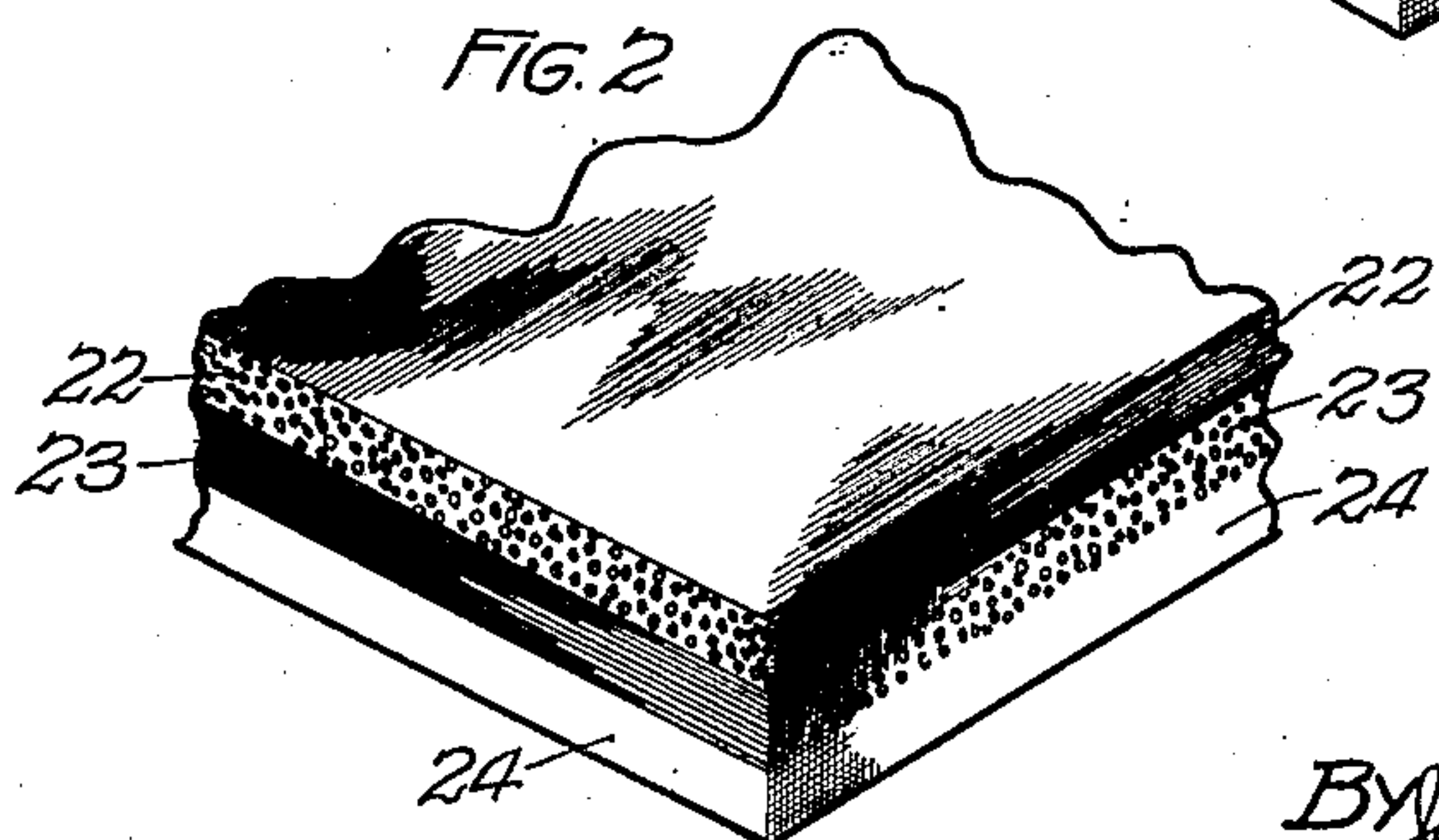
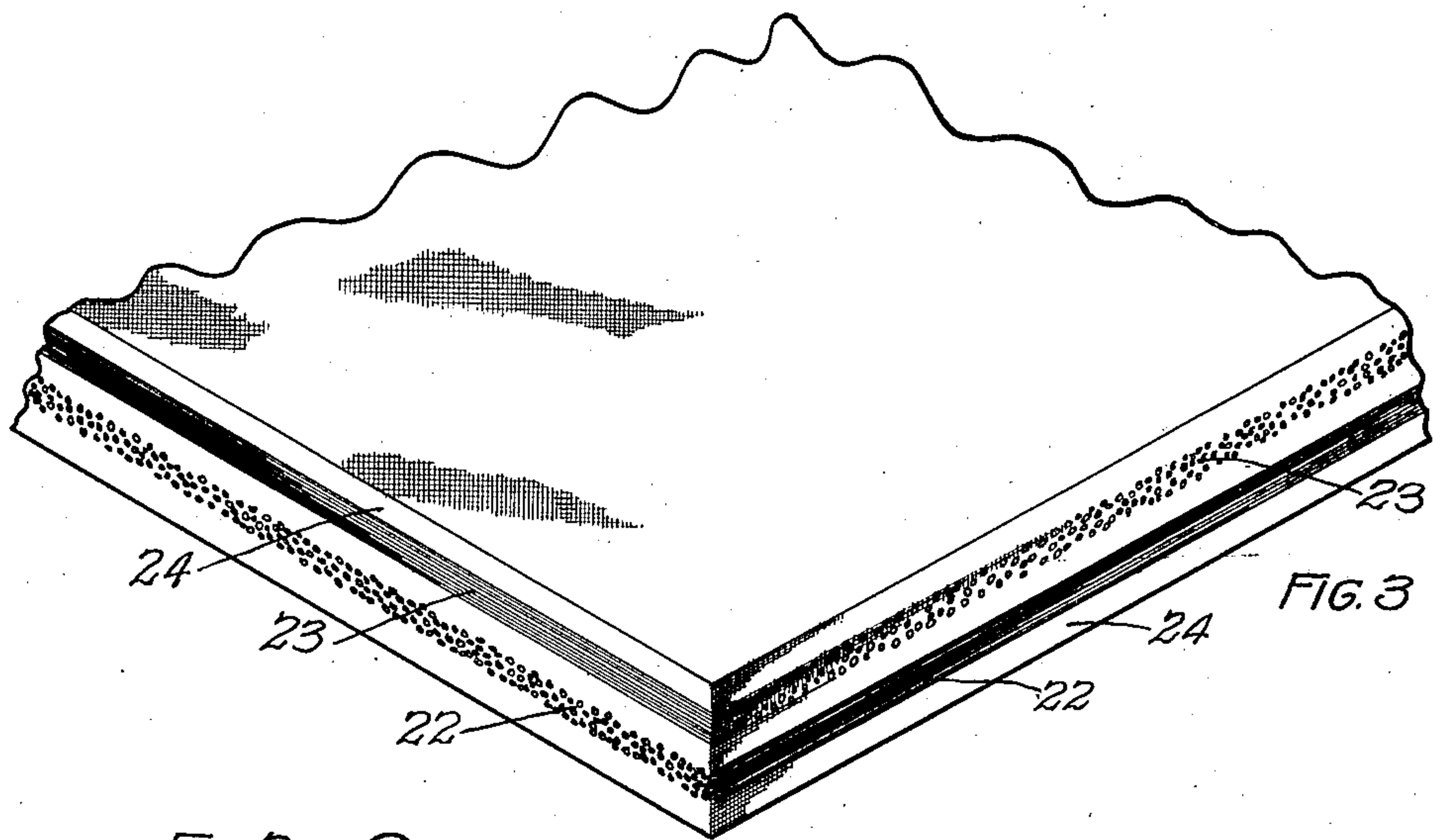
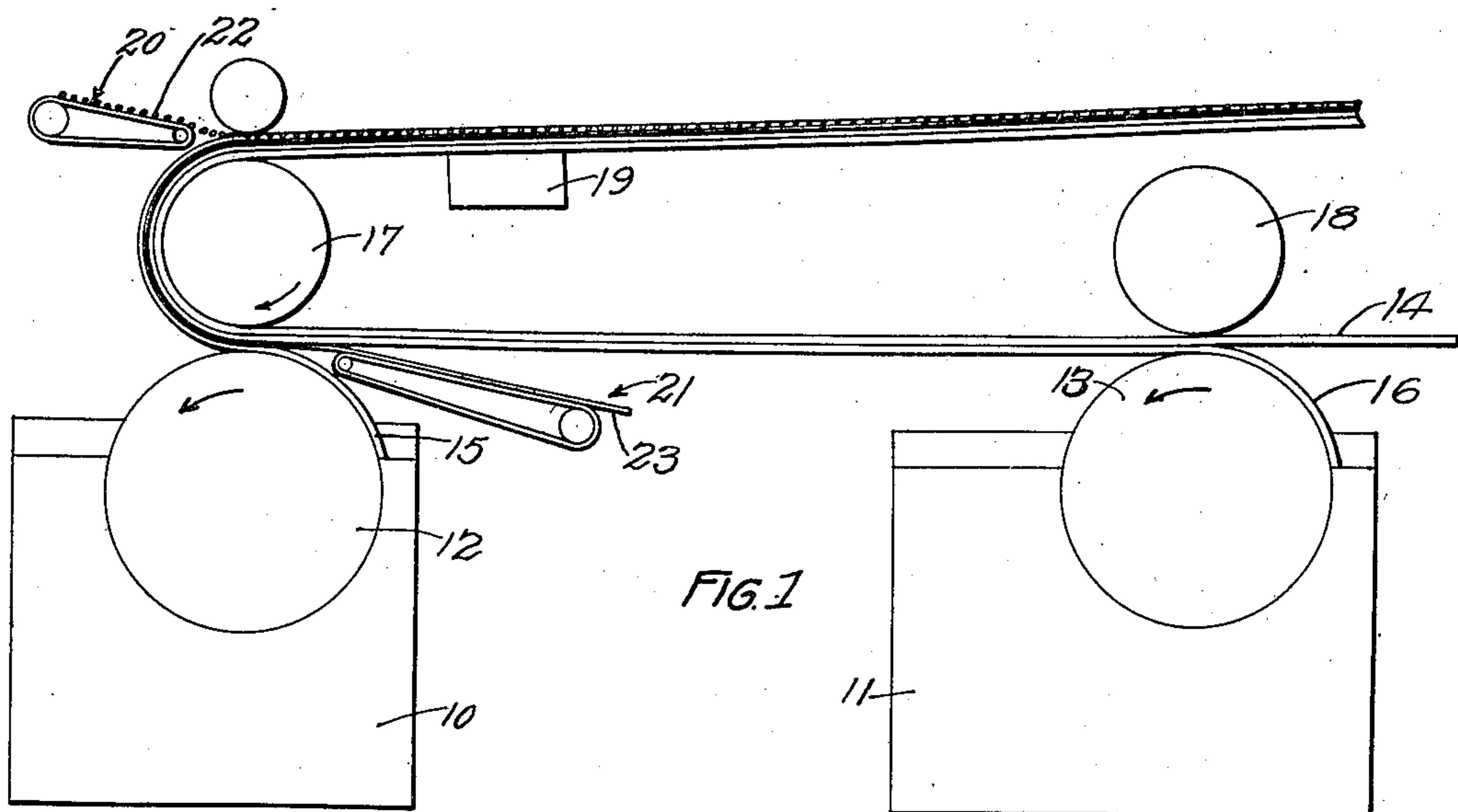


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O. D. RICHARDSON  
COMPOSITE SHEET MATERIAL  
Filed Jan. 30, 1922



INVENTOR:  
Orlo D. Richardson

By Jones, Addington, Ames & Seibold  
ATTYS.



# UNITED STATES PATENT OFFICE.

ORLO D. RICHARDSON, OF CHICAGO, ILLINOIS.

COMPOSITE SHEET MATERIAL.

Application filed January 30, 1922. Serial No. 532,642.

*To all whom it may concern:*

Be it known that I, ORLO D. RICHARDSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Composite Sheet Materials, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to composite sheet material, such as may be used for roofing, flooring, weather-proofing, sheathing, etc., also for making boxes, cartons, etc., also wherever a sheet material fabric is desired having comparatively great tensile strength.

One of the objects of my invention is to provide an improved composite sheet material which will be tougher and more durable than sheets heretofore used.

A further object of my invention is to provide an improved method for forming such sheets, and improved apparatus for use in the manufacture of said sheets.

Further objects will appear from the detailed description to follow and from the appended claims.

In the drawing in which my invention is illustrated—

Figure 1 is a diagrammatic side elevational view showing apparatus for forming a composite sheet;

Fig. 2 is a very much enlarged perspective view showing a portion of the sheet formed; and

Fig. 3 is a very much enlarged perspective view showing a sheet of somewhat different composition from that shown in Fig. 2.

In carrying out my invention I may make use of known apparatus, such as already in use for manufacture of a built-up felted fabric, adding to this known apparatus means whereby fibrous material, such as sisal or the like, will be embedded in the felted fabric, while the fabric is still in a plastic or "pulpy" condition.

In supplying the fibres, I provide means whereby some of the fibres will be supplied crosswise of the sheet of fabric, and whereby other fibres will be supplied to the sheet lengthwise thereof, so that the fibres will strengthen and reenforce the sheet in both

directions, thus greatly increasing the tensile strength of the composite sheet.

By applying the fibres while the fabric is still in pulpy condition, the fibres become embedded in the mass of the pulp, and become firmly united therewith, so that in the composite sheet they extend in both directions of the sheet and are firmly embedded in the pulp, and form a very strong tough sheet, which offers a strong resistance to tearing in any direction.

Referring now to Fig. 1, the apparatus shown therein comprises a series of pulp tanks or vats 10 and 11 (any number of pulp tanks may be used depending on what thickness of fabric is desired) a series of rotatable cylindrical screens 12 and 13, operating in the pulp tanks, and an endless web 14, which may be of felt, onto which the revolving cylinders 12 and 13 successively deposit layers of pulp. This part of the apparatus is old and well-known in the art, a detailed description of similar apparatus being found in chapter 25 of a book entitled "Asphalt and Allied Substances" by Herbert Abraham, copyright 1918 by D. Van Nostrand Co.

In the operation of this machine, the "pulp" which may be ground-up rag fibres, or any suitable material, is suspended in water in the tanks 10 and 11, and as the cylindrical screens 12 and 13, rotate as indicated by the direction of the arrows, each cylinder picks up a layer of the fibrous pulp, as indicated at 15 and 16, and these layers 15 and 16 are deposited on the felt web 14, this web being pressed against the cylinders 12 and 13, by means of rollers 17 and 18.

The relative adhesive and cohesive properties of the pulp, web and screens is such that the films of pulp adhere to the web 14 rather than to the screens, so that the films of pulp are removed from the screens and adhere to the web and travel along with the web.

A suction box is provided at 19 to assist in removing any surplus water which may have been carried along with the pulp. The part of the apparatus thus far described is old and well-known in the art, and commonly used for preparing felted fabrics.

However, I combine with the apparatus described, means 20 and 21 for supplying



fibres such as sisal or other fibre to the film of pulp, while the film is still in a plastic condition. The means 20 supply the fibre to the plastic film crosswise of the film as indicated at 22, while the means 21 supply the fibre lengthwise of the film as indicated at 23.

The nature of the resulting fabric is shown in Fig. 2, which shows the fibres 22 and 23 embedded in the pulp material 24, the fibres 22 extending in one direction, and the fibres 23 extending crosswise of the fibres 22, all of the fibres being thoroughly embedded in the pulp 24, thus strengthening and reenforcing the fabric in every direction, and increasing the tensile strength very materially.

Afterward, the composite sheet may be treated in any suitable manner to fit it for use for which it is intended, that is to say, it may be saturated or coated with bituminous composition, such as asphalt compound, to be used for roofing or waterproofing, or it may be impregnated or coated with wax or paraffine or other suitable composition, or it may be used without further treatment for material for boxes and the like.

A greater or less number of revolving screens than the number shown may be used, depending on the use to which the material is to be put. For making boxes, two or more layers of pulp and two or more layers of fibre may be used or one of the layers of fibre being on the outside.

Fig. 3 shows a sheet formed by apparatus in which three revolving screens are used, three layers of pulp being deposited on a traveling web, the crosswise fibres 22 being fed in between the first and second layers of pulp, and the lengthwise extending fibres 23 being fed in between the second and third layers of pulp.

Using the fibre reenforcement as described, a cheaper grade of pulp can be used than is ordinarily used, as the fibre supplies the necessary tensile strength in both directions, making up for the low tensile strength of the low grade pulp used. It will be noted that I can use for the manufacture of this fabric, apparatus such as is already used in the manufacture of paper, simply substituting for one or more of the vats, apparatus for distributing and applying the fibrous strengthening material.

Having thus described my invention, what

I claim as new and desire to secure by Letters Patent of the United States is—

1. An apparatus for forming a composite sheet comprising means for continuously forming a plastic film of pulp, means for applying fibre to said plastic film substantially crosswise thereof, and means for applying fibre to said plastic film substantially lengthwise thereof.

2. An apparatus for forming a composite sheet comprising means for continuously forming a plastic film of pulp, means for applying fibre to said plastic film substantially lengthwise thereof, and means for applying fibre to said plastic film substantially crosswise thereof, said means for forming a plastic film comprising a pulp tank, a rotatable cylindrical screen operating in said pulp tank, and a web on which said screen deposits a film of pulp, one of said fibre applying means acting to deliver fibre to said film between said screen and web.

3. A method of forming a composite sheet comprising making a film of plastic pulp and applying fibre to said film both crosswise and lengthwise thereof while the film is still plastic.

4. A composite sheet comprising a film formed of plastic material having embedded therein fibres extending both lengthwise and crosswise of said film.

5. An apparatus for forming a composite sheet, comprising means for continuously forming a plastic film of pulp, means for applying fibre to one side of said plastic film substantially crosswise thereof, and means for applying fibre to the other side of said plastic film substantially lengthwise thereof.

6. A method of forming a composite sheet comprising making a film of plastic pulp, and applying fibre to one side of said film crosswise thereof, and to the other side lengthwise thereof, while the film is still plastic.

7. A composite sheet comprising a film formed of plastic material, having imbedded therein on one side thereof fibres extending lengthwise thereof and having imbedded therein on the other side thereof fibres extending crosswise thereof.

In witness whereof, I have hereunto subscribed my name.

O. D. RICHARDSON.