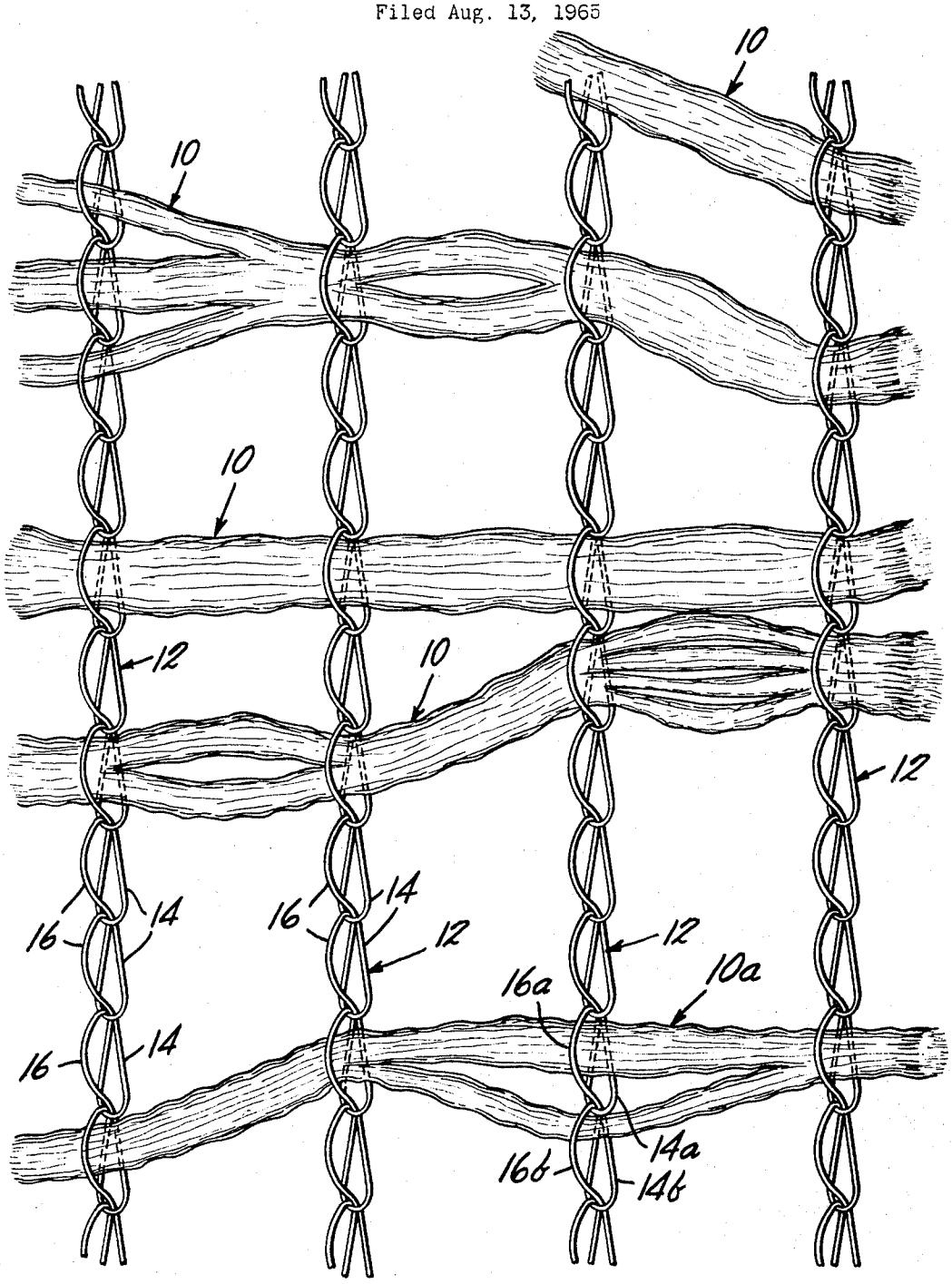
June 25, 1968 D. DUHL 3,389,583

OPEN-MESH FABRIC

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OPEN-MESH FABRIC

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ABSTRACT OF THE DISCLOSURE

An open-mesh fabric made on a stitch-through machine and consisting of a plurality of coarse filling yarns criss-crossing as a group back and forth across the entire width of the fabric in generally parallel relation to each other along each width-wise traverse, the filling yarns of the plurality, in the portions thereof in each width-wise traverse, crossing each other. The filling yarns are bound and held by spaced apart, substantially non-shifting chain-stitched longitudinal elements disposed substantially parallel to each other and transverse to the filling. The filling yarns are bound and held by spaced looped portions of the chains by piercing of the chain-stitched elements through the individual filling yarns at a substantial number of random points in the fabric and are also held at other points by being embraced by loops of the chain-stitched elements.

This invention relates to novel and improved open-mesh fabrics.

Open-mesh fabrics, that is, fabrics which have relatively large spaces between the filling, longitudinal elements or both, have become increasingly popular for, among other uses, curtains and draperies. Such fabrics, because they cannot be seen through from a distance, provide privacy for room interiors; they also considerably reduce the entry of sunlight and heat radiation and thus keep the room cool, but they do so without adversely impairing the entry of light into the room.

The fabric of the invention consists of spaced-apart, coarse filling elements and spaced-apart longitudinal elements of substantially non-shifting chain-stitching, the longitudinal chains being disposed substantially parallel to each other and transverse to the filling elements and binding and holding the filling. The filling is made up by a group of coarse yarns which repeatedly criss-cross back and forth from edge to edge. The angles formed by the criss-crossing filling yarns are, preferably, small, and therefore the filling elements are almost parallel to each other. Further, the filling is desirably substantially perpendicular to the chain-stitching.

The filling elements of the fabric, though they are widely spaced to provide an open-mesh or net, are held firmly in position by the chain-stitching and are substantially non-shifting, i.e., they exhibit very little tendency to be displaced or disrupted during washing or handling. The use of heavy yarns provides stiffness, and the fabric is particularly suitable for curtains and draperies, inasmuch as it hangs well. The chain-stitching of heavy yarn resembles brading and gives an unusual, highly attractive appearance to the fabric.

The fabric may be made on a knit-stitching machine, such as that disclosed in the Mauersberger patents, U.S. Nos. 2,890,579 and 3,030,786. These patents also disclose a method of making a fabric, which utilizes 100% of the sewing and filling capacity of the machine. Quite surprisingly, it has been found that by utilizing substantially less than 100% of the capacity of the chain-stitching and filling of the machine, in different combinations and arrangements, a novel open-mesh fabric is obtained which

resembles a Leno weave and which has greatly improved properties.

The fabric of the invention can be made in a number of patterns by changing the longitudinal chain spacing, the filling spacing, the sizes of the yarns used, and the angle between the longitudinal chains and the filling. The chain-stitching is substantially uniform, regardless of the variations in the pattern and in spite of the fact that the filling is bound and held by only spaced-apart chain loops, other loops being free. In other words, the free loops of the chain-stitching, which constitute the major portion of each of the longitudinal chains, are well formed, highly stable and are of substantially uniform size and tightness. It has been found, however, that at least about 6% of the loops of each of the longitudinal chains should embrace and hold a filling yarn in order to make a practical fabric and to avoid other difficulties in operating the knit-stitching machine.

For a better understanding of the invention, reference may be made to the following description of an exemplary embodiment, taken in conjunction with the accompanying drawing of which the single figure is a plan view of the embodiment on a greatly enlarged scale.

In the following description, the corresponding elements are given the same reference numerals, and a letter suffix is added to designate specific ones of those elements or portions thereof where appropriate or necessary. In addition, the chain-stitching is shown, in order to make the drawings clearer, as being loose and formed from relatively lighter yarns than the filling; in the actual embodiment illustrated, the stitching is made of relatively heavy yarn and is tight.

The fabric comprises a layer of spaced-apart filling elements **10** which, as will be described in more detail hereinafter, are transverse portions of a group of continuous yarns which criss-cross back and forth between the edges of the fabric. The filling yarns may be of uniform size, as shown, or may include two or more different sizes laid in at intervals to provide the desired appearance. Untwisted, crimped 1050 denier nylon yarns have been found to be well-suited for the fabric, inasmuch as they are attractive and durable and lend themselves to being held firmly by the chain-stitching.

The filling elements **10** are engaged and locked in place by separate spaced-apart rows **12** of chain-stitching. Each longitudinal chain **12** is made up by a single sewing yarn of, for example, twisted 1000 denier nylon, and includes inter-connected loops **14**, each of which passes through a preceding loop and leads to the following loop by a connecting portion **16**. The filling yarns are bound between the loops **14** and the connecting portions of each of the stitched chains. Generally, the filling yarns are engaged between a single loop and the adjacent single connecting portion, but the filling yarn may occasionally be split between two or more loops, as represented by loops **14*a*** and **14*b*** and connecting portions **16*a*** and **16*b*** which engage portions of the single filling yarn **10*a***. Moreover, where the filling yarns cross each other, in crossing back and forth from edge to edge of the fabric, two filling elements may sometimes be engaged and held between a single loop and the adjacent connecting portion.

The open-mesh structure of the fabric is obtained by limiting the number of longitudinal chains and filling elements and spacing them relatively widely apart; for example, the longitudinal chains may be ¼ to 4 inches apart, and the filling, say, between ⅛ and ¾ inch or more apart, measured at the edges. The spacing of either chain or filling or both can be varied to form any desired pattern. In the fabric of the invention it has been found preferable to use relatively heavy yarns, which provide an attractive appearance, dimensional stability, durability, and high

resistance to slippage between the longitudinal chain and filling.

The pattern of the individual filling elements **10** is generally irregular in itself, but groups of filling yarns form narrow, elongated diamond patterns across the width of the fabric because of the way in which they are laid in. More particularly, the filling yarns are laid in in groups of any suitable number on a conveyer system; reference may be made to the Mauersberger patents mentioned above or description and illustration of apparatus suitable for laying in the filling yarns. In the fabric of the invention, the spaced-apart groups of filling yarns cross back and forth from one side of the fabric to the other, lie slightly diagonally with respect to the longitudinal chains, and cross each other; because of the criss-crossing and spaced-apart relationship of the filling yarns, the spacing between adjacent filling yarns may vary considerably but may create a uinform pattern of irregularity throughout the cloth.

Another feature of the fabric of the invention is that the chain-stitching structure is substantially uniform, regardless of variations in the sizes and spacing of the filling and the presence or absence of filling bound in the loops.

One of the major advantages of the fabric structure of this invention is that it enables the use of a crimped nylon yarn having a minimum of 15 denier per filament in the yarn bundle. Filaments of this denier or coarser have a high resistance to sun rot, and provide a considerable improvement. Further, the strength of coarse nylon in the longitudinal chains allows use of fewer chains per inch, enabling the crimped filling to retain more of its natural crimped appearance. This is new and of advantage in drapery manufacture.

A fabric made with nylon yarns does not exhibit any significant expansion and contraction with temperature and humidity changes.

The above-described embodiment of the invention is merely exemplary, and many variations and modifications of it may be made by those skilled in the art without departing from the spirit and scope of the invention. All such variations and modifications are intended to be included within the scope of the invention as defined in the appended claim.

I claim:

1. An open-mesh fabric made on a stitch-through machine and consisting of a plurality of coarse filling yarns criss-crossing as a group back and forth across the entire width of the fabric in generally parallel relation to each other along each width-wise traverse, the filling yarns of the plurality in the portions thereof in each width-wise traverse crossing each other in portions thereof along adjacent width-wise traverses, and spaced apart, substantially non-shifting chain-stitched longitudinal elements disposed substantially parallel to each other and transverse to the filling yarns, the filling yarns being bound and held by spaced looped portions of the longitudinal chains by piercing of the chain-stitched elements through the individual filling yarns at a substantial number of random points, the filling yarns also being held at other points by being embraced by loops of the chain-stitched elements.

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MERVIN STEIN, *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,389,583 June 25, 1968

Daniel Duhl

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

In the heading to the printed specification, lines 3 to 5, "to Indian Head Mills Inc., New York, N. Y., a corporation of Massachusetts" should read -- , by mesne assignments, to Indian Head Inc., New York, N. Y., a corporation of Delaware --.

Signed and sealed this 16th day of December 1969.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents