

Sept. 2, 1958

D. F. McCULLOUGH ET AL

2,849,785

PILE FABRIC AND METHOD OF MAKING SAME

Filed Jan. 16, 1956

FIG. 1

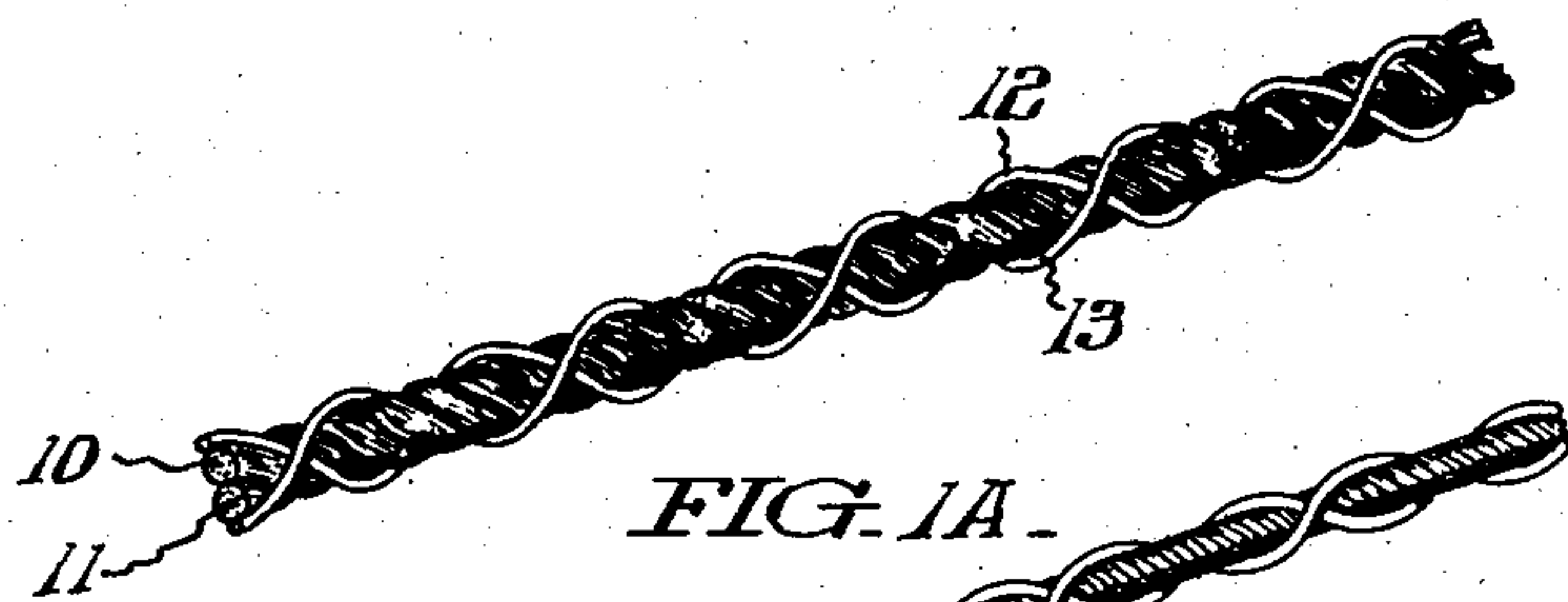


FIG. 1A

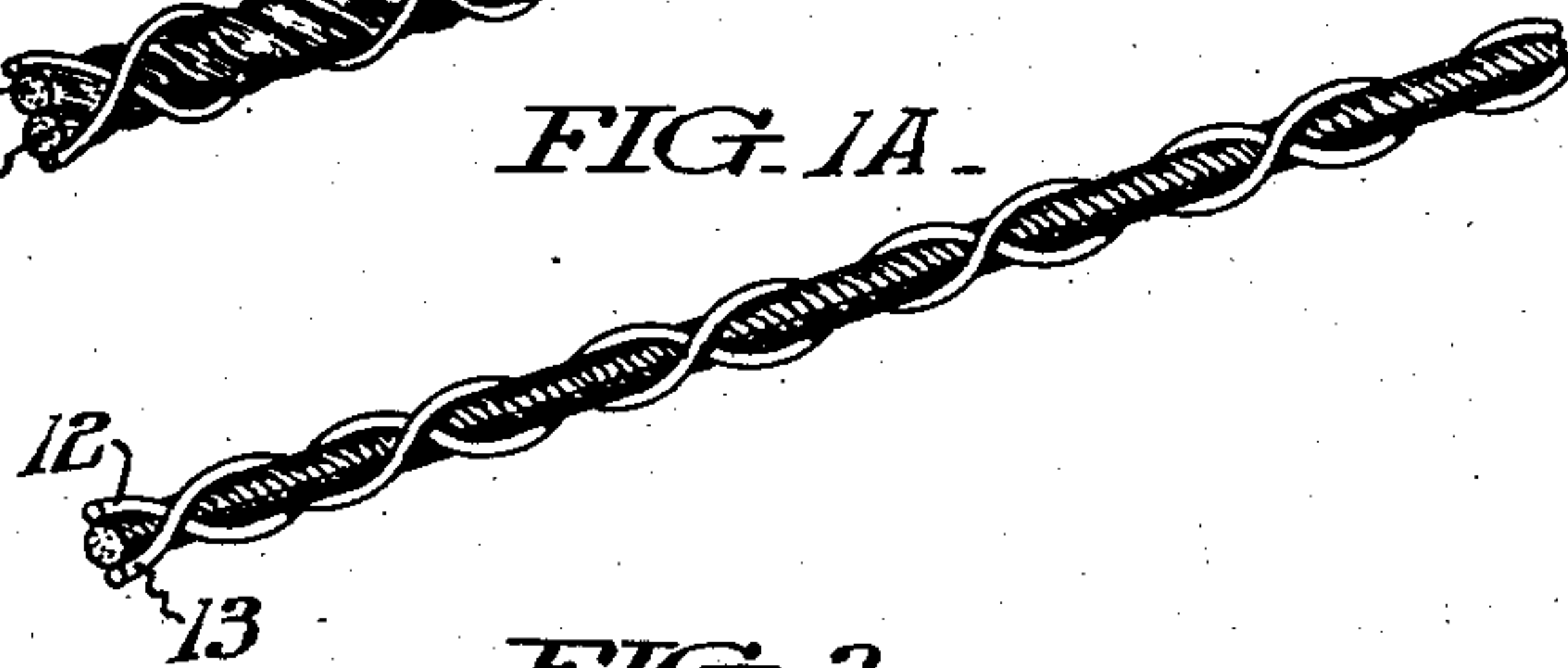


FIG. 2

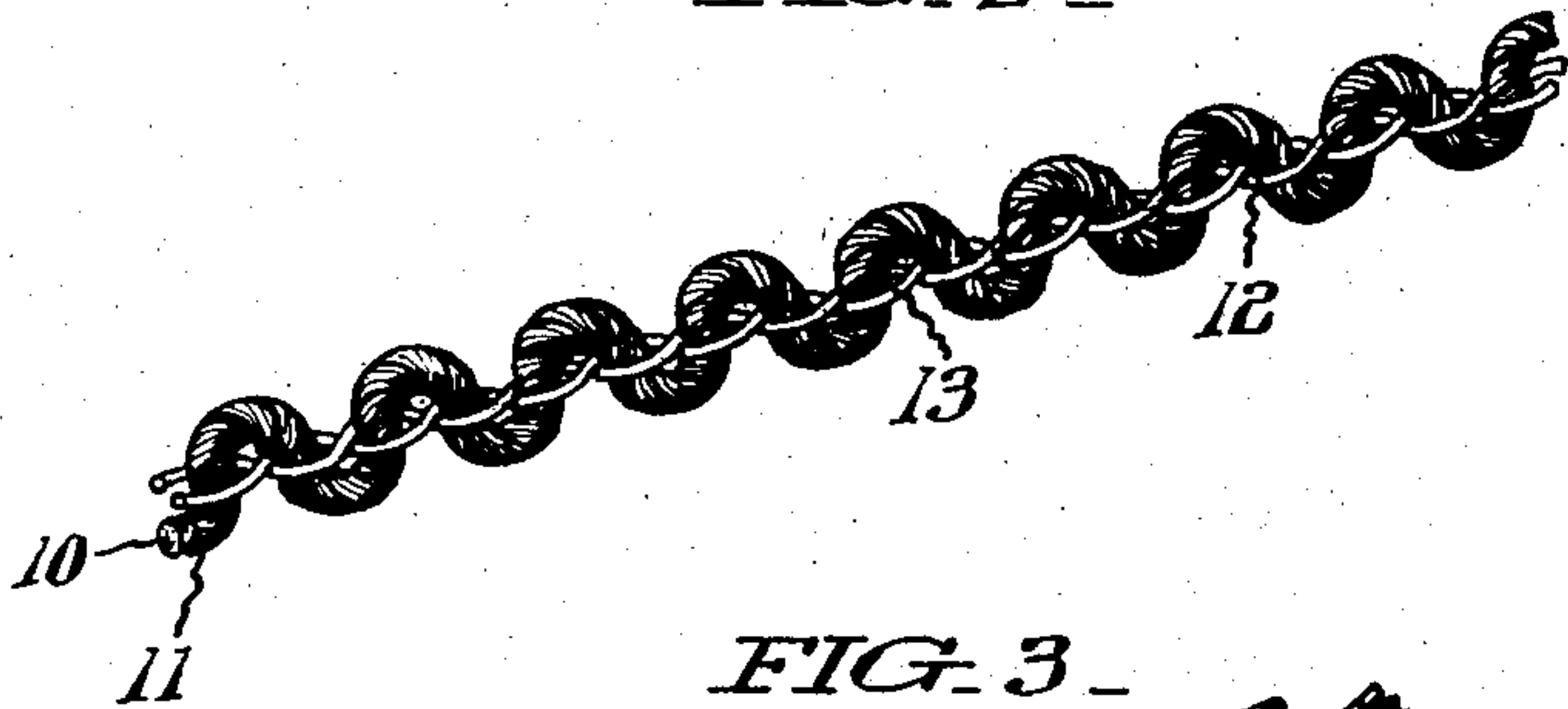


FIG. 3

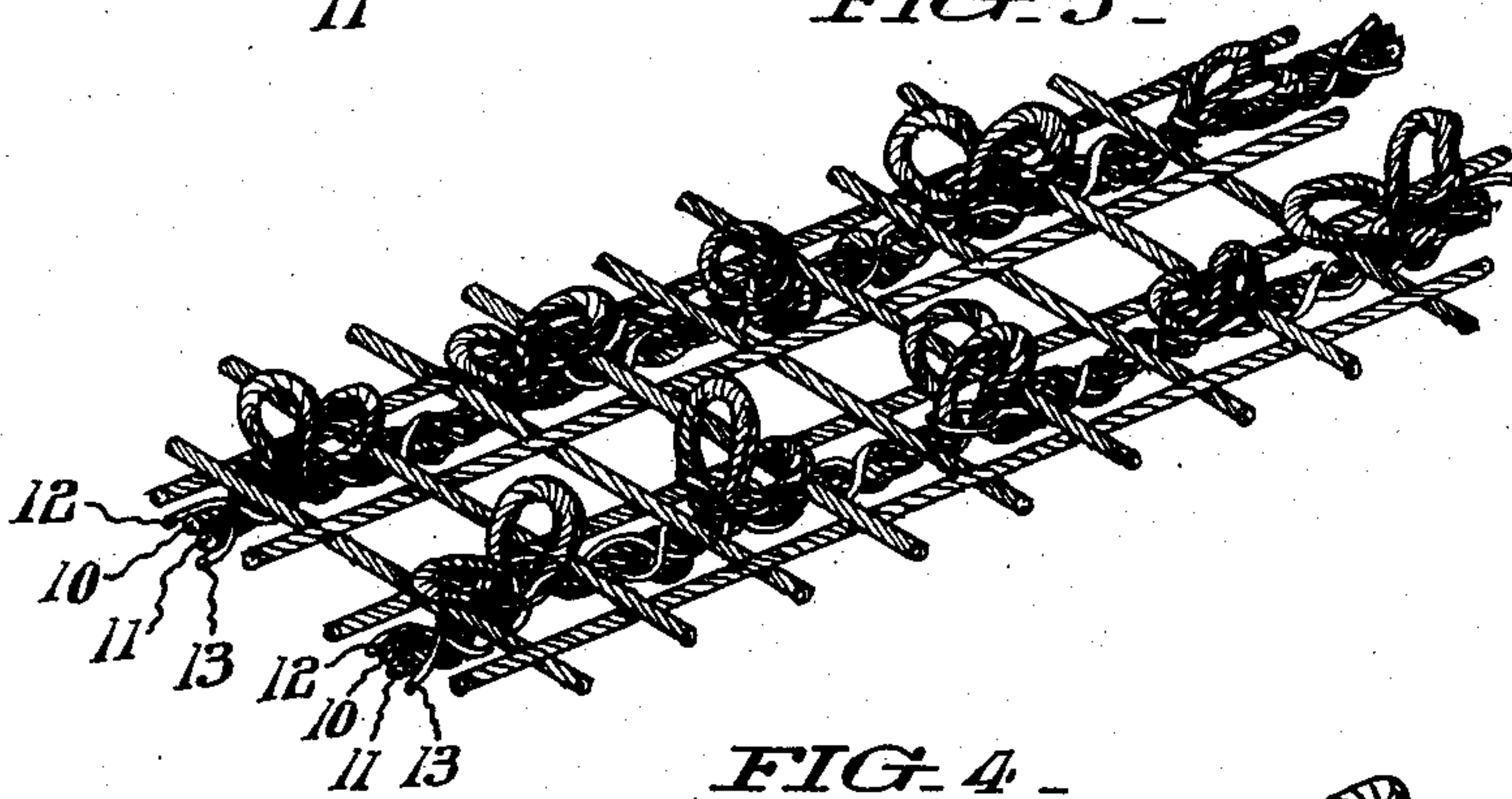
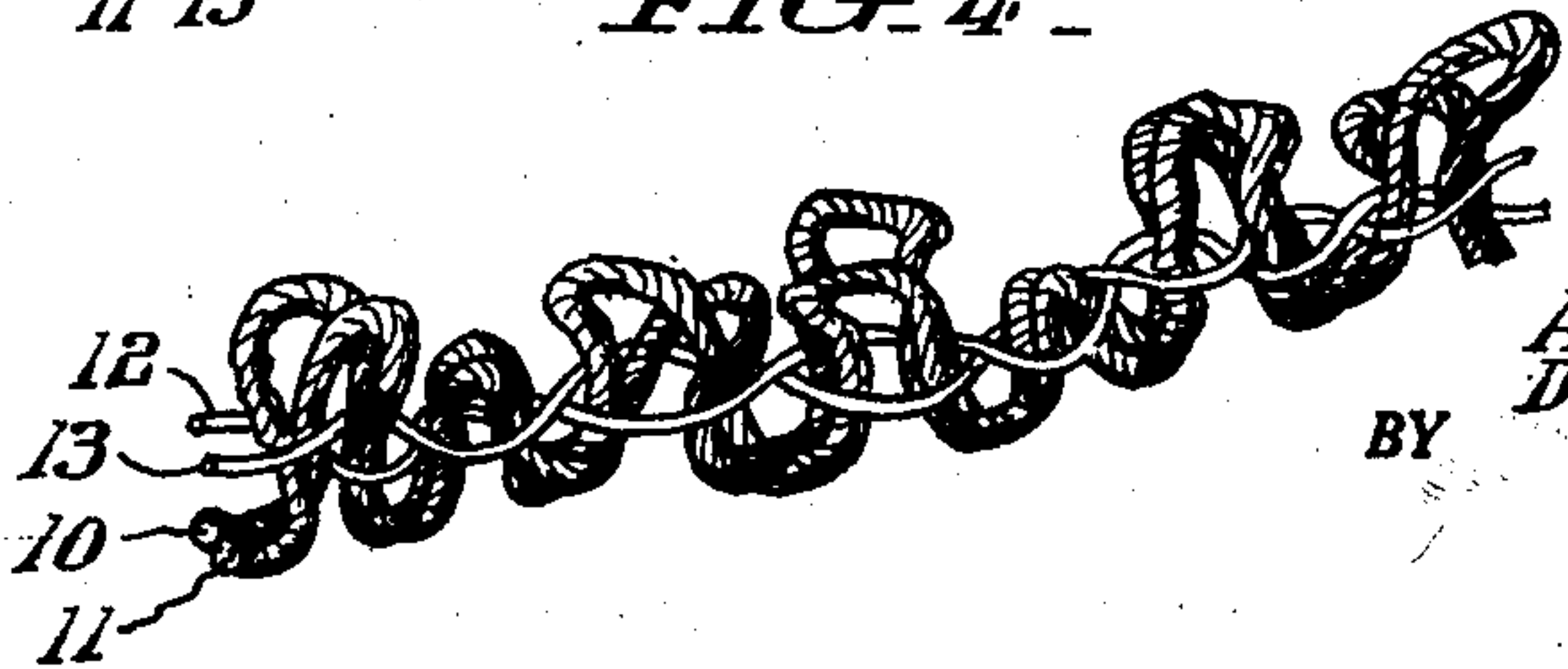


FIG. 4



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PILE FABRIC AND METHOD OF MAKING SAME

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Application January 16, 1956, Serial No. 559,206

9 Claims. (Cl. 28—72)

This invention relates to composite, textile yarns and more particularly to yarns consisting of a non-shrinkable or normally shrinkable core around which heat shrinkable ends are X-twisted. The invention also relates to textile fabrics incorporating such multi-ply yarns.

The principal object of the present invention is to provide a composite textile yarn which is easily handled in textile operations and which has heat shrinkable ends incorporated in the composite yarn in such a way as to produce firmly held core loops when the yarn is subjected to a shrinking action.

It is also an object of this invention to provide a composite yarn which may be used for knitting, tufting or weaving which will form loops in the finished textile fabric when the latter is subjected to a shrinking action.

It is a further object of this invention to form a textile yarn having irregular loops therein in which the loops are produced by shrinking certain ends of the yarn and at the same time firmly holding the loops at spaced intervals by the shrinkable ends.

It is a still further object of this invention to provide a method of producing a looped textile yarn in which the core and the outer plies of a yarn are twisted together in such a way as to form firmly held core loops when the yarn is shrunk.

It is another object of this invention to provide a pile fabric in which the pile forming yarns include non-shrinkable or normally shrinkable plies twisted together to form a core around which are twisted plies of shrinkable ends which on shrinking form the normally shrinkable plies into irregular pile loops firmly held in place by translucent shrunken ends which are positioned low on the loops and are substantially withdrawn from view.

In accordance with the above objects, the present invention provides a novel yarn which is formed by X-twisting a plurality of heat shrinkable ends around a core which is non-shrinkable or normally shrinkable, and then subjecting the yarn to heat treatment to shrink the highly shrinkable filaments, thereby producing a yarn having firmly held loops as shown in the accompanying drawings of which:

Fig. 1 is an illustration of one specific embodiment of the invention showing a yarn formed of a core consisting of a plurality of non-shrinkable or normally shrinkable yarns twisted together to form a core with a plurality of highly shrinkable polyethylene filaments X-twisted about the core;

Fig. 1A shows a yarn of the type of Fig. 1 but having a core consisting of a single end of normally shrinkable material with two ends of heat shrinkable Vinyon X-twisted around the core. Fig. 2 shows the yarn of Fig. 1 after it has been subjected to heat treatment;

Fig. 3 is a perspective view showing the yarn of Fig. 1 tufted in a woven backing and then heat shrunk in the backing;

Fig. 4 shows the pile forming yarn of Fig. 3 removed from the backing;

The yarn shown in Fig. 1 is made up of a core of

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twisted non-shrinkable or normally shrinkable yarns 10 and 11 hereinafter referred to as "normally shrinkable." Highly shrinkable polyethylene filaments 12 and 13 are X-twisted about the core in the manner shown. The polyethylene filaments 12 and 13 consist of oriented polymerized ethylene heat shrinkable lengthwise from 30% to 65%. When the twisted yarn is subjected to a suitable heat treatment in heating to a temperature of about 100° C. in steam, heated water or other heated fluid as, for instance, a dye bath, the high shrinkage of the polyethylene filaments 12 and 13 produces loops in the core yarn as illustrated in Fig. 2. It will be observed that by virtue of the X-twist of the polyethylene filaments, the core yarn is displaced in loops away from the original plane of the core when the polyethylene ends are shrunk. The polyethylene filaments on the other hand take a position along the original plane of the core and interlock each of the core loops at spaced intervals. An irregular yarn is thus provided in which the loops are formed and locked in place by the X-twisted polyethylene filaments. The loops thus formed are accordingly much more stable than would otherwise be the case. At the same time the polyethylene filaments are substantially hidden from view after shrinking, since they are below the core loops and are of small diameter relative to its core and are translucent. The yarn of Fig. 2 may be used for any textile purpose compatible with the irregularities formed by the loops. The yarn could thus be woven as the pile yarn in a pile fabric to produce a pile of great durability and having, after shrinkage, tighter loops than are normally produced in loop pile fabrics. It will be noted that although the loops appear to be regular as formed in the yarn as shown in Fig. 2, they will not appear in such a regular manner in the woven pile fabric but will appear at random in the pile to form a very irregular pile surface.

The yarns of Fig. 1 and Fig. 1A may also be introduced directly into a textile fabric before shrinking the highly shrinkable filaments 12 and 13. As illustrated in Fig. 3, it may be tufted in a backing to form a tufted pile fabric after which the entire fabric is subjected to heat treatment forming loops of even greater irregularity than in the yarn illustrated in Fig. 2. It will be appreciated that the backing shown in Fig. 3 is greatly expanded in the drawing and that in actual practice the openings into which the yarn is tufted would be considerably smaller. It has been found that by tufting the yarns of Fig. 1 or Fig. 1A directly into a backing and then shrinking, the restraining effect of the backing combines with the restraining effect of the X-twisted polyethylene filaments to produce an extreme degree of irregularity and permanence in the pile face of the fabric. The pile yarn of Fig. 3 is illustrated separately in Fig. 4 in which it will be noted that the polyethylene filaments serve to lock in the loops formed in the tufted pile yarns and to draw them into irregular shapes. The fabric thus produced has an extremely hard feel. This is an important feature of the invention, since it would be nearly impossible to adapt the irregular yarn of Fig. 2 for use with tufting needles. The yarns of Fig. 1 or Fig. 1A can be used for tufting, and by virtue of the X-twisted polyethylene filaments, the irregularities will be produced in the tufted pile fabric as shown in Fig. 3.

The non-shrinkable ends of the twisted yarn of the present invention may be either spun or filament and may be of any material which will form a suitable face in the finished textile material. While the yarns and fabrics selected for the purpose of illustrating and describing the present invention contain polyethylene as the shrinkable material, it is intended that other contractible materials may be employed in the practice of the present invention to obtain the same or equivalent results. Any thermo-

plastic resin which can be X-twisted around a normally shrinkable core may be employed provided it has the requisite shrinkage characteristics of about 30% or more lengthwise. For instance, Vinyon, an oriented copolymer of vinyl chloride (88%–90%) and vinyl acetate (10%–12%), may be used as the highly shrinkable material in practicing the present invention. Likewise, it is possible to use a shrinkable yarn which is direct spun from tow.

An important feature of this invention is the development of a tufted pile fabric in which the pile yarns are formed of twisted shrinkable and non-shrinkable ends which are subjected to shrinking treatment after the pile yarn has been tufted in the backing material. It has been found that, while the tufting needles can only with great difficulty, if at all, accommodate a novelty yarn of rough or uneven texture, that similar effects can be produced in tufted fabrics by tufting yarns made by twisting together in various ways non-shrinkable yarns with highly shrinkable yarns which then produce a normally smooth and even yarn suitable for passing readily through the eye of the tufting needles, and then after tufting shrinking the shrinkable components of the yarn by suitable means. The effect of the shrinking operation on the tufted yarns will then depend upon the type of twist in which the shrinkable and non-shrinkable ends are combined. The shrinkable ends may be X-twisted around a non-shrinkable core, or the ends may be S-twisted or Z-twisted about each other. It is important, however, that the shrinking operation be performed after tufting. The pile face of the resultant fabric will, to a considerable extent, depend upon the nature of the twist employed, but in all cases a novelty effect will be produced by virtue of the shrinkage of the shrinkable ends in situ in the tufted fabric.

Having thus described our invention, we claim:

1. A method of forming a textile fabric comprising X-twisting a plurality of high shrinking thermoplastic resin ends around a core of normally shrinkable yarn material, incorporating the yarn thus formed in a textile fabric, and then subjecting the fabric to heat treatment sufficient to shrink the high shrinking ends thereby forming irregular core loops of the normally shrinkable yarn in the face of said fabric.

2. A method of forming a textile fabric comprising twisting a plurality of normally shrinkable yarns together, X-twisting a plurality of high shrinking synthetic resin filaments about said normally shrinkable yarns, incorporating the yarn thus formed as the pile yarn in a tufted pile fabric and subjecting the fabric to treatment to shrink said high shrinking filaments.

3. A textile fabric comprising a backing material and a pile yarn having high shrinking, oriented synthetic resin filaments X-twisted around a normally shrinkable core tufted in said backing material and then shrunk.

4. The textile fabric of claim 3 wherein the synthetic resin filaments consist of polyethylene.

5. The textile fabric of claim 3 wherein the synthetic resin filaments consist of Vinyon.

6. A method of forming a textile fabric comprising twisting normally shrinkable yarns and high shrinking synthetic resin filaments together, incorporating the yarn thus formed as the pile yarn in a tufted pile fabric and subjecting the tufted fabric to treatment to shrink said high shrinking filaments and displace said normally shrinkable yarns to form the face of said fabrics.

7. A textile fabric comprising a backing material and a composite pile yarn formed of normally shrinkable yarns and high shrinking synthetic resin filaments twisted together, tufted in said backing material and shrunk in situ therein.

8. The textile fabric of claim 7 wherein the synthetic resin filaments consist of polyethylene.

9. The textile fabric of claim 7 wherein the synthetic resin filaments consist of Vinyon.

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