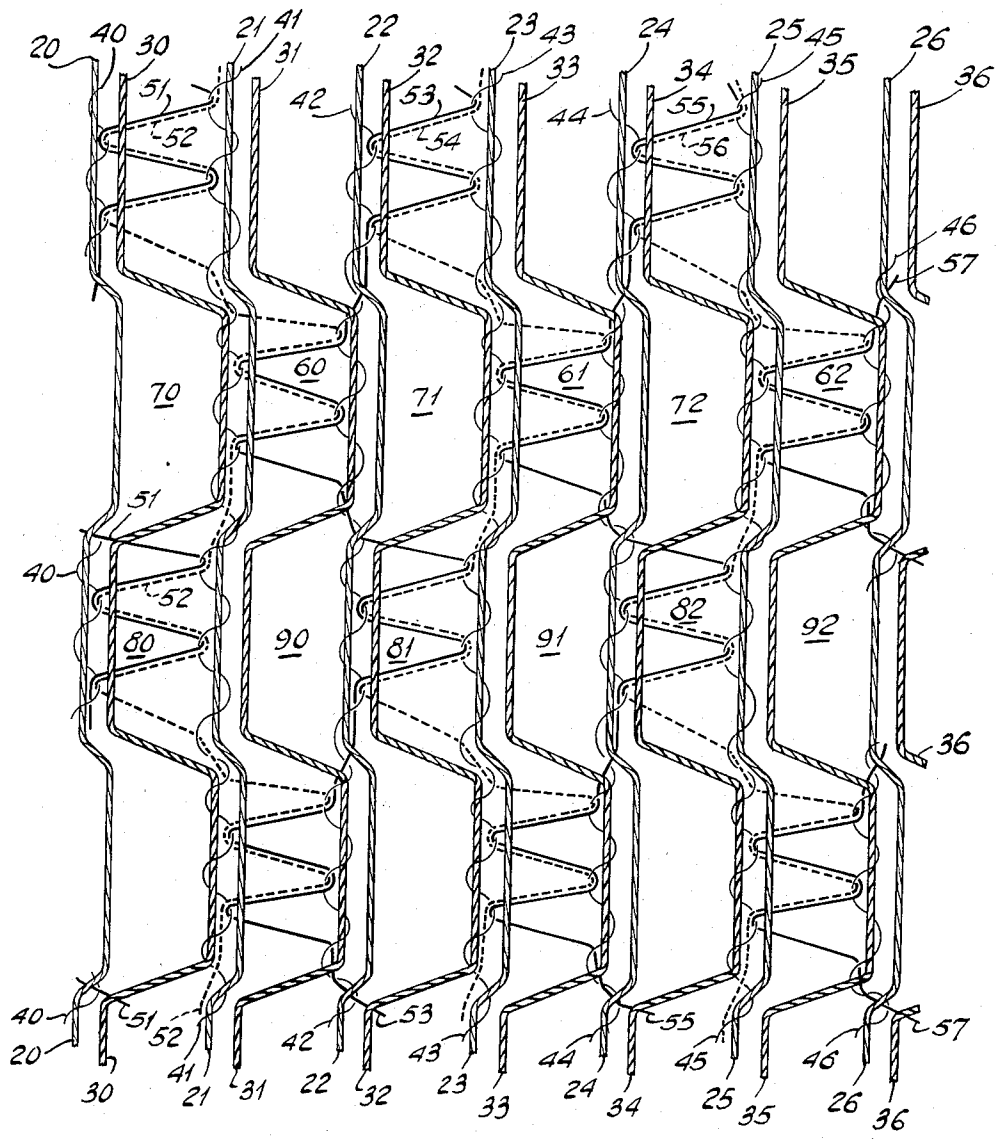
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NOTTINGHAM LACE NETS

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INVENTOR
ARTHUR C. WHEATCROFT
BY Charles A. Morton
ATTORNEY

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NOTTINGHAM LACE NETS

Arthur C. Wheatcroft, Stamford, Conn., assignor, by mesne assignments, to North American Lace Company, Inc., Philadelphia, Pa., a corporation of Pennsylvania

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This invention relates to Nottingham lace nets generally, and more particularly to elastic Nottingham lace nets.

Nottingham lace is woven upon a Nottingham lace curtain machine, but owing to the mechanical limitations of the Nottingham lace curtain machine, the gauge of the lace goods woven by such machines is considerably and noticeably lower than the gauge of the lace goods produced upon other types of lace making machines.

When the gauge of the lace goods to be woven makes their production upon a Nottingham lace curtain machine possible, the production cost of the lace goods so produced compares favorably with the cost of similar goods woven upon other types of lace making machines.

Nottingham lace curtain machines are very expensive, and a mill equipped with such machines represents a very substantial financial investment. It is therefore important to develop new products which can be woven in a Nottingham lace curtain machine and sold in competition with comparable products woven upon other types of lace making machines.

One object of this invention is a Nottingham lace fabric of seemingly finer gauge.

Another object of this invention is to increase the useful range of the Nottingham lace curtain machine by modifying it to weave finer gauge looking Nottingham lace fabrics.

Another object is a finer gauge looking elastic Nottingham lace net.

These and other objects will more fully appear from the detailed description which follows.

In accordance with this invention, additional warp threads, over and above the normal capacity of the Nottingham lace curtain machine, are introduced into the warp of the lace net, and the warp threads are arranged in two distinctive groups or warp beams having bobbin threads common to both, and the spool threads are extended, first between the warp threads of one group and there tied by the common bobbin threads, and then between the warp threads of the other group and there tied by the common bobbin threads, to weave a lace net having a groundwork of seemingly finer gauge than conventional Nottingham lace goods.

In the figure of the drawing, in which one embodiment of the invention is diagrammatically illustrated, a fragment of lace has been considerably enlarged to facilitate an understanding of the structure thereof.

In the lace structure shown in the drawing, the warp threads are sub-divided into two separate and distinct groups or warp beams, in such manner, that the total number of warp threads in either warp beam does not exceed the normal capacity of the Nottingham lace curtain machine. One of the said warp beams, for example the warp beam indicated by the warp threads **20** to **26**, etc., may represent the conventional warp beam and may be filled to the maximum capacity of the Nottingham lace curtain machine; and the other warp beam indicated by the warp threads **30** to **36**, etc., will then represent an

additional or supplementary warp beam within the capacity of the Nottingham lace curtain machine. It should therefore be understood that each of the said warp beams includes other and additional threads, not shown, but which extend sideways across the loom width of the lace net.

Although two separate and distinct warp beams are used, the warp threads of one group alternate with the warp threads of the other group across the loom width of the lace net, so that the warp thread **30** of the supplementary warp beam is positioned between the warp threads **20** and **21** of the conventional warp beam, the warp thread **21** of the conventional warp beam is positioned between the warp threads **30** and **31** of the supplemental warp beam, the warp thread **31** of the supplemental warp beam is positioned between the warp threads **21** and **22** of the conventional warp beam, and so on, all across the loom width of the Nottingham lace curtain machine. By this arrangement, the gauge of the resulting lace structure, when woven, appears twice as fine as the gauge of the Nottingham lace structure produced in the conventional manner upon such Nottingham lace curtain machine.

The bobbin threads **40** to **47** are common to a plurality of warp threads comprising one warp from each warp beam. Thus bobbin thread **40** is common to the warp threads **20**, **30**; bobbin thread **41** is common to the warp threads **21**, **31**; bobbin thread **42** is common to warp threads **22**, **32**; etc. The bobbin threads pillar around one warp thread at a time for a predetermined number of motions, and then around another warp thread for a predetermined number of motions, and the number of such pillaring motions may be varied at will, dependent upon the lace net under construction. Thus the bobbin thread **41** pillars with warp thread **21** for five distinctive motions of the lace structure, and then with the warp thread **30** for six distinctive motions of the lace structure to weave the dot **60**, and then back again with the warp thread **21** for six distinctive motions of the lace structure to weave the dot **80**.

The spool threads **51** to **57**, etc., are variously extended from one warp thread to another of the same warp beam with which the bobbin threads are then pillaring, for a predetermined number of distinctive motions of the lace structure, and are there tied by the pillaring bobbin threads, to weave a row of spaced dots, such as the dots **60**, **61**, and **62**, with openwork figures **70**, **71**, and **72**, therebetween, and thus form a section of the groundwork of the lace fabric. Thereafter the bobbin threads are caused to pillar with the warp threads of the other warp beam, and the spool threads **51** to **57**, etc., are variously extended from one warp thread to another of the warp beam with which the bobbin threads are now pillaring, for a predetermined number of distinctive motions of the lace structure, and are there tied by the bobbin threads to weave another row of spaced dots, such as the dots **80**, **81**, and **82**, with openwork figures **90**, **91**, and **92**, therebetween, and thus form another section of the groundwork of the lace fabric.

Only one warp beam is used at a time to anchor the spool thread ties in place, and the bobbin threads, which are individually common to one warp thread of each beam, pillar for a predetermined number of distinctive motions as selected, to tie the spool threads, if then extended, to the warp threads with which the bobbin threads are then pillaring.

The dots are woven by extending the spool threads across the bars from one warp thread to another in one direction and in proper sequence, tying the spool threads to the warp threads by means of the pillaring bobbin threads, and then reversing the direction of movement to return the spool threads to their previous positions

relative to their associated warp threads, and tie the spool threads again, to form a spool thread tie.

The size of the dots, or clothing, will vary according to the nature of the lace structure, but in the particular lace net illustrated in the drawing, each dot consists of two single spool thread ties, with one double spool thread tie therebetween, woven as follows. Referring to the dot **60**, the spool thread **52** (shown in broken lines) is first pillared with warp thread **30** by bobbin thread **41**; then it is extended to the warp thread **31** and there tied by bobbin thread **42** to form a single spool thread tie, both of the spool threads **52** and **53** are next extended together from warp thread **31** to warp thread **30** and are tied to warp thread **30** simultaneously by the pillaring of bobbin thread **41**; both spool threads are then returned to warp thread **31** and simultaneously tied by bobbin thread **42**; both spool threads are then returned to warp thread **30** and simultaneously tied thereto by the pillaring of bobbin thread **41**, to complete a double spool thread tie; spool thread **52** then pillars along warp thread **30** to lock the double spool thread tie, while spool thread **53** is returned to warp thread **31** and is there tied by the pillaring of bobbin thread **42** to complete another single spool thread tie.

The dots **61** and **62**, and their repeats, are all woven at the same time as the dot **60**; the dot **61** being woven between the warp threads **32** and **33**; the dot **62** being woven between the warp threads **34** and **35**; etc. Each dot **60** to **62**, etc., as shown, consists of a series of spool thread ties as described, four rows or motions long as measured along the warp threads, or lengthwise, of the lace fabric. Preceding, and following, each dot, is an open row or motion, which results because the spool threads pillar with the warp threads for two motions, one at the end of one dot, and the other before the beginning of the next dot. Thus after dot **60** was woven the spool thread **53** pillared with warp thread **31** for one motion to tie off the dot **60**, and then pillars with the warp thread **22** for one motion to tie off dot **81** before forming it. By this arrangement two rows or motions of openwork separate each row of dots from the preceding, or succeeding, row of dots. The total number of rows or motions used up in weaving each row of dots and the pillar therebetween is accordingly six, and this requires three full, or six half, motions, of the Nottingham lace curtain machine to complete the said series of weaving operations.

While the dots **60** to **62**, etc., were being woven, the bobbin threads **40** to **46**, etc., were unable to pillar along the warp threads **20** to **26**, etc., hence the spool threads could not be tied to the warp threads **20** to **26**, etc., and the openwork figures were accordingly formed at **70**, **71** and **72**, etc.

After the row of dots **60** to **62**, etc., and the openwork **70** to **72**, etc., has been woven, the bobbing threads **40** to **46**, etc., are caused to pillar with the warp threads **20** to **26**, etc., as shown, and the spool threads **51** to **57** are now extended variously, as shown, between the warp threads **20** to **26**, and there tied by the pillaring of the bobbin threads **40** to **46**, with the said warp threads, in the manner previously described, to weave the row of dots **80** to **82**, etc., with the openwork figures **90** to **92**, etc., therebetween, thereby completing one full repeat of the structure of the groundwork of the lace fabric illustrated, and the pattern is thereafter repeated to weave so much of the lace goods as may be desired.

Since the resulting Nottingham lace fabric contains more warp threads than a Nottingham lace fabric woven in the conventional manner upon a Nottingham lace curtain machine, it is, in eye appearance, of finer gauge than the conventional lace fabrics woven upon a Nottingham lace curtain machine, and this finer looking gauge Nottingham lace fabric opens up new fields of use for this new Nottingham lace fabric.

By using covered rubber threads or filaments as the warp threads **20** to **26**, etc., and **30** to **36**, etc., and cotton threads, which are inelastic, as the spool and bobbin threads, a Nottingham lace fabric which is elastic, and which can be stretched in any direction can be fabricated. An elastic Nottingham lace fabric of the character described, and which will stretch in any direction, is particularly well suited for use in the manufacture of girdles and other foundation garments.

While the Nottingham lace fabric shown and described is essentially double action goods, the invention is not limited in its application to such goods. It may be embodied in other Nottingham lace goods, including, among others, ordinary work, and combination goods.

The Nottingham lace fabric shown merely exemplifies one simple lace net or groundwork, and it should be understood that the size, and the particular arrangement of the dots **60** to **62**, etc., and **80** to **82**, etc., is a matter of choice, and may be varied in a variety of ways, and that clothing may be added to form ornamental work, if and as desired.

Other modifications of my invention will be obvious to skilled in the art.

What is claimed is:

1. In a Nottingham lace net and in combination, a first series of warp threads spaced apart across the width of the net to define open bars extending lengthwise of the lace net, a second series of warp threads, there being one warp thread of the second series positioned in each of the said open bars so that each warp thread is separated from the next warp thread of its own series by a warp thread of the other series, a series of bobbin threads, there being one bobbin thread common to one warp thread of each series, each common bobbin thread combining first with its warp thread of one series and then with its warp thread of the other series to form two separate and distinct groups of pillars, a series of spool threads extending across the warp threads of alternate bars from one pillar to another and tied to their respective pillars by said bobbin threads to weave staggered rows of spaced dots each one bar wide with bars of openwork between said dots, and the pillars of one group merging with the pillars of the other group before and after each successive row of dots is woven to tie off the corners of the said dots and weave a lane of openwork extending across the lace net between each succeeding staggered row of spaced dots.

2. In a Nottingham lace net and in combination, a first series of elastic warp threads spaced apart across the width of the net to define open bars extending lengthwise of the lace net, a second series of elastic warp threads, there being one warp thread of the second series positioned in each of the said open bars so that each warp thread is separated from the next warp thread of its own series by a warp thread of the other series, a series of inelastic bobbin threads, there being one such bobbin thread common to one elastic warp thread of each warp series, each such common bobbin thread combining first with its elastic warp thread of one series and then with its elastic warp thread of the other series to form two separate and distinct groups of elastic pillars, a series of inelastic spool threads extending across the warp threads of alternate bars from one pillar to another at predetermined intervals and tied to the said pillars to which they are extended by said bobbin threads to weave staggered rows of spaced dots each one bar wide with bars of openwork each one bar wide between said dots, and the pillars of one group merging with the pillars of the other group before and after each successive row of dots is woven to tie off the four corners of each of the said dots and simultaneously weave a lane of openwork extending all across the lace net between each succeeding staggered row of spaced dots.

3. In a Nottingham lace net and in combination, a series of warp threads, a series of spool threads, a series

of bobbin threads, the number of warp threads being substantially greater than the number of bobbin threads, said bobbin threads when in conjunction with said warp threads coacting to form pillars for anchoring the spool threads when extended therebetween and thus form the groundwork of the lace net, said bobbin threads alternating from one warp thread to another in predetermined order to replace some of the warp threads in the anchoring pillars with other and unpillared warp threads so that the gauge of the resulting lace net as indicated by the number and the spacing of the number of warp threads employed substantially exceeds the conventional pillar forming capacity of the bobbin threads, and said spool threads pillaring along first one and then the other of the said warp threads where said bobbin threads alternate from one warp thread to another so as to leave a lane of openwork extending all across the warp of the lace net.

4. In a Nottingham lace net and in combination, a series of warp threads, a series of bobbin threads, a series of spool threads, said warp and bobbin threads in conjunction coacting one with the other to form pillars for anchoring the spool threads when extended therebetween and forming the groundwork of the lace net, the number of warp threads provided substantially exceeding the number of bobbin threads and the conventional pillar forming capacity of the bobbin threads, said bobbin threads alternating back and forth from one warp thread to another in predetermined order so as to use all of the warp threads in the anchoring pillars so that the number of anchoring pillars actually formed and used to anchor the spool threads exceeds the conventional pillar forming capacity of the bobbin threads and the gauge of the groundwork of the resulting lace net as indicated by the number of warp threads provided and used therein exceeds the gauge of a conventional lace net as measured by the conventional pillar forming capacity of the bobbin threads, and said spool threads pillaring first along one and then along the other of the said warp threads under control of said bobbin threads at the point where said bobbin threads alternate from one warp thread to another so as to leave a lane of openwork extending all across the warp of the lace net.

5. A Nottingham lace net as defined in claim 3, wherein the warp threads are composed of filaments of covered rubber, and the bobbin and the spool threads are made of cotton.

6. A Nottingham lace net as defined in claim 3, wherein the warp threads are composed of an elastic material and the bobbin and the spool threads are composed of an inelastic material.

7. A Nottingham lace net as defined in claim 4, wherein all of the warp threads are composed of covered elastic filaments, and all of the bobbin and spool threads are inelastic.

8. A Nottingham lace net as defined in claim 1, wherein all of the warp threads in each series are composed of covered elastic filaments.

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