April 14, 1931. H. McADAMS 1,801,167

KNITTING MACHINE

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Fig. 1.

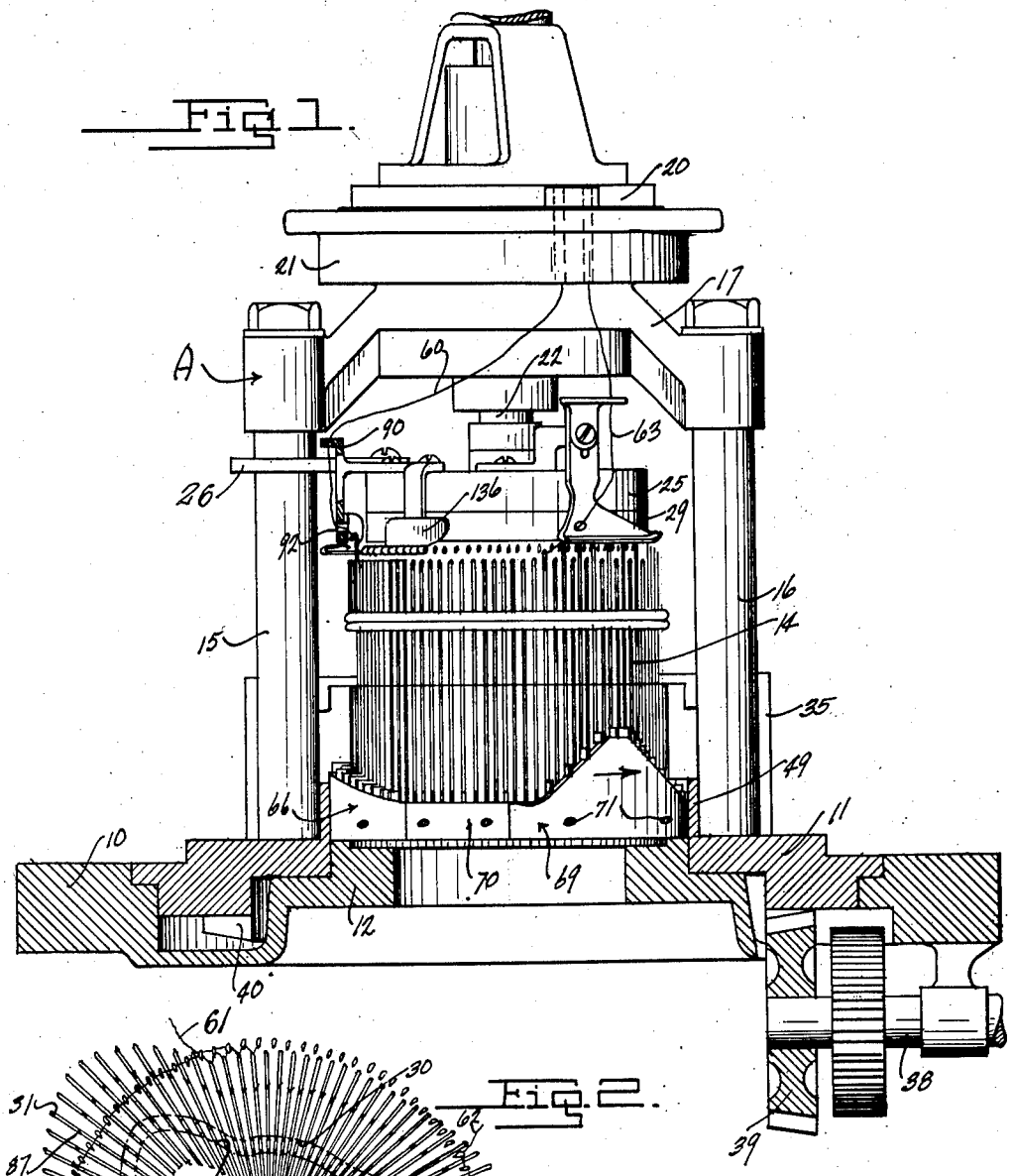
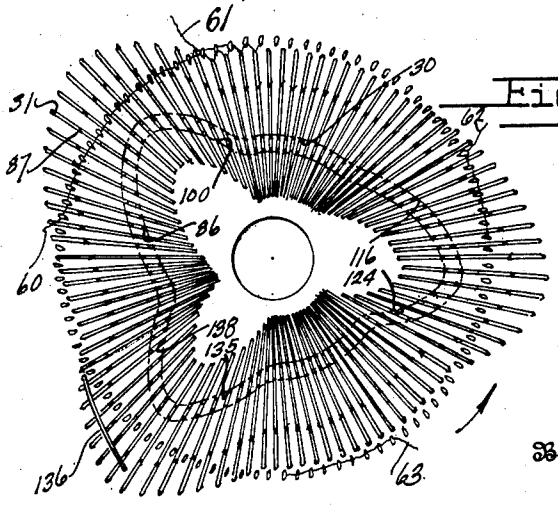


Fig. 2.



Harry McAdams.
Inventor

By Royal R Rommel
Attorney

April 14, 1931. H. McADAMS 1,801,167

KNITTING MACHINE

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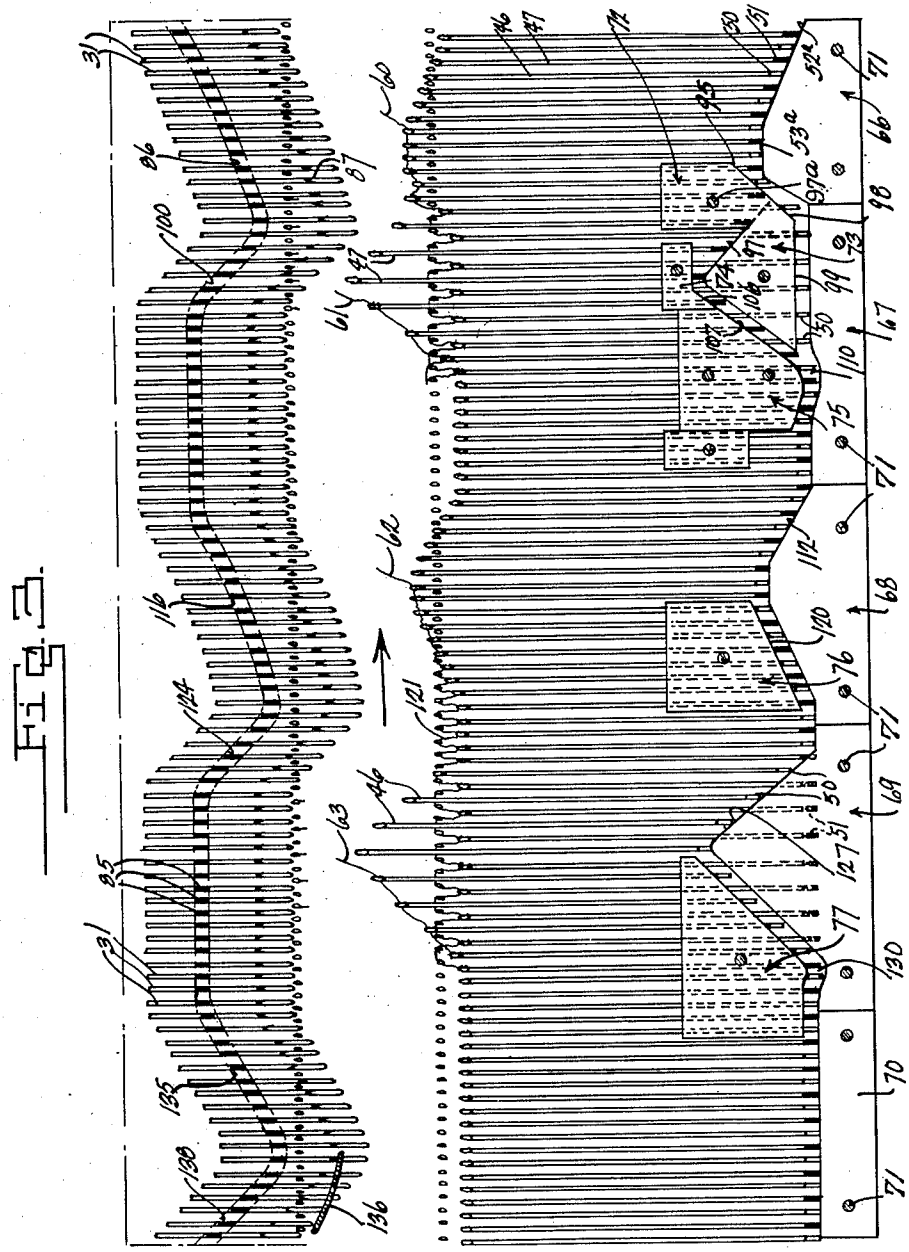


Fig. 5.

Harry McAdams.
Inventor

By Royal R. Rommel
Attorney

April 14, 1931. H. McADAMS 1,801,167

KNITTING MACHINE

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Fig. 4.

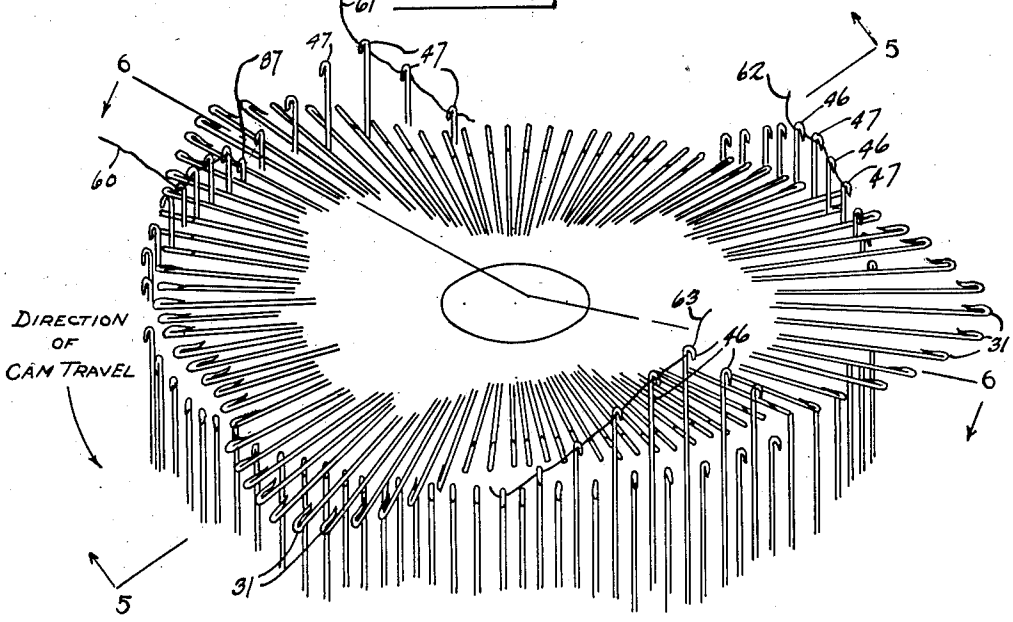
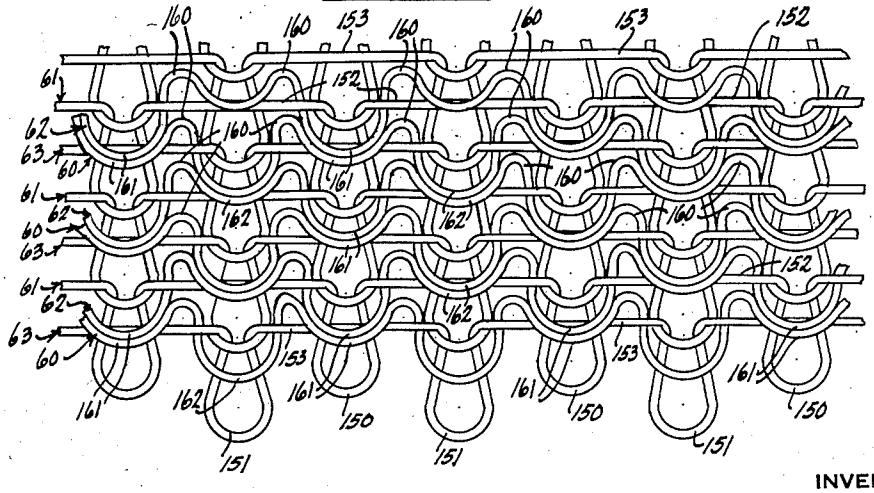


Fig. 8.



INVENTOR.
Harry McAdams

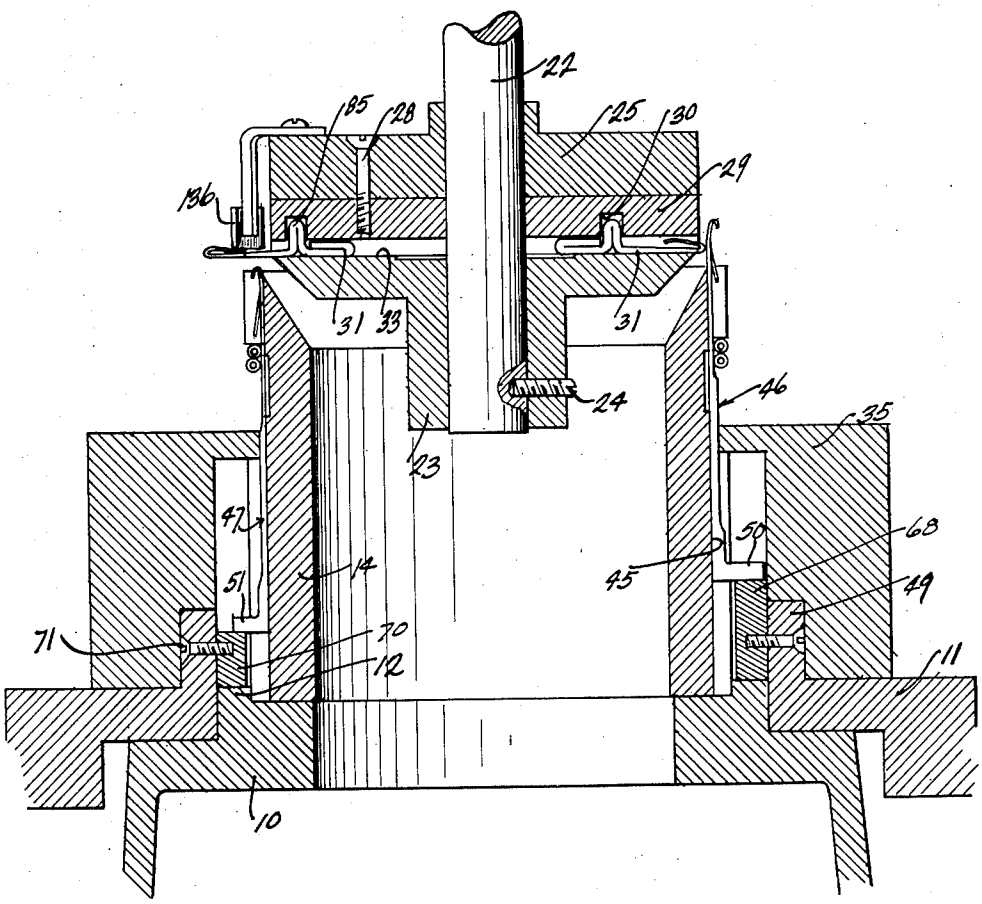
BY Royal R. Rommel
ATTORNEY.

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KNITTING MACHINE

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Fig. 5.



Harry McAdams
Inventor

By Royal R. Rommel
Attorney

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KNITTING MACHINE

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Fig. 6.

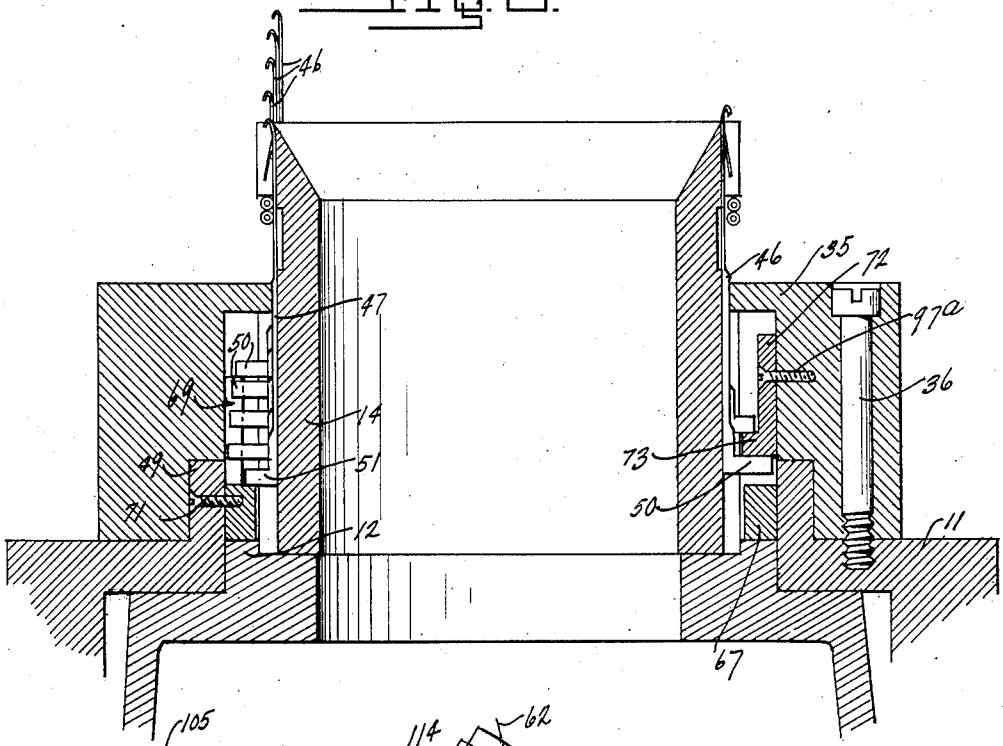
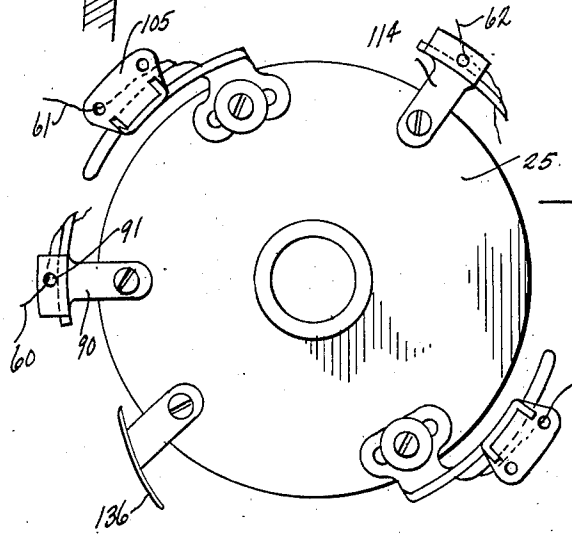


Fig. 7.



Harry McAdams.
Inventor

By Royal R. Rommel
Attorney

Patented Apr. 14, 1931

1,801,167

UNITED STATES PATENT OFFICE

HARRY McADAMS, OF PHILADELPHIA, PENNSYLVANIA

KNITTING MACHINE

Application filed November 6, 1926. Serial No. 146,680.

This invention relates to improvements in knitting machine.

The primary object of this invention is the provision of a circular knitting machine, embodying improved means to knit thereon a fabric with filling threads held therein by the wales of the base yarn in such manner that the filling thread provides loops outstanding at both sides of the fabric so that the base yarn wales are substantially hidden, to produce a fabric similar in appearance to the well known Turkish towel.

A further object of this invention is the provision of means for producing looped pile toweling, wash rags, bath mats, and even garments, such as bath robes, and the like, upon a knitting machine.

A further object of this invention is the provision of an improved knitted fabric which employs main or base threads to be knitted in such relation as to render the fabric non-elastic, to a considerable extent, by the employment of a plurality of main knitting threads interknit in such relation as to provide straight or direct thread portions extending across each wale of the fabric from the wales at the opposite sides thereof, and thus preventing liability of stretching of the garment by limiting the lateral expansion of the wales.

A further object of this invention is the provision of an improved process for the knitting of toweling, by providing main yarns out of which the base of the fabric is knitted, and by employing therewith terry or filler yarns which are drawn through and held by the base of the fabric so as to provide free outstanding loops at opposite sides of the fabric, in a close relation.

A further object of this invention is the provision of an improved mechanism for the knitting of toweling, with outstanding free loops at opposite sides thereof, and including means for interknitting a pair of yarns to provide a base for the fabric, and means to engage and draw a pair of terry yarns through the base fabric to provide the free outstanding loops at opposite sides of the base fabric in simulation of the free loops as found upon conventional Turkish towels and like fabrics.

A further object of the invention is the provision of circular-knitting machines somewhat of the type set forth in Patent 1,012,966, patented December 26, 1911, but embodying improvements thereover in adapting the same for the knitting of toweling fabric thereupon by cooperative regulation of cylinder and dial needles to handle a plurality of knit and terry yarns.

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.

Figure 1 is a side elevation, partly in section, of the upper portion of the improved knitting machine; showing the cylinder and dial needles of the same in position to take both a knit yarn and a terry or filler yarn.

Figure 2 is a plan view showing the cam operation upon the dial needles, with the dial cap and cam removed to expose the relative location and relation of the dial needles, in so far as the dial cams operate upon the same, with respect to the needles of the cylinder.

Figure 3 is a developed plan view of both the dial and cylinder needles; the upper row of needles being the dial needles and the lower row of needles being the cylinder needles, and showing the same in their cooperative cam operated relations for the handling of knitting and terry yarns.

Figure 4 is a fragmentary perspective view of the cam operated cooperative positioning of the dial and cylinder needles, for the handling of knit and terry thread; this view only being intended to show the relative cooperation of the dial and cylinder needles, during the cam operation thereof, to receive the knit and terry threads.

Figure 5 is a fragmentary vertical sectional view taken through the knitting machine, substantially on a vertical plane taken on the line 5—5 illustrated in Figure 4 of the drawings.

Figure 6 is a vertical sectional view, t ken

on line 6—6 of Figure 4, with the dial removed, the section being taken more particularly to show the cam operation upon long and short butt needles.

Figure 7 is a plan view of the dial cap, showing the carriers thereon for the guiding of the main and filler yarns.

Figure 8 is a fragmentary, partly diagrammatic view showing the relation of the knitted yarns with respect to the terry or filler yarns.

In the drawings, wherein for the purpose of illustration is shown only a preferred embodiment of the invention, the letter A may generally designate the improved knitting machine, which may be of any of various types suitable for knitting a fabric of the character herein 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 the usual detachable relation. The bobbin supporting construction and guide for the threads or yarn strands is suitably supported above the yoke, in conventional relation, such as set forth in Patent 1,012,966, granted December 26, 1911, or in any other approved manner, and includes a rotatable bobbin supporting piece 20, beneath which is a stationary ring 21, through which centrally extends the stationary post 22, to which the dial 23 is keyed, as illustrated at 24 in Figure 5 of the drawings.

A dial cap 25 is rotatably supported upon the post 22, and is rotated with the gear ring 11 and the posts 15 and 16, by having an attaching arm 26, illustrated in Figure 1, connected to the post 15, or at any other approved location. It is of course understood that the dial cap 25 has attached thereto, at 28, a disc like cam 29, wherein the cam groove 30 is provided, which receives the butts on the preferably spring beard type of dial needle 31, illustrated in Figure 5 and throughout 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 fabric to be knitted, and these grooves 33 open at the periphery of the dial and slidably receive therein the reciprocating spring beard needles 31, after the relation illustrated in Figure 5 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 the cams thereon, to be subsequently described, for manipulating the various needles of the cylinder 14, in cooperation with the head ring cams.

As is illustrated in Figure 1 of the drawings means is provided to rotate the gear ring 11, comprising a driven shaft 38, having a bevel gear 39 thereon meshing with the downwardly facing gear teeth 40 of the ring gear 11, as in conventional practice, and, it can readily be understood that upon rotation of the gear ring 11 the posts 15 and 16 will be rotated therewith, and thru the bracket or connecting arm 26 the dial cap 25 and its connected cam 29 will be rotated for causing the reciprocation of the dial needles 33 upon the dial 23, as will be subsequently described.

The cylinder 14 is of conventional character insofar as the form is concerned, and is provided with the vertical upwardly opening grooves 45 therealong, which reciprocably receive long and short butt needles 46 and 47 respectively. The needles 46 and 47 are of the latch type, and are operated by means of cams carried by the cam casing 35 and by the upstanding annular flange 49 of the gear ring 11. The needles 46 and 47 are respectively provided with long and short butts 50 and 51 at the lower ends thereof, which are engaged and operated upon by the cams of the casing 35 and flange 49, as will be subsequently mentioned. Referring now to the control of the knit and filler threads, and the control and reception thereof in the fabric, the operation is more particularly designated in Figures 2, 3, and 4 of the drawings, and the direction of rotation of the cams is as designated by the arrows adjacent the drawings; it of course being understood that the cam cylinder and needle dials do not rotate, but their needles reciprocate to knit the article, and that the same number of needles are provided on the dial as are provided on the cylinder, and in an alternating relation therewith, so that during the reception of the terry or filler threads the cylinder needles may be elevated by their cams in an alternating intermeshing relation with the projected dial needles, as well illustrated in Figure 4 of the drawings.

In the formation of the fabric, a typical series consist of a first terry or filler thread 60; first knit thread or yarn 61; a second terry thread or filler yarn 62; and a second knit 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 may be varied.

Referring now to the operation of the needles by the cams of the cylinder and dial for control of the yarn threads above mentioned, it is to be noted that the gear ring flange 49 has attached thereto cams 66, 67, 68, 69, and 70 in a circular relation; these cams being attached by means of set screws 71 as illus-

trated in Figures 5 and 6 of the drawings. Cams 72, 73, 74, 75, 76, and 77 are supported upon the cam casing 35, in conventional manner.

As the gear ring 11 and the cam casing 35 rotate, the long and short butts of the cylinder needles ride up upon the upwardly inclined cam edge 52ª of the cam 66, and this elevates all of the needles of the cylinder to the top edge 53ª of the cam 66, and at which location the hook ends at the top of the cylinder needles are disposed above the plane of the dial needles 31 as is illustrated in Figures 3 and 4 of the drawings. At the same location the butts 85 of the dial needles 31 ride along the outwardly inclined portion 86 of the groove 30 of the dial cap cam, as shown in Fig. 3, to project the spring beard needles 31 alternately between the spaced long and short butt needles of the cylinder which have been elevated by the cams 66, and until the open end of the beards of the spring needles 31 pass beyond the circular line of cylinder needles, as is illustrated at 87 in Figures 2, 3 and 4. The first terry or filler thread 60 is of course guided by a thread guide 90 which is detachably carried on the dial cap, and has a guide opening 91 upwardly therein for guiding the terry thread 60 and a lower opening 92 therein for directing the terry thread beneath the hooks of the open latch needles 46 and 47 as they are elevated by the cam 66. It should be here noted that the cam 66, at 53ª, elevates the needles 46 and 47 to such extent only as to permit the slipping of the terry yarn 60 upon the needle hooks, and the latches do not slip through any of the other loops on the needles at this cam edge 53ª.

As the cylinder cam construction continues its rotation the long butts 50 of the needles 46 engage on a downwardly inclined cam edge 95 of the cam 72, which is supported by the cam casing 35, as by a screw 97ª illustrated in Figure 6 of the drawings, and it is to be noted that this cam 72 is only of sufficient thickness that the cam edge 95 will receive the outer ends of the long butts 50, of needles 46, and the short butts 51 of the short butt needles 47 will pass by the cam 72, and engage on the upwardly inclined edge 97 of the cam 73, thus carrying the short butt needles 47 upwardly to an elevated position where the same may receive the first knitting yarn or thread 61. The long butt needles 46, however, continue to ride down the cam edge 95 and onto a cam edge 98 which is continuous with the edge 95, until the long butts 50 of the long butt needles 46 are positioned beneath the bottom edge 99 of the cam 73, and the long butt needles are thus fully retracted. Thus, the short butt needles are elevated by the cam 73. It is to be noted that as the long butt needles 46 are drawn down by the cams 72 and 73, the terry threads 60 will be pulled downwardly upon the top of the dial needles 31 which have been projected by guiding of the butts in the grooved portion 86, and the pulling of this terry thread down over the spring beard needles of the dial is at a location inwardly of the open ends of the beards of said needles, so that as the dial needles 31 are retracted by means of operation of the butts 85 in the grooved portion 100, illustrated in Figures 2 and 3 of the drawings, the terry thread 60 will be pulled beneath each of the beards of each dial needle.

The alternate needles of the cylinder, that is the short butt needles 47, have been elevated by the cam 73 for the purpose of receiving the first main knitting yarn 61, and when they have been elevated properly the knitting yarn 61 is fed by means of its guide 105 onto the hooked ends of the open latch needles 47 prior to depression by the cams 74 and 75. Upon continued rotation of the cam construction for the cylinder, the short butts 51 of the short butt needles 47 will first ride along the downwardly sloping cam edge 106 of the cam 74, and then downwardly along the sloping edge 107 of the preferably adjustable cam 75, until the short butt needles have been fully retracted, and when they are fully retracted, it is to be observed that the terry thread 60 first fed onto the needles will be in a zig-zag relation between the needles of the dial and cylinder with all of the needles of the dial engaging this terry thread and only the lowered long butt needles pulling the terry thread to a location below the plane of the dial needles.

The function of the cam 73 is of course to elevate the short butt needles 47 so that the latches pass above the loops pulled by said needles, in order that as the needles 47 are retracted by riding along the cam 75, the old loops of the needles will close the latches after the new kit thread 61 has been received in the hooks of the latches, and as the short butts of the needles 47 ride along the lower edge of the cam 75. At the knitting point 110, the old loops of the knit yarn will slip over the tops of the needles 47, as will be well understood by anyone skilled in this art, to form knitted loops, which are held in the fabric by means of the new knit yarn 61 which is herein termed the first knit yarn. It is at this point that the short butt needles also release the second terry thread to be hereinafter mentioned, to form certain loops at one side of the fabric. It is to be observed that only short butt needles 47 do the knitting at the point 110, and after the cam 75 all of the needles of the cylinder are retracted until the cam 68 engages at its upwardly sloping cam edge 112 upon butts of the needles of the cylinder 14, to elevate all of the needles of the cylinder until the hook ends thereof are above the plane of the needles of the dial,

and at which time the second terry thread 62 is fed from a guide 114, illustrated in Figure 7 of the drawings; this guide 114 being entirely similar to the guide 90 illustrated in Figures 1 and 7 of the drawings, and it is to be noted that all of the hook ends of all of the cylinder needles receive this terry thread 62. At this point it should be noted that the cam 68 at the peak thereof elevates the needles 46 and 47 to such extent only as to permit the slipping of the terry yarn 62 upon said needle hooks, and the latches do not slip through any of the other loops on the needles at this cam 68. About the same time as the cylinder needles are being elevated by the cam 68, the dial needles are being projected outwardly by the riding of the butts thereof in the outwardly inclined cam grooved portion 116, illustrated in Figures 2 and 3 of the drawings, so that the open beards of the dial needles ride to a location beyond the circular line of cylinder needles, in order to permit the second terry thread 62 to slip beneath the open beards of the dial needles, and upon rotation of the cylinder cam construction both the long and short butts of the cylinder needles are engaged by the downwardly inclined cam edge 120 of the cam 76, to lower all of the cylinder needles, and thus the second terry thread 62 is held in a zig-zag relation as illustrated at 121 in Figure 3 of the drawings, between all of the cam and dial needles. Upon rotation of the dial cam 29 the spring beard needles of course are retracted by sliding of the butts thereof in the inclined grooved portion 124, illustrated in Figures 2 and 3 of the drawings, to retract the dial needles to produce the zig-zag effect of the terry thread 62.

The cam 69 of the gear ring construction then advances so that the long butts 50 of the long butt needles ride upon the cam edge 127 of the cam 69, to elevate only the long butt needles 46, for a sufficient height that the old loops on these needles pass below the latches thereon, as will be well understood by anyone skilled in this art, in order that when the new knit thread 63 is received the said old loops may slip over the new main thread 63 received on said long butt needles. It is to be observed that no knitting of the terry threads in the fabric wales takes place, for upon elevation of the long butt needles 46 on the cam 69, the second terry thread 62 which had been engaged by the hooks of said long butt needles will ride beneath the closing latch as the long butt needles are retracted, and as is obvious. As the cam construction of the cylinder continues to advance the cam 77 engages the long butts 50 of the long butt needles 46, to lower the said long butt needles to the knitting location 130, illustrated in Figure 3 of the drawings, and this location 130 is of course a knitting point for the old loops of the main yarn 63, as can readily be understood, and at this point the terry yarn which had been engaged by the long butt needles adjacent the cam 66, that is, the terry yarn 60, will be passed off, but it is to be understood that this passing off of the terry yarn 60 at the point 130 will not produce a knit effect, by reason of the fact that no new yarn is received on the long butt needles to produce any knit, and the pass-off of this terry yarn will merely produce a loop at one side of the fabric, which is a free outstanding loop, to simulate the ordinary loops found in Turkish towels.

Attention is now called to the fact that there are two terry yarns held on the spring beard needles above the knitting point 130, that is, both terry yarns 60 and terry yarn 62, and the dial needles thus each have two loops held thereon after the knitting point 130 has passed, and immediately after the fabric has been knit at the point 130, all of the dial needles 31 are projected outwardly, by riding along an outwardly inclined cam grooved portion 135, until the beards have been projected beyond the terry thread loops held thereon, and when the dial needles have been fully projected, the beards are pressed down by a beard presser 136, of any approved formation, and immediately thereafter, while the beards are held closed, the dial needles are retracted by riding along an inwardly sloping dial cam grooved portion 138, to cast off the pair of loops held by each of the dial needles. Upon further rotation of the cam construction, the cylinder needles ride up upon the cam 66 and the operation above described is repeated. After the cast off of the two loops from the dial needles, at the beard presser 136, it is to be noted that the short butt needles with the terry thread 62 thereon will retain the loops of the terry thread 62, and the cast off of this terry thread 62 is effected upon elevation of the short butt needles by the cam 73, and at their knitting point 110, as will be readily understood by anyone skilled in the art relating to operation of knitting machinery.

Referring now to Figure 8, wherein the fabric is diagrammatically illustrated, it should be understood that the wales and base yarns 61 and 63 have been exaggerated, as to size, and that the filler threads 60 and 62 pulled therein between and by the wales will have free outstanding loops at both sides of the fabric, which, in fact, will hide the wales and produce a pile or looped effect similar to a Turkish towel.

Due to the fact that only the short butt needles do knitting at the point 110 as is illustrated in Figure 3, the knit yarn will knit at this point, to produce parallel rows of stitch loops 150, illustrated in Figure 8 of the drawings, and due to the fact that only the long butt needles do the knitting

at the point 130, of the second knit yarn 63, parallel rows of loops 151 will be formed of this yarn 63, and it is to be noted that the rows of loops 150 will alternate with the rows of loops 151, as illustrated in Figure 8, and due to the independent knitting of the long and short butts, straight portions 152 of the yarn 61 will extend between the loops 150 and, across the loops 151, and likewise the straight yarn portions 153 of the knit yarn 63, will extend between the loops 151 across the loops 150. In this manner the two knit yarns are interknit so that one yarn produces wales alternating with the wales of the other yarn, and the straight portions of yarn between the alternating wales of the fabric extend across the wales of the other yarn to prevent lateral elasticity of the knitting base yarns to a greater degree than ordinary knitting, and which renders the fabric practical as used in connection with Turkish toweling and like fabrics which are ordinarily woven upon looms, and which it is intended this invention shall produce in a more efficient and economical relation than Turkish towels have herebefore been produced.

With respect to the terry threads 60 and 62, the double loop cast off of the dial elements at the beard presser 136 produces the double terry loops 160 illustrated in the drawings, in the fabric between adjacent rows of wales, all at one side of the base knitted fabric. The cast off of the short butt needles produces the double filler thread loops 161 of both terry yarns at the opposite side of the fabric from the double loops 160. It is of course understood that the loops 161 are cast off at the knitting point 110. Other double loops 162 of both terry yarns are cast off at the knitting point 130, at the same side of the fabric as the loops 161. Thus, the loops 160 stand out freely from one side of the fabric, and the loops 161 and 162 stand out freely from the opposite side of the fabric, and the representation shown in Figure 8 of the drawings is merely diagrammatic, by way of example, and due to the close knit of the wales and stitch loops of the fabric and the non-elasticity due to the special alternate knit of the long and short butt needles, the filler or terry threads are held in such a looped relation as to practically hide the base knit yarn of the fabric, to all intent and purposes as in a conventional Turkish towel.

From the foregoing description of this invention it is apparent that novel, economical, and efficient means has been devised for knitting, upon a circular type of knitting machine, with main and filler yarns in such manner as to provide a practically unstretchable or nonelastic knitted fabric with filler yarns held therein in a freely looped relation at each side as to provide a fabric suitable for use as Turkish toweling; wash rags; bath mats, bath robes, and the like.

Various changes in the steps to effect the knitting of the main and terry yarns, as well as alteration of parts 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.

I claim:

1. In a knitting machine a set of needles and their carriers, means for feeding a knitting yarn to alternate needles of said set, means for feeding a second knitting yarn to the remaining needles of said set, means to dependently operate the needles of the first and second knitting yarns to knit fabric, a dial construction including thread controlling elements, means to supply a pair of extra threads to the respective groups of alternate needles of said set and the dial elements intermediate the feeds of the first and second yarns above mentioned, and means to operate on the needles of said set and the dial elements to draw the extra threads into loose loops at both sides of the plane of the fabric.

2. In a circular knitting machine a cylinder having a plurality of longitudinal reciprocating needles thereon, means to operate on alternate needles to elevate and lower the same, means to operate on the remaining needles to elevate and lower the same, means to feed two knitting yarns to said needles, one yarn to alternate needles and the other yarn to the remaining needles, a dial, reciprocating elements supported by the dial in transversely movable cooperation with the needles of the cylinder, means for feeding an extra yarn to the cylinder needles and the dial elements, and cam means cooperating upon the cylinder needles and dial elements in cooperation with said last mentioned means to receive the extra yarn in such relation to the knitting yarn that the same will provide loose loops at opposite sides of the fabric.

3. In a knitting machine a stationary cylinder having a plurality of longitudinal reciprocating needles thereon, a stationary dial over the cylinder having a plurality of reciprocably supported elements thereon in transversely movable cooperative relation with the needles of the cylinder, cam means for elevating all of the cylinder needles and projecting all of the dial elements to receive a first extra thread, cam means immediately succeeding the last mentioned cam means to retract the dial elements and lower alternate needles of the cylinder, means for elevating the remaining needles of the cylinder to receive a first knitting yarn, cam means operating on the last mentioned needles to lower them to knitting position, cam means succeeding the last mentioned means to elevate all of the cylinder needles and project all of

the dial elements for receiving a second extra thread, cam means succeeding the last mentioned cam means for retracting all of the cylinder needles and retracting all of the dial elements, cam means succeeding the last mentioned cam means to elevate the alternate needles of the cylinder which were not elevated when the first knitting thread was fed, means for feeding a second knitting thread to the elevated needles of said last mentioned cam means, cam means for lowering the said elevated needles to a knitting position, and cam means for projecting the dial elements, to a loop cast off position for casting off the loops formed by the extra thread supported thereby.

4. In a knitting machine, a cylinder, a set of cylinder needles, means guiding and controlling knitting yarns upon the needles, means to operate said needles to knit a base fabric of said knitting yarns, a dial construction including reciprocating yarn controlling elements, means for guiding terry looping yarns upon said dial elements and cylinder needles, and means to operate said cylinder needles and dial elements to draw said terry yarns through the base fabric as it is knitted in free long outstanding terry loops at both sides of the base fabric.

HARRY McADAMS.