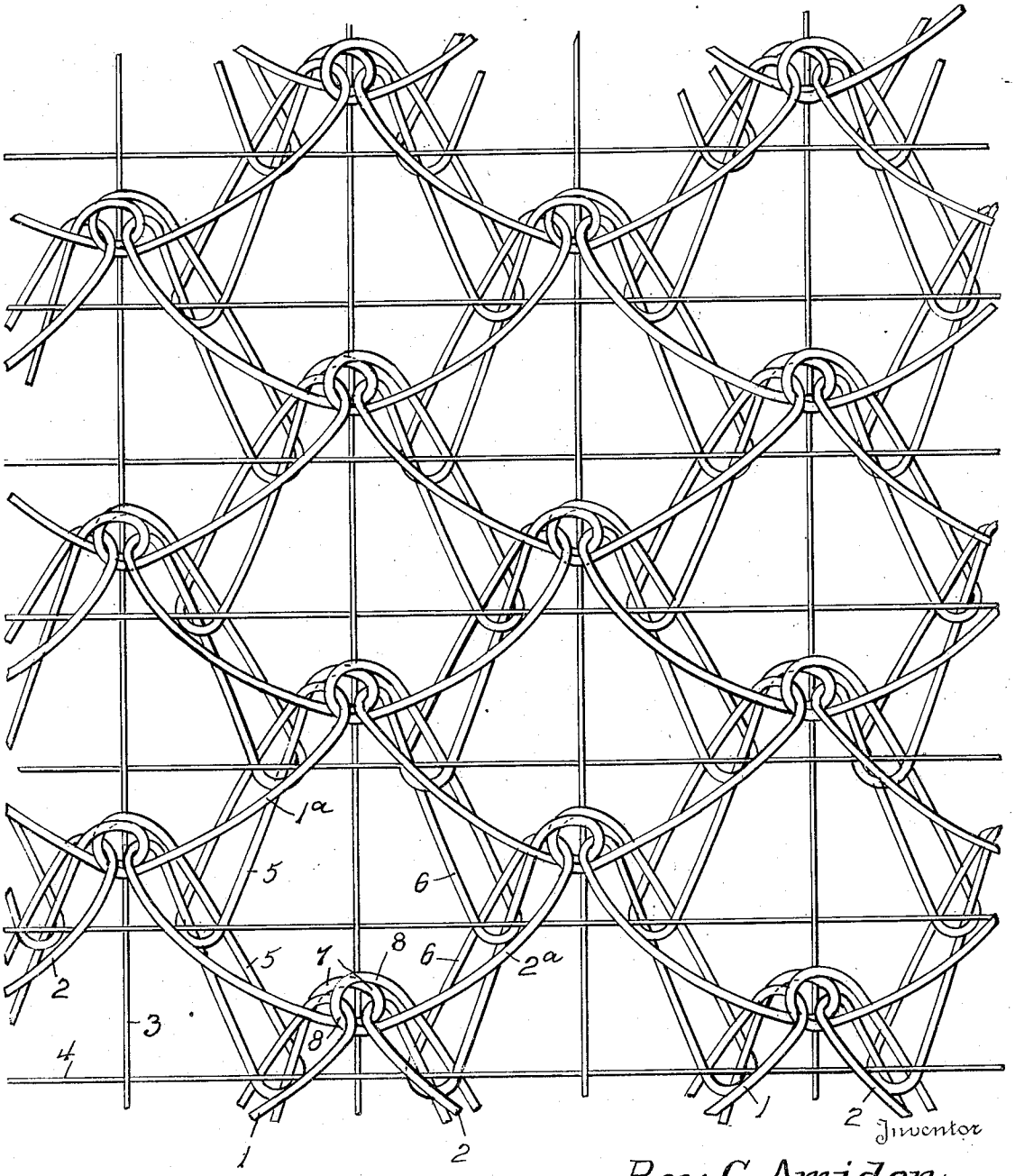
Feb. 20, 1945. R. C. AMIDON 2,369,651

COMPOSITE FABRIC AND METHOD OF MAKING SAME

Filed July 22, 1943 2 Sheets-Sheet 1

Fig. 1.



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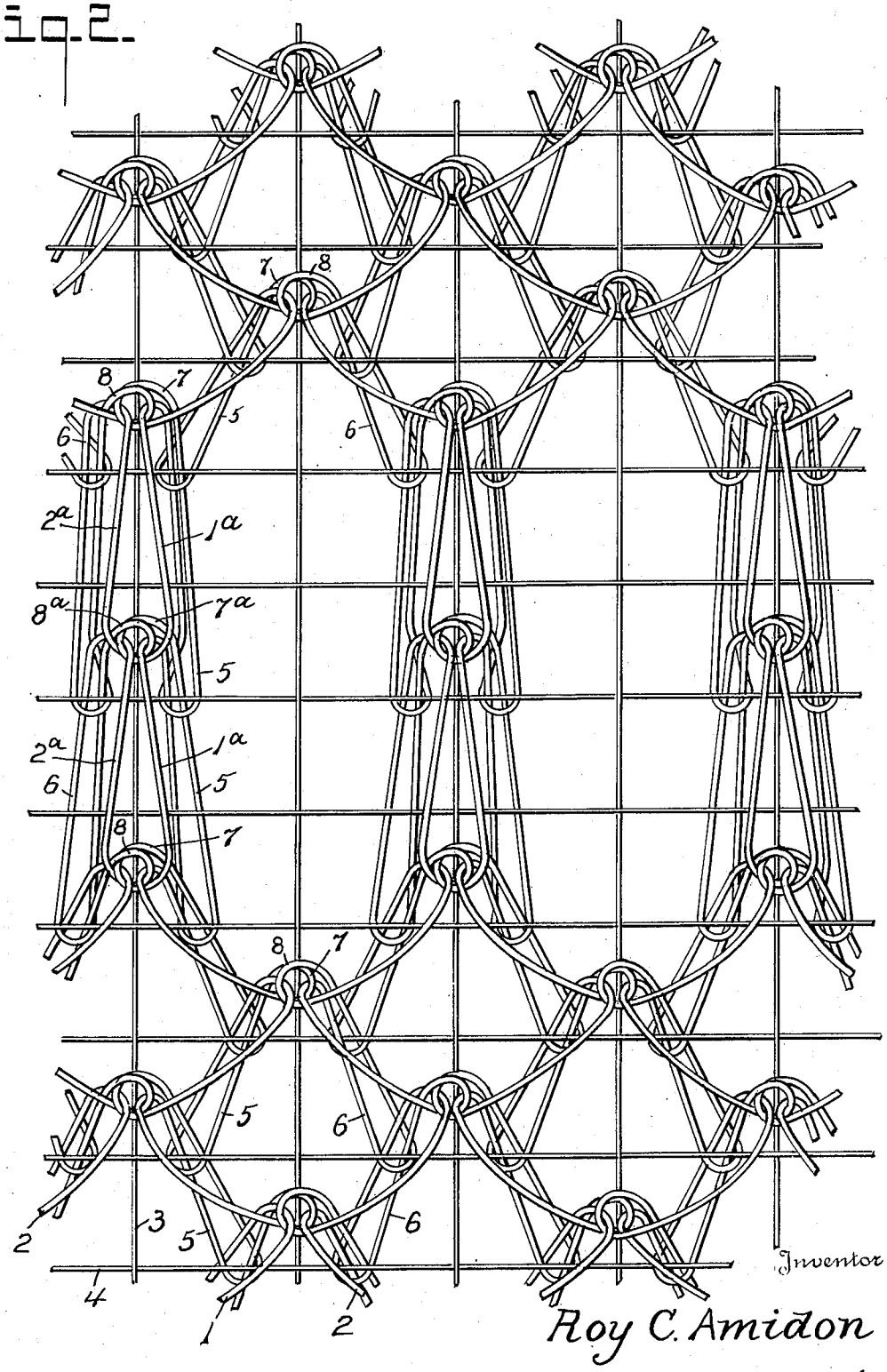
Filed July 22, 1943 2 Sheets-Sheet 2

Fig. 2.



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2,369,651

COMPOSITE FABRIC AND METHOD OF MAKING SAME

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16 Claims. (Cl. 66—193)

My invention relates to a new and improved composite fabric and method of combining a previously woven base material with a knitting process to produce a composite fabric of a formation and thickness not to be had by any method heretofore known.

More particularly, the invention relates to a method wherein the formation of the process is governed by one thread or yarn feeding device for each needle used. In heretofore known methods of combining a preformed base material with a knitting process, wherein the thread or yarn feeding devices are in the same proportion as the needles used, the method has been followed which places the knitting loops in chain formation on one side of the base material. In the process where the knitting thread or yarn is racked from one knitting course to another, on more than one needle, the cross-connecting or feeding threads or yarns from one knitting chain to another lie upon the other side of the base fabric (see my Patent No. 2,136,367). In a knitting process wherein the knitting threads or yarns knit upon one needle only in a straight line, the reverse side of the fabric from the knitting chains has no connecting threads or yarns from one chain to another, the feeding thread or yarn running in a nearly straight line with the knitting chains on the side of the fabric opposite from the knitted chains.

In my Patent No. 2,155,385 straight-line knitting has been followed and an inlay thread has been used to connect the knitting chains on the side of the base fabric opposite that on which the chains lie.

It will be readily seen from the above that in composite fabric construction, where one thread or yarn feeding stitch has been used for each knitting needle, the lay of connecting cross threads or yarns from one knitting chain to another has been in a flat formation or has followed the needle chains in a nearly straight line; therefore, in such construction the threads or yarns laid on the reverse side of the base material from that on which the needle chain stitches lie, lie in a single string formation.

One object of the present invention is to produce a composite fabric and method whereby that part of the knitting which is connected by cross threads or yarns and lies on the side of the base material opposite that on which the chain-loops lie, will be formed by a looping and drawing of the stitching threads or yarns in interlooped loop formations, so that more than one thickness of thread or yarn is looped on the face of the fabric opposite that on which the single thickness thread or yarn chain-loops lie.

Again, it is an object to provide a composite woven-knit fabric of a net-like formation, in which the inter-looped parts are drawn together, thereby drawing the chain loops into zigzag formation, while the inter-loops are held spaced apart at predetermined distances in longitudinal and transverse rows to provide substantial openings through the composite fabric and enable the fabric to be used as a liner for light waterproof garments. Previously these garments were composed of a light waterproof outer garment and a liner of fur or pile fabric, which made the garments relatively quite heavy and permitted very little air circulation. By substituting my improved fabric for the fur liners and the pile fabric liners it becomes possible to aluminize the inside of the outer garment and thereby reflect the body heat back to the body through the openings in the inner garment. The use of my fabric for the inner garment thus reduces the weight of the combined garment without sacrificing the warming effect of the garment as a whole.

Other objects will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:

Fig. 1 is an enlarged diagrammatic view of a portion of a fabric embodying my present invention.

Fig. 2 is a view similar to Fig. 1, showing a modification of the same.

In the drawings, in which like numerals of reference indicate like parts in both figures, 1 and 2 designate the threads or yarns which are knit through the base fabric. The base fabric is composed of warp threads 3 and weft threads 4 woven together, preferably as an open mesh or net fabric.

Each thread or yarn is so knit as to form a row including a chain having loops 5, which loops all lie on the same side or face of the base fabric; each thread or yarn 2 is also knit to form a chain having loops 6, which loops all lie on the same side or face of the base fabric as do the loops 5. The rows of two adjacent threads or yarns are connected through the base fabric by interlooped loops 7 and 8 which are spaced apart

from one another longitudinally and transversely at predetermined distances.

The interloops 7, 8 lie between adjacent rows of loops 5 and 6, but on the opposite face of the base fabric, and are connected together by portions of the threads or yarns 1, 2 which lie on the same side of the base fabric as do the interloops 7 and 8. The interloops 7 and 8 are drawn together into the form of knots and shall be hereinafter referred to as knot-like elements. The drawing together of the loops 7 and 8 causes the chain loops 5 and 6 to assume inclinations which give the chains a zigzag appearance. As will be seen from an inspection of the drawings, the loops 5 and 6 of adjacent chains alternately converge and diverge.

The inclination of the chain loops 5 and 6, together with the spacing of the inter-looped loops 7 and 8, provides substantial openings through the fabric for light, heat and air to pass. These openings, in the embodiment shown in Fig. 1, are all the same size and of quadrilateral form.

Preferably, the loops 5 and 6 are each crossed by at least two weft threads 4, while at least one warp thread underlies the rows of knot-like elements 7, 8.

If desired, elongated holes may be formed in the fabric by not cross-connecting certain interlooped loops, but effecting longitudinal connections only between certain interloops 7, 8 and 7^a, 8^a (as shown in Fig. 2) by the thread portions 2^a, 1^a.

When, with relation to the knitting especially, I refer to threads or yarns I wish it understood that these words are used interchangeably and not as limitations.

From the foregoing description, taken in connection with the accompanying drawings, it is thought the construction and advantages of my improved fabric and method of making the same will be clear to those skilled in the art to which it appertains.

What I claim is:

1. In a composite fabric wherein a woven base fabric is embedded in a knit fabric: the improvement which comprises an open-mesh woven fabric and a knit fabric composed of a plurality of rows of chains of loops lying on one face of the woven fabric, the chains of adjacent rows being interlocked at intervals by knot-like connections lying on the other face of the woven fabric and spaced intermediate the rows of loops, the loops of each chain running zigzag, the loops of one chain inclining in an opposite direction from those of adjacent chains, said knot-like connections lying in parallel longitudinal and transverse rows, those of one row being stepped with respect to those of adjacent rows, the knot like elements of a row being cross-connected to those of the adjacent rows by threads lying on the same face of the woven fabric as the knot-like elements.

2. The composite fabric of claim 1 wherein the warp threads of the woven fabric lie under the knot-like elements and the weft threads lie over the loops of the chains and lie under the cross-connecting threads between the knot-like elements.

3. The composite fabric of claim 1 wherein the warp threads of the woven fabric lie under said knot-like elements and the weft threads lie over the loops of the chains and lie under the cross-connecting threads between the knot-like elements, there being at least one warp thread lying under the knot-like elements of each row and at least two spaced weft threads lying over the loops of the chains between adjacent knot-like elements, thereby providing openings of substantial areas through the composite fabric, for purposes described.

4. In a composite fabric wherein a woven fabric is embedded in a knit fabric: the improvement which comprises an open-mesh woven fabric through which the knitting takes place, and knitting comprising, on one face of the woven fabric, a plurality of longitudinally disposed chains of loops, the loops of which run zigzag, the chains being laterally spaced apart, and, on the other face of the woven fabric, a plurality of longitudinally and transversely disposed rows of knot-like elements connected through the woven fabric to the loops of the chains and themselves being cross-connected by threads lying over said other face of the woven fabric.

5. The composite fabric of claim 4 wherein the longitudinal rows of knot-like elements are located intermediate the chains of loops.

6. The composite fabric of claim 4 wherein the longitudinal rows of knot-like elements are located intermediate the chains of loops, there being portions of the composite fabric where the chains have their loops running straight and the knot-like elements adjacent thereto are not transversely connected, thereby providing areas of the fabric having longitudinally elongated openings of greater length than those of the remainder of the fabric.

7. The composite fabric of claim 4 wherein there is a portion of the fabric where the chains run straight and the knot-like elements are not transversely connected, thereby providing longitudinally elongated openings of greater lengths than those of the remainder of the fabric.

8. In a composite fabric wherein a woven fabric is embedded in a knit fabric: the improvement which comprises a knit fabric composed of a plurality of longitudinally disposed rows of chains of loops, the chains being spaced apart and the loops of the respective chains lying in zigzag paths, those of one row being directed oppositely to those in the adjacent rows, said rows of chains lying under the woven fabric, the threads forming the loops of a chain passing through the woven fabric to the other face thereof and being inter-knit with those of the adjacent chains, the inter-knit portions being cross-connected by threads lying over the woven fabric, the inter-knit portions lying over the woven fabric and being disposed in spaced-apart longitudinal and transverse rows.

9. The composite fabric of claim 8 wherein the longitudinal distance between adjacent inter-knit portions is greater than the length of a loop of the chains.

10. The composite fabric of claim 8 wherein the longitudinal distance between adjacent inter-knit portions is greater than the length of a loop of the chains and the transverse distance between adjacent inter-knit portions is approximately equal to the space between adjacent rows of chains.

11. In a composite fabric wherein a woven fabric is embedded in a knit fabric: the improvement which comprises a plurality of rows of chains of loops, the loops of each chain lying zigzag fashion, with the loops of a chain alternately approaching and diverging from those of adjacent chains, the threads of the several loops where the loops join being passed through the woven fabric to the opposite face of the woven fabric and there inter-knit with corresponding

threads of adjacent chains to form rows of knot-like elements, said knot-like elements being arranged in longitudinal and transverse rows spaced apart, and cross-connecting threads joining said knot-like elements of one row to those of the adjacent rows, thereby providing substantial air spaces through the composite fabric.

12. The composite fabric of claim 11 wherein the distance between any two knot-like elements is not less than the length of one loop of a chain.

13. In a composite fabric wherein a fabric is knit through a base fabric: the improvement which comprises a loosely woven base fabric, a plurality of rows of single-thread chain loops transversely spaced apart on one face of the base fabric and a plurality of spaced-apart interlooped loops on the other face of the base fabric connected together over said other face by single threads, whereby the lay of the threads on said other face of the base fabric is greater than that on said one face of the same.

14. In a composite fabric wherein a woven fabric is embedded in a knit fabric: the improvement which comprises a woven fabric, a plurality of parallel rows of chains of loops, each chain being constructed throughout its length of a length of thread distinct from the others, the threads of adjacent chains passing through the woven fabric at spaced intervals and there being interlooped to form knot-like elements on the face of the fabric opposite that on which the chain loops lie.

15. A method of making a composite fabric: said method comprising knitting through a base fabric to form, by separate threads, spaced rows of chains having each of their links lying on one face of the base fabric, and having loops lying on the other face of the base fabric, the loops of one row of chains being interlooped alternately with those of adjacent chains, each loop of a chain being connected with each other loop of the same chain by a portion of the thread of that chain which lies over the base fabric.

16. In a method of making a composite fabric wherein a knit fabric and a woven fabric are combined: the improved method which consists in knitting a plurality of chains each from an individual thread so that the links of the chains all lie on one side of the woven fabric, taking portions of the threads of the chains and forming the same into loops on the other side of the woven fabric, interlooping the loops of adjacent chains, and connecting the interlooped loops together over the said other face of the woven fabric by portions of the same threads that formed the loops and links of the chains.

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