Aug. 18, 1936. P. J. FITZGERALD 2,051,373

LAMINATED ARTICLE AND METHOD OF MAKING

Filed June 18, 1934 2 Sheets-Sheet 1

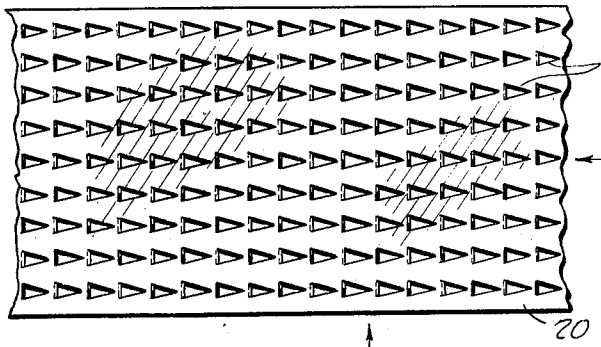


FIG. 1

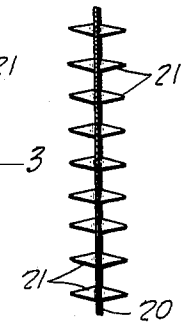


FIG. 3

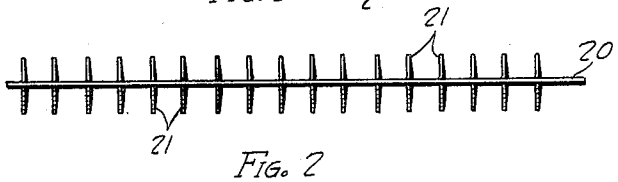


FIG. 2

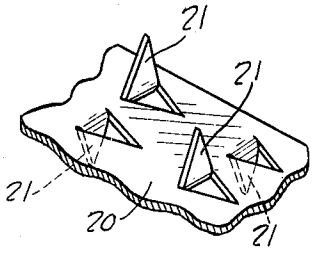


FIG. 4

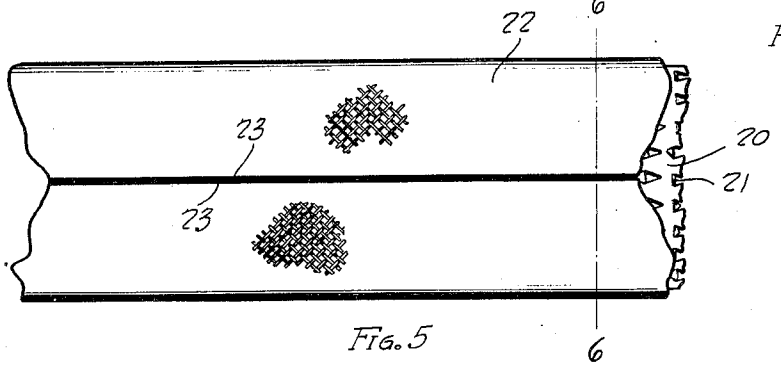


FIG. 5

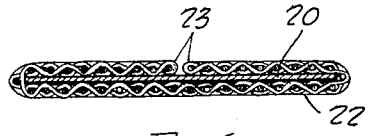


FIG. 6

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Aug. 18, 1936. P. J. FITZGERALD 2,051,373

LAMINATED ARTICLE AND METHOD OF MAKING

Filed June 18, 1934 2 Sheets-Sheet 2

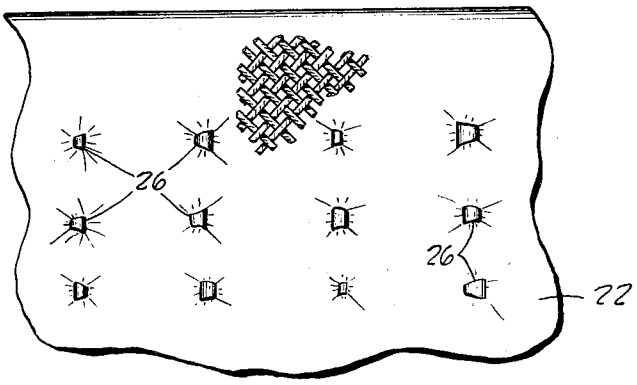


FIG. 7

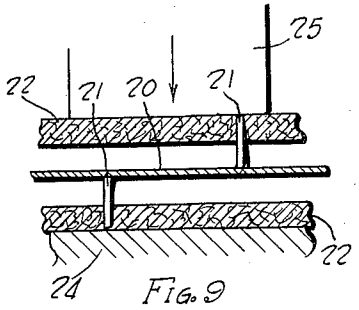


FIG. 9

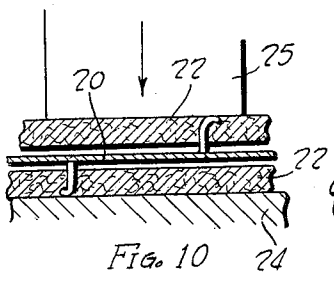


FIG. 10

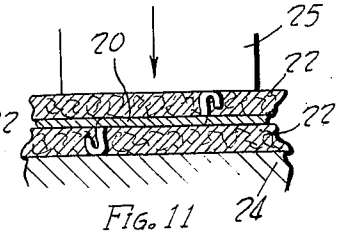


FIG. 11

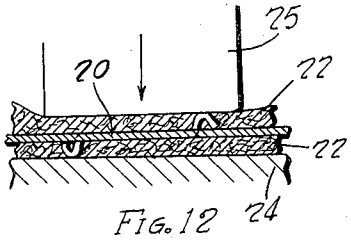


FIG. 12

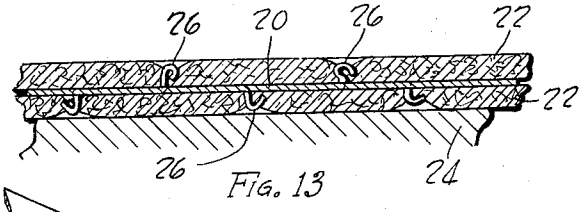


FIG. 13

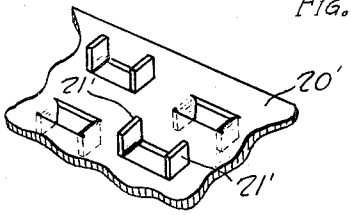


FIG. 8

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Patented Aug. 18, 1936

2,051,373

UNITED STATES PATENT OFFICE

2,051,373

LAMINATED ARTICLE AND METHOD OF MAKING

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Application June 18, 1934, Serial No. 731,107

6 Claims. (Cl. 154—2)

This invention relates to laminated articles, and the method of making, and has for an object to provide an article made up of a plurality of sheets of material, with improved means for binding the sheets into a unitary structure.

A further object of the invention is to provide a laminated article, one of the lamina of which is composed of sheet metal or analogous material, with one or both sides of said sheet metal covered by a fibrous or yielding material, said sheet metal having improved means for binding the second sheet thereto applied by an improved method.

A further object of the invention is to provide a laminated article comprising one lamina of sheet metal or the like, having struck from one or both sides thereof penetrating points, and forcing a sheet of fibrous or yielding material onto the penetrating points so that the penetrating points shall tend to project through said fibrous or yielding sheet of material, but turned over and projected into the sheet during such pressing process, whereby the penetrating points and all parts thereof are within the surface of the fibrous or yielding material.

A further object of the invention is to provide a laminated article and method of making, which article will lend itself to a multitude of uses, among which may be mentioned a belt for use upon pulleys or the like, lining for brakes, gaskets and other uses now known or not known, and comprises the formation of penetrating points extending preferably, though not necessarily, from both sides of a sheet of metal or like material, and having a fibrous or yielding material forced onto said penetrating points by some mechanical device exerting pressure, which tends to turn over the ends of said penetrating points forming hooks which are projected into the fibrous or yielding material as the pressure continues, and serves to anchor the fibrous or yielding material onto the sheet of metal or like material.

The invention, therefore, comprises, first, forming a sheet of metal or like material by stamping penetrating members, preferably though not necessarily from both sides, forcing a sheet of fibrous or yielding material onto the members by the exercise of pressure so that said members shall pass through the fibrous or yielding material, and by the continued pressure, be turned over and entered into the fibrous or yielding material to lock into the fibres or other structural parts of said sheets, whereby the sheets are firmly locked upon the sheet of metal or the like, and disposed within the surface of said sheet of fibrous or yielding material.

The invention further comprises the folding over of a sheet of material, such as a fabric or the like, so that its central area shall be upon one side of the sheet of metal or the like, and the opposite edges upon the opposite side folded substantially into abutment, thereby covering both sides of the sheet of metal or the like, with the same fabric or similar material, and is a continuation, so far as applicable, of applications Serial No. 596,793, filed March 4, 1932, for "Belting and method of constructing the same", and Serial No. 596,794, filed March 4, 1932, for "Brake lining and method of producing the same".

The drawings illustrate several embodiments of the invention, and the views therein are as follows:

Figure 1 is a view in plan of a sheet of metal or the like stamped in accordance with the present invention,

Figure 2 is a view of the sheet in edge elevation, as indicated by arrow 2 at Figure 1,

Figure 3 is a view of the sheet in end elevation, as indicated by arrow 3 at Figure 1,

Figure 4 is a fragmentary perspective view taken on a greatly enlarged scale,

Figure 5 is a view in elevation of a completed article, no attempt having been made on this figure, because of its scale, to indicate the penetrating members as they appear upon the surface,

Figure 6 is a transverse sectional view taken on line 6—6 of Figure 5,

Figure 7 is an enlarged view in plan of the article, here showing the penetrating members sunken below the surface,

Figure 8 is a fragmentary perspective view of a modification of the reinforcing sheet,

Figures 9, 10, 11 and 12 are in their order named, respective stages in the method of making the article, and shown diagrammatically, and

Figure 13 is a diagrammatic view showing the completed article in section.

Like characters of reference indicate corresponding parts throughout the several views.

The present invention comprises a sheet of material 20, which, according to the present practice, will be sheet metal. Hereinafter this sheet of material will be referred to as sheet metal without any limitation upon the use of other materials, such other materials being found advantageous.

This sheet of metal is technically referred to as a core and will be so referred to herein for

convenience. The sheet of metal **20** is stamped with upstanding, preferably triangular, penetrating members **21**, although as shown at Figure 8, the sheet of material **20'** is stamped with upstanding members **21'** which are not triangular, but which, under some circumstances, are found of advantage. The invention, therefore, includes both types shown at Figures 1 and 8.

Cooperating with this core **20** or **20'** is a fibrous or yielding material. This may take various forms, and the invention is in no way limited to the particular material so employed. It is well illustrated by the use of a heavy fabric **22** which may be similar to canvas or any other preferred or satisfactory material. Merely for convenience, this sheet of material will hereinafter be referred to as canvas, without, however, any limitation by such name.

In the case where the penetrating members **21** are struck from both sides of the sheet, as indicated in the drawings, the canvas will occupy also both sides of the core. As shown at Figure 5, this is accomplished by folding the edges over upon the side of the core opposite the initial placement until the edges are in abutment or substantially so, as indicated at **23**, in Figures 5 and 6.

This, however, is merely one type and the invention includes the use of the canvas upon one side only of the core, or if upon both sides, the use of two separate sheets of canvas.

The points or members **21** or **21'** are designed to be hooked into the canvas to firmly attach the canvas to the core. For the purpose named and for other purposes, it is desirable that the hooks when so hooked shall be below or within the surface of the canvas, so that in use only the surface of the canvas is presented to utility. This may be brought about in various ways. A satisfactory way is shown diagrammatically in the drawings.

At Figure 9 the sheet of canvas here particularly designated as **22'** is placed upon the bed **24** of a press. The core is then placed upon the top of the canvas standing upon the apices of the penetrating members. A second sheet of canvas is laid upon the top of the upstanding penetrating members or the edges are folded over, as indicated at Figures 5 and 6 to occupy a position upon the top.

The press head **25** is now brought into bearing upon the top part of the top canvas and the penetrating members are forced through the canvas. At Figure 9 the position of these penetrating members is that they have just passed into the canvas and reached the opposite surface. The pressing is continuous and not by steps, and the various showing are merely stages rather than steps in the products.

As the pressure continues, the points of the penetrating members are turned over upon the bed of the press and under the head, as indicated at Figure 10. Continuation of pressure forces the canvas into union with both sides of the core, and forms a further hook or bend in the penetrating members, as shown at Figure 11.

By reason of the fact that the canvas is yielding, a greater pressure exerted upon the press head will compress the fabric so that the penetrating members are hooked over to a still greater extent than shown at Figure 11.

When the pressure is released the resiliency of the canvas causes it to assume its original proportions, whereby the surfaces of the canvas display only bends of the penetrating members, which are shown at Figure 7, and for convenience numbered **26**, similar numbers being also applied at Figure 13.

The method outlined produces a laminated article the surface or surfaces of which are the canvas or like material firmly attached to the metallic or like core by a great number of hooks extending outwardly from the core and hooked into the material of the canvas, but not rising to the surface of the canvas so that the canvas presents a surface unobstructed by any of the metallic parts projecting beyond said surface.

Of course, the laminated article and the method of making illustrated may be modified and changed in various ways without departing from the invention herein set forth and hereafter claimed.

I claim:—

1. The method of making a laminated article consisting of supporting a sheet of metal provided with a plurality of penetrating members having apices at their outer ends, said sheet of metal constituting a core, positioning a sheet of fibrous material upon the apices, pressing the fibrous material toward the core to force the apices to penetrate the fibrous material, simultaneously overturning the apices into return bends inserted into and below the surface of the fibrous material.

2. The method of making a laminated article consisting in supporting a sheet of metal having triangular penetrating members extending with their apices from opposite sides of the sheet of metal to form a core, positioning a sheet of fibrous material upon the apices of the penetrating members, exerting force to cause the penetrating members to penetrate through the fibrous material and continuing the pressure to overturn the apices of said points and direct them within the fibrous material as hooks interhooked with the fibres of the material, with the bend portions of the hooks lying below the surface of the fibrous material.

3. A laminated fabric comprising a metallic core having outstanding penetrating members, and a sheet of canvas upon one side of said core and having its edges turned over upon the opposite side of the core into substantial abutment and secured thereto by the penetrating members directed toward the core in hooking engagement with inner fibres of the canvas.

4. The method of making a laminated article consisting in supporting a sheet of metal having triangular penetrating members extending with their apices upon opposite sides of the sheet to form a core, placing a sheet of canvas upon the penetrating points of one side, said sheet of canvas being wider than the core, turning the edges of said canvas over upon the opposite side of the core and upon the apices of the penetrating members, forcing the canvas toward the core and the apices to penetrate through the canvas, said pressure being continued to overturn the apices and other parts of the penetrating members and direct the apices backwardly into the canvas with the apices forming hooks engaging fibres of the canvas.

5. The method of making a laminated article consisting in supporting a metal core having penetrating members upon opposite sides, positioning a canvas upon the penetrating members, said canvas being wider than the core, and turning the edges over the other side of the core and positioning them in substantial abutment

upon the ends of the penetrating members, exerting force upon the opposite sides of the combined article to force the penetrating points through the canvas and continuing the pressure to cause said penetrating members to hook over and return into the canvas and to further hook the penetrating members, said canvas resiling to normal thickness when pressure is released with the hooks of the penetrating members within the lines of the canvas.

6. The method of making a laminated article which consists in forming a sheet of material with a plurality of outstanding penetrating members to provide a core, and then forcing a sheet of material over the penetrating members towards the core and at the same time turning the ends of the penetrating members into return hooks, the return hooks being forced into the sheet of material as they are being formed, the bend portions of the hooks being forced into position below the surface of the fibrous material.

PATRICK J. FITZGERALD.