Aug. 7, 1945. H. E. KALLMANN 2,381,061

FLEXIBLE PLASTIC SHEET

Filed Aug. 11, 1943

Fig. 1.

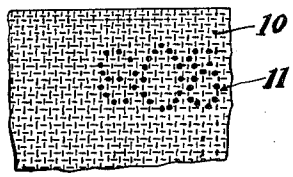


Fig. 2.

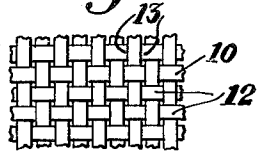


Fig. 3.

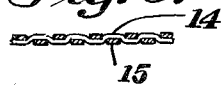


Fig. 4.

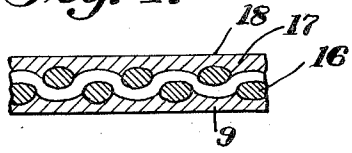


Fig. 5.

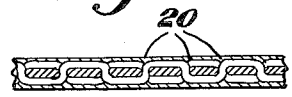


Fig. 6.

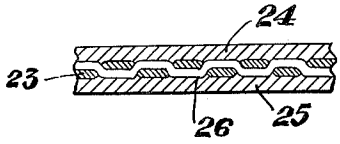
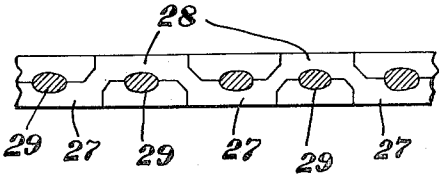


Fig. 7.



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FLEXIBLE PLASTIC SHEET

Heinz E. Kallmann, Boston, Mass.

Application August 11, 1943, Serial No. 498,183

6 Claims. (Cl. 28—78)

My present invention relates to new articles of manufacture, and more particularly to new types of flexible plastic sheets.

It is therefore an object of my present invention to provide new types of flexible sheets for a large variety of purposes.

It is another object of my invention to provide thin sheets which have a textile pattern and are more elastic, more durable, and thus more economical for many purposes than paper or textiles.

Another object of my present invention consists of sheets of flexible plastics which are smooth yet offer the ineradicable appearance of textile patterns.

Still another object of my invention consists of sheet-shaped articles of manufacture which will not warp, crease or break under any ordinary handling and will preserve their essential qualities longer than similar products produced up to now from paper.

A further object of my invention consists of sheet like product which are of pleasant cleanness, long lasting, and difficult to destroy or defacé.

Still a further object of my invention consists in flexible sheets, which have the indications incorporated therein and are difficult to tear and so flexible that folding will leave no marks on them.

Still a further object of my invention consists of sheet-like products which are non-inflammable and not affected by water or other usual solvents.

With the above objects in view, my present invention mainly consists of a flexible sheet comprising a flexible textile fabric consisting at least partly of flexible fibres or filaments or a plastic material, which flexible plastic filaments are at least partly fused to each other so as to form a sheet like article of manufacture. For the purposes of the present invention, it is preferable to use non-inflammable water resistant plastic materials. Thus, for instance, plasticised vinyl ester resin, polyvinyl butyrol and other flexible plastics which are non-inflammable and water-resistant are materials adapted for the purposes of the present invention.

By selecting one or the other type of plastic and by treating the fabric sheets made from filaments of this plastic by various processes, the properties of such sheets may be varied to a great extent; thus, for instance, the finished fabric sheets may be of different color or thickness or more or less transparent or stretchable.

The flexible textile fabric used for the purposes of my present invention may be woven, braided, knitted, felted, or meshed of flexible plastic filaments and these filaments then fused to each other. Of course, the textile fabrics do not have to be woven, knitted, braided, felted, or meshed of the plastic filaments themselves, but they might be produced of spun threads of such filaments or also of felted strands of plastic fibers.

For certain purposes, it is preferable to use glass filaments which are non-inflammable and not affected by water or other usual solvents. Furthermore, glass filaments can be easily spun into threads which can then be used very well for weaving and knitting purposes. By subjecting the thus produced glass fabrics to heat, the glass filaments of contacting threads may be fused to each other, thereby forming a flexible sheet like product consisting of glass filaments and having a textile pattern.

In order to provide my new plastic sheets with various patterns or indicating marks such as figures or numbers, I use at least two types of visibly contrasting flexible filaments of the same or various plastic materials and produce, e. g. weave or knit, the flexible textile fabric from these visibly contrasting filaments, respectively from the threads spun from these filaments. It is evident that these visibly contrasting plastic filaments will form a design which cannot be removed from the sheet at all after it is finished. This design may consist of an artistic pattern; however, it is also possible to weave or knit into the fabric figures or numbers of the type generally used on bank notes or similar instruments of value.

After the plastic textile fabric is thus produced, it might be transformed into the required flexible plastic sheet in one or a combination of different ways; thus, for instance, it is possible to subject the plastic fabric to pressure and thereby to mold it, that is the flexible plastic filaments of which it consists, into a homogeneous flexible plastic sheet which is smooth on both sides and has a textile pattern. This textile pattern will be particularly distinct if visibly contrasting flexible plastic filaments are used.

Instead of molding the plastic fabric into a sheet, it is also possible to leave the fabric substantially unchanged and to fill the interstices between the flexible filaments forming the fabric with another flexible plastic material adhering to these filaments; the outer faces of this filling plastic material may be smooth so as to form a substantially homogeneous plastic sheet having a smooth surface. Another way of producing a

sheet of the new type consists in using two flexible layers of another plastic material, each covering one face of the flexible plastic textile fabric and being fused to the same. These plastic layers may then have smooth outer faces.

It should be mentioned that for the purposes of the present invention I may use not only differently colored plastic filaments but also filaments of the same color yet visibly different due to their different transparency. Furthermore, it is also possible to use filaments which have certain physical effects which are not visible under usual conditions but may nevertheless serve as distinguishing characteristics. Thus, for instance, some of the plastic materials of which the used filaments are made may contain fluorescent or phosphorescent particles. It is furthermore possible to use plastic materials having a polarizing effect; of course, from what has been said above it is evident that materials having other distinguishing physical effects, particularly optical effects, may also serve for the purposes of the present invention.

The novel features which I consider characteristic for my invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments, when read in connection with the accompanying drawing in which:

Figure 1 shows a sheet with indicating marks woven of filaments of plastic material;

Figure 2 is an enlarged view of a part of the sheet shown in Fig. 1;

Figure 3 is a cross section through the sheet shown in Fig. 2; and

Figures 4 to 7 are cross sections through various embodiments of plastic sheets according to the present invention.

The sheet shown in Figures 1 to 3 is woven of plastic filaments 10. The indicating marks, i. e. figures, are woven from filaments 11 distinguishing from the filaments 10. In the embodiment shown in these figures, the woven fabric has been subjected to pressure and heat and all filaments of the fabric, i. e. filaments 10 forming the base fabric as well as filaments 11 forming the indicating marks, are fused to each other, thereby forming a sheet having a textile like pattern. As shown in Figure 2, this sheet does not have a smooth outer surface, but in view of the fact that the filaments adhere to each other only at their portions marked 12, they form open interstices 13 between each other. However, despite these interstices 13, the fabric obtained by the exerted pressure has a cross section as shown in Figure 3, i. e. the exposed sides of the plastic filaments are flattened, thereby forming substantially smooth outer faces 14 and 15, giving the fabric the appearance of a smooth sheet. The material near the inner faces of the filaments is, due to the pressure, forced into mutual contact, thus abolishing the interstices.

The modification shown in Figure 4 consists of a fabric 16 of plastic filaments embedded in another plastic material 17. This plastic material 17 is subjected to pressure, forming thereby entirely smooth sheet faces 18 and 19, and is also forced into the interstices between the filaments.

In the modification shown in Figure 5, only the interstices 20 between the filaments 21 of the fabric 22 are filled with another plastic material. This fabric sheet may also have smooth outer faces.

The modified embodiment shown in Figure 6 consists of a plastic fabric 23 and two layers 24 and 25 of plastic material enclosing fabric 23 and adhering thereto. These layers 24 and 25 may adhere only to the outer faces of fabric 23 or they may partly or entirely fill the interstices 26 between the filaments of fabric 23. Also the sheet formed in this way has smooth outer faces.

The embodiment shown in Figure 7 is a sheet produced by exerting strong pressure on a plastic fabric of the type shown in Figures 1 to 3. The single filaments are deformed as shown, i. e. filaments 27 and 28 are compressed to the exclusion of all interstices, embedding filaments 29 as shown. In this as in the other cases the filaments may be of different color or otherwise visibly contrasting, so as to form a pattern and/or indicating marks. It should be emphasized that these figures are only illustrative of single fabrics and furthermore that compressed filaments may assume shapes different from the shapes shown.

I wish to stress that in all cases where I mention fabrics of plastic filaments, these filaments are preferably of at least two types visibly differing from each other, also that everywhere in the specification and claims the term "filaments" should be comprehended as also including threads made of a number of filaments.

Furthermore, I wish to mention that my new flexible plastic sheets may be used instead of waterproof textile materials, as for instance for waterproof clothes, curtains, and covers. For these purposes, my new flexible material is especially adapted since it resembles textiles but is superior to them.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of sheet like products.

While I have illustrated and described the invention as embodied in sheet-like products, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

Without further analysis, the foregoing will so fully reveal the gist of my invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What I claim as new and desire to secure by Letters Patent is:

1. As an article of manufacture, a flexible sheet consisting of at least two types of visibly contrasting flexible filaments of plastic material being compressed into a homogeneous flexible plastic sheet being smooth on both faces and having a textile pattern composed of said visibly contrasting flexible plastic filaments.

2. As an article of manufacture, a flexible sheet comprising a flexible textile fabric consisting of at least two types of visibly contrasting plastic glass filaments being compressed into a flexible plastic sheet having a textile pattern composed of said visibly contrasting flexible glass filaments.

3. A textile fabric composed of yarns formed of continuous flexible glass filaments permanently

crimped and fused together at points of interlacing of said yarns.

4. A textile fabric composed of yarns formed of at least two types of visibly contrasting continuous flexible glass filaments permanently crimped and fused together at points of interlacing of said yarns.

5. Woven textile fabric woven of yarns formed of continuous flexible glass filaments permanently crimped and fused together at points of interweaving of said yarns.

6. Knitted textile fabric knitted of yarns formed of continuous flexible glass filaments permanently crimped and fused together at points of interknitting of said yarns.

HEINZ E. KALLMANN.