846	Thiele	Aug. 23, 1932
2,198,724	Schreiner	Apr. 30, 1940
2,285,650	Faris et al.	June 9, 1942
2,341,130	Unsworth	Feb. 8, 1944
2,563,478	Mason et al.	Aug. 7, 1951
2,580,202	Talalay et al.	Dec. 25, 1951
2,688,152	Marco	Sept. 7, 1954
2,784,773	Rowland	Mar. 12, 1957