

Oct. 7, 1930.

H. McADAMS

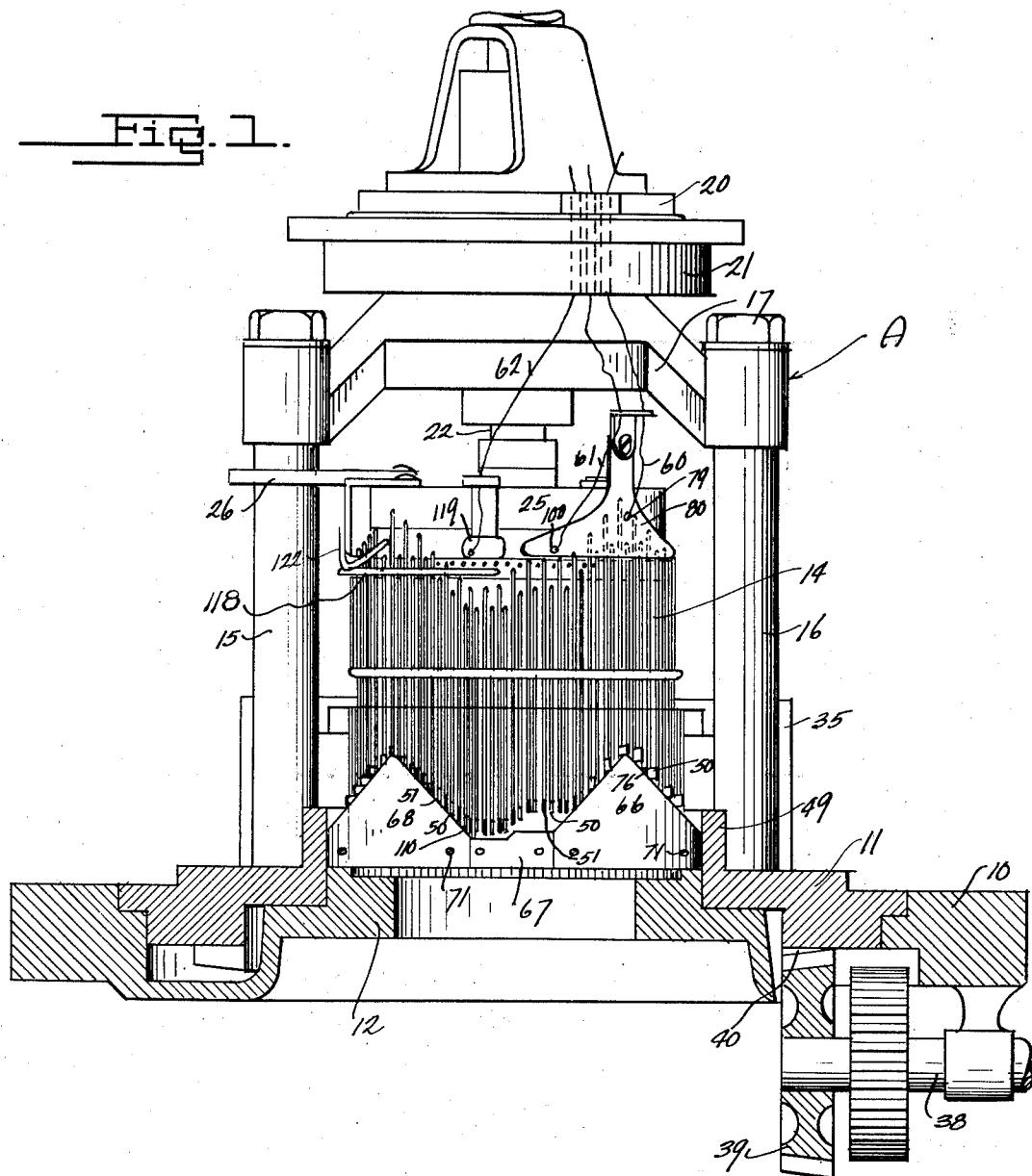
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KNITTED FABRIC AND MACHINE FOR KNITTING THE SAME

Filed Dec. 18, 1926

6 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

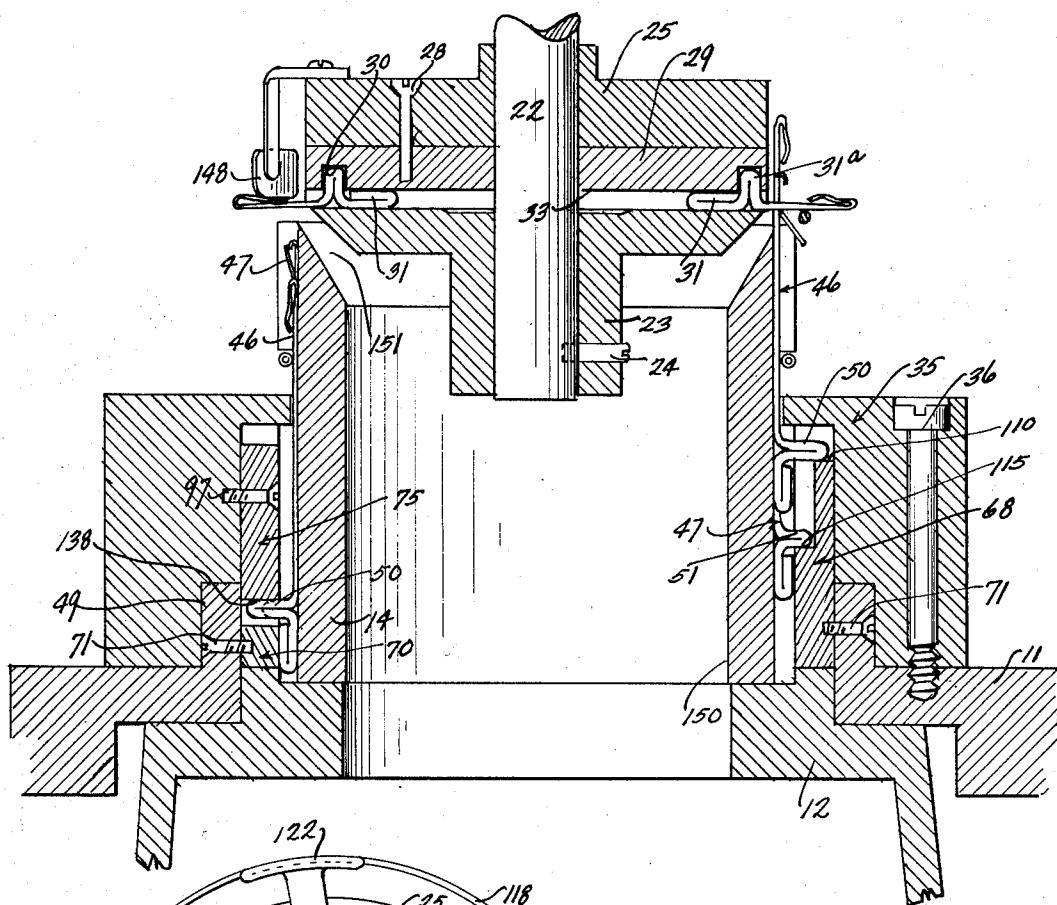
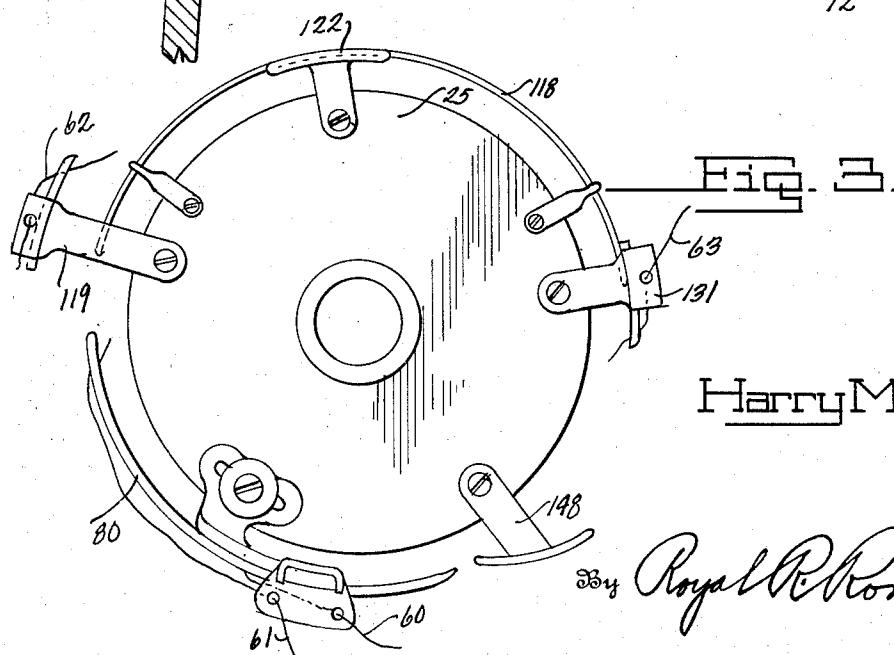


Fig. 3.



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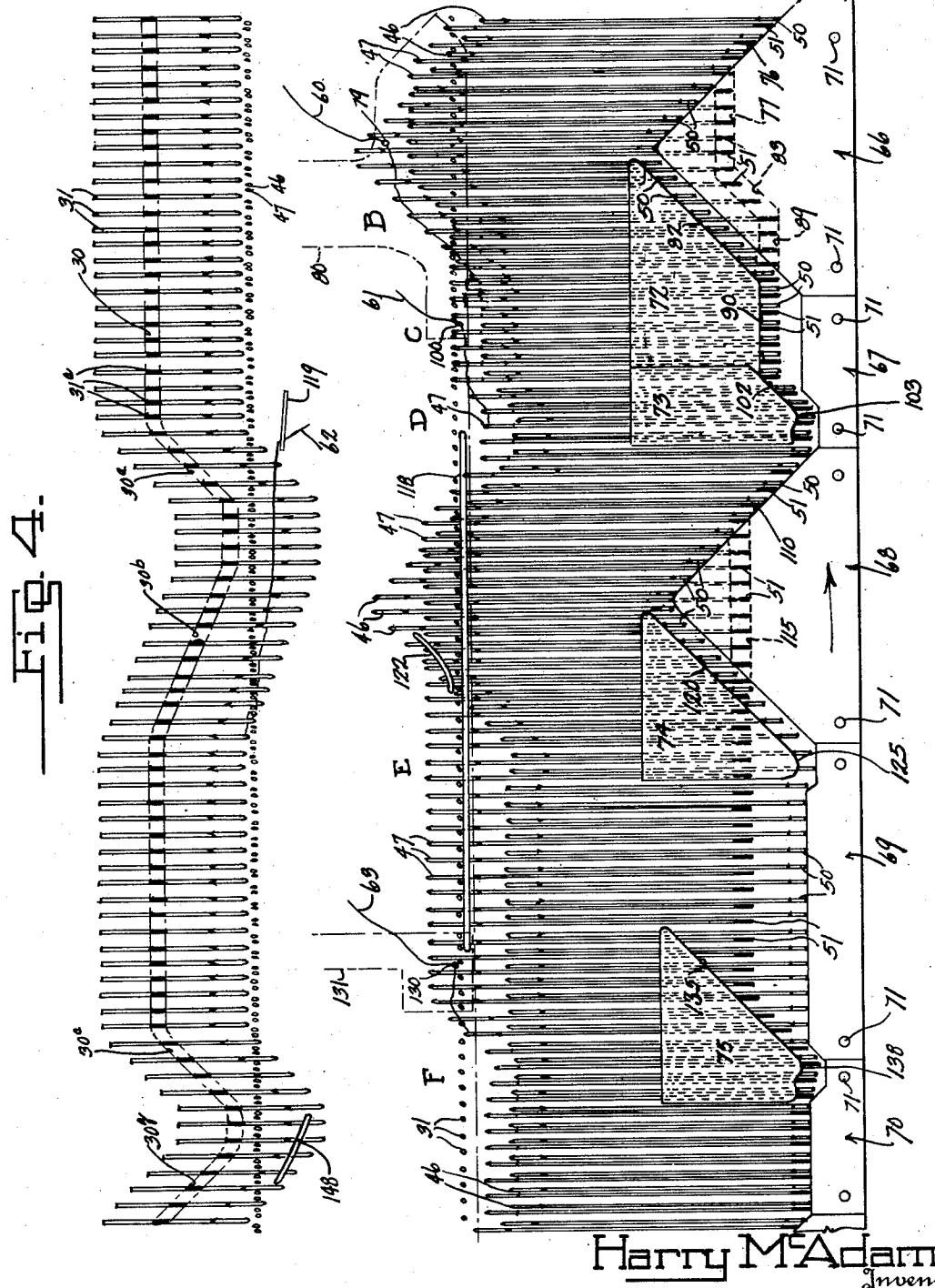
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KNITTED FABRIC AND MACHINE FOR KNITTING THE SAME

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6 Sheets ~~1~~ Sheet 3



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FIG. 5.

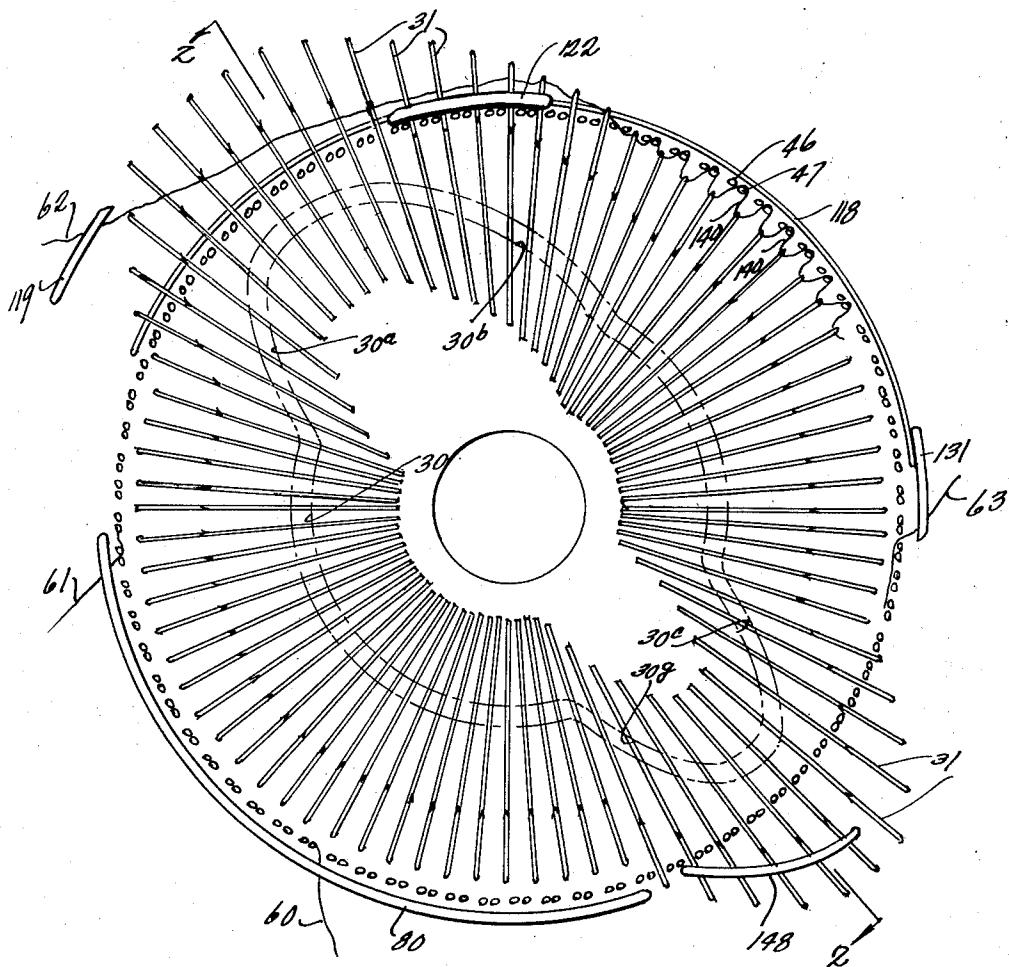
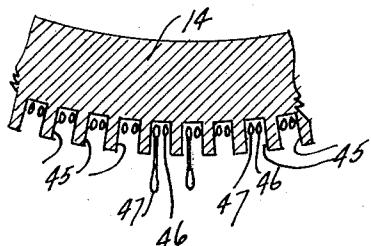


FIG. 6.



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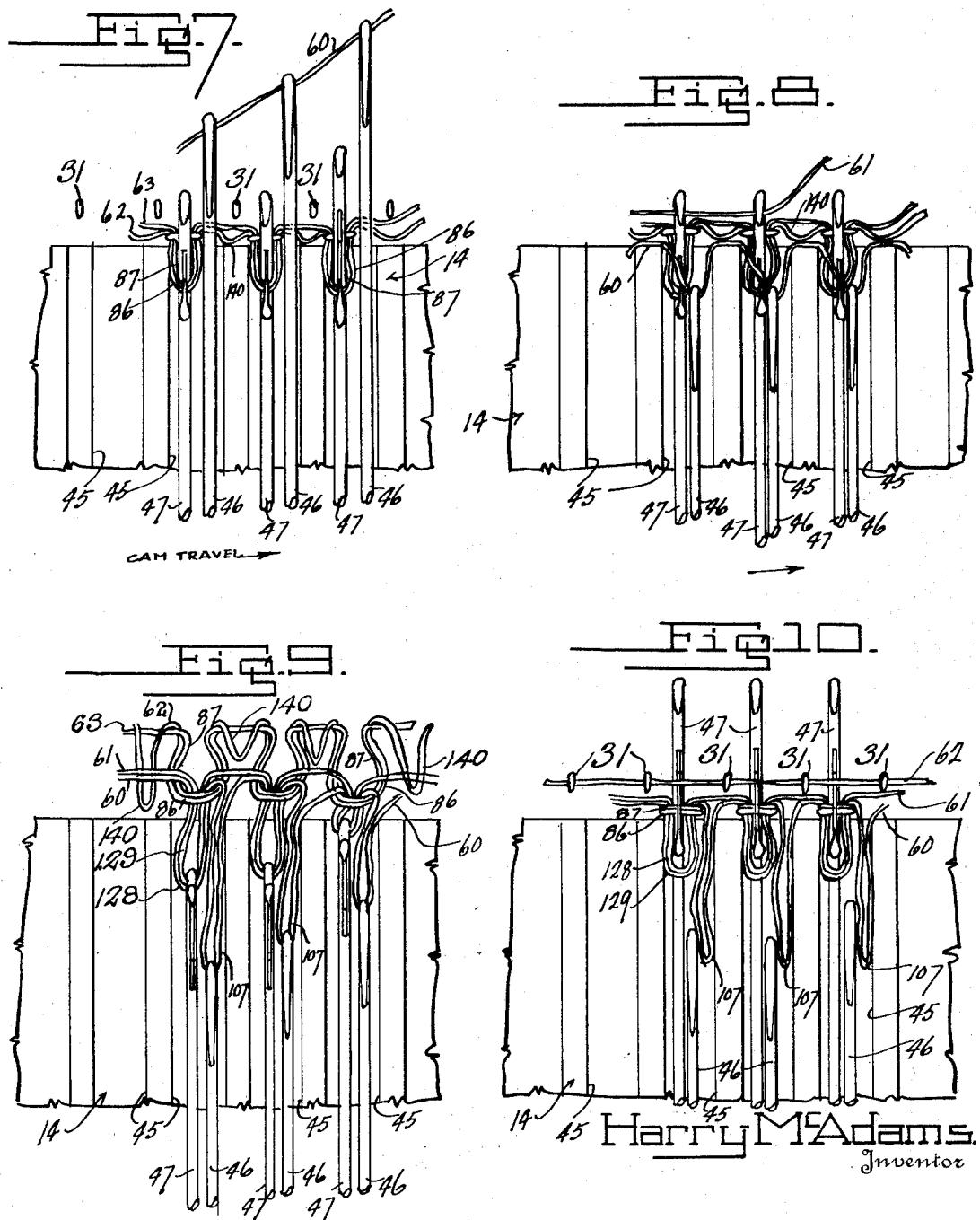
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KNITTED FABRIC AND MACHINE FOR KNITTING THE SAME

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6 Sheets-Sheet 5



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KNITTED FABRIC AND MACHINE FOR KNITTING THE SAME

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6 Sheets-Sheet 6

Fig. 12.

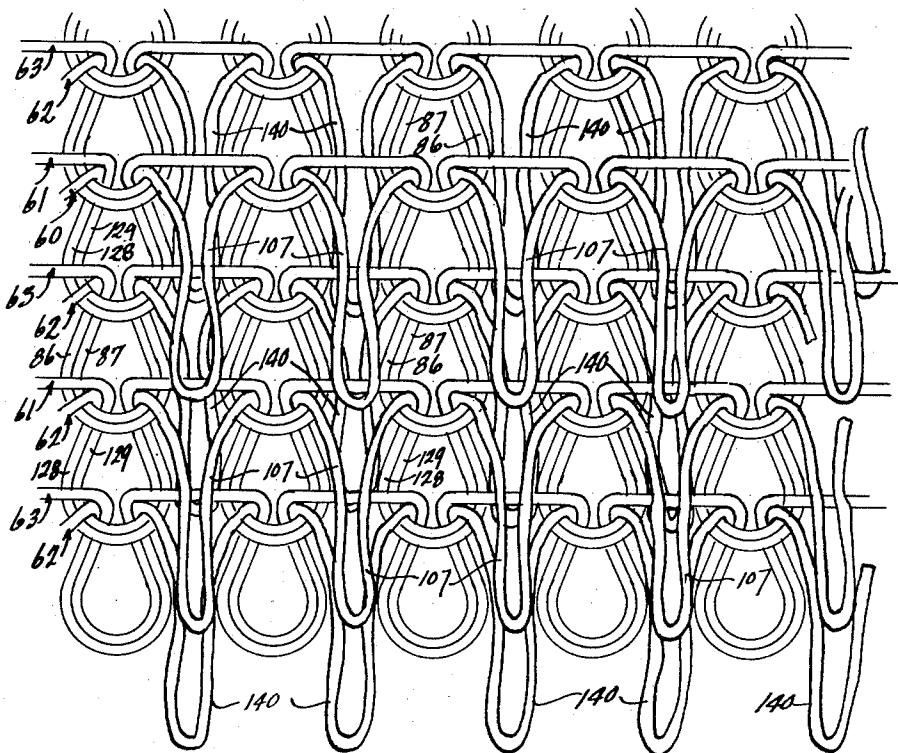
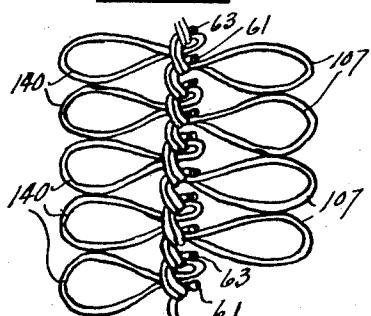
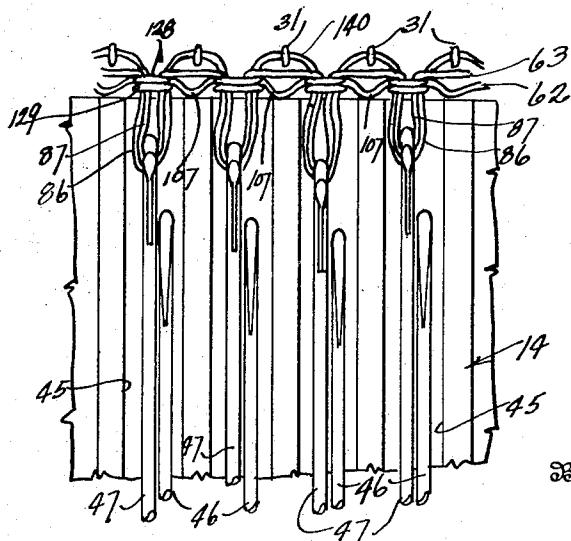


Fig. 13.

Fig. 11.



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UNITED STATES PATENT OFFICE

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KNITTED FABRIC AND MACHINE FOR KNITTING THE SAME

Application filed December 18, 1926. Serial No. 155,661.

This invention relates to improvements in knitting machines.

The primary object of this invention is the provision of a circular knitting machine, embodying improved means to knit thereon a fabric with terry threads held therein in the wales of the base yarn, in such manner that the terry threads provide loops outstanding at both sides of the fabric, in a slack 10 free relation, in a preferably thickly matted relation, so that the base yarn wales are substantially hidden, and produce a fabric simulating, in appearance only the well known Turkish towel, which is a conventionally woven product, in contra-distinction to knitting.

A further object of this invention is the provision of means and an improved method for producing slack looped pile towelling; 20 wash rags; bath mats; bath robes; and other fabrics, by means of knitting.

A further object of this invention is the provision of an improved method or process for the knitting of fabric, by manipulating 25 main knitting yarn in such relation as to provide a base fabric, and in cooperation with which is employed terry yarns drawn through and interknitted with the wales of the base fabric to provide slack outstanding loops 30 in a closely matted relation at both sides of the fabric.

A further object of this invention is the provision of a method and apparatus for knitting looped terry fabric, such as described in my co-pending application Serial 35 Number 146,680, filed November 6, 1926, and including departure from such application in the efficient manipulation of a plurality of terry threads to knit the same in a novel relation in a base knitted fabric.

A further object of this invention is the provision of knitting apparatus including three cooperating sets of needles, one of which is adapted to knit a base fabric, and 45 other which is adapted to control a terry yarn for the formation of slack loops at one side of the base fabric, and the other set of needles being adapted to control another terry yarn for the formation of slack loops 50 at the opposite side of the base fabric.

Other objects and advantages of this invention will be apparent during the course of the following detailed description.

In the accompanying drawings, forming a part of this specification, and wherein similar reference characters designate corresponding parts throughout the several views, 55

Figure 1 is a side elevation, partly in section, of the upper part of the improved knitting machine, showing the needles of the 60 same in position for the feeding of different yarns into the cylinder and dial needles.

Figure 2 is a vertical sectional view taken through the improved knitting machine, substantially on the line 2—2 of Figure 5 of the 65 drawings.

Figure 3 is a plan view of the dial cap of the improved machine, showing the carriers thereon for the guiding of the main and terry yarns, as well as showing beard pressers, 70 and guides thereon for holding latch needles open.

Figure 4 is a developed plane view of both the dial and cylinder needles, showing three cooperative sets of needles, one set of which is 75 shown in the upper row of needles; the same being dial needles; and the other two sets of which are shown in the lower row of needles, as being cylinder needles, and showing the same in their cooperative cam operated relation for the handling of knitting and terry 80 yarns.

Figure 5 is a plan view, showing the cam operation upon the dial needles, with the dial cap and cam removed to expose the relative 85 location and relation of the dial needles, in so far as the dial cam operates upon the same with respect to the needles of the cylinder, and the feed of the threads.

Figure 6 is a fragmentary sectional view 90 taken through a portion of the cylinder, showing the grooved arrangement thereof for the reception in each groove of the cylinder of two needles, one of the needles being a latch 95 needle to cooperate in the knitting of the base fabric, and the other needle being a beard needle for cooperatively controlling the terry thread to be looped at one side of the fabric.

Figures 7 to 11 inclusive are enlarged fragmentary views, somewhat diagrammatic and 100

exaggerated, but showing progressively various steps in the knitting of terry looped fabric.

Figure 12 is a distorted diagrammatic representation of an enlarged fabric knitted upon the improved knitting machine, and after the improved method herein described, this view being merely intended to show the relative interknitting of the main and terry threads, and not being a simulation of the resultant product, since in the resultant fabric the terry loops preferably completely hide the base knit portion of the fabric.

Figure 13 is an enlarged sectional view taken transversely through a portion of the fabric, showing somewhat the relation in which the fabric would appear in cross section.

In the drawings, wherein for the purpose of illustration is shown only a preferred embodiment of this invention, the letter A may generally designate the improved knitting machine, which may be of various types suitable for knitting a fabric of the type herein described, but which includes novel operating mechanism as hereinafter described.

In the preferred construction the machine A preferably comprises a head ring or supporting frame 10, which rotatably supports therein the gear ring 11 centered on the portion 12 of the head ring or frame 10. The hollow cylinder 14 is rotatably supported in a suitable seat provided in the portion 12, and is of course concentric with the gear ring 11. Diametrically opposed supporting posts 15 and 16 are vertically carried by the gear ring 11, for rotation therewith, and a yoke 17 is carried at the top of these posts, in a detachable relation, as is usual. The bobbin supporting construction and guide for the threads or yarns is suitably supported above the yoke, in a conventional relation, such as set forth in my copending application above referred to, and more specifically detailed in Patent 1,012,966 granted December 26, 1911, or in other approved manner, and includes a rotatable bobbin supporting piece 20, beneath which is a stationary ring 21, thru which centrally extends the stationary post 22, to which the dial 23 is keyed, as illustrated at 24 in Figure 2 of the drawings.

A dial cap 25 is rotatably supported upon the post 22, and is rotated with the gear ring 11 and with the posts 15 and 16, by means of an attaching bracket or arm 26 illustrated in Figure 1 of the drawings. It is of course understood that the dial cap 25 has attached thereto, preferably at 28, see Figure 2 of the drawings, a disc like cam 29, wherein a cam groove 30 is provided, which receives the butts 31^a on the preferably spring beard type of dial needle 31, illustrated to best advantage in Figure 2 of the drawings, in order to project and retract the dial needles after the

manner illustrated in Figures 4 and 5 of the drawings.

The dial 23 has a plurality of radially disposed grooves 33 therein, of any approved number, consistent with the size and character of the machine and fabric to be knitted, and these grooves 33 open at the periphery of the dial, and slidably receive therein individual reciprocating spring beard needles 31, as is well illustrated in various figures of the drawings.

A multiple section cam casing 35 may be bolted or otherwise keyed at 36 upon the gear ring 11, so as to surround the needle cylinder 14, and the same receives some of the cams thereon, to be subsequently described, for manipulating various needles of the two sets of cylinder needles to be subsequently described.

As is illustrated in Figure 1 of the drawings, means is provided to rotate the gear ring 11, including a driven shaft 38, having a gear 39 thereon which meshes with the downwardly facing gear teeth 40 on the lower surface of the ring gear 11, as is conventional, and it can readily be understood that upon rotation of the ring 11 the posts 15 and 16 will be rotated therewith, and thru the bracket arm 26 the dial cap 25 will be rotated, and likewise the connected cam 29, for causing reciprocation of the dial needles 33, which are located in individual grooves in the stationary dial 23.

The cylinder 14 includes a somewhat novel construction. It is of preferably hollow cylindrical formation, and as is best illustrated in Figure 6 of the drawings, and likewise illustrated to advantage in Figures 7 to 11 of the drawings, the said cylinder body is provided with external vertically disposed grooves 45 therealong, each of which reciprocably receive a spring beard needle 46 and a latch needle 47. The needles 46 form one series or set of spring beard needles adapted to control a terry yarn or thread in a cooperative relation with the latch needles 47 which form a second set or series of needles adapted to control knitting yarn and to knit the base fabric from which the terry loops project. The needles 46 and 47 are operated upon by means of cams carried by the sections of the cam carrier 35 and by the upstanding annular flange 49 concentrically surrounding the cylinder 14. The set of needles 46 and 47 are respectively provided with long and short butts 50 and 51, adjacent the lower ends thereof, which are engaged and operated upon by the cams, as will be subsequently mentioned. A most important difference between the needles 46 and 47 lies in the fact that from the butts of the needles, to the hook heads thereof which engage the threads, the said needles of the two sets are of unequal lengths, with the needles 46 shorter than the needles 47; the difference in length being about $\frac{3}{16}$ of an

inch, although this difference may vary, since it determines to a considerable extent the length of the terry loops at one side of the fabric.

Referring now to the control of the knit and terry threads or yarns, and the reception thereof in the fabric, the operation is more particularly designated in Figures 4 and 7 to 12 of the drawings, and the direction of rotation of the cams is as designated by the arrows adjacent the various figures of the drawings; it is of course understood that the cam cylinder and needle dial do not rotate, but that their respective needles reciprocate. The needles 46 and 47 are of course disposed in alternating relation about the cylinder, and a single dial needle is provided for each pair of needles 46 and 47; it being understood that the dial needles project in a reciprocating relation through the spaces between the pairs of needles 46 and 47, as is illustrated in Figure 5 of the drawings and elsewhere.

In the formation of the fabric, a typical series consists of a first terry thread or yarn 60; a first knit thread or yarn 61, a second terry thread or yarn 62; and a second knitting yarn or thread 63. It is of course understood, and intended, that any number of such series may be provided on the machine A, and that the number of needles shown on said machine may be vastly increased, since the illustration of the invention requires, for clearness, that only the series illustrated need be shown, to designate the principle, and the arrangement illustrated may be multiplied any number of times desired, without departing from the spirit of the invention as claimed.

Referring now to operation of the needles of the cylinder and dial, by the respective cams thereof, for controlling the yarn threads above mentioned, it is to be noted from Figures 2 and 4 that the gear ring flange 49 has attached thereto cams 66, 67, 68, 69 and 70, in a circular relation; the cams being attached by means of set screws 71, as illustrated in Figure 2 of the drawings. The cams 72, 73, 74 and 75 are supported upon the cam casing 35, by means of detachable screws or elements 97, as is conventional.

As the gear ring 11 and the cam casing 35 rotate, all of the cylinder needles 46 and 47 ride upon the inclined cam edge 76 of the cam 66; this cam 66 being sufficiently thick that the edge 76 will engage both long and short butts 50 and 51 as is well illustrated in Figure 4 of the drawings. The cam 66 on the inside face thereof is provided with a preferably horizontal short butt receiving groove 77, of a depth sufficient to permit the short butts 51 of the knit thread receiving latch needles 47 to enter, whereas the elevation of the spring beard needles 46 is continued inasmuch as the longer butts 50 there-

of continue their ride upon the inclined edge 76 to the peak of the cam 66. The reason for projecting the spring beard needles 46 above the latch knitting needles 47, at the cam 66, is in order to project the beards of the needles 46 above the hooks of the latch needles 47, to take the first terry yarn or thread 60 as is illustrated in Figure 4 of the drawings, which is fed through an opening 79 in the carrier 80, beneath the beards of the needles 46 and above the latch needles 47 of the cylinder. Another reason for elevating the latch needles 47 on the cam 66, is in order to open the latches and permit the latches thereof to ride above portions of the terry yarn 62 and knit yarn 63 which have been previously received on said knitting needles 47, as will subsequently appear, and by elevating the needles 47 on the cam 66 the latches thereof may be made to ride above the yarns held on the needles 47 at this location, in order to prepare for a cast off of said yarns at a subsequent knitting location. During the elevation of the needles 47 to the groove 77 of cam 66, the latches, of course, open due to the sliding of the yarns over the latches as the needles elevate, and the carrier 80 at the lower edge thereof acts as a cam to retain the latches of the needles 47 open until the first knitting yarn or thread 61 has been fed thereinto.

After the needles 46 have been elevated by the cam 66 to the desired extent, the first terry thread or yarn 60 is fed beneath the beards thereof, as illustrated in Figure 4, and immediately thereafter the long butts 50 of the needles 46 are pushed downwardly by coming into engagement therewith of the downwardly inclined cam edge 82 of the cam 72, as illustrated in Figure 4. Immediately prior to the lowering of the spring beard needles 46 to their lowest points on the cam 72, it is to be noted that the latch needles 47 are also lowered by the pushing downwardly of the short butts 51 thereof in a downwardly inclined cam groove 83, of cam 66, as is illustrated in dotted lines in Figure 4 of the drawings, and the purpose of lowering the latch needles at this location is in order to slip the loops 86 and 87 of the second terry and knit yarns under the latches, and the butts 51 then ride along the horizontal groove 89, in the cam 66, and the latch needles have then been lowered to a point on the cylinder approximately designated in Figures 4 and 7 of the drawings. In this location it is to be noted that under the latch of each of the latch needles 47 is engaged yarn looped portions 86 and 87 of the terry and knit threads 62 and 63 respectively, and the beard needles 46 are lowering with the first terry thread 60 under the beards thereof. The enlarged view Figure 7 is taken at the location where the cams 66 and 72 operate on the long and short butt needles 46 and 47, approximately at the designation B in Figure 4 of the drawings.

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120

125

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From the location B the cam 72 continues to lower the long butt spring beard needles 46 until the butts 50 and 51 of the long and short butt needles 46 and 47 are on a horizontal line, and the butts thus ride along the lower cam edge 90 of the cam 72, and it is to be noted that the spring beard needles 46 at this location have drawn the terry yarn 60 into the grooves 45 of the cylinder 14, with the intermediate portions of the terry yarn 60 between the grooves overhanging the top of the cylinder, as well illustrated in Figure 8 of the drawings, which designates in an enlarged fragmentary and somewhat diagrammatic manner the upper end relation of the needles 46 and 47, at approximately the location C, designated in Figure 4 of the drawings. At this point it is to be noted that the spring beard needles 46 have drawn the thread 60 down beneath the hooks of the spring latch needles 47, although not below the latches of said latch needles 47, and at the location C the first knit thread 61 is fed through an opening 100 in the carrier 80 beneath the hooks of the elevated latch needles 47. Thus, at the location C it is to be noted that beneath the latch of each of the needles 47 the loops 86 and 87 above described are retained on the needles, and above the latches of each of the needles 47 and beneath the hooks of said needles the threads 60 and 61 are received, and the terry thread 60 is drawn downwardly into the groove 45 by the lowering of the spring beard needles 46, as is well illustrated in Figure 8 of the drawings.

Immediately succeeding the location C, the cam 73 advances and the downwardly inclined cam edge 102 thereof rides against both the long and short butts 50 and 51 to project said needles 46 and 47 downwardly to a knitting point 103, and at which location the latch knitting needles 47 have been projected low enough to cast off the loop portions 86 and 87 previously beneath the latches thereof, and since the threads 60 and 61 are engaged beneath the hooks of the latch needles 47, the cast off of the loop portions 86 and 87 receive the terry and knit threads 60 and 61 through the cast off loops, in order to thus form a wale of the loop 87 and the loop 86 follows around the wale and intermediate the wales provides terry loops 140, at the inside of the fabric; said loops 140 being formed as subsequently described, by the dial needles. At this knitting point 103, designated by letter D in Figure 4 of the drawings, and illustrated in enlarged relation in Figure 9 of the drawings, the latch needles 47 have been lowered sufficiently to cause the knitting operation to take place, as can be readily understood, and well illustrated in the drawings, and it is to be noted to what extent the beard needles 46 have been lowered, to pull the first terry thread or yarn

60 downwardly into the grooves 45 of the cylinder 14, to provide relatively long terry loops 107 which will subsequently form the loops at the opposite side of the fabric from the loops 140, say the outside of the fabric. The extent to which the beard needles 46 are retracted downwardly into the grooves 45 of the cylinder 14 determines the length of the loops 107, as is readily apparent from Figure 9 of the drawings.

Succeeding the knitting location 103 the cam 68 advances and the long and short butts 50 and 51 both ride upwardly on the lower portion of the upwardly inclined edge 110 of the cam 68 in order to project both the beard and knitting needles 46 and 47 upwardly. The beard needles 46 are elevated at the cam 68 in order that the terry loops 107 may be slipped from beneath the beards thereof in order to cast the same off during the next lowering of the needles 46; and the reason for elevating the latch needles 47 at the cam 68 is in order to open the latches thereof and receive beneath the hooks thereof the second terry yarn or thread 62, which is fed in cooperation on dial needles 31 and the cylinder latch needles 47.

After the latch needles 47 have been elevated to open the latches thereof the butts 51 of the latch needles 47 ride along a horizontal cam groove portion 115 of the cam 68, but the long butts 50 of the needles 46 will continue to ride along the cam edge 110 to the peak of the cam 68, due to the fact that at the groove 115 the cam 68 is not cut all the way through as is quite readily apparent, and will be understood by anyone skilled in this art. Thus, the beard needles 46 are elevated until the beards thereof are elevated above the top of the hooks of the latch needles 47, which condition occurs at the peak of the cam 68. The extent to which the latch needles 47 are elevated by the cam 68 is limited, so that preferably the lower ends of the latches of said latch needles 47 here are received within the grooves 45, although the latches are held open by means of a guide rail 118, carried by the dial cap 25, and the latches of said latch needles 47 remain open for a considerable travel of the cam arrangement to a point which will be subsequently mentioned, and during their open position the needles 47 receive thereon the second terry yarn 62 and second knit yarn 63 as will be subsequently mentioned.

During the time that the needles 46 and 47 have been projected upwardly by the riding of the cam 68 against the butts thereof, the dial needles 31 have been projected from their respective grooves in the dial 23, in an intermeshing relation through the spaces between each pair of needles 46 and 47. The butts 31^a of the needles 31 ride along the groove 30 of the dial, and are projected outwardly by riding along a portion 30^a of the groove 30,

and the beards of the needles 31 are projected sufficiently beyond the circular line of needles of the cylinder so that the second terry yarn or thread 62 may be fed from a thread carrier 119 over the needles 31 beneath the beards thereof, and immediately thereafter the needles 31 are retracted by the riding of the butts thereof along a groove portion 30°. The needles 31, however, are not retracted until 5 at a location where the same have received the second terry yarn 62 beneath the beards thereof and after the needles 47 have been fully elevated by the cam 68, so that upon retraction of the needles 31, the second terry yarn 10 62 will be looped beneath the hooks of and above the latches of the now open latch needles 47.

Upon continued rotation of the cam means, only the long butts 50 are caught on the 20 downwardly inclined edge 120 of the cam 74, to project the spring beard needles 46 downwardly, to cast off the terry loops 107 previously received thereon, as at the position E designated in an enlarged relation in Figure 25 10, and during the riding of the long butts of the needles 46 along the cam edge 120, the beard presser 122 operates upon the beards of the now lowering beard needles 46, to close the beards thereof and enable the beards to 30 slip past the terry thread or yarn 62, and the beards are held closed by the presser 122 for a sufficient length of time that the lower ends of said beards will slip through the loops 107 of the first terry yarn 60, and at 35 the location 125, at the lower end of the cam 74 the spring beard needles 46 have cast off the terry loops 107, as designated in somewhat diagrammatic relation in Figure 10 of the drawings, which shows an enlargement 40 of a fragment of the cylinder and the needles operating in the grooves thereof, together with the dial needles in associated relation; this view being taken at approximately the location E designated in Figure 4 45 of the drawings. It is to be noted that at this location the second terry yarn 62 now lies upon the dial needles 31, beneath the beards thereof, and said yarn 62 is ready to be received in the hooks of the latch needles, 50 which are open, upon lowering of said latch needles 47, and it is to be noted from Figure 10 that the open latches of the needles 47 have been elevated so that their lower ends are above the looped portions 128 and 129 55 of the first terry thread 60 and first knit thread 61, and enables said looped portions 128 and 129 to slip behind the latches to enable a cast off when the latch needles are next projected downwardly into the cylinder as will be subsequently described.

Preferably just before the cam 75 operates upon the needles 46 and 47, the second knitting thread 63 is fed through an opening 130 in a carrier 131, beneath the open hooks of the 60 elevated latch needles 47, and since the beard

needles 46 are retracted in the grooves of the cylinder 14 the thread 130 will not catch thereon. Immediately after the feeding of the second knitting thread 63, the downwardly inclined cam edge 135 of the cam 75 70 operates upon the short butts 51 of the needles 47, to lower the needles 47 in the grooves, and the lower end of the cam 75 is projected sufficiently downward that at the lower cam edge 138 thereof the same will operate on all of the needles, to lower them sufficiently to enable a cast off; this location 138 being a knitting point, and at this location the result of the knitting appears as illustrated in enlarged 75 relation in Figure 11 of the drawings; this being also designated in Figure 4 as location F, and the result of operation of the cam 75 on the needles 46 and 47 is to permit the loop portions 128 and 129 of the first terry and first knit threads 60 and 61 to slip off of the latch needles, which in the meantime have caught the yarns 62 and 63, and knitting is effected and the loop portions 86 and 87 now on needles 47 are the same as above described 80 at the start of the description of the operation of the improved machine.

It is to be noted that the dial needles 31 after their retraction into the dial grooves succeeding the point E, pull the terry yarn 62 under the beards of said needles 31, into loops designated at 140 in Figure 11 of the drawings and likewise designated at 140 in Figure 7 of the drawings, the retraction of the needles 31 to provide these loops being of any degree desired, and these loops with respect to the latch needles 47 are illustrated in Figure 5. Immediately succeeding the location F, dial needles 31 are again projected outwardly by riding of the butts 31^a in an inclined grooved portion 30°; the beards of said needles being projected to a point outwardly beyond the circular line of needles 46 and 47, and the beards are then operated upon by the beard presser 148, carried by the dial cap, to close said beards of the dial needles 31, and immediately thereafter the butts 31^a of the dial needles 31 are operated upon by a cam groove portion 30^b and the dial needles retracted to cause the beards to cast off the second terry thread loops 140. The loops 107 at about the location F are shown disappearing into the cylinder, in Figure 11 of the drawings.

The knitted fabric of course passes downwardly through the passageway 150 in the cylinder 14, from the top edge of the cylinder thru the space 151 between the dial 23 and the top of the cylinder 14, and as illustrated in Figure 11 the loops 107 are shown just disappearing into the cylinder, and the terry loops 107 will be at the outside of the fabric, whereas the terry loops 140 when cast off will be at the inside of the fabric, in approximately the relation illustrated in Figure 13, although this view is 110 115 120 125 130

also partly diagrammatic, since due to the method and the disposed relation of the terry loops, to hide the base fabric, the real nature of the fabric is practically incapable of fair 5 illustration.

5 The relation of the wales and terry loops is illustrated to advantage in Figure 12 of the drawings, which only gives a representation of the relative location of the terry loops 10 with respect to the base knitted fabric, and therein it is shown that the terry yarns follow about the wales of the knit yarns with which they are associated in the knitting operation, and intermediate the wales, the 15 terry yarns provide the loops which produce the matted terry looped appearance on towelling, in simulation of the slack terry loop arrangement of conventional woven towelling.

20 Any multiple of the series of cams in the relation above described may be provided upon the machines, to produce a large tubular knitted fabric, and it is to be understood that the invention as illustrated applies 25 merely to the principle and the mechanism employed to carry out that principle.

Various changes in the shape, size, and arrangement of parts of the improved knitting machine herein shown and described, 30 as well as alteration in the steps of carrying out the method of knitting may be made to the form of invention herein shown and described, without departing from the spirit of the invention or the scope of the claims.

35 I claim:

1. In a knitting machine, a set of needles, means for operating the needles to receive knitting yarn and knit the same to form a knitted base fabric, means for feeding a terry 40 yarn to said needles so that it will knit with the knitted loops of said knitting yarn in alternate courses, a second set of needles for receiving said terry yarn, means to operate the second set of needles in cooperation with 45 the first set of needles to form long slack terry loops at one side of the fabric base, a third set of needles for receiving a second terry yarn, means to feed said second terry 50 yarn to the needles of the first set to knit in said second terry yarn with the knitted loops of the remaining courses, and means cooperatively operating the third set of needles to receive said second terry yarn in cooperatively operating the third set of needles 55 to form long slack terry loops at the opposite side of the base fabric from the first mentioned terry loops.

2. In a circular knitting machine the combination of a knitting cylinder having 60 grooves therein, two sets of cylinder needles, one needle of one set and one needle of the other set being disposed in each groove of the cylinder, a dial, a third set of needles reciprocably carried by the dial in a trans- 65 verse acting relation with the needles of the

cylinder so that the dial needles cooperatively operate in intermeshing relation through spaces between the pairs of needles in the grooves of the cylinder, means for operating one set of needles of the cylinder to receive 70 knitting yarn and knit the same into loops to form a knitted base fabric, means to operate the second set of cylinder needles in cooperation with the first set of needles to receive yarn and form slack terry loops at one 75 side of the fabric base, and means for cooperatively operating the third set of needles of the dial to receive a terry yarn in cooperating relation with the other sets of needles to form slack terry loops at the opposite side 80 of the base fabric from the first mentioned terry loops.

3. In a knitting machine the combination of a cylinder, a set of needles operably movable on the cylinder, a second set of needles operably movable on the cylinder, a dial, a third set of needles operably movable on the dial, means for operating the first set of needles on the cylinder to receive a knitting 85 yarn and to form knitted loops to provide a base fabric, means for feeding first and second terry yarns to the needles of the first set for interknitting the same with the base fabric, means for operating the second set of needles on the cylinders to receive the first 90 terry yarn in interknitting associated relation with the first set of needles to draw the yarn through the base fabric and provide terry loops at a side of the base fabric, and means for operating the dial needles to receive the second terry yarn in its interknitting association with the base fabric to draw terry loops through the base fabric at the opposite side thereof from the first mentioned 95 terry loops.

4. In a circular knitting machine the combination of a needle cylinder, a first set of needles operably carried by the cylinder, a second set of needles operably carried by the cylinder in a needle alternating relation with the needles of the first mentioned set, means for feeding main yarn to the needles of the first mentioned set, knitting cams positioned to operate on the needles of the first mentioned set of needles to receive the main yarn and form loops to provide a complete base knitted fabric, means for feeding a loop forming yarn to the needles of the second set, and knitting cam means for operating on the needles of the second set in a cooperating relation with the needles of the first mentioned set to loop the loop forming yarn in a secure relation with the loops of the base fabric and in a terry loop projecting relation from the fabric.

5. In a circular knitting machine the combination of a needle cylinder, a first set of needles operably carried by the cylinder, a second set of needles operably carried by the cylinder in a needle alternating relation with

the needles of the first mentioned set, means for feeding main yarn to the needles of the first mentioned set, knitting cams positioned to operate on the needles of the first mentioned set of needles to receive the main yarn and form loops to provide a base knitted fabric, means for feeding a loop forming yarn to the needles of the second set, and knitting cam means for operating on the needles of the second set in a cooperating relation with the needles of the first mentioned set to loop the loop forming yarn in a secure relation with the loops of the base fabric and in a terry loop projecting relation from the fabric, said cylinder having grooves therein for receiving the needles and each groove of the cylinder being adapted to receive side by side one needle of one set and a needle of the other set. 5

6. In a circular knitting machine the combination of a needle cylinder, a first set of needles operably carried by the cylinder, a second set of needles operably carried by the cylinder in a needle alternating relation with the needles of the first mentioned set, means for feeding main yarn to the needles of the first mentioned set, knitting cams positioned to operate on the needles of the first mentioned set of needles to receive the main yarn and form loops to provide a base knitted fabric, means for feeding a loop forming yarn to the needles of the second set, knitting cam means for operating on the needles of the second set in a cooperating relation with the needles of the first mentioned set to loop the loop forming yarn in a secure relation with the loops of the base fabric and in a terry loop projecting relation from the fabric, said cylinder having grooves therein for receiving the needles and each groove of the cylinder being adapted to receive side by side one needle of one set and a needle of the other set, the needles of the two sets bearing such relation that the needles of the second set are effectively shorter from their butts to the hook heads than the needles of the first mentioned set. 10

7. In a knitting machine the combination of a cylinder having grooves therein, each groove being formed to receive a pair of reciprocating needles, one needle in each groove being a latch needle and the other needle being a spring beard needle, means to feed yarn to and operate the latch needles to knit a base fabric, and means to feed a terry yarn to and operate the beard needles to form projecting loops on the base fabric. 15

8. In a knitting machine the combination of a cylinder having grooves therein, each groove being formed to receive a pair of reciprocating needles, one needle in each groove being a latch needle and the other needle being a spring beard needle, one needle in each groove having a long butt and the other needle 20 in each groove having a short butt means to feed yarn to and operate the latch needles to knit a base fabric, and means to feed a terry yarn to and operate the beard needles to form projecting loops on the base fabric. 25

9. In a knitting machine the combination of a cylinder having grooves therein, each groove being formed to receive a pair of reciprocating needles, one needle in each groove being a latch needle and the other needle being a spring beard needle, one needle in each groove having a long butt and the other needle 30 in each groove having a short butt, and one needle from the head to butt being longer than the other needle from its butt to its head, means to feed yarn to and operate the latch needles to knit a base fabric, and means to feed a terry yarn to and operate the beard needles to form projecting loops on the base fabric. 35

10. In a knitting machine the combination of a cylinder having grooves therein, needles in said grooves, each groove having a pair of needles slideable therein side by side, circumferentially of the cylinder, one of the needles having a long butt and the other 40 needle having a short butt, means to feed yarn to and operate the needles of one length of butt to knit a base fabric, and means to feed a terry yarn to and operate upon the needles of the remaining butts to form loops 45 in the base fabric. 45

11. In a knitting machine the combination of a cylinder having grooves therein, needles in said grooves, each groove having a pair of needles slideable therein side by side circumferentially of the cylinder, one of the needles having a long butt and the other needle having a short butt, and the two needles in each groove being of unequal length from their butts to the hook ends thereof, means to feed yarn to and operate the needles of one length of butt to knit a base fabric, and means to feed a terry yarn to and operate upon the needles of the remaining butts to form loops 50 in the base fabric. 55

12. In a knitting machine the combination of a cylinder, knitting needles operably movable upon the knitting cylinder in grooves provided in the knitting cylinder, means for feeding a main yarn and a looping yarn to the needles, means operating the needles to take the main yarn and looping yarn and interknit the same into knitted loops, needles of a second set of needles in the grooves of the cylinder with the first mentioned needles, means for feeding said looping yarn to the needles of the second set of needles, cam means for operating on the needles of the second set of needles in cooperation with the first mentioned needles to draw long terry loops of the second yarn downwardly into the grooves of said cylinder between the adjacent needles of the knitting needles, and means to cast off the terry loops of the second set of needles. 60

13. In a knitting machine the combination 65

of a stationary cylinder having a set of reciprocably supported hooked knitting needles thereon, a second set of reciprocably supported hooked knitting needles on said cylinder, a stationary dial operably mounted with respect to the cylinder having a set of reciprocably supported hooked needles thereon in cooperating relation with the needles of the cylinder, cam means for elevating the second set of cylinder needles to receive terry yarn, cam means for lowering the second set of needles into the cylinder to pull the terry yarn for the production of terry loops, the second set of needles thus pulling the terry 15 yarn into a receiving relation with the first mentioned set of cylinder needles, means feeding a first knit thread to the first mentioned set of cylinder needles, means operating on all of the needles of said cylinder to 20 cast off previously formed loops from the knitting needles, cam means for operating on all of the needles of the cylinder to elevate the same subsequent to the cast off operation above described, means to project the dial 25 needles in intermeshing relation with the elevated needles of the cylinder as in the position last mentioned, means to feed a second terry thread to the dial needles in the thus projected relation at the outer side of the 30 needles of the cylinder, means for lowering the second mentioned set of cylinder needles and operating upon the same to cast off the second terry thread and the terry loops of the 35 first mentioned terry thread, means for retracting the dial needles to draw the second mentioned terry thread to loop over the first mentioned cylinder needles, means for feeding a second knitting thread to the first mentioned cylinder needles, means operating on 40 the first mentioned cylinder needles to receive in the hooks thereof the second mentioned terry thread and second mentioned knitting thread and to cast off previously received first terry and first knitting threads, 45 and means for subsequently projecting the dial needles and casting off the second mentioned terry thread therefrom.

14. In a knitting machine the combination of a cylinder having grooves therein, a set of 50 knitting needles operatively movable in said grooves, a second set of needles operatively movable in said grooves, means for moving the first set of needles for receiving a knitting yarn, means for operating on the first 55 set of needles in connection with the knitting yarn to knit a base fabric, means for feeding a terry loop yarn to the other set of needles of the cylinder in such relation that needles of the first set will engage and knit the terry 60 loop yarn into the knitted loops of the base yarn, and means actuating the needles of the second set so that they will draw the terry yarn into long loops between the knitted loops and several times longer than the 65 knitted loops of the base fabric.

15. In a knitting machine the combination of a cylinder having grooves therein, a set of knitting needles operatively movable in said grooves, a second set of needles operatively movable in said grooves, means for moving the first set of needles for receiving a knitting 70 yarn, means for operating on the first set of needles in connection with the knitting yarn to knit a base fabric, means for feeding a terry loop yarn to the other set of needles of the cylinder in such relation that needles of the first set will engage and knit the terry loop 75 yarn into the knitted loops of the base yarn, means actuating the needles of the second set so that they will draw the terry yarn into long loops between the knitted loops and several times longer than the knitting loops of the base fabric, a dial having a set of needles operatively associated therewith in cooperation with the needles of the first and second 80 mentioned sets, means for feeding a second terry yarn to the dial needles and in such relation that the needles of the first set will engage said second terry yarn and knit the second terry yarn together with the loops of the base fabric, and means actuating the dial needles for drawing long loops of the second terry yarn at the opposite side of the base web from the loops of the first mentioned 85 terry yarn and in length each several times greater than the length of the knitting loops of the knitting yarn.

HARRY McADAMS.