Oct. 7, 1947. H. J. SCHMIDT ET AL 2,428,529

MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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Fig. 1.

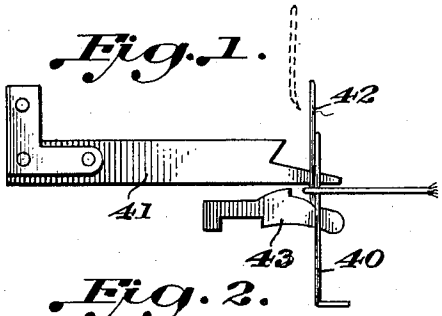


Fig. 2.

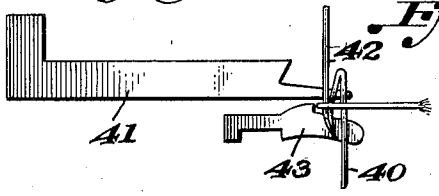


Fig. 3.

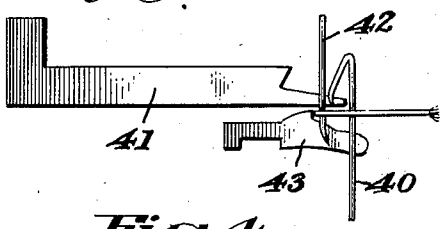


Fig. 4.

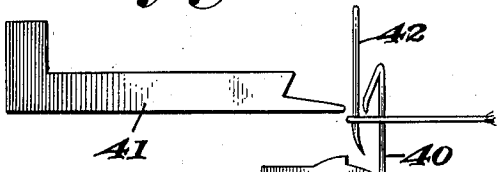


Fig. 5.

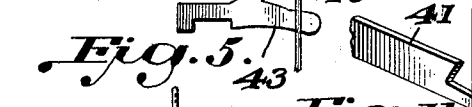


Fig. 6.

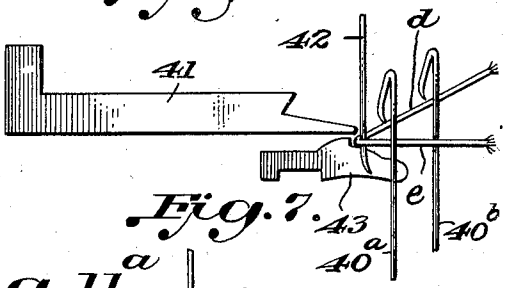


Fig. 7.

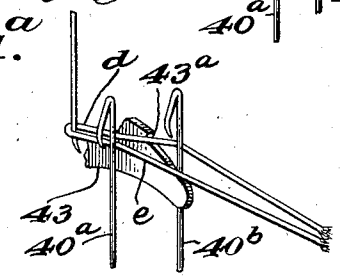


Fig. 8.

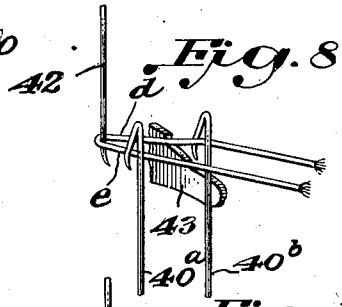


Fig. 10.

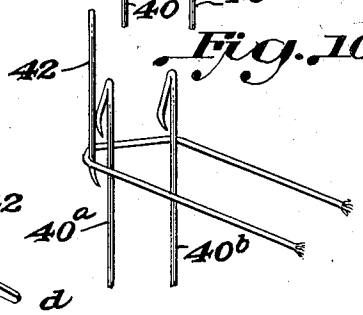


Fig. 11.

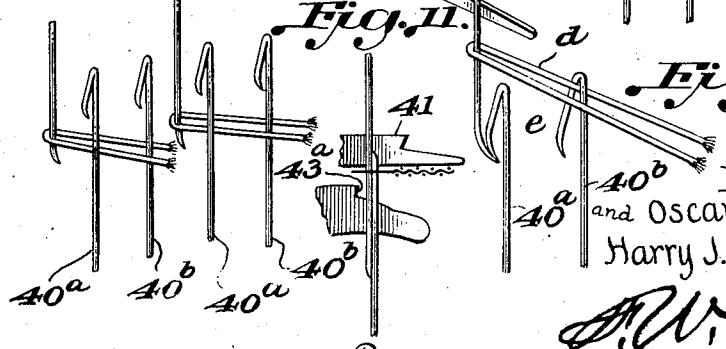


Fig. 9.

Inventors,
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Harry J. Schmidt,

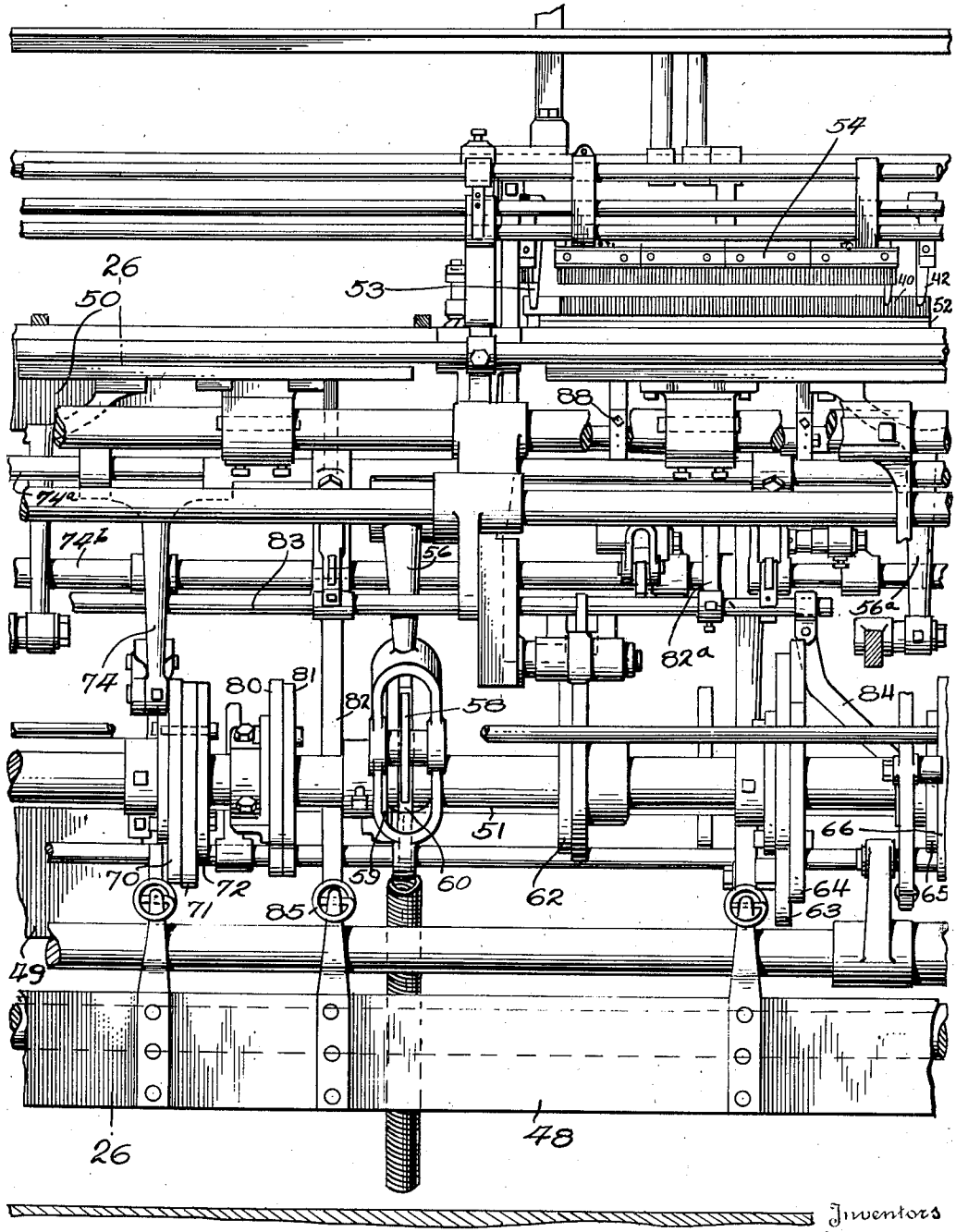
By

Atty.

Oct. 7, 1947. H. J. SCHMIDT ET AL 2,428,529

MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

Filed Nov. 15, 1945 8 Sheets-Sheet 2



Inventors

Fig. 12 Oscar Dojan
Harry J. Schmidt

By H. W. Baker, Attorney

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MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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Fig. 13

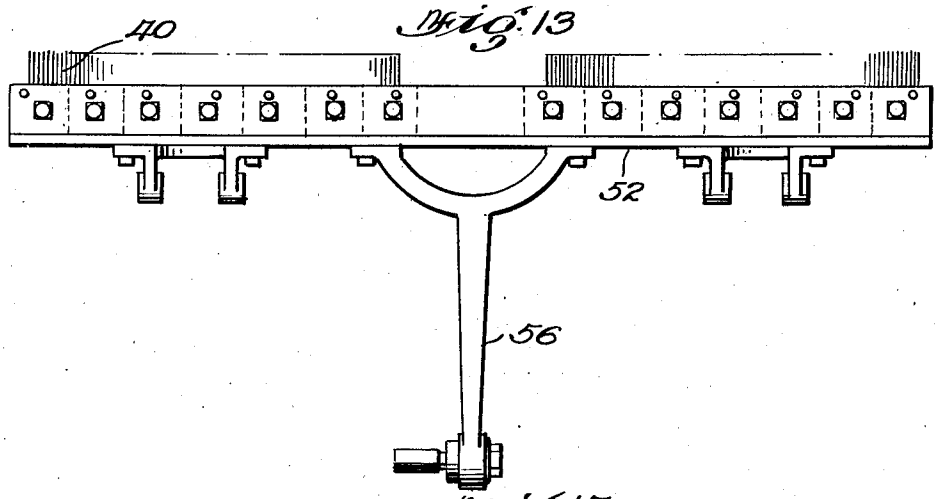


Fig. 14

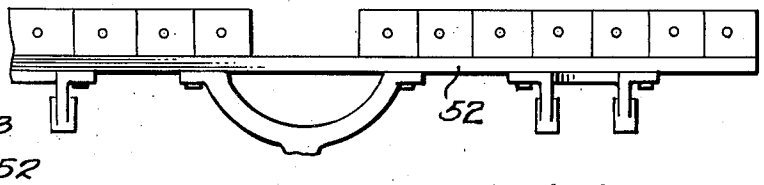


Fig. 16

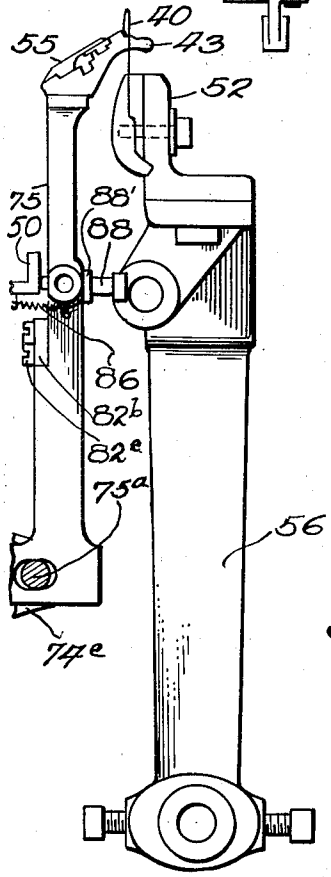


Fig. 15

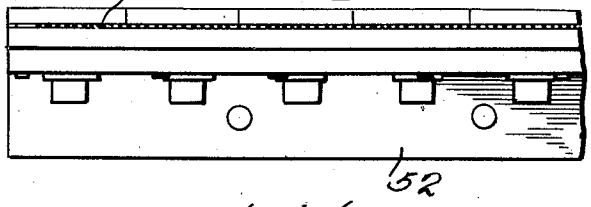


Fig. 18

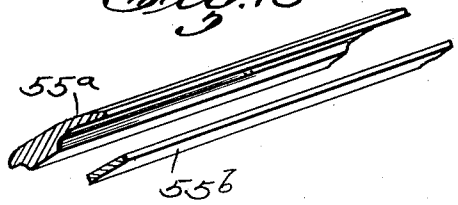
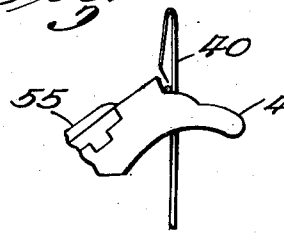


Fig. 17



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MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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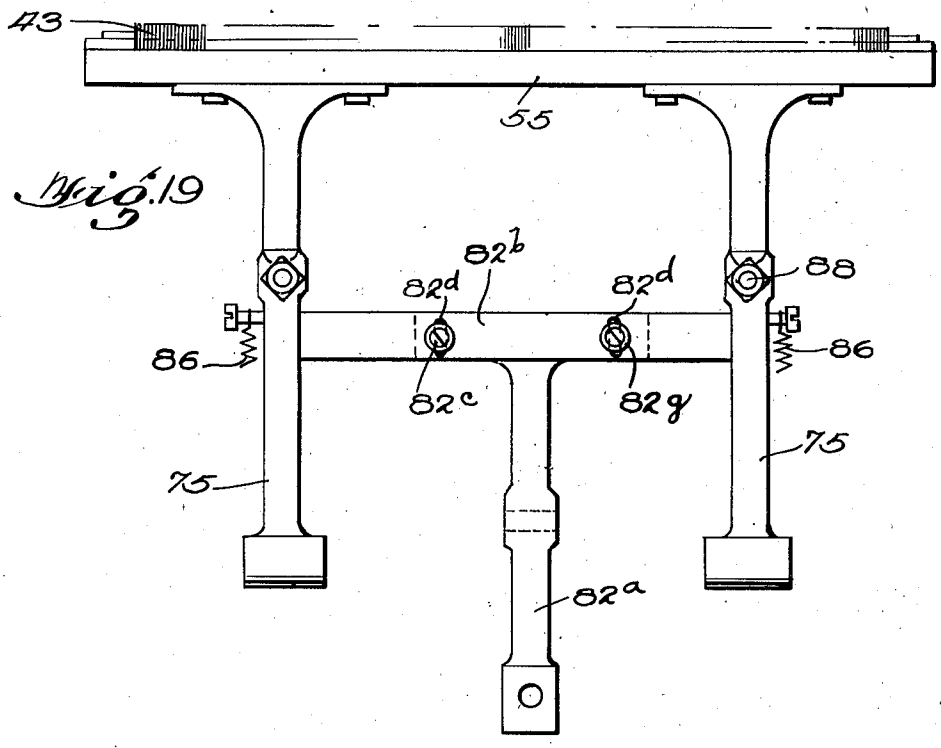


Fig. 19

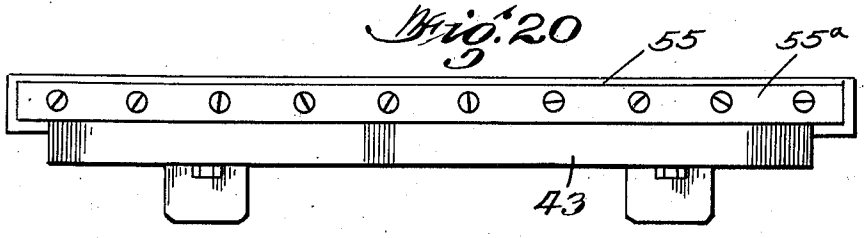


Fig. 20

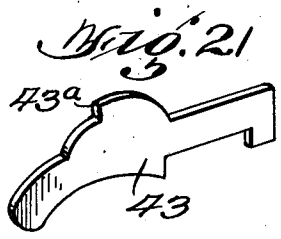


Fig. 21

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Fig. 22

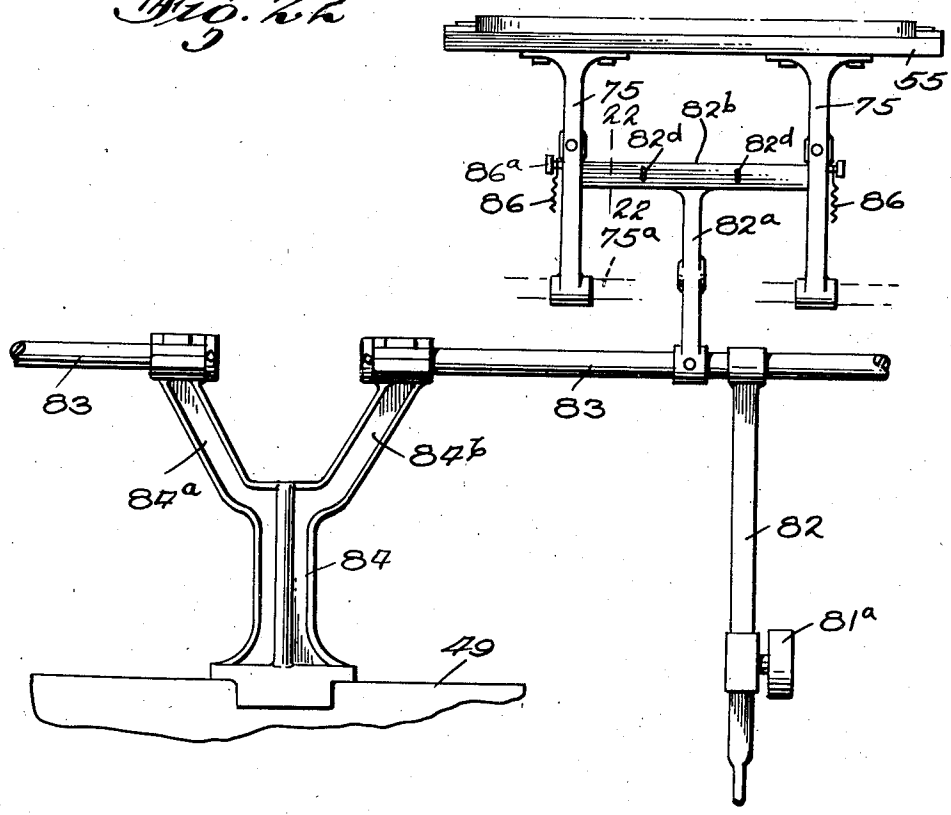


Fig. 24

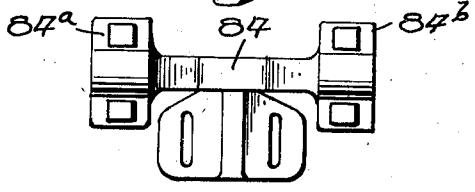
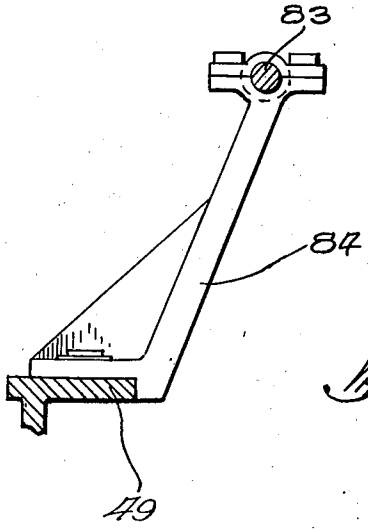


Fig. 23



Inventors
Oscar Dojan
& Harry J. Schmidt

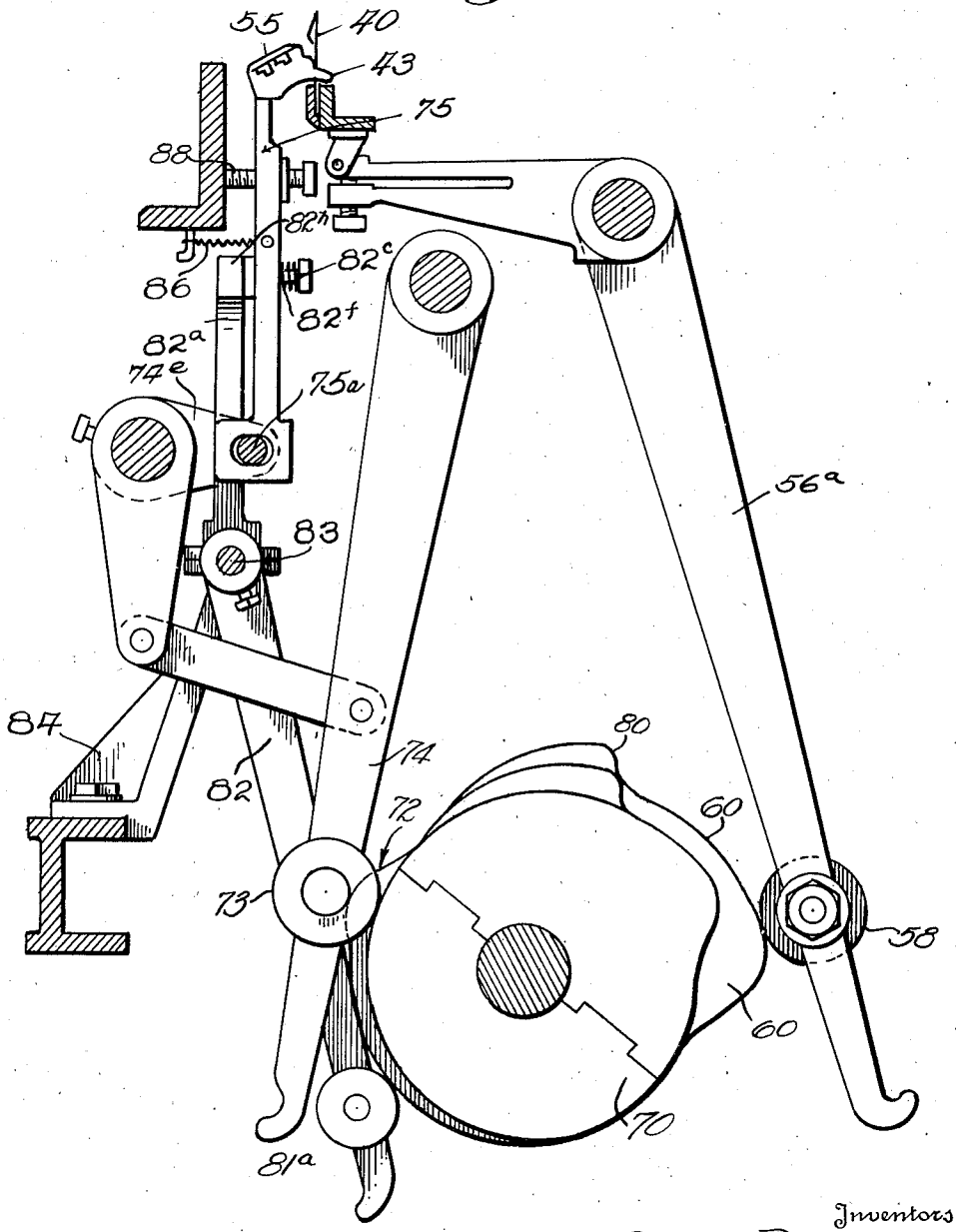
By W. W. Dalton, Attorney

Oct. 7, 1947. H. J. SCHMIDT ET AL 2,428,529

MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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Fig. 2.5



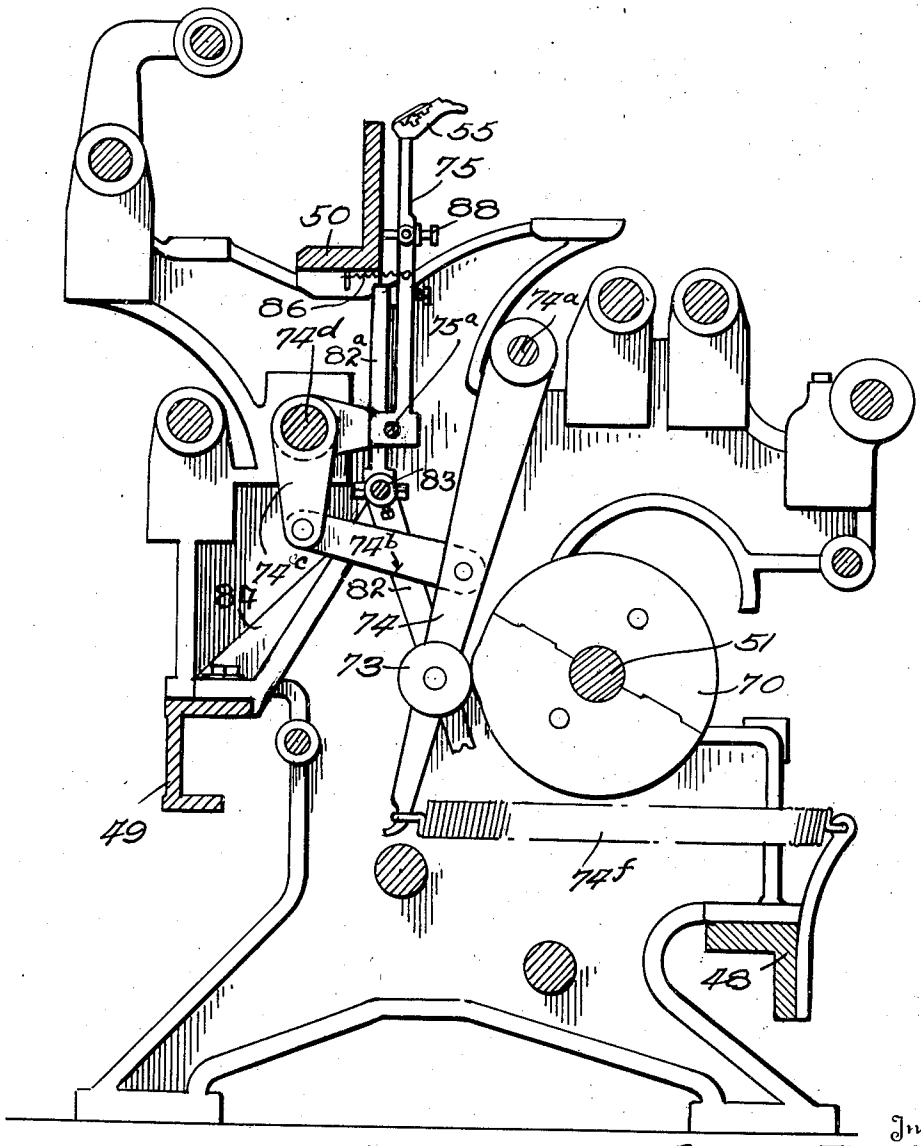
Inventors
Oscar Dojan
& Harry J. Schmidt
By D. W. Dorsey, Attorney

Oct. 7, 1947. H. J. SCHMIDT ET AL 2,428,529

MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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Fig. 26



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MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

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Fig. 27

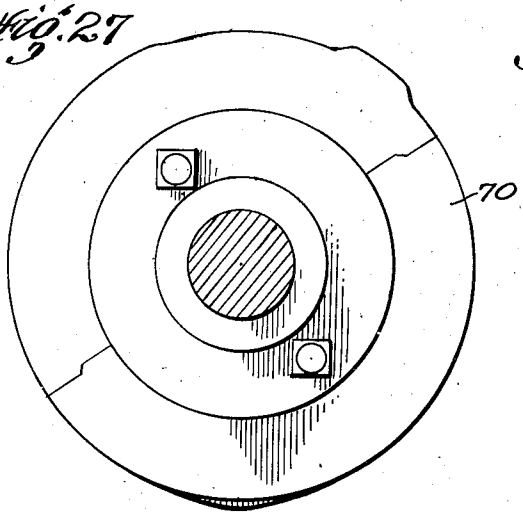
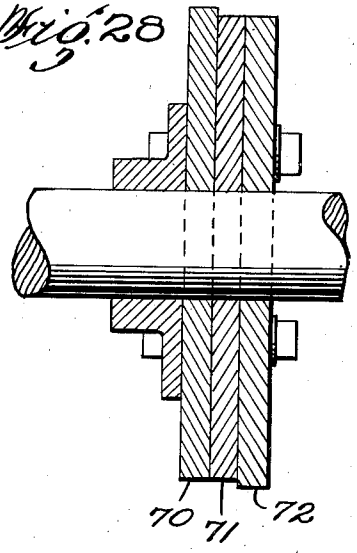


Fig. 28



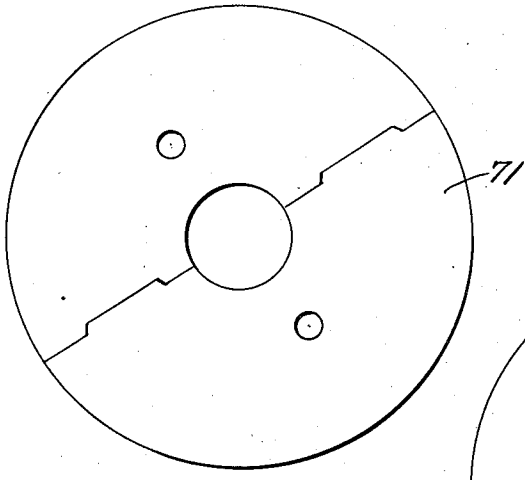


Fig. 30

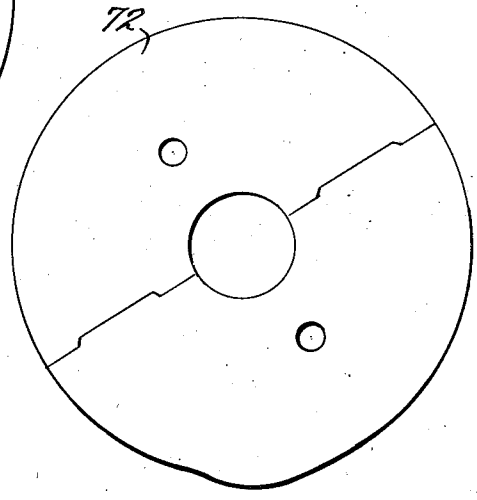


Fig. 29

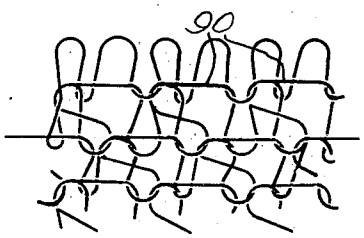


Fig. 31

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By

Attorney

Patented Oct. 7, 1947

2,428,529

UNITED STATES PATENT OFFICE

2,428,529

MEANS AND METHOD FOR MAKING KNITTED FABRICS WITH SPREAD STITCHES

Harry J. Schmidt, Collingswood, N. J., and Oscar Dojan, Temple, Pa.

Application November 15, 1945, Serial No. 628,812

8 Claims. (Cl. 66—96)

1

Our invention relates to a method and means for making knitted fabric with spread loops, and it is an object thereof to provide a machine of the well-known full-fashioned type with improved means enabling the machine to knit a fabric containing or including spread loops, either for ornamentation or to provide a run resistant cloth.

Fabrics containing spread loops have long been known, such loops (knotted stitches) being shown in Fig. 141 of Wilkomm, Die Technologie der Wirkerei, published 1875, and various mechanisms and mechanical methods have been devised for knitting such fabrics. Because of the method of manipulating the loops that are being spread they are liable to slip off the transfer point, or in other ways to make defective work, and it is common knowledge that an undue percentage of seconds occurs in the fabric so made and in articles made with "knotted stitch" cloth. It is the primary object of our invention to provide means in a knitting machine for spreading loops with certainty and definiteness so that a pattern can be knitted with practical certainty of exactness in the pattern, or a run resistant fabric can be knitted which shall be uniform in appearance and in non-run quality.

Another object of the invention is to provide an improved mechanism for operating the knockover bits to give them a novel and desirable motion.

Referring to the drawings, which are made a part of this application, and in which similar reference characters indicate similar parts:

Figs. 1 to 11 are diagrammatic views illustrating the operations of needles and needle co-operating devices in carrying out the process of our invention,

Fig. 11*a*, an elevation, partly in section, showing portions of a needle and a transfer point in transfer position,

Fig. 12 is a front elevation of part of a full-fashioned knitting machine,

Figs. 13, 14 and 15, respectively, front, rear, and top plan views of part of the needle bar,

Fig. 16, a detail of the needle bar and the knockover bit bed and coacting parts, viewed from the left in Fig. 12,

Fig. 17, a detail of a needle and an adjacent knockover bit,

Fig. 18, a perspective of means for clamping the bits to the knockover bit bed,

Fig. 19, a front elevation of the knockover bit bed, and operating means therefor,

Fig. 20, a top plan of the same,

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Fig. 21, a perspective of a knockover bit,

Fig. 22, a view similar to Fig. 19 but showing additional parts,

Fig. 23, a side elevation of a bracket shown in Fig. 22,

Fig. 24, a plan of said bracket,

Fig. 25, a section on line **25—25** (Fig. 19) of parts shown in Figs. 19 to 24,

Fig. 26, a vertical section on line **26—26** of Fig. 12, showing the mechanism for raising and lowering the knockover bit bed,

Fig. 27, a left elevation of the cam for raising and lowering the knockover bed (all cams on the main camshaft being shown in neutral positions in the detail figures),

Fig. 28, a vertical section of said cam and cams carried thereby,

Figs. 29 and 30, elevations of the cams at the middle and right side in Fig. 28,

Fig. 31, a detail of a specimen of fabric made according to my process.

The mechanism shown in the drawings is, in general, that of the full-fashioned knitting machines made by the Textile Machine Works of Reading, Penna., and reference may be had to the 1929 catalogue of that company for details not shown herein, but which are matters of common knowledge to those skilled in the art.

In the drawings:

Fig. 1 shows one of the bearded knitting needles **40** of the series, a sinker **41**, a transfer point **42**, and a knockover bit **43**, the point having just been moved from its normal or rest position, indicated in dotted lines to a position lower than the usual position for transferring stitches as in narrowing operations and the like, in which low position it covers the beard of the lowered needle and is positioned inside the terminal loop on the needle (terminal loops being shown as greatly exaggerated in size in Figs. 1 to 10), the sinker being advanced to hold down the fabric.

In Fig. 2 the needle has been moved downward and swung to the right away from the transfer point to move the needle beard away from the point.

In Fig. 3 the needle is shown as rising to elevate its beard above the terminal loop, the cloth being held down by the sinker during such rise of the needle.

In Fig. 4 the needle has risen to free its beard and has moved somewhat farther to the right, and the sinker has moved back out of the way to permit the point to pass in spreading the loop over an adjacent needle without interference between point and sinker.

Fig. 5 shows four needles of the series including two needles 40*b*, the terminal loops of which are in process of transfer to the respective needles 40*a* of said series. The needles remain fully raised while the points are moved laterally to or nearly to the limit of their lateral movement and both needles and points are then lowered as shown in Fig. 6. It should be noted that there are here shown only half as many points as needles, i. e., a point at every other needle, as when run-resistant cloth is to be knitted. Of course if only a few ornamental spread stitches are to be made, the number of points is made to correspond to the pattern desired. The fabric and the new stitch are both controlled by the bits before the bits come all the way forward to lock the stitches, the fabric resting on the bits at this time.

The bit 43 is now advanced (Fig. 7) to hold the leg *d* of the spread loop securely under the beard of needle 40*b* in said figure by means of the nose, best shown at 43*a* in Figs. 11 and 21, the bits remaining in this position until after the leg of the loop is safely under the needle beard. The relative positions of the point 42 and the needle 40*a* are such that the legs *d* and *e* of the loop do not engage under or within the needle beard but slide over the top of the needle (Figs. 8 and 9) as the downward movement of the needle continues. The sinker remains retracted as in Fig. 6.

Fig. 9 shows a position where the needles have been fully lowered and the loop is located in position to surround the needle 40*a* when the needles are raised. The sinkers 41 are now advanced to hold the loop down when the needles rise. Fig. 10 shows a later position where the needles and points are both ready to transfer loops as in Fig. 11, and the loops, together with the fabric, are being held down by the sinkers (Fig. 11). After the transfer operation is completed the points return to the dotted line position of Fig. 1. Fig. 11*a* shows the terminal loop 45 of the previously formed cloth as being under the needle beard at the time when the new loop 44 is being placed on the needle 40.

The steps of the operation may be summarized as follows: the paragraph numbers corresponding to figure numbers in the drawings:

1. Points have been located to remove stitches from needles. Sinkers in advanced position.

2. Needles moving downward until top of hooks about 1/16 to 1/8 inch above adjacent part of sinker, and also moving away from points to relieve pressure of point against beard. Sinkers still remain forward to hold down loops.

3. Needles rising to raise beards above terminal loop on needles. Sinkers remain forward to hold down fabric and end loops.

4. Sinkers back, needles fully raised and farther from presser bar to fully relieve pressure of point on beard and permit points to move laterally past needle either to right or left. Bits lowered to permit points to pass by.

5. Perspective of Fig. 4, showing how points have moved laterally. Beards about 1/16 inch above terminal loops as in Fig. 4.

6. Needles and points moving downward, bits moved upward to stretch and support fabric and spread loops.

7. Knockover bits advanced to hold leg of each spread loop under beard of its needle as needles descend.

8. Needles descending toward position where spread or stretched loop slips over end of needle

40*a*. Bits moved downward and backward to normal position.

9. Needles fully down with selected loops spread in position to pass around needle 40*a*. Sinkers being advanced to hold down fabric and spread loops.

10. Beard being closed by point. Needles and points rising, and sinkers advancing to hold down fabric and the spread loops (see Figs. 11 and 11*a*). Points, when freed, return to idle (dotted line) position of Fig. 1.

Our method may be carried out on full-fashioned knitting machines of various types by appropriate adaptations of the mechanism, but we have shown a section of a machine of the well-known Reading type and parts of such a machine in detail to indicate to those skilled in the art the alterations made therein for our purpose. The machine includes a frame comprising a front beam 48 (Figs. 12 and 26), a back beam 49, a center bed 50, a main cam shaft 51, a needle bar 52, yarn fingers 53, a narrowing point bar 54, a knockover bit bed 55 (Figs. 16, 19, 20), with means 55*a*, 55*b*, for clamping the bits thereon, and other conventional parts and operating devices therefor.

The needle bar 52 (Fig. 13) has the usual means, including depending rock arm 56 (Fig. 12), follower 58, and cams 59 and 60 (Figs. 12, 34 and 35, etc.) for moving the bar vertically. Other cams such as the narrowing cams 62, the catch bar cams 63, 64, and the presser cams 65 and 66 for rocking the needle bar to press the beards, by the usual connections, including a rock arm 56*a* for each section, are arranged along the main cam shaft, and are connected by conventional means to the parts operated thereby. The lift cams 70, 71, 72 (cam 71 being round or idle) act through intervening connections including a roller 73 on arm 74 to raise and lower the knockover bit bed 55 as required in putting in welt bars, etc., the arm 74 being tightly mounted on a shaft 74*a* and being connected by link 74*b* to rock arm 74*c* on a shaft 74*d*, said arm 74*c* being integral with arm 74*e* or fixed thereto, and said arms 74*e* loosely engaging a shaft 75*a* at the lower ends of standards 75 that carry the knockover bed 55, said standards having horizontally elongated slots receiving shaft 75*a*. Spring 74*f* holds the roller 73 against its cams. It will be understood that various cams on the main cam shaft have been changed in shape in order to give the several parts the relative movements necessary for our purpose, and such altered shapes are illustrated in Figs. 27 to 30 in sufficient detail to inform those skilled in the art.

The knockover bit bed is moved backward and forward to lock one leg of each of the desired stitches under the beard of its needle, and this is done by means of cams 80, 81 on the main cam shaft, arranged to engage a roller 81*a* on a lever 82 mounted on a shaft 83 carrying rock arms 82*a*, said shaft being supported by brackets, one of which is shown at 84 as mounted on the back beam 49. In order to avoid interference with the rock arms 56*a*, which rock to press the needle beards, the shaft 83 is not continuous over the length of the machine, but is divided into sections, each supported at opposite ends in bearings carried respectively by arms 84*a*, 84*b* of an adjacent pair of the forked brackets 84, there being as many of said forked brackets as there are sections in the machine. A spring 85, as usual, holds the lever 82 in such position that its follower 81*a* contacts with cam 80 or 81.

Accurate determination of the extreme rear position of the knockover bits is provided by a setscrew 88 (Fig. 16) on each standard 75, said screws bearing against center bed 50 and being each fixed in adjusted position by a nut 88'. The standards are normally held in rearmost position, where screws 88 rest against the center bed, by springs 86 secured at one end to the center bed and at the other to pins 86a (Figs. 16 and 22).

At the upper end of each rock arm 82a a crossbar 82b extends at its ends back of the adjacent pair of standards 75, 75 (Figs. 16, 19 and 22), said bar being secured to the standards by bolts 82e shown in Fig. 16. Each rock arm 82a has a head 82h, shown in dotted lines in Figure 19, which is yieldably secured to its crossbar by means comprising bolts 82c (Figs. 19 and 25) threaded into laterally extending arms of head 82h. These bolts pass through vertically elongated slots 82d in bar 82b which permit the parts 55, 75, 82b and elements carried thereby to move up and down independently of the rock arm 82a, etc., and are encircled by springs 82f arranged between the heads of the bolts 82c and washers 82g resting against the front face of crossbar 82b. Thus it will be seen that the knockover bits are moved positively forward to an extreme forward position determined by the contour of cams 80 or 81, and are yieldingly drawn back by means of springs 82f, 85 and 86.

In Fig. 31 we have shown a specimen of fabric which may be made by our process. In said figure, stitches 90 in alternate or even numbered wales have been stretched so as to extend over an adjacent intermediate stitch in the next wale to the left. Obviously, the stitches may be spread to the right instead of to the left, the spread stitches may be increased or reduced in number, and in general the process and its products may be changed in various ways. It will be obvious also that the knockover bed movement herein disclosed may be utilized in other ways and for other purposes and that its construction may be varied. Therefore we do not limit ourselves to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

This application is a continuation-in-part of our application, Serial No. 444,406, filed May 25, 1942.

Having thus fully described our said invention, what we claim as new and desire to secure by Letters Patent is:

1. A method of knitting fabric having spread stitches therein on a machine having bearded needles, sinkers, transfer points and knockover bits, comprising the steps of entering a transfer point in the loop on each of one or more of said needles, lowering the needles to land such loops on the points, moving the needles away from the points, raising the needles to clear such loops off their beards, holding down the fabric by means of the sinkers during all of the foregoing steps, retracting the sinkers and lowering the bits, moving the points laterally over at least one needle space to spread said loops, depressing the needles and points while raising the bits to stretch and support the fabric, advancing the bits to hold a leg of each spread loop against the shank of its needle, lowering the needles and returning the bits to idle position, advancing the sinkers, and raising the needles and points to clear the spread loops off the points and leave them on the needles.

2. A method of knitting fabric having spread

stitches therein on a machine having bearded needles, transfer points, sinkers and knockover bits, including the steps of entering a transfer point in the loop of each of one or more of the needles, lowering the needles to a level where their heads are still above the plane of the lower part of the sinkers so as to land the loops on the said points, raising the needles to clear their beards, holding down the fabric throughout all of the foregoing steps by means of the sinkers, retracting the sinkers and lowering the bits to provide space for lateral movement of the points, moving the points laterally at least one needle space, moving the bits upward and forward to cause them to hold a leg of each spread loop against the shank of its needle, and placing the spread loops on the adjacent needles.

3. A method of knitting fabric having spread stitches therein on a machine having bearded needles, transfer points, sinkers and knockover bits, including the steps of engaging loops of selected needles by transfer points while holding the fabric down by means of the sinkers, retracting the sinkers and depressing the bits to permit lateral movement of the points, moving the points laterally in the space so provided, the movement being at least over one needle space for spreading the loops carried by said points, raising the bits while lowering the needles and points, advancing the bits to hold a leg of each spread loop against the shank of its needle, and moving the spread loops from the transfer points onto adjacent needles.

4. A method of knitting fabric having spread stitches therein on a machine having bearded needles, transfer points, sinkers and knockover bits, including the steps of entering transfer points in selected needle loops, while the fabric is held down by the sinkers, then retracting the sinkers and lowering the bits, moving the points laterally over at least one needle space, positioning the bits to hold down a leg of each spread loop against the shank of its needle, and placing the spread loop on the needle adjacent thereto.

5. In a full-fashioned knitting machine having a main cam shaft, knockover mechanism comprising a knockover bit bed, means operated from the main cam shaft for raising and lowering said bed, means independently operated from said cam shaft for giving the bit bed a forward and backward movement, the last-named means acting to move the bit bed positively toward the needle bar and including standards supporting the bed, a shaft, a lever on said shaft, means for oscillating said lever, slidable connections between said lever and said standards to permit vertical movement of the bed, and yielding connections between said lever and the standards to permit independent swinging movement of the lever.

6. In a full-fashioned knitting machine having a main camshaft, knockover mechanism comprising a knockover bit bed, standards supporting said bed means operated from the main camshaft for raising and lowering said bed, and means independently operated from said camshaft for giving the bit bed a forward and backward movement, the means for raising and lowering the bed including a rock arm having lost motion connections with the lower ends of the standards, the means for giving said bed a forward and backward movement including a rock arm having a lost motion connection with an intermediate portion of said standards, and resilient means holding said standards against the last-named rock-arm.

7. A device as in claim 6, including resilient

means for moving said bit bed away from the needle bar, and means for positively limiting such movement.

8. In a full-fashioned kitting machine having a main camshaft, knockover mechanism comprising a knockover bit bed, means operated from the main camshaft for raising and lowering the bit bed, means independently operated from said camshaft for giving the bit bed a forward and backward movement, the last-named means acting to move the bit bed positively toward the needle bar, said means including standards supporting the bed, a shaft, a rockarm on the shaft, means for oscillating the rockarm, yielding connections between the rockarm and the standards to permit vertical movement of the bed, and yieldable means to move the bit bed away from the needle bar.

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