

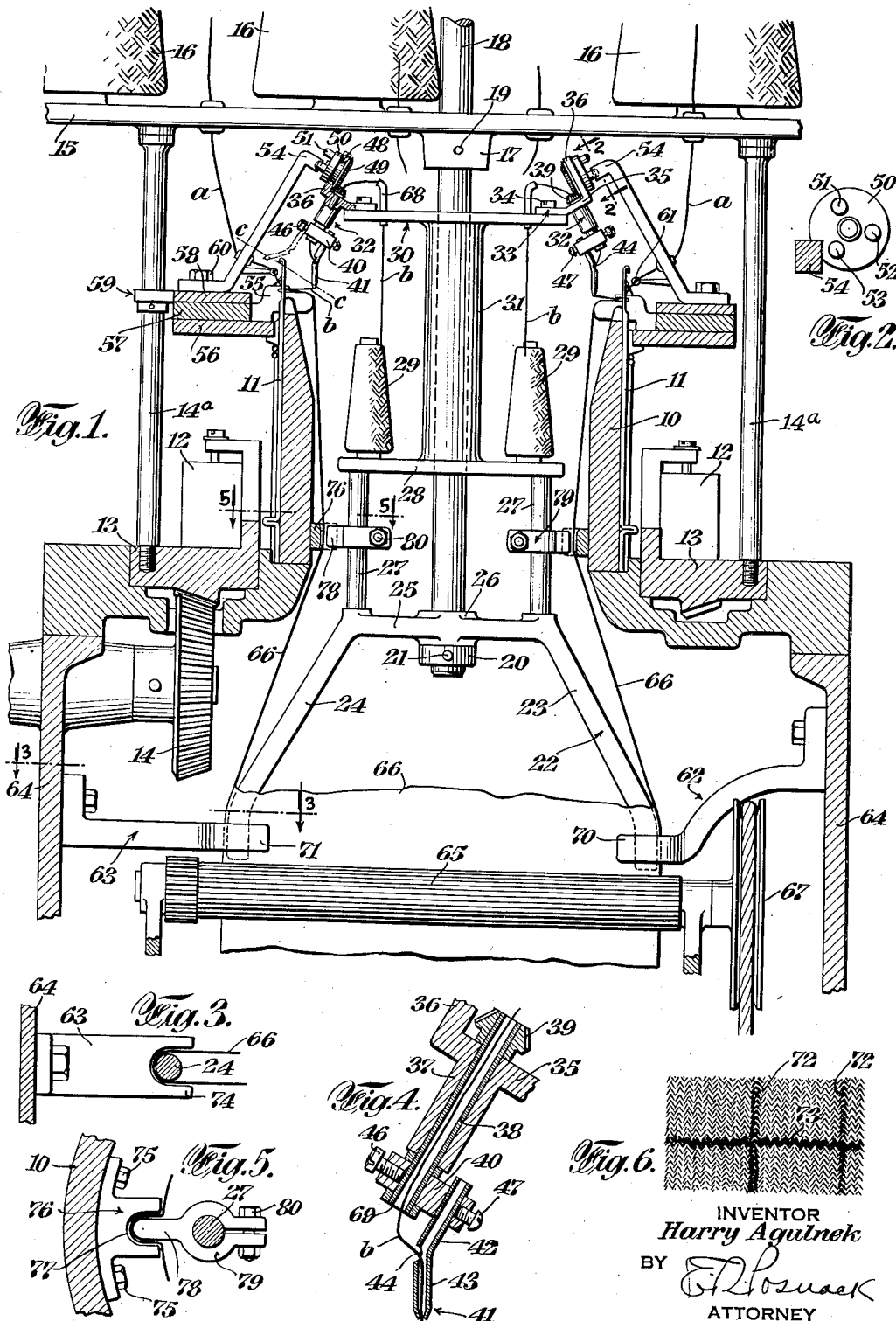
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KNITTING MACHINE

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KNITTING MACHINE

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This invention relates to knitting machines adapted to manufacture fabric containing vertical stripes, and particularly to circular open top machines having a hollow needle-retaining cylinder operatively associated with the usual yarn-feeding and needle-actuating elements.

In conventional methods of knitting with most machines of this category, a revolving yarn stand is arranged to feed a plurality of yarns to a corresponding number of feed stations on a stationary cylinder, and by means of various types of needle-actuating mechanisms knitted cloth of certain predetermined designs can be fabricated. Should it be desired, however, to produce vertical stripes, the needle-actuating means must be so arranged as to operatively knit a selected color at predetermined intervals, causing substantially long invisible floats to be formed due to the inherent necessity of having a continuous and uninterrupted feed of the selected yarn. It is known that such floats might be eliminated by employing certain "wrap-around" devices similar to those employed in the manufacture of stockings, such devices being intermittently actuated in cooperation with an exteriorly disposed auxiliary yarn stand containing the selected striping yarn cones. Due to the dimensional and structural complexities of circular open top knitting machines, such wrap-around devices have generally not been considered conveniently adaptable therefor, particularly in view of the fact that there would of necessity have to be two independent yarn stands positioned about the cylinder, with either one or both stands revolving during the operation of the machine, and of such large proportions and revolving at such speeds as to render the machine highly dangerous to operators and exceedingly difficult to construct. It is, hence, primarily within the contemplation of my invention to provide a knitting machine of the aforesaid type with relatively simple means for enabling vertical stripes to be produced during the manufacture of knitted fabrics, without the presence of connecting floats, and whereby the various disadvantages and shortcomings above set forth are obviated.

It is a further object of my invention to enable a circular knitting machine of the open top variety to conveniently produce various types of striped fabric including plaided effects.

It is also within the contemplation of this invention to provide a machine for accomplishing the aforesaid functions wherein the vertical striping yarn cones are supported by a stand positioned within the central interior of the

needle cylinder and in fixed relation with respect thereto, and so disposed as to be in proper operative position with respect to the cylinder needles whereby one or more of a selected number of yarn strands may be operatively fed to a plurality of stations about the cylinder.

Another object of my invention is to provide stretcher or spreader means for the tubular fabric made on knitting machines which may be adapted to cooperate with means for holding the striping yarn stand in fixed position with respect to the cylinder.

And it is still a further object of this invention to provide a simple wrap-around device whereby the yarn operatively associated therewith will be kept closely confined therein and consequently free from the danger of entanglement with other proximate machine parts.

Referring to the drawing:

Figure 1 is a vertical fragmentary section of a circular open top independent latch needle knitting machine with a stationary cylinder and containing my invention, including a semi-diagrammatic representation of a portion of the fabricated cloth.

Figure 2 is a section of Figure 1 taken along line 2—2 showing the wrap-around actuating means.

Figure 3 is a part sectional plan of Figure 1 taken along line 3—3, showing the position of a portion of the tubular fabric upon the stretcher and within the bifurcated terminal of certain of the striping yarn stand holding means.

Figure 4 is an enlarged longitudinal cross-section of the wrap-around device forming part of my invention.

Figure 5 is a fragmentary sectional plan of Figure 1 taken along line 5—5, and

Figure 6 illustrates a portion of knitted fabric of plaided effect produced by the machine constituting my invention.

In the drawing, the knitting machine illustrated is of conventional structure comprising a stationary cylinder 10 containing a plurality of independent vertically movable latch needles 11 adapted to be operatively actuated by elevating and depressing mechanisms (not shown on the drawing inasmuch as they are well known in the art) operatively mounted upon cam blocks 12 which are positioned upon the rotatable cam ring 13, this ring being in operative engagement with the gear 14 connected to suitable driving means not shown. Suitably mounted upon said cam ring 13, and attached thereto are the vertical columns 14a which support the revolving main

yarn stand 15 containing thereon the yarn cones 16. The stationary cylinder construction shown in the drawing has been chosen for illustrative purposes, it being understood that a revolving cylinder type of structure may be similarly adapted for use with my invention.

Extending through the central portion of the said yarn stand 15 and through the hollow boss 17 thereof is a central supporting post 18, said post being held in suspended position from the yarn stand 15 by suitable fastening means illustrated in the drawing as the set screw 19. The lower portion of the post 18 contains a collar 20 shown secured in place by the set screw 21, the fabric spreader or stretcher 22 being suspended from the post through the medium of said collar 20. Specifically, the said stretcher in the form shown preferably contains two arms 23 and 24 diverging downwardly and joined at their upper portions by the bridge 25 containing centrally thereof the hollow hub 26 through which the post 18 extends. The said stretcher 22 contains the props 27 in supporting engagement with and secured to the auxiliary stationary yarn stand 28 operatively supporting the striping yarn cones 29. In the structure illustrated, the wrap-around carrier platform 30 is supported by the hollow sleeve 31 extending upwardly from platform 28 and surmounted over the post 18.

The said platform 30 has mounted thereupon and suitably secured thereto a plurality of wrap-around devices 32, the number of such devices being dependent upon the number and spacing of the vertical stripes to be formed on the knitted fabric, there being one such device for each of cones 29 in operative use. Each of said devices contains a mounting block 33 suitably secured to platform 30 by fastening means 34, a portion 35 of said block being angularly disposed with respect to the vertical axis of cylinder 10, and another portion 36 thereof being preferably at right angles to portion 35. Suitably secured to said portion 35 is a stationary collar or bearing 37 within which is rotatively positioned the hollow shaft 38 the upper end of which has secured thereto a pinion 39 and the other end the arm 40, whereby upon a rotatable manipulation of pinion 39 said shaft 38 and arm 40 will be correspondingly rotatably actuated. Attached to arm 40 at a point remote from the axis of shaft 38 is a hollow wrap-around finger 41 preferably consisting of a portion 42 substantially parallel with the axis of shaft 38, and a portion 43 inclined with respect thereto, the wall of said finger 41 containing an aperture 44 disposed towards shaft 38 and communicating with the hollow interior of finger 41. It is thus apparent that said finger 41 is eccentrically positioned with respect to the axis of shaft 38, so that for every revolution of said shaft there will be a revolution of the finger carrying with it the yarn *b* to be operatively wrapped around the needle 11 in a manner to be more specifically hereinafter set forth. In the structure illustrated, the said arm 40 is secured to shaft 38 by means of the set screw 46 and the finger 41 is secured to the arm 40 by the set screw 47.

The portion 36 of the block 33 serves as a bearing for the shaft 48 which carries at one terminal thereof the bevel gear 49 in operative engagement with pinion 39, and at the other terminal thereof the disc 50 containing thereon three pins, 51, 52 and 53 (see Figures 1 and 2). Positioned adjacent the said disc 50 of each of the

wrap-around devices is the actuator 54 adapted to intercept and operatively engage in succession each of the said pins 51, 52 and 53, as will be more fully hereinafter explained.

The conventional structure of knitting machine illustrated contains a plurality of sinkers 55 circumferentially positioned about the cylinder, and supported by a sinker ring 56 and operatively actuated by a sinker cam ring 57 in a manner well known in the art. Positioned above the member 57 is a mounting 58 secured to the column 14 by means of the collared holding means 59. It is thus apparent that the mounting 58 is rotatable about the cylinder of the machine with the rotation of the cam ring 13 and the yarn stand 50. Each of the actuators 54 is attached by bolt means 60 to the mounting 58, so that the actuators are obviously rotatable with the rotating elements aforesaid.

The lower portions of the stretcher arms 23 and 24 are positioned, respectively, within the forked members 62 and 63, as clearly indicated in Figures 1 and 3, said forked members being suitably attached to some suitable stationary portion of the machine, such as the framework 64, although it is understood that attachment can be effectuated to some other suitable stationary portion. Positioned below the forked members 62 and 63 are the two rollers 65 (only one being shown) between which the tubular fabric 66 passes during the rotation of the rollers actuated by the suitably driven pulley 67.

Attached to the cylinder 10 by suitable securing means such as the studs 75 is the holding member 76 containing therein a vertical slot 77; and extending into the slot is the arm 78 forming part of the clamp 79 secured through the medium of the bolt means 80 to the prop 27. In this manner the spreader structure together with the platforms 28 and 30 are held in fixed relation with respect to the cylinder, supplementing the effect of members 62 and 63. It is understood, however, that the holding member 76 and associated parts can serve to adequately hold the platforms 28 and 30 in the desired fixed relation to the cylinder without the aid of the said members 62 and 63 if so desired.

In considering the operation of this device, note should be taken that the main yarns *a* extending from the cones 16 pass through yarn guides 61 to be operatively fed to the needles in well known manner. This feed continues uninterruptedly through the knitting operation, the striping loops being formed by the wrap-around devices at selected intervals without interfering with the knitting of main yarn strands *a*. During the rotation of the cam ring 13 and associated parts, each actuator 54 will come into engagement with one of the pins on disc 50 to cause a rotation of said disc until the actuator has cleared the pins engaged thereby. For example, referring to Figure 2, if the actuator 54 travels in the direction of the arrow it will engage the pin 53 to produce a counter-clockwise rotation of disc 50 until the pin 53 is substantially in the position of pin 52. With the arrangement of three pins as indicated, it is thus apparent that whenever the actuator passes a disc, it will cause the rotation thereof of one-third of a complete revolution. In the apparatus illustrated, the pinion 39 is one-third of the diameter of gear 49 producing a geared ratio of one to three, so that for every one-third of a revolution of disc 50, there is a complete revolution of pinion 39, thereby

causing a corresponding complete revolution of arm 40 and finger 41.

By referring to Figure 1 it will be seen that the position of the finger diametrically opposite to the normal position is represented by broken lines, the figure showing the two extreme positions of the finger 41 during one complete revolution. It will be observed that if a line c-c is drawn through the terminals of the finger at the extreme positions illustrated, it will intersect the shank of the adjacent needle underneath the hook thereof. Thus, any yarn extending from the lowermost extremity of finger 41 will be carried, during its operative rotation, around the top portion of the needle underneath the hook, and upon the return of the finger 41 to its original position, striping yarn b will form a loop operatively wrapped around the needle 11. If this operation is repeated once during every revolution of the cam ring 13, there will obviously be one vertical stripe for each such revolution. By using two actuators 54, the number of vertical stripes will be doubled; and so in this manner any number of vertical stripes can be obtained, within the dimensional limitations of the machine, by employing a corresponding number of actuators 54, wrap-around devices and yarn cones.

It will be noted that the striping yarn b extends upwardly from cone 29 through tubular guide 68 and then through hollow shaft 38, leaving the terminal 69 thereof to enter the hollow interior of portion 43 and finger 41 through aperture 44; and then, from the lower terminal of the finger the yarn is fed to the selected needle or needles as aforesaid. It will thus be seen that the portion of yarn b extending through the wrap-around device is confined, almost throughout the entire length thereof, within the interior of the device, thereby providing a positive and convenient guiding means for the arm without the danger of outside entanglement.

It is of course important that the wrap-around device 32 be located in proper operative position with respect to the needles, and this can obviously be readily accomplished by raising or lowering the position of post 18 with respect to stand 15, thereby controlling the position of the stretcher 22 and consequently of platforms 28 and 30. It is also apparent that the position of the stretcher 22 can readily be varied with respect to post 18 by securing the collar 20 to the post at any desired position, this being another way of adjusting the platforms 28 and 30 in proper operative position.

It is also of utmost importance that the auxiliary yarn stand 28 and wrap-around stand 30 be kept in fixed relation with respect to the cylinder; and where the cylinder is stationary, as in the illustrated structure, said stands must also be stationary. This is very readily accomplished by means of holding member 76 and associated parts, and also by the members 62 and 63 containing bifurcated terminals 70 and 71 respectively, as previously set forth. Inasmuch as these members are affixed to a stationary part of the machine, the stretcher 22, and consequently the platforms 28 and 30, are held in a fixed position with respect to the cylinder. At the same time, the fabricated cloth 66 extending downwardly from the cylinder in tubular form is permitted to pass over the arms 23 and 24 of the spreader and between the said bifurcated terminals 70 and 71 to the rollers 65.

Figure 6 shows a piece of finished knitted fabric containing vertical stripes 72 formed by the wrap-around method above described, these stripes being independent and not connected by

floats. The horizontal stripe 73, however, can be formed by conventional methods by the yarn a fed from cones 16. The combination of vertical and horizontal stripes, and different colored body portions, produces a plaid effect which has heretofore only been found in loom cloths.

It is further apparent that any standard knitting machine of the above class having an open-top cylinder can be readily provided with this invention which avails itself of the central space within the cylinder which normally is not otherwise utilized. Inasmuch as the platforms 28 and 30 can be stationary and are positioned within the machine, they do not complicate the structure and cannot possibly constitute a source of interference with the rotating cones 16, and being remote from the operators cannot constitute a source of danger to them.

It is of course understood that the structure above described and shown in the drawing is illustrative of my invention and not employed by way of limitation, inasmuch as numerous changes and modifications may be made therein within the scope of the appended claims without departing from the spirit of this invention.

What I claim is:

1. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said feeding means constituting wrap-around devices each comprising a rotatably mounted finger, yarn guiding means associated therewith for operatively engaging and directing the yarn from the corresponding striping yarn cone to an adjacent needle, the finger being rotatable about said adjacent needle to operatively wrap the yarn thereabout, and means for rotatably actuating the finger at predetermined times.

2. In a circular open top knitting machine, an open-ended needle cylinder, a stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said stand into operative engagement with the needles on the cylinder, the said feeding means constituting wrap-around devices each comprising a rotatably mounted finger positioned in operative relation to a selected needle on the cylinder and disposed inwardly therefrom towards the vertical axis of the cylinder, the axis of rotation of the finger being inclined with respect to the axis of the cylinder, guiding means associated with the finger for operatively engaging and directing the yarn from the corresponding striping yarn cone to said selected needle, the finger being rotatable about said adjacent needle to operatively wrap the yarn thereabout, and means for rotatably actuating the finger at predetermined times.

3. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, and supporting means carried by the post and holding the said inner stand at a predetermined level within the cylinder.

4. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, supporting means carried by the post and holding the said inner stand at a predetermined level within the cylinder, and holding means secured to the machine and in operative engagement with said supporting means for holding said latter means and the parts carried thereby against movement with respect to the cylinder.

5. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, supporting means carried by the post and containing vertical props supporting the said inner stand at a predetermined level within the cylinder, and holding means in operative engagement with said props for holding them and the parts carried

thereby against movement with respect to the cylinder.

6. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, supporting means carried by the post and containing vertical props supporting the said inner stand at a predetermined level within the cylinder, and holding means in operative engagement with said props for holding them and the parts carried thereby against movement with respect to the cylinder, the said holding means having a stationary member affixed to the inner wall of the cylinder and in interlocking engagement therewith a complementary element attached to one of said props.

7. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, and supporting means carried by the post and holding the said inner stand at a predetermined level within the cylinder, said supporting means containing downwardly extending spreader arms for operatively receiving thereover the tubular fabric knitted on the machine and extending downwardly from the cylinder.

8. In a circular open top knitting machine, an open ended needle cylinder, an outer stand positioned exteriorly of the cylinder for operatively holding body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, an inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, and feeding means supported on mountings in fixed relation with respect to said inner stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles

on the cylinder, the said outer stand being positioned above the cylinder and being provided with a central post secured thereto and extending downwardly axially of the cylinder, and supporting means carried by the post and holding the said inner stand at a predetermined level within the cylinder, said supporting means containing downwardly extending spreader arms for operatively receiving thereover the tubular fabric knitted on the machine and extending downwardly from the cylinder, and bifurcated holding means attached to and extending inwardly from the framework of the machine and engaging one of said spreader arms to hold the said supporting means against movement from its operative position.

9. In a circular open top knitting machine, a stationary open-ended needle cylinder, a rotatable outer stand positioned exteriorly of the cylinder for operatively holding a plurality of body yarn cones in predetermined positions with respect to selected feeding stations about the cylinder, means for selectively bringing the yarn from said cones into operative engagement with the needles on the cylinder, a stationary inner stand within the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, a stationary platform in spaced relation to said inner stand, feeding means mounted on the platform and adapted to operatively bring the yarn from the corresponding striping yarn cones on said inner stand into operative engagement with the needles on the cylinder, the said outer stand being positioned above the cylinder, a central post keyed to the outer stand so as to revolve therewith and extending downwardly axially of the cylinder, and stationary supporting means carried by the post and in supporting engagement with said inner stand and platform.

10. In combination with a circular open top knitting machine, a wrap-around device for forming vertical stripes in the fabric being knitted on the machine, comprising a hollow shaft inclined with respect to the cylinder, a mounting

for rotatably supporting said shaft, an arm affixed to the shaft, a hollow finger attached to the arm eccentrically with respect to the axis of the shaft whereby upon a rotation of the shaft the finger will revolve about the axis of the shaft, means to rotatably actuate the shaft, and an apertured portion in the wall of the finger communicating with the hollow interior of the finger, the said shaft and finger being adapted to operatively accommodate therein a yarn strand extending from the interior of the shaft into the interior of the finger through the said apertured portion thereof.

11. In a circular open top knitting machine, an open-ended needle cylinder, a stand centrally disposed with respect to the axis of the cylinder for operatively holding vertical striping yarn cones in fixed predetermined positions with respect to the cylinder, feeding means supported on mountings in fixed relation with respect to said stand and adapted to operatively bring the yarn from the corresponding striping yarn cones on said stand into operative engagement with the needles on the cylinder, supporting means for the stand containing a member fixedly attached to said stand and extending downwardly therefrom, and holding means attached to and extending inwardly from the framework of the machine and engaging said member to hold said stand against substantial movement, said holding means being so proportioned as to permit the operative downward passage between said member and said holding means of the tubular fabric knitted on the machine.

12. In a circular open-top knitting machine, the combination according to claim 11, the said member comprising a plurality of downwardly and outwardly extending arms for operatively receiving thereover said knitted fabric, and the said holding means being provided with a bifurcated terminal straddling at least one of said arms and sufficiently spaced therefrom to operatively accommodate the downwardly moving tubular fabric.

HARRY AGULNEK. 45