March 7, 1950 E. D. MILLER 2,499,406

TUFTED TERRY PRODUCT

Original Filed Dec. 18, 1945 2 Sheets-Sheet 1

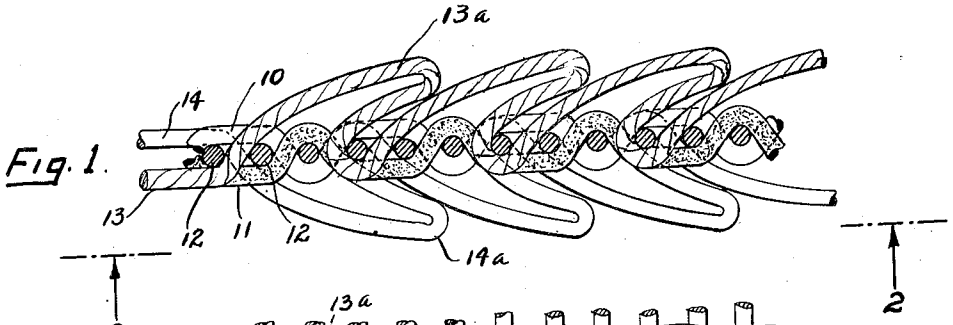

Fig. 1.

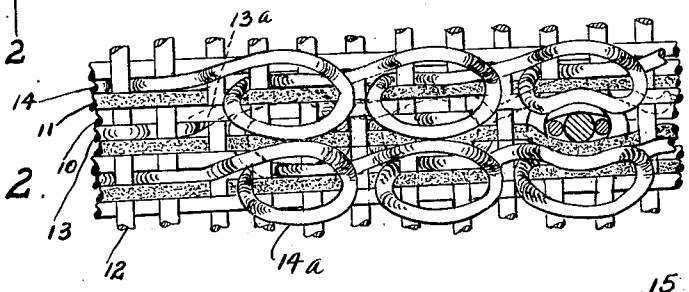

Fig. 2.

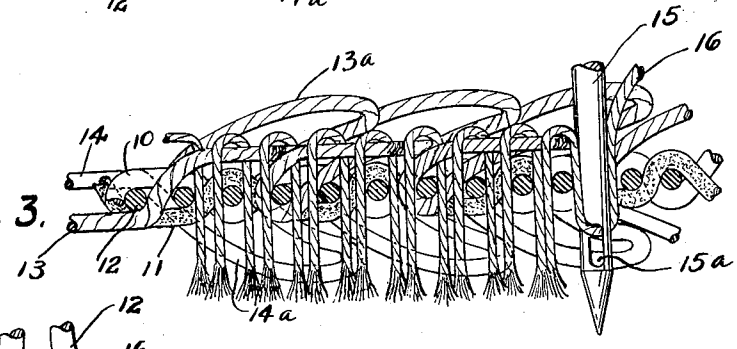

Fig. 3.

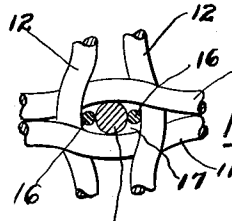

Fig. 5.

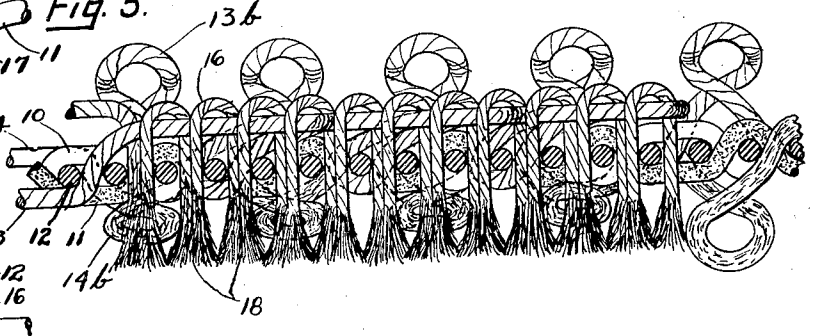

Fig. 4.

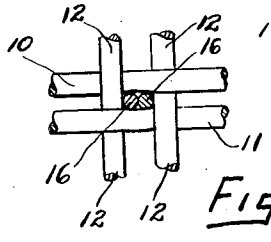

Fig. 6.

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TUFTED TERRY PRODUCT

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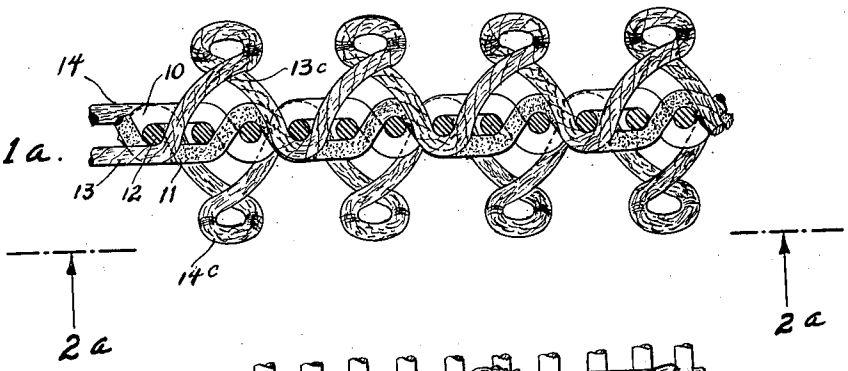

Fig. 1a.

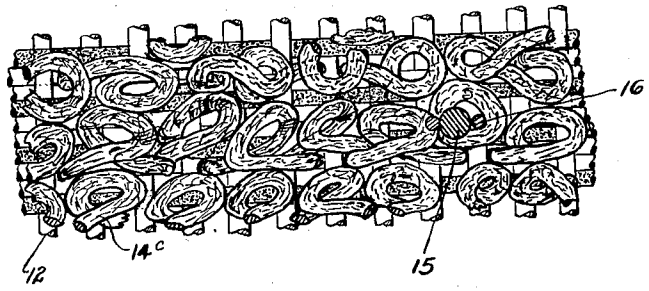

Fig. 2a.

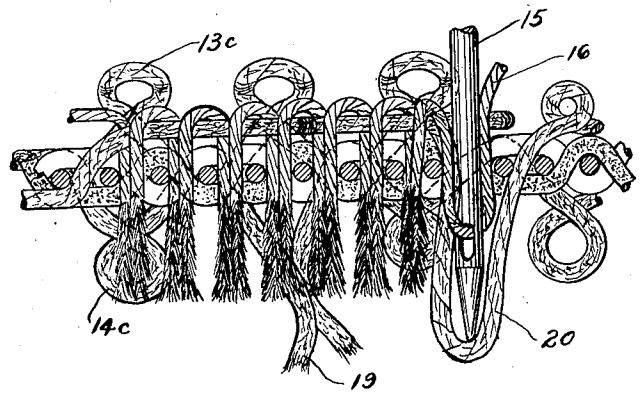

Fig. 7.
PRIOR ART

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TUFTED TERRY PRODUCT

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Original application December 18, 1945, Serial No. 635,747. Divided and this application December 28, 1948, Serial No. 67,624

5 Claims. (Cl. 28—78)

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This invention relates to terry products, such as bath towels, carrying designs formed by yarns of appropriate colors which have been passed through the fabric in selected areas by means of a tufting machine to form tufts projecting from the face of the material. More particularly, the invention is concerned with a novel tufted terry product which is superior to similar prior articles in the respects that the tuft yarns are held more securely in place in the fabric, the tufts give a better coverage of the base fabric in the design areas and have a better appearance, and, at the completion of the tufting operation, the design is devoid of stray lengths of terry or ground yarns or of terry loops projecting through the tufted areas and visible at the face of the design.

Terry products with tufted designs have commonly been made heretofore by a procedure which involves weaving a terry fabric on a standard terry loom after which the grey goods are subjected to the usual bleaching and finishing operations. In those operations, the sizing carried by the terry and ground warp yarns is removed, so that those yarns become soft and expand somewhat and the individual terry loops tend to become erect and to twist together. The designs are then formed on the bleached and finished fabric by stitching the tuft yarns in place on a tufting machine, which includes a needle for passing the tuft yarns through the fabric and a looper which cooperates with the needle to form the tuft yarn into loops and to cut the loops to produce tufts.

Tufted terry materials made in the manner above described have a number of objectionable features which result from their method of manufacture, as, for example, the tuft yarns are not securely held in place in the fabric and are liable to be pulled out during use of the fabric. The reason is that when the needle of the tufting machine carries a loop of tuft yarn through the fabric, the closely adjacent yarns in the fabric at the point of penetration of the needle are spread apart to form an opening sufficiently large for the passage of the needle and the two legs of the tuft yarn loop carried by the eye of the needle. When the needle is retracted, the tuft yarn loop is retained in the opening by the action of the looper, but it fits loosely in the opening, because the displaced fabric yarns are not resilient and do not spring back to their original positions. In the completed fabric, the legs of each tuft looped about yarns at the back of the fabric lie within and are only loosely held in adjacent openings, and, as a result, the tufts can be easily dislodged during handling or use of the tufted product.

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Another objectionable feature of the present tufted terry products arises from the fact that, at the time the tufting operation is performed, the terry loops of the fabric have risen and the individual loops have twisted together and the fibres in such yarns have separated as a result of the removal of the sizing from the yarns in the bleaching and finishing operations. Accordingly, when the needle of the tufting machine passes a loop of tuft yarn through the fabric, it frequently happens that the needle will pierce a yarn in a terry loop, so that the yarn is broken and the broken ends are carried out past the ends of the tufts in the design. In other instances, the terry loop may be caught by the needle and pulled out of the fabric past the level of the face of the design. In either case, the lengths or loops of terry yarn, which are thus projected out of the design and are both variable in length and of a color contrasting with that of the tuft yarns, are readily noticeable and give the design a ragged unfinished appearance. The stray lengths of terry yarn and terry loops must, accordingly, be trimmed off in a subsequent operation and this adds to the cost of production.

The tufted terry products of the invention are superior to those heretofore made, in that the tuft yarns are more securely held in place, the tufts cover the base fabric in the design areas more completely, the tufted areas are free of lengths of yarn from the base fabric, and the colors of the dyed yarns in the products are brighter and more delicate.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which:

Fig. 1 is a longitudinal sectional view on an enlarged scale of a conventional terry fabric as taken from the loom;

Fig. 1*a* is a view similar to Fig. 1 showing the terry fabric after it has been subjected to bleaching;

Fig. 2 is a plan view of the terry fabric as taken from the loom; on the line 2—2 of Fig. 1;

Fig. 2*a* is a plan view of the material shown in Fig. 1*a* after bleaching, on the line 2*a*—2*a* of Fig. 1*a*;

Fig. 3 is a view similar to Fig. 1 showing the operation of tufting the unbleached material;

Fig.4 is a longitudinal sectional view on an enlarged scale of the terry product of the invention;

Fig. 5 is a fragmentary plan view showing the displacement of the yarns in a terry fabric during the passage of the tufting needle therethrough;

Fig. 6 is a view similar to Fig. 5 showing the gripping of the tuft yarns, in the new product, as the result of the shrinking of the fabric during the bleaching operation; and

Fig. 7 is a longitudinal sectional view illustrating the tufting of an ordinary bleached terry product and showing the breaking of terry loop yarns by the action of the needle.

The terry fabric illustrated in Fig. 1 is of usual construction and it includes ground warp yarns **10** and **11** in two sets interwoven with filling yarns **12**. Two sets of terry yarns **13**, **14** are employed and they form loops **13***a*, **14***a* projecting from the fabric at opposite faces thereof. In preparation for the weaving of the fabric, the ground and terry warp yarns have been sized and the fibers in the yarns are, accordingly, bound together. As a result, the yarns forming the loops in the fabric are somewhat stiff and springy, and, as the fabric is taken up on the loom, the loops on opposite faces are all bent to lie in the same direction and have the regular appearance shown in Figs. 1 and 2.

In the production of the new terry article, the fabric as taken from the loom and in the grey or unbleached condition is delivered to the tufting machine for the application of the tufts forming the design. Such tufting machines are of well known construction and they include a needle **15**, through the eye **15***a* of which the tuft yarn **16** is passed, and in the tufting operation, the fabric is supplied to the tufting machine upside down, so that the needle inserts the tuft yarn through the fabric from its rear face. When the needle reaches its lowermost point, a looper engages the loops of yarn carried by the needle and retains that loop as the needle is retracted. Ordinarily, the looper retains a number of loops before releasing any of them and the looper may be provided with a knife for cutting the loops to form the tufts at the face of the fabric or the tufting machine may include a separate knife for the purpose.

When the needle starts its downward movement to pass a loop of tuft yarn through the unbleached fabric, the point of the needle first enters the layer of pile formed by the terry loops at the back of the fabric, and, since the yarn in these loops is sized and the loops are somewhat springy, a loop struck by the point of the needle will not be pierced but will slip to one side. As the needle moves down farther and penetrates the ground of the fabric, the ground warp and filling threads will be forced aside to form an opening **17**, through which the needle and the two lengths of tuft yarn forming the loop carried by the needle may pass. Such displacement of the fabric yarns is easy, because the fabric has been somewhat loosely woven so that when it is shrunk in bleaching, the yarns will not be drawn too tightly together and thus make the fabric too stiff. The displacement of the fabric yarns referred to is diagrammatically illustrated in Fig. 5, in which adjacent ground warp yarns **10**, **11** and adjacent filling yarns **12** are shown as pushed aside by the needle and the two lengths of tuft yarns **16**. It will be evident that, upon retraction of the needle, the tuft yarns **16** are held only loosely in the opening, since their combined cross-sections are substantially less than the cross-section of the opening and the yarns are not resilient and, accordingly, do not tend to close up the opening.

When the tufting has been completed to provide the terry product with the desired tufted

design, the tufted material is subjected to the usual finishing and bleaching operations, and, during those operations, the ground yarns which have been displaced during the tufting, as shown in Fig. 5, shrink and straighten out as the weave tightens up. As a result, the size of each opening **17** through the fabric is reduced and the shrunk yarns tightly grip the lengths of tuft yarn **16** lying within each opening, as shown in Fig. 6. The tufts are, accordingly, firmly anchored in position.

During the bleaching and finishing operations, the lengths of the tuft yarns forming the exposed legs of the tufts open up and bloom out, as indicated at **18**, and adjacent tufts intermingle and form a substantially uniform surface in the design area. Also, the sizing is removed from the yarn forming the terry loops and the loops tend to assume the twisted and somewhat erect condition, indicated at **13***b*. The loops **14***a* at the face of the fabric have been embedded among the tufts in the tufting operation, and, when the tufts fluff up and bloom out they overlie the terry loops, so that when the latter have been de-sized and have twisted, as shown at **14***b*, the terry loops can not force their way out beyond the ends of the tufts. The opening up of the yarns forming the tufts as a result of the bleaching operation, accordingly, serves to conceal both the ground of the fabric and the terry loops in the front face thereof.

The application of the tuft yarns to the fabric while the latter is in the grey condition affords another advantage as follows. In the grey goods, the layers of pile at each face of the base fabric are relatively thin, because the pile loops have been laid flat, and the base fabric is relatively loosely woven and is likewise thin. In the tufting operation, it is necessary that the ends of the tufts should lie outward from the face of the fabric beyond the level of the terry loops, but, since the layers of pile are thin and the fabric is also thin, the legs of the tufts need have only a relatively short length to obtain the desired effect. If the tufting were applied to the bleached terry fabric, much longer lengths of tuft yarn would be required to form the legs of each tuft, because the bleaching causes the terry loops to become erect and also causes the base fabric to become thicker as a result of the shrinkage during the bleaching. The tufting of the grey terry fabric thus permits shorter tufts to be used and this results in a saving in tuft yarn. Also, the finished design formed by the tufts applied to the grey fabric may lie slightly below the level that the surface of the pile in untufted areas reaches after bleaching and this causes the tufted designs to have the appearance of being embedded in the pile.

Another advantage of applying the tuft yarns prior to the bleaching is that the bleach liquor reacts with the dyestuffs in the tuft yarns and makes the colors of those yarns distinctly brighter and more delicate. The colors thus produced could not be easily obtained in the dyeing of the tuft yarns.

The action of the bleaching and finishing operations on an ordinary terry fabric shown in Figs. 1 and 2, is illustrated in Figs. 1*a* and 2*a*, in which it will be seen that the terry loops **13***c* and **14***c* have become somewhat erect and have twisted together as a result of the removal of the size therefrom. In the pile surface of the bleached fabric, the loops **13***c*, **14***c* extend in random directions and the yarns are relatively soft

and have no springiness. When the tufting needle is passed through bleached terry fabric, as in the production of tufted terry products according to the prior practice, the needle tends to penetrate and break the terry loop yarns, such as that shown at 19, and the broken ends of the yarns are frequently forced out through the tufted areas. Also, in tufted terry products as made heretofore, with the tufting carried on after the bleaching, the legs of the tuft yarns must be sufficiently long to project farther from the fabric than the twisted loops 13c, 14c, so that the plane of the outer ends of the tufts lies approximately in or outwardly from the plane of the ends of the twisted loops in the areas of the fabric surrounding the tufted areas.

This application is a division of my copending application Serial No. 635,747, filed December 18, 1945, now Patent No. 2,486,963.

I claim:

1. A terry product which comprises interwoven ground warp, terry pile warp, and filling yarns forming a fabric from which terry loops project at both faces, and U-shaped tuft yarns having their bights lying at one face of the fabric and their legs extending through the fabric to project from the opposite face, the tuft yarns lying in areas in accordance with a pattern and being held in place by fabric yarns in tight gripping contact with the legs thereof, the projecting portions of the legs overlying and concealing the terry yarns within said areas on the face of the fabric from which the legs project.

2. A terry product which comprises interwoven ground warp, terry pile warp, and filling yarns forming a fabric from which terry loops project at both faces to form pile, and U-shaped tuft yarns having their bights lying at one face of the fabric and their legs extending through the fabric to project from the opposite face, the tuft yarns lying in areas in accordance with a pattern and the lengths of such yarns in projecting portions of the legs being expanded and intermingled to form a substantially continuous tuft pile surface in said areas, the terry loops within said areas on the face of the fabric from which the legs project being overlain and concealed by the expanded portions of the tuft yarns and the level of said tuft pile surface being lower than that of the terry loop pile outside of and adjacent to said areas.

3. A terry product which comprises interwoven ground warp, terry pile warp, and filling yarns forming a fabric from which terry loops project on both faces, and U-shaped tuft yarns having their bights lying at one face of the fabric and their legs extending through the fabric to project from the opposite face, and tuft yarns lying in areas in accordance with a pattern and the yarns in the projecting portions of the legs being expanded and overlying and concealing terry loops within said areas on the face of the fabric from which the legs project.

4. A terry product which comprises interwoven ground warp, terry pile warp, and filling yarns forming a fabric from which terry loops project on both faces, and U-shaped tuft yarns having their bights lying at one face of the fabric and their legs extending through the fabric to project from the opposite face, the tuft yarns lying in areas in accordance with a pattern and being held in place by fabric yarns in light gripping contact with the legs thereof, the yarns in the projecting portions of the legs being expanded and overlying and concealing terry loops within said areas on the face of the fabric from which the legs project.

5. A terry product which comprises interwoven ground warp, terry pile warp, and filling yarns forming a fabric from which terry loops project at both faces to form pile, and U-shaped tuft yarns having their bights lying at one face of the fabric and their legs extending through the fabric to project from the opposite face, the tuft yarns lying in areas in accordance with a pattern and being held in place by fabric yarns in light gripping contact with the legs thereof, the lengths of the tuft yarns in the protecting portions of the legs being expanded and intermingled to form a substantially continuous tuft pile surface in said areas, the terry loops within said areas on the face of the fabric from which the legs project being overlain and concealed by the expanded portions of the tuft yarns and the level of said tuft pile surface being lower than that of the terry loop pile outside of and adjacent to said areas.

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