

May 12, 1931.

H. McADAMS

1,805,339

KNITTING MACHINE

Filed July 26, 1927

6 Sheets-Sheet 1

Fig. 1

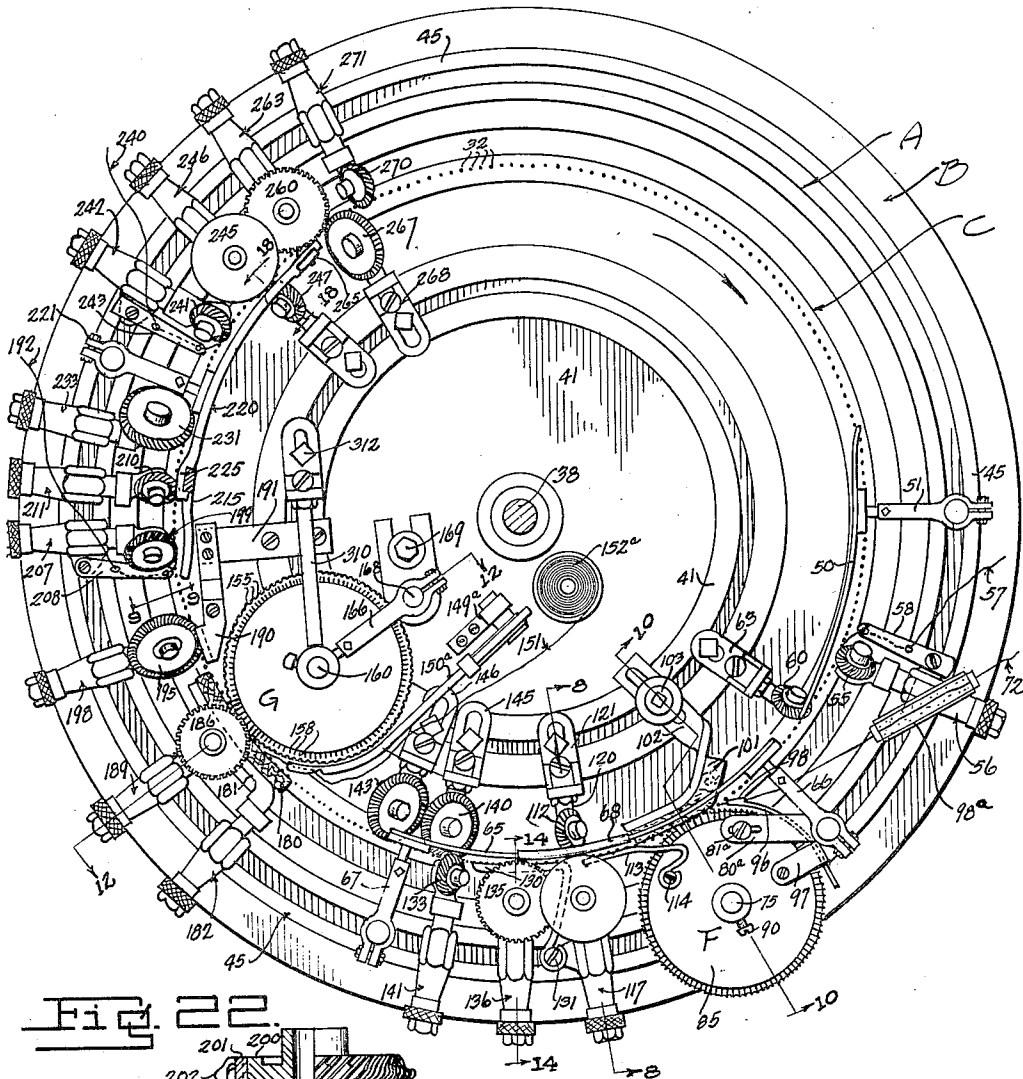


Fig. 22

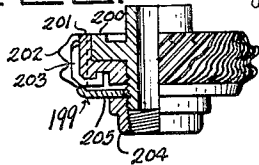
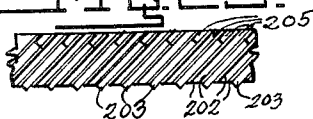


Fig. 23



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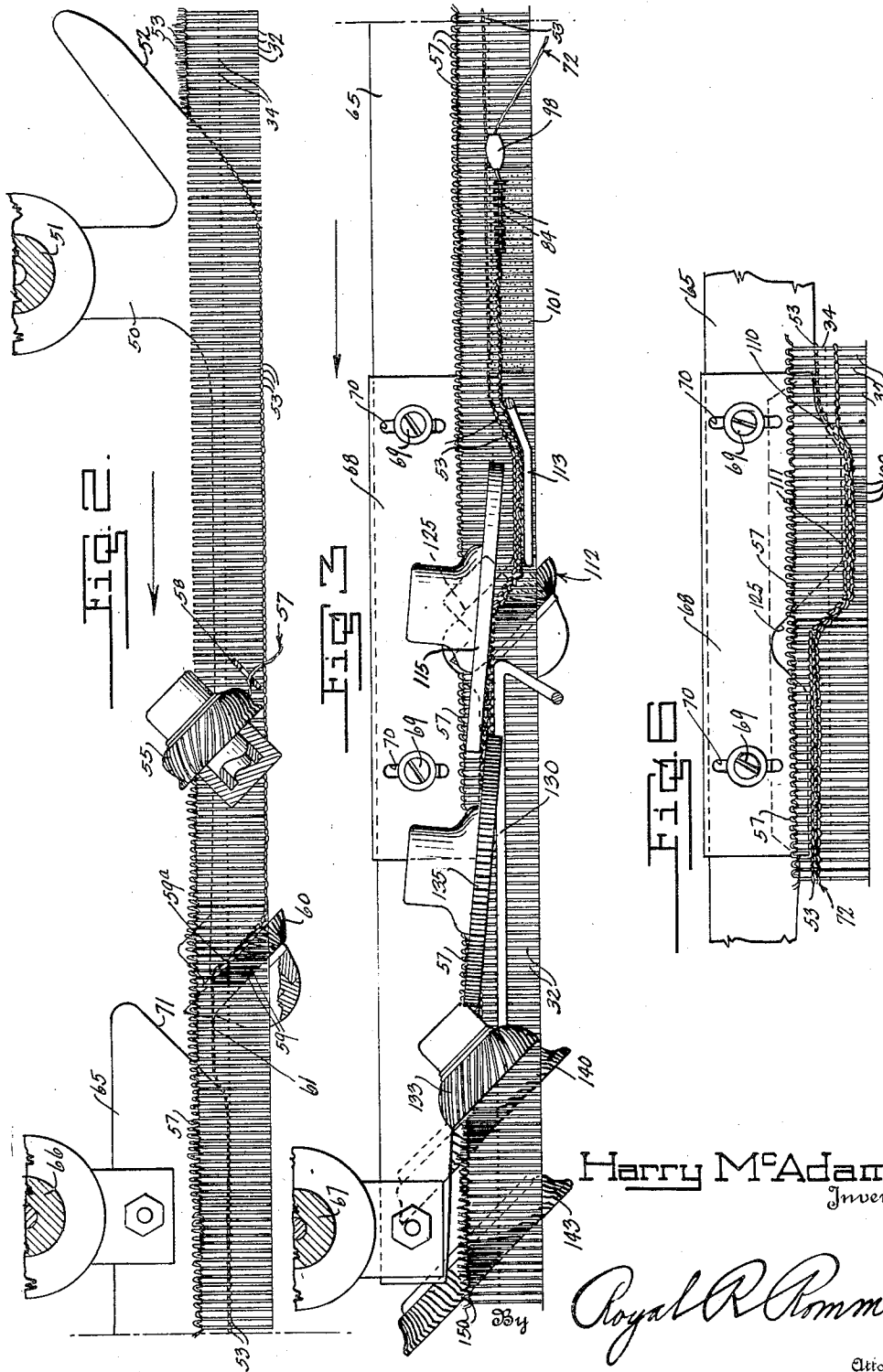
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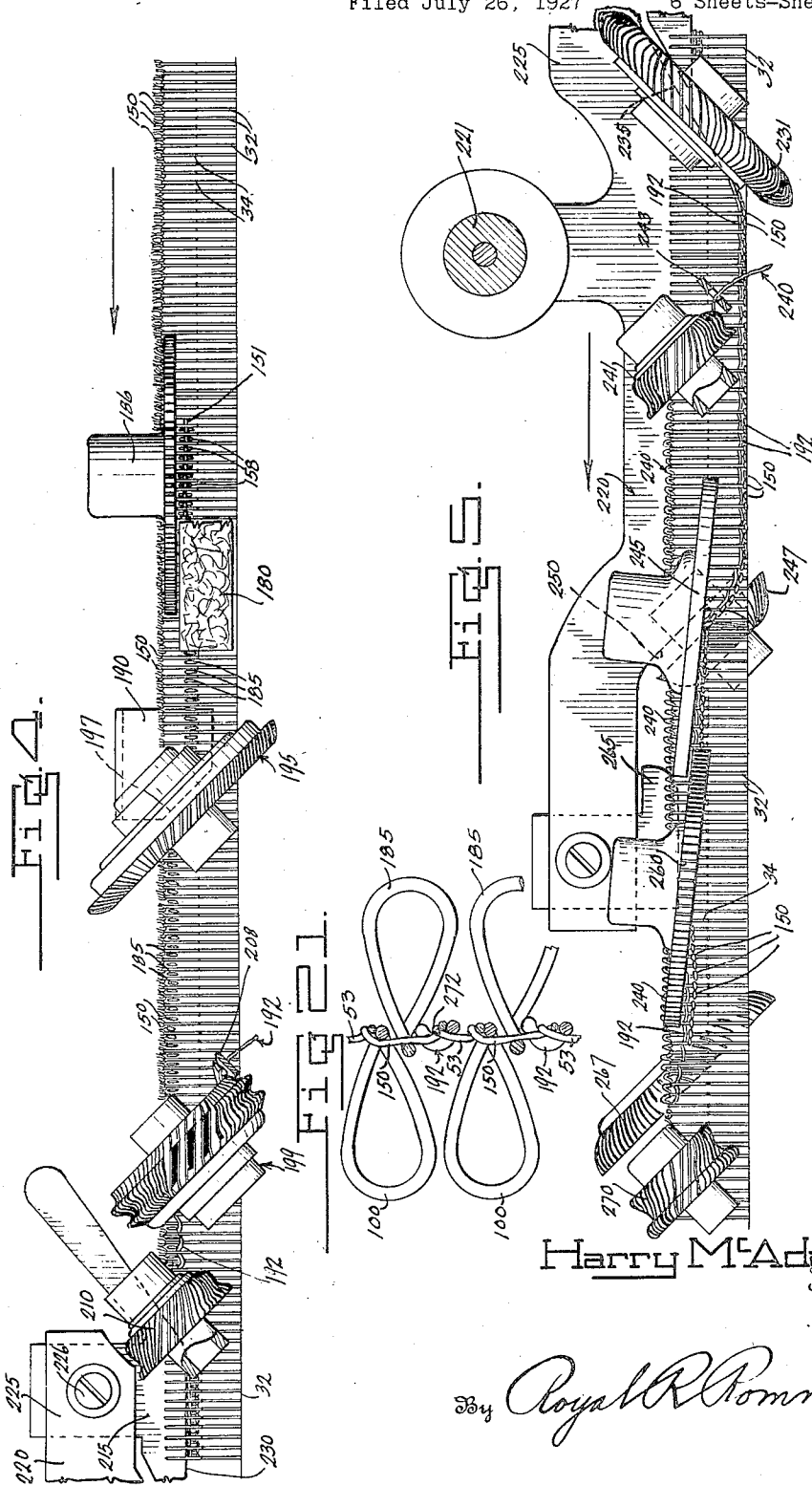
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6 Sheets-Sheet 3



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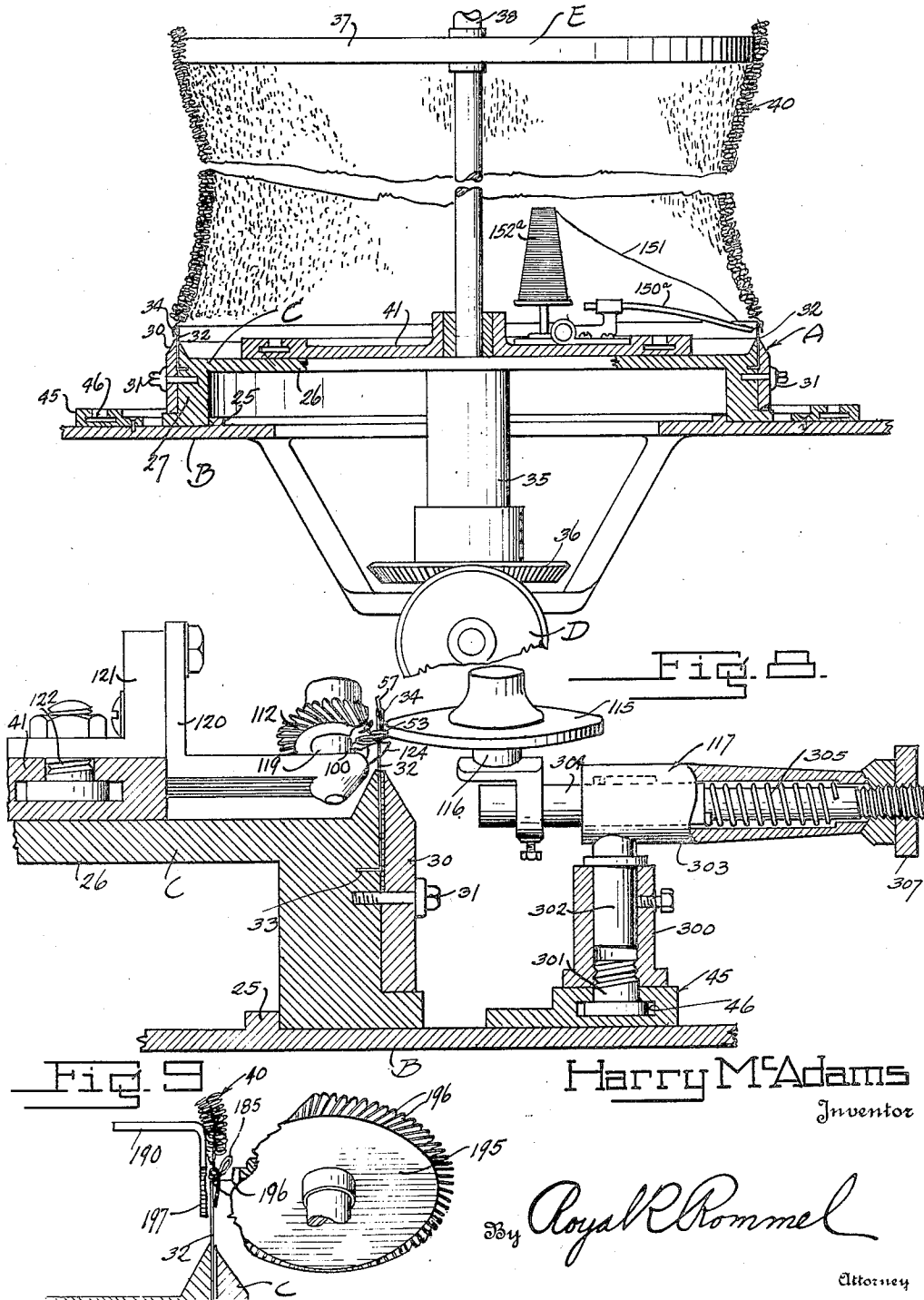
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KNITTING MACHINE

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Fig. 7



May 12, 1931.

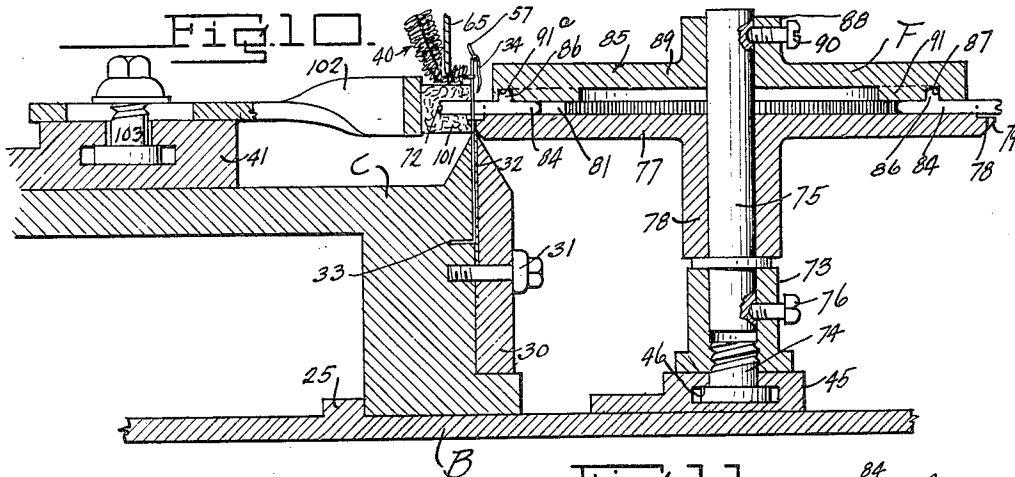
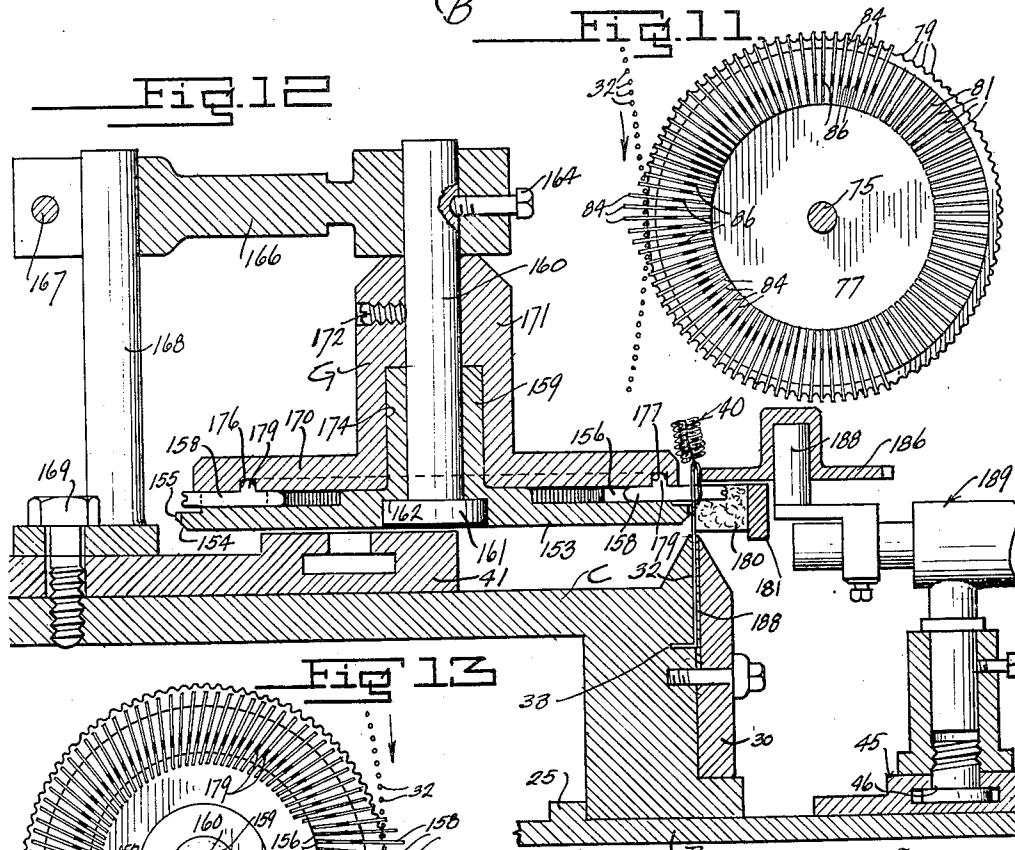
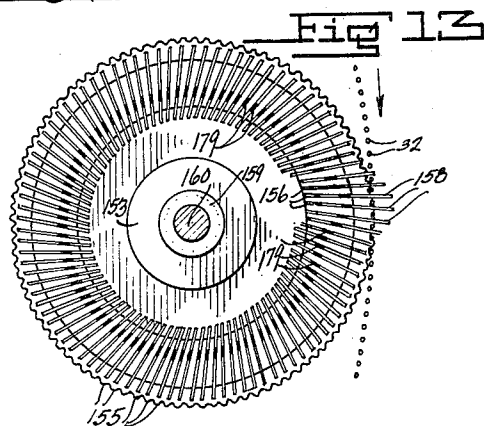
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KNITTING MACHINE

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6 Sheets-Sheet 5



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KNITTING MACHINE

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Fig. 16

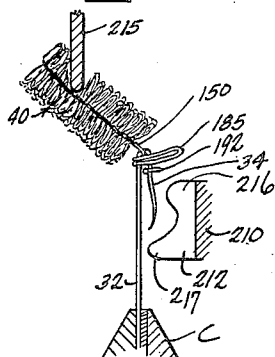


Fig. 15

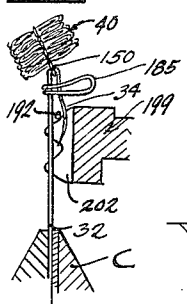


Fig. 14

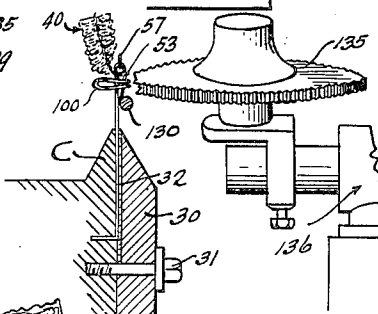


Fig. 17

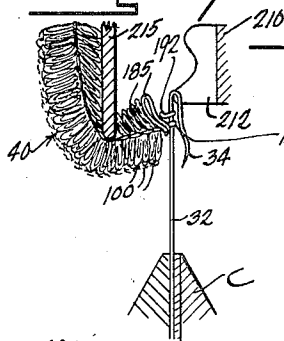


Fig. 1a

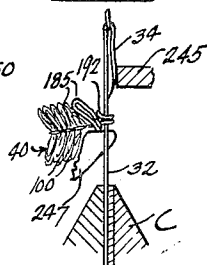


Fig. 19.

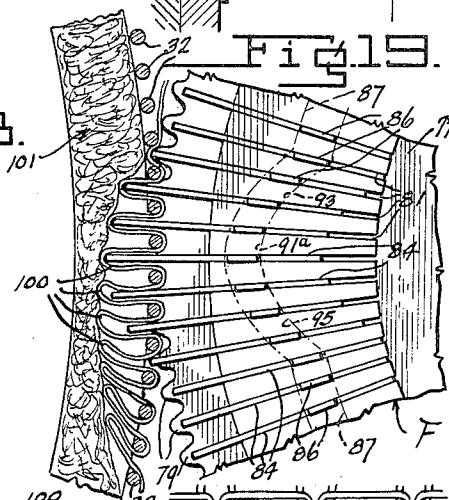
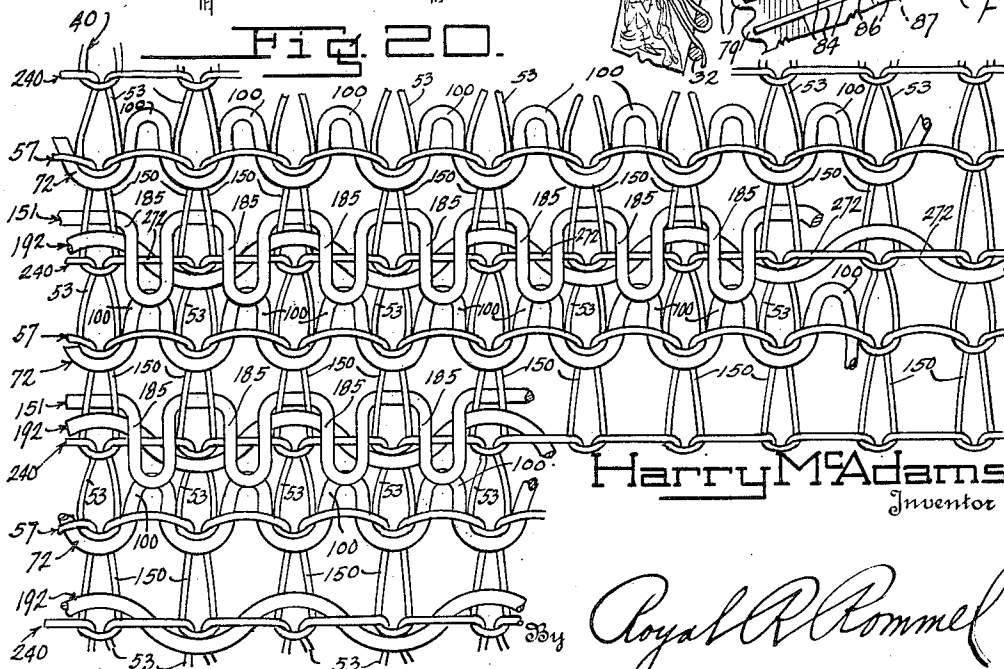


Fig. 20.



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UNITED STATES PATENT OFFICE

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KNITTING MACHINE

Application filed July 26, 1927. Serial No. 208,483.

This invention relates to improvements in means for knitting terry looped fabrics.

The primary object of this invention is the provision of a novel terry looped fabric, knitted after a novel method, and including improved mechanism to knit the same.

A further object of this invention is the provision of a novel terry looped knitted fabric, which includes a knitted base fabric resembling plain stocking stitching, which has introduced therein terry yarns of a somewhat heavier nature, looped in a novel relation with respect to the stitches of the knitted base so as to project in relatively long and prominent loops at opposite faces of the fabric, and in such relation that the base fabric is not visible; the terry yarns being introduced in such relation that they are not knitted into the loop stitches of the base knitting, but introduced therein in a protected relation which will not permit the same to be easily withdrawn; the fabric being adaptable for a variety of uses and resembling the conventional woven terry looped fabric such as found in Turkish towels, but being in fact superior thereto, inasmuch as the loops can be more regularly drawn and in closer more compact relation.

A further object of this invention is the provision of a method and means for knitting fabric with loops prominently projected at both faces thereof in simulation of conventional Turkish toweling, the method and machine being an improvement over what is shown in my application, Serial No. 148,849, filed November 17, 1926.

A further object of this invention is the provision of apparatus and means to knit a novel fabric with terry loops prominently projected at both faces thereof, in a somewhat different and improved relation with respect to my co-pending application above mentioned, and also differing with respect to knitting operation and mechanism for knitting the same, over my co-pending applications Serial No. 146,680, filed November 6, 1926, and Serial No. 155,661, filed December 18, 1926, all of which are adaptable for the knitting of terry looped fabrics in a relation which is broadly new in the art. In making

this statement I am aware that there have been previous attempts to provide looping on the sides of base knitting simulating woven Turkish toweling, but the attempts were in the main experimental, and lack the showing of practical means for such accomplishment. The problem of providing such fabric is entirely different from the knitting of ribbed fabrics, pile fabrics, plush fabrics, or fleece fabrics, not only because the terry yarns have to be introduced at opposite faces of the base fabric, but also because the terry looped knitted fabric has to be of such a nature as to withstand practical conditions of use, such as the use to which washrags and towels are subjected, and mainly because with ordinary looping arrangements for fabrics, the loops are not projected in length great enough from the base fabric, and ordinary looping wheels and expedients are not able to accomplish this. With the apparatus of this application, I have provided an entirely new fabric in which the terry loops are prominently projected uniformly and in very closely spaced relation at opposite sides of the fabric, so as to, in fact, hide the base stitching, and this fabric has been subjected to practical tests, and has been found to be far superior to ordinary terry woven fabric.

A further object of this invention is the provision of a novel looper and means for cooperation therewith to maintain the loops in an efficient relation with respect to knitting needles in the machine which I employ.

A further object of this invention is the provision of a novel relation of yarn introducing, landing, knitting, and looper wheels and burrs, as used upon the large rotary cylinder knitting machines, known in the art as underwear knitting machines.

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 plan view of the improved circular knitting machine, showing the novel

arrangement of details for the knitting of the improved terry looped fabric.

Figures 2 and 3 are views on a developed plane, showing details for effecting the knitting of the base fabric and introduction of the terry yarn for what I prefer to call one-half of the knitting operation of the improved machine; the view Figure 3 being a continuation of the apparatus of Figure 2.

Figures 4 and 5 are successive views illustrating in developed planes the apparatus for knitting the terry looped fabric, continued from the apparatus of Figure 3, and showing the means for introducing, knitting, and looping a second knitting yarn, a second terry yarn, and a weft yarn in a knitting operation succeeding the knitting operation which is accomplished by the parts of Figures 2 and 3.

Figure 6 is a fragmentary view illustrating an adjustable cam which is also illustrated in Figure 3, but this view showing the same clearer because of the absence of the landing and presser wheels.

Figure 7 is a reduced fragmentary sectional view taken through the improved circular knitting machine, showing in addition to conventional features means for introducing a terry yarn from the inside of the cylinder.

Figure 8 is a fragmentary sectional view of details of the circular knitting machine which cooperate in pressing the beards of the cylinder needles closed at the time that a landing wheel elevates the first terry yarn loops and previously knitted stitches preparatory to a cast-off from the needles, this view being taken substantially on the line 8—8 of Figure 1.

Figure 9 is a fragmentary view, partly in section, taken substantially in the position indicated by the section line 9—9 of Figure 1 of the drawings.

Figure 10 is a cross sectional view taken through the first terry yarn looper, the view being taken substantially on the line 10—10 of Figure 1 of the drawings.

Figure 11 is a fragmentary plan view of the plunger or sinker arrangement of the looper wheel of Figure 10, with the cam cap thereof removed.

Figure 12 is a cross sectional view showing the looper wheel for introducing the second terry yarn from the inside of the circular row of knitting needles, the view being taken substantially on the line 12—12 of Figure 1 of the drawings.

Figure 13 is a plan view of the plunger or sinker arrangement for the looper wheel of Figure 12, with the cam cap thereof removed.

Figure 14 is a fragmentary view, partly in section, taken substantially on the section line location 14—14 of Figure 1 of the drawings, showing a gear wheel for taking slack

out of the first terry yarn as looped on the needles to hold the loops at their full length at the insides of the needles.

Figure 15 is a fragmentary sectional view showing how the weft yarn introducing burr of Figures 22 and 23 closes the beards of alternate needles to feed a weft yarn to the needle below the looped second terry yarn.

Figures 16 and 17 are views showing successive positions of a novel bladed wheel cooperating on the needles of the cylinder succeeding the weft introducing burr of Figure 22 for the purpose of elevating the loop of the second terry yarn and the weft yarn and throwing them over the tops of the needles to the insides thereof where the loops of the second terry yarn are held by the weft yarn in interlocked relation, these views showing the burr wheel illustrated to the extreme left in Figure 4 of the drawings.

Figure 18 is a fragmentary sectional view taken substantially at the location illustrated by the section line 18—18 of Figure 1 of the drawings, showing a needle beard presser wheel and landing burr cooperating therewith for elevating the fabric, second terry yarn, and weft yarn over the beards of a needle just prior to a knitting operation.

Figure 19 is an enlarged fragmentary sectional view showing the manner in which the improved looper devices introduce the terry yarn to the needles of the machine, in a cooperating relation with a felt or friction pad for holding the loops in place while the sinkers of the improved looper device are withdrawn.

Figure 20 is an enlarged, distorted, and diagrammatic representation of the relation of the knitting yarns forming the loops or stitches of the plain base knitting with respect to so-called first and second terry yarns in a looped arrangement between the loop stitches of the base fabric, and in relation to a weft yarn which serves the dual purpose of preventing transverse stretch in the fabric and filling the spaces between loops or stitches to hold the terry yarns in substantially an interlocked relation.

Figure 21 is a sectional view taken through the improved fabric, showing more accurately the relation of the loops of the terry yarn with respect to the stitch formation of the base knitted fabric and with respect to the weft yarn.

Figure 22 is a side view in half section of the weft yarn introducing wheel.

Figure 23 is a view showing the blades and pressers of the wheel of Figure 22, on a developed plane.

In the drawings, wherein for the purpose of illustration is shown the novel knitted fabric, and the means for knitting the same, the letter A may generally designate the improved knitting machine, which includes a supporting bed or frame B, having a rotary

cylinder construction C thereon, operably driven by means D. A fabric take-up mechanism E may be provided, of conventional construction, and cooperating with the needles

5 of the cylinder C is an improved looper F for introducing one of the terry yarns from the outside of the circular row of needles, to loop the same to the inside of the circular row of needles. A second novel looping wheel
10 G presenting some of the characteristics of the looper F is also provided, for introducing the second terry yarn from the inside of the circular row of needles to loop the same at the outside of the circular row of needles.

15 Referring more particularly to Figure 7 of the drawings, wherein the type of machine is disclosed, which it is preferred to use with this invention, the supporting bed B is horizontally positioned, and supported in any approved relation, and the same has an annular
20 flange 25 on the top thereof, which guides the rotation of the cylinder C. The cylinder C includes the top wall 26, integrally connected to the depending cylinder body 27, at the inner periphery. On the external periphery
25 of the cylinder body 27 the needle plates or segments 30 may be clamped by bolts 31, as well understood in the art, and shown in Figure 7 of the drawings. As well illustrated
30 in Figures 10 and 12 of the drawings, and also in Figure 8, the needles 32 are shown as clamped in position on the cylinder body by the clamping plates or segments 30, the lower ends of the needles being anchored at 33, in
35 well known relation, in the cylinder body, and the upper ends thereof projecting upwardly above the top edges of the cylinder body and clamping plates 30. The needles 32 are of the non-movable type, and rotate
40 with the cylinders, and the same are preferably of the spring-beard type, having the outside downwardly facing beards 34, best illustrated in the open positions in Figures 16 and 17 of the drawings.

45 The cylinder may of course be of any diameter, and any approved number of needles may be provided thereon, consistent with the diameter of the fabric to be knitted, and the spacing of the stitches of the base fabric. Inasmuch as the stitch loops of the base fabric
50 will have to be closely spaced, for terry loop knitted fabric such as I provide, it is essential that the needles be closely spaced together, and this somewhat complicates the practical production of a well formed terry
55 loop knitted fabric. It is to be understood that the cylinders may be very large in diameter, and that the arrangement of terry, weft, and stitch yarn controlling wheels and devices constitute but one series, and that any
60 number of said series may be provided on the needle cylinder, as desired, consistent with the size of the knitted fabric, and the speed with which the same is to be manufactured.

65 Rigidly associated with the cylinder C is a

depending sleeve 35, shown in Figure 7 of the drawings, having a bevel gear 36 thereon which meshes with the drive means D, below the bed of the machine.

The take-up mechanism E is of course conventional in character and includes a wheel
70 37, shown in Figure 7 of the drawings, keyed on a vertical shaft 38, and the seamless terry loop knitted fabric 40, as the same is knitted, is held upwardly above the rotating cylinder,
75 as will be well understood by those skilled in the art.

Within the circular line of knitting needles is provided a grooved top plate 41, which is held stationary, as by being secured to a stationary sleeve about the shaft 38, shown in
80 Figure 7. It is adapted to support brackets which in turn support various burr wheels and devices for effecting the knitting of the fabric; these devices of course operating at
85 the inside of the circular line of needles. On the bed B externally of the cylinder, and concentrically surrounding the same, is the conventional grooved back stand ring 45, having a T-shaped slot 46 therein, well illustrated
90 in Figure 8 of the drawings, for receiving suitable stands or supports which in turn support various burrs and bladed wheels, and looper wheels, as will be subsequently mentioned.

Referring to an operative description of the parts of this invention in connection with the knitting and loop forming operations, it is to be noted that the plan view of Figure 1
100 shows substantially all of the wheels and devices for operating on the two knitting yarns, two looping yarns, and weft yarn, and Figures 2, 3, 4 and 5 successively show, in a developed plane, the various devices as they
105 operate on the threads or yarns to effect the knitting and loop introduction with respect to the needles. Referring to Figures 1 and 2 of the drawings, a push-down cam 50 is provided, supported by preferably a single
110 bracket 51 which is detachably and adjustably carried in the back stand ring 45; the push-down cam 50 being positioned within the inside of the circular line of needles 32, having a downwardly sloping edge 52,
115 shown in Figure 2 of the drawings, against which the fabric rides as the cylinder C rotates, to lower the last knitted stitches 53, shown at the right hand end of Figure 2; said last mentioned knitted stitches 53 being
120 lowered by the push-down cam 50 to the very bottom of the needles 32, to the top edge of the cylinder, C, and below the beards 34 of the needles 32, as illustrated in Figure 2 of the drawings. The cylinder and needles rotate in the
125 direction illustrated by the arrows in Figures 1 and 2 of the drawings, and it is readily obvious that the cam 50 will lower the fabric and more particularly the last knitted stitches which are on the needles 32, to locations
130 below the beards of said needles. While the

cam 50 holds the fabric in this position, a bladed feed burr 55, which is rotatably supported by an adjustable bracket construction 56, receives the first knitting yarn 57 in a guided relation from a guide arm 58 which is carried by the bracket 56 also, and pushes the said first mentioned knitting yarn 57 upon the needles 32, below the beards 34 thereof, and elevates the said first knitting yarn 57 beneath the beards of every needle 32, to the top of the needles, in the relation on said needles illustrated in Figure 2 of the drawings. This bracket 56 which supports the feed burr for the first knitting yarn 57 is of well known construction, and of the type detailed in Figure 8, and to be subsequently described. The cam 50 continues to hold the fabric in its connection on the needles 32 down to the bottoms of the needles 32 at the top edge of the cylinder C, to a location past the feed burr 55, and the free end of this cam 50 has an edge 59^a, shown in Figure 2, sloping upwardly, and below this edge 59^a, at the inside of the line of needles 32, is disposed a bladed landing wheel or burr 60, the blades of which mesh in the spaces between all of the needles 32, and elevate the stitches 53 last made on the needles 32, above the free ends of the beards of the needles, to approximately the position illustrated by numeral 61 in Figure 2 of the drawings. It is to be noted that the stitches last made and hooked on the needles are thus elevated into the open beards, so as not to touch the new yarn 57, which is under the beards of said needles at the tops thereof. It should be mentioned that the landing wheel 60 is of well known construction, having a top straight edge which rides the stitch up upon the needle to the location mentioned, and this wheel 60 is rotatably supported upon a suitable well known bracket 63, carried by the grooved top plate 41, in a manner well known to the art, and shown in Figure 1.

A push-down cam 65 is provided at the inside of the circular line of needles succeeding the bladed wheel 60, the function of which is of course to regulate the pushing down of the fabric, in a relation to be subsequently described; this push-down cam 65 being supported at its extreme end by means of brackets 66 and 67, shown in Figures 1, 2 and 3 of the drawings, and shown in Figure 1 as being supported by the grooved back stand ring 45. Between its ends the cam 65 is provided with a vertically adjustable push-down cam 68, supported by means of bolts 69, shown in Figures 3 and 6 of the drawings, on the cam 65, so that it may be vertically adjusted, said adjustable cam 68 having slots 70 for receiving the bolts 69, the latter being carried by the cam 65, so that the extent to which the fabric may be lowered on the needles by the cam 68, may be regulated, according to the character of yarn used, and

the relation of the landing wheels at the cam 68, to perform a cast-off of the yarn from the needle beards, to be subsequently mentioned.

Referring again to the operation on the yarn succeeding the landing wheel 60, the cylinder C continues to rotate, until the fabric comes into engagement with the inclined edge 71 of the cam 65, shown in Figure 2 of the drawings, and which lowers the stitch loops 53 of the fabric hung over the needles to a location just above the free ends of the beards, as shown in Figure 2, and in this location the fabric rides along the lower straight edge of the cam 65 until the vertically adjustable cam 68 is reached. Prior to the time that the stitches reach the vertically adjustable cam 68, however, the first terry yarn 72 is introduced between each of the needles 32 of the rotary cylinder, by the outside looper device F illustrated more particularly in vertical section in Figure 10 of the drawings. This looper device F presents some of the characteristics of the looper wheel or device for terry yarns set forth in my co-pending application Serial No. 148,849, filed November 17, 1926, above referred to, but embodies improvements thereover in the relation in which the same is driven with respect to the cylinder, and in the manner in which the yarn is introduced in long loops and maintained in such relation. It is the function of this looping device F to take the terry yarn 72, and introduce the same onto the needles of the cylinder from the outside of the circular row of needles 32, looping the same between each of the needles 32, to the inside of the circular line of knitting needles, in relatively long loops.

Referring in detail to the looping device F, a hub 73 is provided therefor as illustrated in Figure 10, which is connected in adjustable relation upon the back stand ring 45, by means of a conventional hub bolt 74, which operates in the groove 46 of the back stand ring 45, in the well known manner. A shaft 75 is keyed against rotational movement by means of a set screw 76, in the hub 73, vertically upstanding therefrom. A rotatable wheel body 77 is provided with a hub 78 having the shaft 75 therethrough, so that the wheel body 77 may rotate on the shaft 75. The wheel body 77 at its outer periphery is beveled at 78 in downwardly sloping relation, and there is provided with a series of spaced teeth 79 which are adapted to intermesh in the spaces between the needles 32 of the cylinder C, immediately at the top edge of the cylinder from which the needles 32 arise, and which gearing of the looper wheel body 77 to the needles 32 is provided as a means for driving the wheel body 77, and at a location on the needles 32 where the drive of said looper wheel body 77 will not be a strain

on the knitting needles or interfere with the successful operation thereof, it being noted that the bevel 78 aids in placing the teeth 79 to the lowest possible intermesh of the gear teeth 79 with the needles. On the top surface of the wheel body 77 is provided a circular or ring-shaped raised portion, having exposed radial slots 81 therein, which are adapted to reciprocally or slidably receive the sinker or pusher members 84 which loop the terry yarn 72 between the needles 32. In Figure 11 is shown a top plan view of the wheel body 77, with the cam plate 85 of the looper device F removed, and at the right side of this view of Figure 11, the sinkers 84 have been removed to show the radial slots 81, and it is to be noted that the portion in which the slots 81 are provided, does not extend as far as the gear teeth 79. It is to be noted that in this particular looper device F the slots 81 are truly radial with respect to the axis of rotation of the wheel body 77, that is, with respect to the axis of the shaft 75.

The sinkers or pushers 84 are well illustrated in side elevation in Figure 10 of the drawings, the same comprising flat bodies rectangular in cross section, which slide back and forth in their respective slots 81, and each of which is provided with an upwardly extending butt 86, adapted to ride in the cam slot 87 of the cam cap 85, in a relation to be subsequently described. Furthermore the pusher members 84 at the free ends thereof are concavely grooved, as shown in Figure 10, so that they may readily take the terry yarn 72 and maintain the same therein as the terry yarn is being looped between the needles 32.

The cam groove cap 85 of the pusher device F includes a hub 88 with which the cam plate 89 is rigid, the hub 88 being keyed at 90 against rotation on the shaft 75. The cam plate 89 is provided with a ring-shaped portion 91 on the lower surface thereof at the outer margin thereof, upwardly into which the cam groove 87 is provided. This cam groove 87 is adapted to receive the butts 86 of the sinkers 84, and the groove 87 for substantially the entire length thereof is concentric with the axis of the shaft 75, but at the location thereof nearest the needles 32 the cam groove 87 inclines outwardly to a point and then returns to a concentric position with respect to the shaft 75, this offset portion 91^a of the cam groove 87 being shown in Figure 10, where the sinker 84 of that view is shown as projected to its greatest extent between the needles 32, for forming the terry loop. As shown in Figure 11 of the drawings, adjacent the circular row of needles 32, the butts 86 of the sinkers 84 follow the shape of the cam groove 87, to project the sinkers 84, between the needles 32, in the relation illustrated in Figure 11 of the drawings.

In Figure 19 is shown an enlarged section of the relation in which the terry yarn is

looped between the needles 32, at the offset portion of the cam groove 87. This view in Figure 19 shows the cam plate as including an outwardly inclining portion 93 of the cam groove 87, along which the needle butts 86 ride, to project the pushers 84 in the relation illustrated in Figure 19, between the needles 32. The sinkers 84 are then retracted, by the riding of the sinker butts 86 along a sloping portion 95 of the cam groove 87, shown in dot and dash lines in this Figure 19.

The first terry yarn 72 is fed onto the sinkers 84 from a guide arm 96 which is carried by a bracket 97 secured upon the stationary cam plate portion 85 of the looper device F, as shown in Figure 1 of the drawings, the eye 98 of the yarn guide arm 96 being plainly shown in Figure 3 of the drawings at the right side of the figure, and said eye receiving the first terry yarn 72 from a bracket 98^a of conventional form, with an oil pad therein; said bracket 98^a being secured upon the adjustable standard or bracket 56 above referred to, and as shown in Figure 1.

The manner in which the loops are formed between the needles 32 is best illustrated in the view Figure 19, where the first terry yarn 72 is introduced thru the spaces between each of the needles 32 to form long terry loops 100, of a length suitable for forming a terry loop fabric. In cooperation with the looper device F, means is provided at the inside of the circular row of needles 32 for preventing the loops 100 from retracting as the sinkers 84 are retracted. This means includes a preferably felt pad 101, illustrated in Figures 1, 10, and 19 of the drawings, the same being of a nature to permit the projecting ends of the sinkers to sink thereto, as the terry loops 100 are pushed between the needles, the felt pad 101 being of a compactness to yieldably and frictionally grip the loops 100 as they are inserted, and hold the same in place temporarily while the sinkers 84 are retracted, as can readily be gained from the view of Figure 19. Of course, as the cylinder rotates, the loops 100 will ride from their recess in the felt pad 101, but the loops will not be pushed to the outer side of the circular line of needles, but will be retained in their looped relation to the inside of the circular line of needles. This yieldable pad 101, as is shown in Figures 1 and 10 of the drawings, is supported by a radially adjustable bracket 102, which is carried upon a suitable bolt 103. The yieldable pad 101 is of course at the inside of the circular line of needles and the bracket bolt 103 is carried in the groove of the grooved top plate 41, in a relation well illustrated in Figure 10 of the drawings.

Figures 2 to 6 inclusive of course show the view of the details from the outside of the cylinder, in a developed plane, and in Figure 3 at the right hand end is shown the relation in which the first terry yarn 72 is

introduced by the sinkers 84 between each of the needles 32, at a location below the free ends of the beards of the needles, and of course spaced below the fabric loops or stitches 53 previously knitted and engaged about the needles 32.

As the cylinder C continues to rotate past the looping device F, the fabric previously knitted comes into engagement with a downwardly inclined edge 110, of the vertically adjustable push down cam 68, as shown in Figure 6 of the drawings, and the stitches engaged about the needles 32, are lowered to below the free ends of the beards of the needles, and this edge 110 also lowers the looped terry yarn 72, as shown in Figure 6 of the drawings, the stitches 53 of the knitted yarn on the needles and the looped terry yarn 72 riding below the horizontal straight edge portion 111 of the vertically adjustable cam 68 until the same reaches a landing wheel 112, shown in Figures 1 and 3 of the drawings. A guide wire or arm 113 supports the looped terry yarn 72 on the needles 32, below the inclined and straight edge portions 110 and 111 of the cam 68, as shown in Figure 3 of the drawings, and prevents the loops of this first terry yarn 72 from becoming displaced on the needles, so that the same may properly approach the landing wheel 112. This guide arm 113 may be carried by a suitable screw 114, on the stationary top cam plate 85 of the looping device F, as shown in Figure 1 of the drawings. The free end of the arm 113 terminates at the plane of the top edges of the blades of the landing wheel 112, as shown in Figure 3.

Referring now to Figure 8, a beard presser wheel 115 is rotatably supported upon the stub shaft 116 of the well known type of star box bracket 117 conventionally carried by the grooved back stand ring 45; the outer periphery of this presser wheel 115 being smooth, and riding over the beards 34 of the needles 32, to close the same, while the landing wheel 112 elevates the previously knitted stitches 53 which are now on the needles below the beards, and also the first terry yarn 72, to cast the same over the beards. At this time it is well to mention that the first knitting yarn 57 has all of the time been supported on the tops of the needles 32 beneath the beards thereof.

The landing wheel 112 is at the inner periphery of the circular row of knitting needles 32, as shown in Figures 1 and 8 of the drawings, and this wheel 112 is rotatably carried by the stub shaft 119 of an adjustable L-shaped bracket 120 which is carried by a suitable bracket 121 bolted at 122 in the grooved top plate 41 above mentioned, and clearly shown in Figure 8 of the drawings. This landing wheel 112 operates in the usual manner with its blades between each of the needles 32, the top edges of the blades be-

ing straight and engaging in the spaces between the needles below the loops 100 of the first terry yarn 72, as is clearly shown in Figure 8 of the drawings, where the numeral 124 designates one of the blades of the landing wheel 112, and the said blades of the landing wheel ride upwardly between the needles 32, to elevate the terry yarn 72 and also the previously knitted stitches which are engaged on the needles 32, over the outsides of the beards 34 of the needles 32, which have now been closed by the presser wheel 115, as shown in Figure 8 of the drawings. As shown in Figure 6 of the drawings, the vertically adjustable cam 68 is provided with an upwardly inclined edge 125 to permit this operation. The previously knitted stitches and the looped terry yarn 72 are now over the beards 34, of the needles 32, as shown in Figure 6, where the various wheels have been removed to more clearly designate the relation of the yarn on the needles and with respect to the cam 68.

In order to prevent the first terry yarn 72, which has thus been cast over the beards of the needles, from slipping down below the beards, a guard arm 130, is provided, which arches about the circular line of needles immediately below the free ends of the beards, to prevent the slipping of the yarn down over the beards, as is shown in Figure 3 of the drawings. This guard arm 130 is preferably a piece of wire bent to conform to the outer periphery of the circular line of needles, and it is carried by a screw 131 on the standard 117 for the presser wheel 115, as shown in Figure 1 of the drawings. It is also shown in Figures 3 and 14. The guard arm 130 extends to a point adjacent the bladed burr 133, which operates on the yarns over the beards. Between the burr 133, and the location where the landing wheel 112 elevated the previous stitches of the fabric on the needles, together with the looped first terry yarn 72, there is placed a gear wheel 135, rotatably supported by one of the conventional adjustable brackets 136, ordinarily arranged on the grooved back stand ring 45, said wheel 135 having shallow gear teeth which intermesh between adjacent needles 32, at a location where said gear teeth will press against the portions of the terry yarn 72 which engage about the beards of the needles, for the purpose of taking any outside slack off of the terry yarn 72, and placing it in the loops 100 arranged at the inside of said needles. This operation of the gear wheel 135 on the terry yarn 72 is well illustrated in Figure 14, which view also shows the guard arm 130, and it is readily obvious that the gear teeth pushing into the spaces between the needles 32, and riding over the portions of the terry yarn which cross the beards, will take all slack out of the terry yarn and place it in the loops 100 where it

belongs, thus efficiently aiding in the formation of the terry loops.

As the needle cylinder rotates the first terry yarn 72 and the stitches 53 on the needles come into engagement with the convex edges of the blades of the burr wheel 133, which press in on the knitting thread stitches and the first terry yarn to bind them firmly about the needles, so that the inside knitting burr 140 may elevate them in proper condition, for casting off the loops of the first terry yarn 72, and casting off the old stitches 53 onto the first knitting yarn 57 which all of the time has been at the tops of the needles, and at this location of the knitting burr 140, the knitting takes place.

The burr wheel 133 is of course carried by one of the conventional brackets 141, adjustably supported on the grooved ring 45. In addition to the bladed knitting burr 140 there is also a second knitting burr 143, succeeding the burr 140 to insure that any yarn not properly handled at burr 140 will be taken care of. These two burrs 140 and 143 are of the usual construction, the blades of each operating between each of the needles 32 of the cylinder, and said burrs are respectively supported by adjustable brackets 145 and 146, carried on the grooved top plate 41 of the knitting machine A.

It is to be particularly noted that from the time that the first knitting yarn 57 is introduced on the needles, the same is held high beneath the beards of said needles until the knitting takes place at the wheels 140 and 143.

The above comprises the operation for knitting the first knit yarn and introducing the first terry yarn into the fabric, and it is to be noted that the loops 100 project at what I prefer to call the inside face of the seamless tubular fabric as the same is fabricated.

Referring to the manner of introducing the second knit yarn and the second terry yarn and a weft yarn, the apparatus and method for these operations is well designated in Figures 4 and 5 of the drawings mainly. As is shown in Figure 4 of the drawings, at the right hand end, the stitches 150 are shown as high on the needles beneath the beards, said stitches being formed in the previous knitting operation, out of the first knit yarn 57. As the needle cylinder rotates the second terry yarn designated by numeral 151 is introduced at the inside of the circular line of needles, by the looping device G, to project loops of the said terry yarn between the needles to the outside thereof, to form the terry loops at the outside face of the seamless knitted fabric as completed.

Referring to the looping device G, the same is supported within the circular line of knitting needles, above the grooved top plate 41 as shown in Figure 12. The same includes a rotatable sinker supporting plate 153, of

substantially the same diameter as the sinker plate 77 of the looper F above described. This sinker plate 153 at the outer margin thereof is beveled at 154, and provided with spaced teeth 155, so that the said sinker plate or body 153 may gear with the needles 32 of the cylinder C, in the relation illustrated in Figures 12 and 13 of the drawings. On the top surface of the sinker plate 153 is provided a ring-shaped integral portion, provided with non-radial slots 156 therein, adapted to slidably receive the sinkers or loop pushers 158, which are altogether similar to the sinkers 84 above described for the looper F. The sinker plate 153 is provided with a hub portion 159, adapted to receive there-through a stationary shaft 160, the stationary shaft 160 at its lower end having an annular projecting flange 161 which fits into an enlarged recess 162 in the lower end inwardly of the lower surface of the sinker plate 153, to support the latter.

The shaft 160 of the looper G is supported at its upper end by a set screw 164, or the like, which bites into the material thereof, and in turn is supported by a right angled bracket 166, which is clamped at 167 on the upper end of a stationary standard 168 connected at 169 directly on the top plate 41, as illustrated in Figures 1 and 12 of the drawings. With this supporting construction it should be noted that upon releasing the clamping means 167 the arm 166 may be swung laterally to release the sinker plate from its geared connection with the needles, as is sometimes required.

Fixed on the shaft 160 against rotation is a cam grooved plate 170, provided with a hub 171 which receives the shaft 160 therethrough, and is keyed thereto at 172, as shown in Figure 12 of the drawings. As shown in this figure, the hub 171 is provided with an enlarged socket 174 therethrough for receiving the hub portion 159 of the sinker plate 153. Inwardly of the bottom surface of this cam plate 170 is provided a cam groove 176 which for the most part is concentric with the shaft 160, but closest to the needle line the said cam groove 167 is offset at 177, in a sort of U-shaped relation, in the direction of the needles 32, for the purpose of projecting the sinkers 158 between each of the needles 32, so that the outer ends thereof will extend between the needles to the outside of the circular line of needles, for the purpose of projecting the second terry yarn 151 in loops to the outside of the circular line of needles in a looped relation which can be readily understood from the foregoing description of the looper F.

A very important feature of the looper G is the fact that the sinker slots 156 thereof are non-radially positioned with respect to the axis of rotation of the sinker plate 153, as is clearly shown in the plan view of the

sinkers as positioned on the sinker plate, in Figure 13. In my earlier experiments I found that with a looper wheel at the inside of the circular line of needles, having radial slots for the sinkers, the sinkers could not be pushed to form loops of terry yarn of the desired length, without catching of the sinkers on the needles. The problem was solved by positioning the slots 156 non-radial, as shown in Figure 13, for receiving the sinkers 158 so that they will operate non-radial with respect to the axis of rotation of the sinker plate, slightly inclined at their forward ends off the radial position, in the direction of rotation of the cylinder, as is shown in Figure 13 of the drawings.

The sinkers 158 of course have butts 179 which operate in the cam groove 176 and offset cam groove 177 thereof, so that during a normal operating position the butts are as illustrated in the black areas in Figure 13 of the drawings, to project the sinkers between the cylinder needles 32, as shown in said Figure 13, for the obvious purpose of looping the terry yarn 151 to the outside of the circular line of needles, for forming terry loops in the knitted fabric at the opposite face of the fabric from that side of the face to which the terry loops 100 will project.

The operation of the looper G will be apparent. The sinker plate 153 has a geared drive with the needles 32 independent of the sinkers 158, so that the latter are free to reciprocate between the needles 32, for the looping of the terry yarn.

As shown in Figures 4 and 12 of the drawings the sinkers 158 of the looping device G operate in a plane just above the free ends of the beards of the needles 32, so that the loops are introduced between the needles to the outside thereof, above the entrance end of the beards of the needles, as is apparent from Figures 4 and 12 of the drawings. It should be noted that the fabric is hung high on the beards of the needles 32, so that the terry loops of the second terry yarn 151 are introduced below the fabric stitches 150 hung on the needles, as is shown in Figure 4. In order that the sinkers 158 when retracted will not pull the terry loops back therewith to the inside of the needles, a yieldable flexible pad 180 is provided, shown in Figures 1, 4 and 12 of the drawings, which is held tightly in conforming relation against the outer sides of the needles by means of a rigid bracket arm 181, which is carried by an adjustable stand 182 detachable on the grooved back stand ring 45, as shown in Figures 1 and 12 of the drawings. This pad 180 does not interfere with the beards of the needles, but extends thereacross, so that the sinkers 158 plunge with the loops of the terry yarn 151 therewith, as shown in Figure 12 of the drawings, and upon retraction of the sinkers 158 the material of the pad 180 will frictionally

grip the loops to prevent the retraction thereof, so that as the needles 32 pass the pad 180 the loops will project as shown at 185, in Figure 4 of the drawings, from between adjacent needles 32, above the free ends of the beards of the needles.

A very important feature used in cooperation with the inside terry yarn looper G is a bracing wheel 186, having gear teeth thereon intermeshing with the needles 32, immediately above the plane in which the terry loops of the yarn 151 are introduced, and directly at the location where the sinkers 158 are projected, the said wheel 186 being provided for the purpose of bracing the needles against outward flexing as the sinkers 158 push the terry yarn. In the absence of the wheel 186 the force of the sinkers will tend to flex the needles 32 outwardly, inasmuch as there is ordinarily a leather washer 188 backing the needles 32 between the needle plates 30 and the face of the cylinder in which the needles are anchored, as shown in Figure 12 of the drawings. This gear wheel 186 is rotatably mounted upon the stub shaft 188 of a suitable adjustable stand 189 of the well known type to be mounted on the grooved ring 45, as shown in Figures 1 and 12 of the drawings.

As the cylinder C continues on its way the needles 32 passing the pad 180, the loops 185 will be prominently projected between each of the needles 32, as shown in Figure 4 of the drawings, and to insure that the loops 185 of the terry yarn 151 project properly to the outside, without any slack of the yarn 151 to the inside of the needles an evening plate or member 190 is provided at the inside of the circular row of needles, inside of the fabric hung on the needles, as shown in Figures 1 and 4 of the drawings, which tends to keep the loops of the terry yarn 151 in proper position. This guard plate 190 is carried by a suitable bracket arm arrangement 191 secured on the grooved top plate 41, as shown in Figure 1 of the drawings.

It is desired to lift the terry loops 185 high on the needles in order that the weft or filler yarn 192 may be introduced with respect to the needles. A bladed burr or wheel 195, is rotatably supported to the outside of the circular line of needles, shown more particularly in Figures 1, 4 and 9 of the drawings, the function of which is to elevate the terry loops 185 high on the beards of the needles. This bladed wheel 195 has blades 196, with straight line top shoulders, which engage in the spaces between the needles 32, and lift the terry yarn 151 and the loops 185 thereof upwardly upon the needles, and in this respect it is to be noted that the guard plate 190 cooperates at its edge 197, shown in Figure 4 of the drawings, in dotted lines, to prevent the pushing of the terry loops 185 to the insides of the needles as they are moved up-

wardly by said wheel 195. The wheel 195 is suitably supported upon a conventional stand 198 carried by the grooved back stand ring 45, as shown in Figure 1 of the drawings.

The cylinder C continues to rotate with the fabric stitches 150 of the knitting yarn previously knitted high on the needles, immediately therebelow the terry loops 185 project prominently to the outside of the circular line of needles, until the combination beard pressing and weft yarn introducing wheel 199 is reached. It is the function of this wheel 199 to introduce the weft yarn 192 upon alternate needles 32 beneath the beards thereof. This wheel 199 is detailed in Figures 22 and 23 of the drawings, and it is shown in action on the needles in Figures 4 and 15 of the drawings. As shown in Figures 22 and 23, the said wheel 119 includes a supporting body 200 having a blade supporting ring 201 keyed thereon, for supporting blades 202, of a novel contour. Substantially L-shaped pressers 203 are hooked on the blade ring 201 in the alternate spaces between the blades 202, and clamped therein by a clamp nut 204 operating against a washer 205 which engages the said L-shaped pressers 203 to force them into a secured engagement with the blade ring 201, as shown in Figure 22. Figure 23 is a view of the blade and presser arrangement of the wheel 199, on a developed plane, showing the pressers 203 in the alternate spaces 205 between the blades 202.

The weft introducing wheel 199 is rotatably supported upon a suitable adjustable stand 207, shown in Figure 1 of the drawings, and on this stand 207 is carried a guide arm 208 with a pair of eyes through which the weft yarn 192 is supported as it is introduced to the blades of the wheel 199.

As the wheel 199 rotates, it is perfectly apparent that the pressers 203 will operate upon the beards of alternate needles to close the same, while the weft yarn 192 is elevated beneath the open beards of alternate needles, and then cast to the outside of the closed beards of the remaining needles, as is clearly shown in Figure 4 of the drawings, in the position on the cylinder needles succeeding the weft yarn introducing wheel 199.

It is to be noted that the weft yarn 192 is thus introduced between the beards of alternate needles, below the terry loops 185, previously positioned. The cylinder C continues to rotate until the needles with the looped second terry yarn and weft yarn reached the bladed wheel 210, which serves a very important purpose. It is to be noted that the burr 210 is rotatably mounted to the outside of the circular line of needles, on a stand 211 which is of the conventional type carried by the ring 45, as shown in Figure 1 of the drawings. This wheel 210 is mounted so that the blades operate high on the needles, from the position illustrated in Figure 16 of the draw-

ings, to the position illustrated in Figure 17 of the drawings, wherein the blades 212 of the wheel 210 are shown as performing the very important function of flopping the terry loops 185 and the weft yarn 192 over the tops of the beards of the needles, to the inside of the circular line of needles, as shown in Figure 17, and during this operation an adjustable push-down cam 215 cooperates in pushing down the fabric to permit the wheel 210 to perform this operation. It is to be noted that the blades 212 are of a novel shape, including the convex upper portion 216, shown in Figure 16 of the drawings, which first engages the outer end of the terry loops 185 to elevate the same, and then the lowermost acute shank end 217 of each blade 212 projects thru the space between the needles 32, to raise the weft yarn 192 over the tops of the needles, and to the inside of the circular line of needles placing said weft yarn 192 on top of the second terry yarn loops, to interlock the latter so that the loops 185 will not become displaced. Figures 16 and 17 show the operation of these blades of the burr 210, with respect to the weft yarn and terry loops 185 of the second terry yarn. It is to be noted that in this operation the weft yarn 192 serves the very important purpose of interlocking the terry loops 185 in place, so that the blades of the wheel 210 mainly operate on the weft yarn for forcing the looped terry yarn over the tops of the needles to the position illustrated in Figure 17, where it is shown that the weft yarn, which is engaged only on every alternate needle floats across the terry loops 185 at the base thereof to hold the terry loops high up in the spaces between the stitches 150 of the fabric which are engaged on the needles 32. At this point it is well to note that the terry yarn has thus been introduced between the same stitch loops that the first terry yarn was introduced to loop at the opposite face of the fabric.

Referring to the mounting of the adjustable push-down cam 215 which cooperates with the wheel 210 in lowering the fabric to permit the second terry yarn and weft yarn to flop over the tops of the needles, a main push-down cam 220 is provided at the inside of the circular line of needles, supported by a suitable bracket 221, which as shown in Figure 1 is mounted on the grooved ring 45. This bracket engages the cam 220 between the ends thereof, and the cam is arcuated and spaced a sufficient distance away from the insides of the circular line of needles, to permit the last placed terry loops 185 to ride freely without interference from this cam or the needles. The push-down cam 220 to one side of the bracket 221 is provided with a push-down cam arm 225, provided with a bolt or screw 226, which is the means for vertically adjustably securing the push down cam 215 above mentioned, so that it will cooperate in low-

ering the fabric to permit the flop over as above described as shown in Figures 4 and 5. The fabric with the weft yarn and last knitted stitches 150 on the shanks of the needles, in the position illustrated in Figure 17 of the drawings, then rides along the lower straight edge 230 of the cam 215, as shown in Figure 4, until a push down wheel or burr 231 is reached, which operates at the outside of the circular line of knitting needles with blades moving downwardly between adjacent needles. It is rotatably supported on a bracket 233 adjustable on the back stand ring 45, and the function of which wheel 231 is to lower the weft yarn 192 and the fabric stitches on the needles, to a location below the beards of the needles, with the terry loops 185, of course, lowering therewith in the same relation of yarn as illustrated in Figure 17, it being noted that due to the fact that the weft yarn 192 floats over the second terry yarn loops 185, the latter will also be lowered as the wheel 231 performs the function above described. As shown in Figure 5 of the drawings the push down cam 220 has a sloping edge 235 which assists the wheel 231 in lowering the fabric to the very top edge of the cylinder C, as shown in Figure 5.

The fabric and all associated yarns now having been lowered to the top edge of the cylinder, below the beards of the needles 32, and held thus lowered by the cam 220 as shown in Figure 5 of the drawings, the second knitting yarn 240 is now introduced by the feed burr 241, upon each of the needles, beneath the beards thereof; the burr 241 operating to elevate the knitting yarn 240 high beneath the beards of the needles as shown in Figure 5 of the drawings succeeding the burr 241. This burr 241 is rotatably supported in usual relation upon a conventional star box bracket 242, carried in conventional relation on the back stand ring 45, the said standard 242 having a guide arm 243 thereon for supporting the second knit yarn 240, as shown in Figure 1 of the drawings.

Succeeding the placing of the knit yarn 240 on the needles beneath the beards thereof, the needle beards ride into engagement with a presser wheel 245, shown in Figures 1 and 5 of the drawings, which presses the beards of every needle closed. This presser wheel 245 is of the same arrangement as the presser wheel 115 above described and shown in Figure 8, and it is rotatably supported upon a suitable adjustable stand 246, shown in Figure 1 of the drawings, and carried by the back stand ring 45. The presser wheel 245 closes the beards at the same time that a landing wheel 247, at the inside of the circular line of the needles, elevates the stitches 150 on the needles which were last knit, together with the weft yarn 192 and the second terry yarn with the loops 185. It is to be noted that the landing wheel 247 is rotatable

at the inside of the circular line of needles, and the same operates at the inner and now under side of the fabric, so as not to interfere with the terry loops 185 previously placed. It is to be noted that the push down cam 220 has an inclined edge 250, as shown in Figure 5 of the drawings, which enables the fabric to be elevated as the landing wheel 247 operates to elevate the yarns over the closed beards of the needles.

A toothed wheel 260 placed at the outside of the circular row of needles now operates on the outsides of the beards of the needles, to insure that no slack of the terry loops projects to the outside of the circular line of needles. This wheel 260 is suitably supported by an adjustable standard 263 carried by the grooved ring 45. At the inside of the circular line of needles opposite the wheel 260, the free end of the push down cam 220 supports a vertically adjustable auxiliary cam 265, which spaces the fabric from the needles to permit the wheel 260 to properly function.

Succeeding the operation of the fabric and yarns by the wheel 260, the needles ride into engagement with an inside cast-off burr 267, rotatably supported by a bracket 268 on the grooved top plate 41, as shown in Figure 1 of the drawings. As an aid in the cast-off of the weft yarn and second knitting yarn incident to the knitting operation, an outside bladed burr 270 is rotatably supported on a suitable adjustable standard 271 carried by the back stand ring 45.

In Figure 18 is shown the relation in which the landing wheel 247 cooperates with the presser wheel 245 in elevating the fabric, the second terry yarn and the weft yarn 192.

In the knitted fabric the loops 100 from the first terry yarn 72 project all to one side or face of the base fabric, in a closely packed relation, so that unless the loops are brushed aside the base fabric formed by the first and second knit threads 57 and 240 cannot be seen. In like manner the loops 185 of the second terry yarn 151 project at the opposite face of the base fabric, in closely packed relation so that the base fabric is not visible unless the loops are brushed aside. In Figure 20 is shown a very much distorted arrangement of the knitted fabric, with the loops conveniently arranged to more clearly designate the relation which the loops bear to the wales of stitches of the knit fabric, and with respect to the weft yarn 192. In this figure it is shown that the first terry yarn 72 is introduced so that its loops project through the spaces between the stitches 150 of the first knitting yarn 57, with the first terry yarn 72 crossing at the side opposite from its looped side across the stitches 150, in a tightly floated relation thereover. The second terry yarn 151 on the contrary has its loops projected to the opposite face of the fabric, through the same spaces between the stitches 150 of the

knitting yarn 57, within which the first terry yarn 72 is received, and the connecting portions of the second terry yarn 151 between the loops of course float tightly across the back or opposite side of the stitches 150 from the connecting portions of the loops of the first terry yarn, as clearly designated in Figure 20. In conjunction with the loop placement of the second terry yarn 151, the weft yarn 192 is introduced during the knitting operation to hold the loops 185 of the second terry yarn in an interlocked or projected relation, so that when the fabric is finished the loops will project with their connecting portions floating across the backs of the stitches 150. The weft yarn 192 extends across the stitches 150 at the same side or face of the fabric to which the loops 185 of the terry yarn 151 project, and the weft yarn 192 therefrom extends across the connecting portions 272 between the wales 53 of the knitting yarn 240, as shown in the drawings, and pass across said connecting portions 272 at the same face of the fabric from which the loops 100 of the first terry yarn 72 project, and then cross the sides of the stitches 53 of the knitting yarn 240 at the same side of said wales to which the loops 185 of the second terry yarn 151 project. It is thus apparent that the weft yarn closely follows the connecting portions 272 of the second knitting thread 240, as shown in Figure 20, spiralling about the connecting portions 272 and across the stitches of both knitting yarns alternately from the stitches of the first knitting yarn to the stitches of the second knitting yarn and then back across the stitches of the first knitting yarn, the crossing of all stitches taking place at the same face of the fabric and the crossing of the connecting portions of the yarn 240 taking place at the opposite face of the base fabric. Of course in the actual knitted fabric the loops 100 and 185 at the base thereof where they pass between the stitches 150 are closely crowded together, and even more crowded in that space because the weft yarn 192 passes therethrough, so that there is but small liability of them being loosely placed in the space, and the freedom of space in the actual knitted fabric is not as pronounced as illustrated in the rather diagrammatic view of Figure 20. Rather, the loops are crowded adjacent the base fabric similar to the view of Figure 21, which shows the loops 100 and also 185 prominently projecting at opposite faces of the fabric, in a cooperative relation with respect to the weft yarn. A feature of the knitted fabric is the fact that the loops of one of the terry yarns at one face protect the connecting portions of the loops of the other terry yarn at the opposite face, so that there is no liability of unavelling of the terry yarns from their position in the base fabric.

The stands 56, 117, 136, 141, 182, 189, 198, 207,

211, 233, 242, 246, 263 and 271 are of the ordinary construction known as the star box type, and detailed to some extent in Figure 8 showing that the same includes a hub 300 secured by a bolt 301 in the groove of the back stand ring 45, and in which hub is positioned a shank 302 of the horizontal tubular support 303 wherein the wheel supporting shaft 304 is splined and actuated by a spring 305 to push the wheel, which in the case of the illustration of Figure 8 is the presser wheel 115 toward the needles. A thumb piece 307 of course is provided on the shaft 304 to permit movement of the wheel carried by the star box away from the needles.

As it is thought the inside terry looper G may shift its position, the brace rod 310, shown in Figure 1 of the drawings is provided which may brace against a portion of the arm 166 through which the supporting shaft 150 extends, to hold the said looper against shifting in the direction of rotation of the cylinder, this brace arm 310 being carried by a clamping means 312 applied to the grooved top plate as shown in Figure 1 of the drawings.

The second terry yarn 151 is fed from a spool 152^a supported in suitable manner on the top plate 41, within the circular line of needles, as shown in Figures 1 and 7 of the drawings, a pivoted guide arm 150^a being pivoted on a bracket 149^a attached to the plate 41, and which guides the yarn 151 to the looper G as shown in Figures 1 and 7.

As an additional means of preventing rotation of the cam plate 85 of the looper F, an adjustable bracket arm 80^a may be secured to the bracket 66 and to the cam plate 85 at 81^a, as shown in Figure 1.

It is apparent from the foregoing that a novel knitted terry loop fabric has been provided, which is of a practical nature. The knitted fabric can actually be produced with much greater economy than terry loop woven fabric, as conventionally manufactured, and the terry loop knitted fabric of this invention is far superior and has been met with favor by retailers and the trade, where the same has been introduced. Washrags, toweling, and the like made of the improved terry looped knitted fabric have been found to be more absorbent and far better appearing than terry loop woven fabric.

Various alterations in the arrangement of yarns in the improved terry fabric; various changes in the steps of method by which the improved terry yarn is produced; and various changes in the shape, size, and arrangement of parts of the improved machine may be made without departing from the spirit of the invention or the scope of the claims.

I claim:

1. In a knitting machine a cylinder having needles, a yarn introducing wheel provided with means to pass between the needles and

introduce a yarn in looped relation at the opposite side of the needles from said wheel, and means at the sides of the needles where the loops are produced for holding the loops against retraction as the means of the wheel which forms said loops are withdrawn.

2. In a knitting machine, a support having spaced needles thereon, and a terry yarn introducing device having sinkers thereon adapted to pass between the needles and project loops of the yarn between the needles to the opposite sides of the needles from said device, and means at the sides of the needles where the loops are provided of the terry yarn for frictionally holding the loops in position during retraction of the sinkers of said device from between the needles.

3. In a knitting machine a support having spaced needles thereon, a terry yarn introducing device having sinkers thereon adapted to pass between the needles and project loops of the terry yarn between the needles to the opposite sides of the needles from said device, means at the sides of the needles where the loops are provided of the terry yarn for frictionally holding the loops in position during retraction of the sinkers of said device from between the needles, said needles and their support being movable and the means which frictionally holds the loops being stationary and frictionally holding the loops with only sufficient friction thereon that the sinkers of the device may be retracted and that the loops may move with the needles as the needles pass said means.

4. In a terry loop providing device for knitting machines a rotating cylinder having spaced needles thereon, a terry loop yarn introducing wheel having sinkers intermeshing between the needles of the cylinders for looping terry yarn from one side of the needles through the spaces between the needles to the opposite sides of the needles, and a friction pad at the sides of the needles to which the loops are projected, and into which the loops are projected for frictionally holding the loops in position as the sinkers are withdrawn.

5. In a united needle circular knitting machine a cylinder having non-reciprocatory needles thereon, means for knitting a base web on the needles during cylinder rotation, a rotary device at the outside of the cylinder eccentric with the cylinder for introducing terry loops to the inside of the circular row of needles on the cylinder during the knitting of the base web, and a device on the inside of the cylinder eccentric with the rotary cylinder for introducing therefrom a second terry yarn in looped arrangement at the outside of the circular line of needles on the cylinder during the knitting of the base web, to provide on opposite faces of the base web prominently projecting terry loops.

6. In a circular knitting machine a rotat-

ing cylinder having beard needles, means to lower below the beards of said needles the fabric stitches on the needles, means to introduce a first knitting yarn beneath the beards high on the needles, means to elevate the stitches of the fabric on the needles beneath the beards thereof, means to introduce from the outside of the cylinder to the inside thereof a terry yarn in looped arrangement to the inside of the cylinder between the needles and below the beards thereof, means to lower the stitches of the fabric on the needles and the looped terry yarn together on the needles beneath the beards thereof, means actuating with the needles including a beard presser and a landing wheel to elevate the stitches of the fabric on the needles and the terry looped yarn above the free ends and over the beards of the needles to knit with the first knitting yarn and secure the terry yarn between the stitches of the first knitting yarn in looped arrangement to the outside thereof, means to introduce from the inside of the cylinder between the needles to the outside of the cylinder a second terry yarn in looped projection to the outside of the needles, means to introduce beneath the second terry yarn and beneath the beards of alternate needles and over the beards of the remaining needles a weft yarn, means to cast the outside loops of the second mentioned terry yarn and also the weft yarn from the outsides of the beards of the needles over the tops of the beards of needles to the inside of the circular line of needles on the cylinder, a push-down cam to hold the yarn and fabric in its thus associated relation on the needles, means to lower the first knitting yarn with the above described association of weft yarn and second mentioned terry yarn below the beards of the needles, means to introduce a second knitting yarn under the beards of the needles while the last mentioned means hold the fabric in the position last mentioned, and means for casting off from the needles and over the beards the stitches on the needles of the first knitting yarn together with the loops in the arrangement defined of the second mentioned terry yarn together with the weft yarn so that the first knitting yarn will cast off and form the stitches of the second mentioned knitting yarn which are the stitches of the fabric first mentioned.

7. In a circular knitting machine a rotating cylinder having a plurality of needles thereon in circular arrangement, a rotating wheel having reciprocating plungers operating in sinker fashion between the needles of the machine, cam means acting on said plungers to project them between the needles of the machine, means to feed a yarn to said plungers so that it will loop the same between the needles, and a friction pad at the opposite sides of the needles from said wheel

into which the plungers sink to embed the loops of the yarn therein.

8. In a circular knitting machine a rotating cylinder having stationary needles in circular arrangement thereon, a yarn feed wheel at the outer side of the circular line of needles for looping a yarn from the outside of the circular line of needles between the needles in loops projecting to the inside of the circular line of needles, a second wheel to the inside of the circular line of needles having means to project between the needles towards the outside of the circular line of needles, and means on the inside of the circular line of needles for feeding a second yarn to the second wheel and the last mentioned means on the second wheel which projects between the needles for looping to the outside of the circular line of needles the second yarn.

9. In a circular knitting machine a rotating cylinder having stationary needles in circular arrangement thereon, a yarn feed wheel at the outer side of the circular line of needles for looping a yarn from the outside of the circular line of needles between the needles in loops projecting to the inside of the circular line of needles, a second wheel to the inside of the circular line of needles having means to project between the needles towards the outside of the circular line of needles, means on the inside of the circular line of needles for feeding a second yarn to the second wheel and the last mentioned means on the second wheel which projects between the needles for looping to the outside of the circular line of needles the second yarn, and means for feeding knitting yarn and knitting a base fabric on the needles in cooperation with the introduction of the first and second mentioned yarns by said needles to provide at the opposite sides of the base web the loops of the first and second mentioned yarns in prominently projecting closely spaced relation thereon in terry loops.

10. In a knitting machine the combination of a support, a line of knitting needles operatively mounted upon said support, a friction pad at one side of the line of knitting needles, and sinker means for introducing yarn in projecting loops between the needles and into the friction pad for releasable restrained positioning of the loops in said pad.

11. In a united needle circular knitting machine the combination of a rotating cylinder having non-reciprocatory needles thereon, means for knitting a base web fabric on the needles, a sinker wheel cooperating with said cylinder including sinker plungers operating between the needles during the knitting of the base web fabric for introducing a first terry looping yarn in long projecting loops between the needles, means arranged along

the needles for frictionally receiving the loops of the terry yarn therein in a restraining yet releasable relation, a second sinker including sinker plungers operating between the needles during the knitting of the base web fabric for introducing a second terry looping yarn in long projecting loops between the needles in a relation to be positioned at the opposite side of the base web fabric from the loops of the first mentioned terry yarn, and means along the needles into which the loops of the second terry yarn are sunk by the sinker means in a restrained yet releasable relation.

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