G. STIBBE.

KNITTED FABRIC AND THE METHOD OF PRODUCING THE SAME.

APPLICATION FILED JULY 7, 1919.

1,386,444.

Patented Aug. 2, 1921.

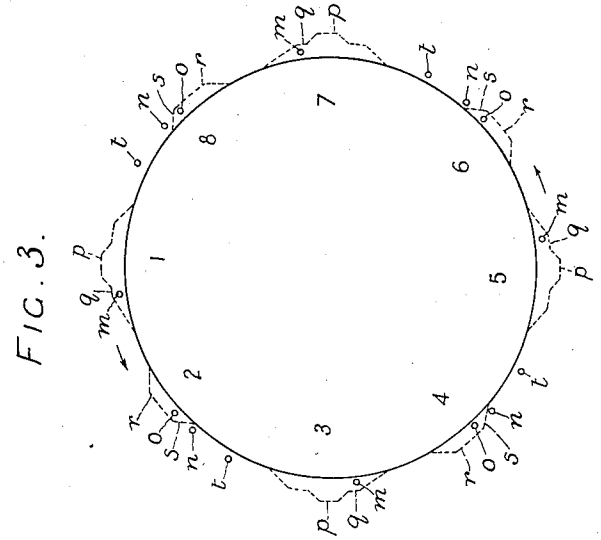


FIG. 3.

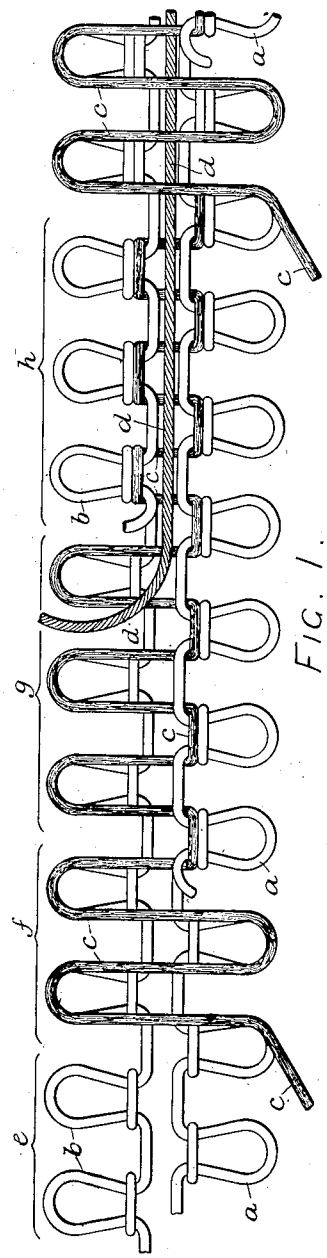


FIG. 1.

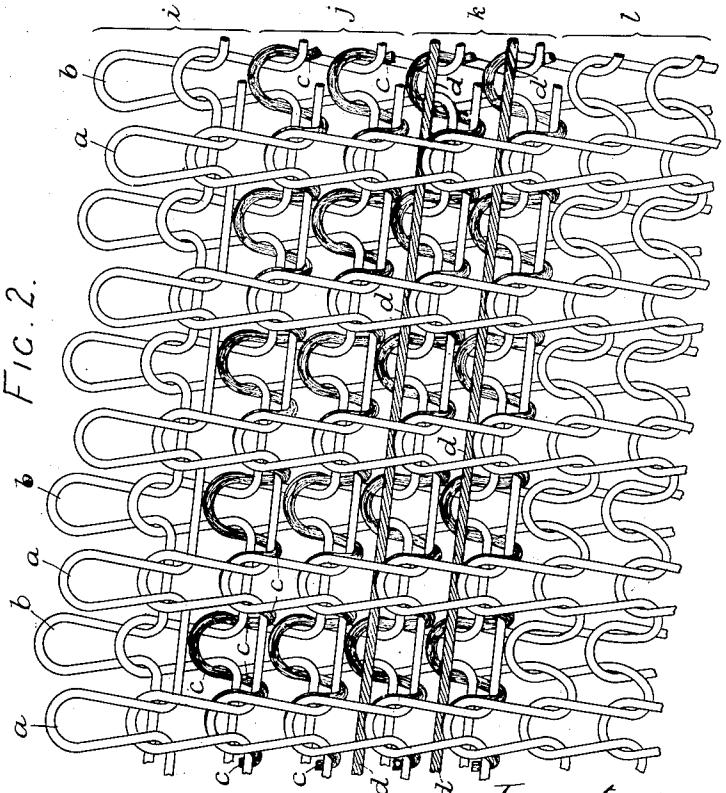


FIG. 2.

Inventor.
Godfrey Stibbe
by Connolly Bros. Attys

UNITED STATES PATENT OFFICE.

GODFREY STIBBE, OF LEICESTER, ENGLAND.

KNITTED FABRIC AND THE METHOD OF PRODUCING THE SAME.

1,386,444. Specification of Letters Patent. Patented Aug. 2, 1921.

Application filed July 7, 1919. Serial No. 308,916.

To all whom it may concern:

Be it known that I, GODFREY STIBBE, subject of the King of Great Britain, residing at Leicester, in the county of Leicester, England, have invented certain new and useful Improvements in Knitted Fabrics and Methods of Producing the Same, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to knitted fabrics and the method of producing the same and has reference to what is known as a double fabric *i. e.* a knitted fabric comprising two webs one overlying the other and united at intervals by a tying or binding loop.

In knitted fabrics of this type as heretofore known the two webs have been united by loops or stitches of a tying yarn which has formed part of the one web or the other. Or, where tying yarn has been independent of those of which the webs have been composed, the tying yarn has appeared upon and overlayed the surface of the web or webs.

The present invention comprises, as a new article of manufacture, a knitted fabric consisting of two independently knitted webs or walls one overlying the other and united by tying or binding loops of a yarn which is additional to the yarns of which the said webs are formed said additional yarn being connected with the said webs without being knitted into stitches at any point and without at any point appearing on the surface of either web.

The characteristic feature of my improved double fabric is that the independently formed webs are united by an additional tying yarn which does not appear on the surface of either web and is not formed into stitches. In my fabric each web or wall is complete in itself and removal of the yarn forming the tying loops would allow the knitted webs to be separated and would leave each knitted web intact without disturbing the loops formation thereof.

In making the improved fabric, I prefer to use a fine yarn to compose the tying loops and to run this in between the webs in continuous horizontal courses in such a manner that it embraces the loops of the opposing webs.

A further feature of the invention is to combine with the aforesaid double fabric, a ribbed fabric, that is to say, during the production of the double fabric change is made to rib knitting when desired and after a length of ribbed fabric has been formed change is made back again to the knitting of the double fabric. This process enables a ribbed fabric to be formed with the double fabric such fabrics being continuous.

Another feature of the invention is to improve or modify the double fabric hereinbefore described by reducing its elasticity and thus making it more rigid and consequently suitable for some purposes, such for example as to constitute cloth. By reducing or eliminating the elasticity of the double fabric I can produce a fabric which owing to its lofty character and close texture is found eminently suitable as a substitute for woven cloth for a number of purposes such for example as clothing, boots and the like. For the purpose in view I incorporate with the double fabric a yarn (referred to in British Provisional Specification No. 15230 of 1918 as a warp yarn) which is not formed into loops or knitted but is simply laid in between the walls of the double fabric and serves to restrain the elasticity of the said fabric in a lateral direction. This yarn will be more fully described later and hereinafter is referred to as a restraining yarn.

In particularly describing the invention reference will be made to the accompanying drawing wherein by a series of diagrammatical views the improved fabric and the method of producing the same are illustrated.

In the drawing:—

Figure 1 is a plan of the double fabric, and

Fig. 2 is a perspective face view or elevation of the same, these views representing the fabric in a magnified and somewhat stretched form to clearly illustrate the loop formation.

Fig. 3 is a diagram illustrating the method of producing the fabric on a circular multiple feeder knitting machine.

Referring generally to Figs. 1 and 2, the two independent plain fabrics are represented by the loops *a* and *b* the fabric *a* being that which is produced on the cylinder needles of the machine while the fabric *b* is the one produced upon the dial needles. The tying or binding yarn which is addi-

tional to the yarns of fabrics *a* and *b* is represented at *c*. The restraining yarn is shown at *d*.

Looking along Fig. 1 from the left hand end, the method of producing the fabric will be seen, the part *e* showing the separate or independent fabrics *a* and *b* disposed back to back, the part *f* showing the introduction of the binding yarn *c*, the part *g* showing the binding yarn *e* knocked over with loops of the fabrics *a*, the part *h* showing the introduction of the restraining yarn *d* and binding yarn *c* knocked over with loops of the fabric *b*, and the right hand end showing the commencement of the process again as at the part *f*. In Fig. 2 the top course *i* shows the independent walls of fabric *a* and *b*, the next two courses *j* show the connection of the said walls by the binding yarn *c*, the next two courses *k* show the connected walls and a restraining yarn *d* laid in, while the two lower courses *l* show rib fabric combined with and formed in continuation of the double fabric.

In the fabric illustrated in Figs. 1 and 2 it will be seen that the walls *a* and *b* are quite independently formed and are united by the yarn *c* which is incorporated with said walls without being made into stitches.

In making the improved knitted fabric I use a circular knitting machine having two sets of needles, for example cylinder and dial needles, and two or more feeders, the said machine being arranged so that at one or more feeders (or other feeders) yarn is fed to the cylinder needles only, whereby the two sets of needles knit independently of each other and produce the individual webs *b* and *a*. At a suitable point I feed in the additional yarn *c* so that it is taken by all the dial needles and drawn around the stems of the cylinder needles (see *f* in Fig. 1) above the old loops thereon and below the latches. During the subsequent operation the binding yarn *c* is knocked over with the old loops on the cylinder needles (*g* in Fig. 1) and is also knocked over with the loops of the dial needles (*h* in Fig. 1) so that it becomes incorporated with the loops of the two independently knitted webs *a* and *b* as shown at *h* (Fig. 1.) and *j*, *k* (Fig. 2) and ties them together without however appearing on the face of either web or having any detrimental effect thereon.

In the method just described, the binding yarn *c* is laid on the needles of each set between the old loops and the hook but the needle hooks do not engage said yarn to draw loops of same the binding yarn being simply knocked over with the old loops. The result of this is that the binding yarn is not knitted into either web, that is to say it is not formed into stitches or loops but merely passes around the knit loops of the webs, and moreover, as shown in Figs. 1 and 2, the said yarn passes behind the corresponding loops of the said webs and is thus hidden by the same.

In a concrete example, a circular knitting machine represented by the diagram Fig. 3, having eight feeds numbered 1 to 8 may be used. The feeders are arranged so that at 1, 3, 5, and 7 yarn is fed at *m* and knitted by the dial needles only. The projection and retraction of the dial needles is represented by the dotted line in the figure. At the feeders 2, 4, 6 and 8 yarn is fed at *n* and knitted by the cylinder needles only. Thus arranged the machine will produce two independent plain tubular webs one overlying the other and disposed back to back as is already known. At each feeder 2, 4, 6 and 8 I provide an additional yarn feed *o* which supplies a supplementary yarn to the dial needles which although not receiving a knitting yarn here are projected outward and receive the supplementary yarn (binding yarn *c*) which as the dial needles are retracted is taken and held by the hooks of the dial needles and drawn around the stems of the cylinder needles so that as the latter move down to knock over their loops the binding yarn is as aforesaid knocked over with said loops. Where as at the feeders 1, 3, 5 and 7 the dial needles receive a knitting yarn and the cylinder needles do not knit, the said dial needles are projected in the usual way to clear their old loops and also the binding yarn and here they take the knitting thread and knock over said binding yarn with the old loops. The needle cylinder revolves in the direction indicated by the arrow and the complete operation is that at *p* (feeders 1, 3, 5 and 7) the dial needles are projected to clear, at *q* they are retracted and take and knit yarn from feed *m* at *r* (feeders 2, 4, 6 and 8) the dial needles are advanced but do not clear, at *o* the dial needles take the binding yarn, and at *s* the dial needles are retracted drawing binding yarn around stems of the cylinder needles before said cylinder needles take yarn and knit at the feed *n*.

Obviously if a binding yarn is fed to the dial needles at each of the feeders 2, 4, 6 and 8 the two webs will be tied together by said yarn at each course, but where in a machine arranged as described, the binding yarn is fed in at a less number of the feeders the webs will be connected at a correspondingly less number of courses. This feature however admits of variation as it will be manifest that in a machine having a comparatively large number of feeders, such as eight or more, the connection between the two independently knitted webs formed by the courses of binding yarn may be widely distributed if desired. For general purposes it is found best to introduce the

binding yarn at each course, or at least at every other course.

When in the production of the improved double fabric, a restraining yarn *d* is to be incorporated, this is introduced at a suitable point between the knitting of the dial course and the knitting of the following cylinder course. For instance, the restraining yarn may be laid between the cylinder and dial needles by a feed *t* (Fig. 3) this being positioned to introduce said yarn at or about the time when the cylinder needles are rising and the dial needles are moving outward. It will be understood that the restraining yarn is not formed into loops or knitted but is simply laid in between the walls *a* and *b* of the fabric and likewise between the courses of binding yarn *c* which unite the said walls at every course or at other intervals. The restraining yarn constitutes a straight weft and is preferably introduced at each course of the fabric.

The combination of the knitted walls of fabric, the binding yarn uniting them and the restraining yarn, is intended to produce a close and durable structure of fabric more particularly when the same has been scoured and finished.

An improved double fabric such as herein described may be modified in construction by using yarns of different weight, color and or material to form the independent webs, and while I prefer, as already stated, to use a fine yarn to form the binding loops, I do not limit myself in this connection as in some cases it may be found desirable or advantageous to use a heavier yarn for this purpose, and further the binding yarn may be varied as regards its color and material.

With regard to the combined double fabric and ribbed fabric, a length of the double fabric may be formed in the manner herein described and then by changing to rib knitting a length of ribbed fabric may be produced such as to form the ribbed end of a shirt. Or by changing from double fabric knitting to rib knitting and subsequently changing back again to double fabric knitting, a ribbed portion such as may form the waist of a vest is produced in continuous combination with two lengths of double fabric.

The change from knitting double fabric to rib knitting may be effected by any suitable and convenient means, but one manner of effecting the desired result is to provide at the appropriate feeders adjustable needle actuating cams so that the needles can be caused to take yarn or miss it as required. For instance, in a machine arranged as already described with reference to Fig. 3, at the feeders 2, 4, 6 and 8 an adjustable outthrow cam may be furnished so that the outward movement of the dial needles can be regulated to cause them to miss or take yarn. Similarly at the other feeders 1, 3, 5 and 7 an adjustable up-throw cam may be furnished so that the cylinder needles are caused to miss or take yarn. These cams may be shifted by automatic means. Obviously when only the dial needles take yarn at one feeder and only the cylinder needles take yarn at the next and a binding yarn is incorporated, the aforesaid double fabric will be produced, but when by an adjustment of the cams at the respective feeders both the dial and cylinder needles are caused to take yarn at each feeder, ribbed fabric will be produced. Any suitable form of adjustable cam may be employed for the above mentioned purpose and suitable yarn feeding devices may be used for the binding and restraining yarns so that these yarns may be withdrawn, if desired, when ribbed fabric is to be produced. The machine constructed and arranged for producing the improved double fabric and combined ribbed fabric forms the subject of a separate patent application in the United States, Serial No. 339,109, and is more fully described in the specification accompanying said application.

What I claim then is:—

1. A knitted fabric consisting of two independently knitted webs one overlying the other and united by means of a yarn which is additional to the yarns of which said webs are formed, said additional yarn being passed around the bases of the loops of the individual webs wholly below the exposed surfaces of said webs and running from one web to the other to tie them together.

2. A knitted fabric consisting of two independently knitted webs, one overlying the other and united by means of a yarn which is additional to the yarns of which the said webs are formed, said additional yarn being laid between the webs in continuous horizontal courses and engaging alternate opposite wales of said webs by passing around the bases of the loops thereof wholly below the exposed surfaces of said webs and running from one web to the other to tie them together.

3. A knitted fabric consisting of two independently knitted webs, one overlying the other and united by means of a yarn which is additional to the yarns of which the said webs are formed, said additional yarn being passed around the bases of the loops of the individual webs wholly below the exposed surfaces of said webs and running from one web to the other to tie them together, and a ribbed fabric combined with the aforesaid double fabric, said fabrics being continuous.

4. A knitted fabric consisting of two independently knitted webs, one overlying the other and united by means of a yarn which is additional to the yarns of which the said webs are formed, said additional yarn being passed around the bases of the loops of the individual webs wholly below the exposed

surfaces of said webs and running from one web to the other to tie them together, and a restraining thread incorporated therewith adapted to reduce the elasticity of the fabric.

5. A knitted fabric composed of two independently knitted webs one overlying the other and united by means of a yarn which is additional to the yarns of which said webs are formed, said additional yarn being passed around the bases of the loops of the individual webs wholly below the exposed surfaces of sad webs and running from one web to the other to tie them together, and a restraining thread incorporated therewith, said thread being laid between the walls of the fabric substantially as described.

6. The method of making the herein described fabric, consisting in knittng two yarns independently of each other and thereby producing individual webs and in simultaneously feeding an additional yarn so that it becomes incorporated with the fabric and engages with the opposing webs, such additional yarn passing around the bases of the loops of the opposing webs wholly below the exposed surfaces of said webs and running from one web to the other to tie them together.

7. The method of making the herein described fabric, consisting in knitting two yarns independently of each other and thereby producing individual webs, simultaneously feeding an additional yarn so that it becomes incorporated with the fabric and engages with the opposing webs, said additional yarn passing around the bases of the loops of the opposing webs wholly below the exposed surfaces of said webs and running from one web to the other to tie them together, and then changing to rib knitting to produce ribbed fabric in continuation of the double fabric.

8. The method of making the herein described fabric, consisting in knitting two yarns independently of each other and thereby producing individual webs, simultaneously feeding an additional yarn so that it becomes incorporated with the fabric and engages with the opposing webs, said additional yarn passing around the bases of the loops of the opposing webs wholly below the exposed surfaces of said webs and running from one web to the other to tie them together and feeding in a further additional yarn so that it lies straight between the opposing webs to restrain the lateral stretch of the fabric.

In testimony whereof I affix my signature in presence of two witnesses.

GODFREY STIBBE.

Witnesses:
E. N. LEWIS,
FRANK DAVIS.