Nov. 16, 1954 V. H. BUTLER 2,694,304

AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

Filed March 16, 1950 9 Sheets-Sheet 1

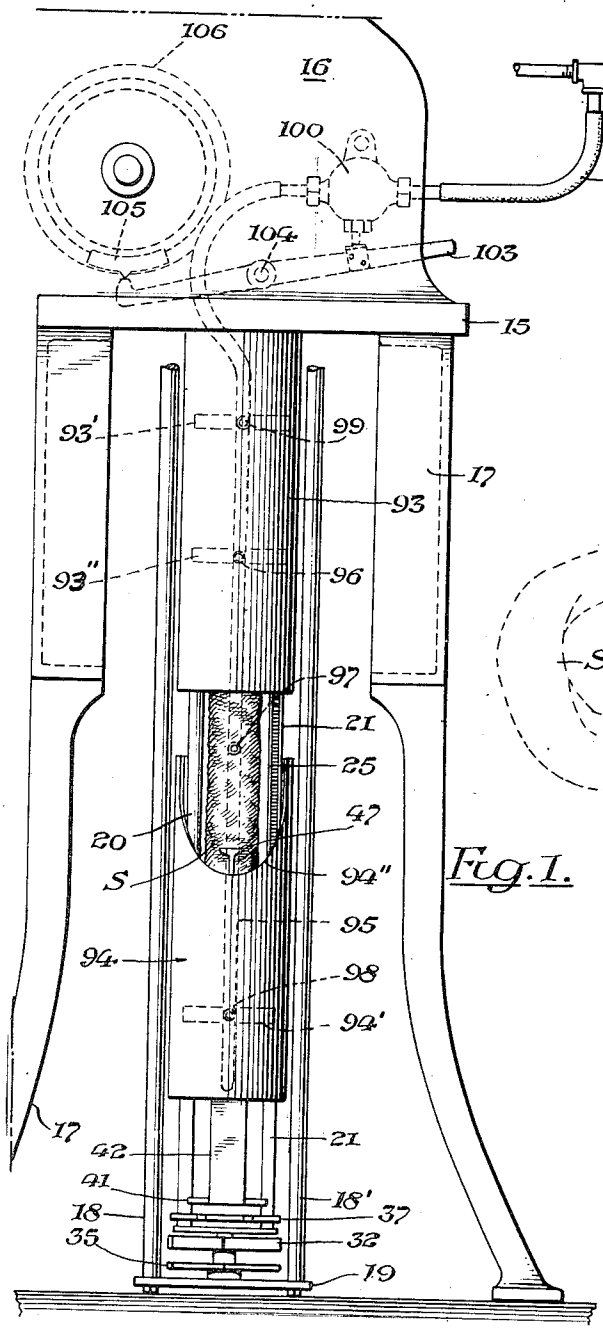


Fig. 1.

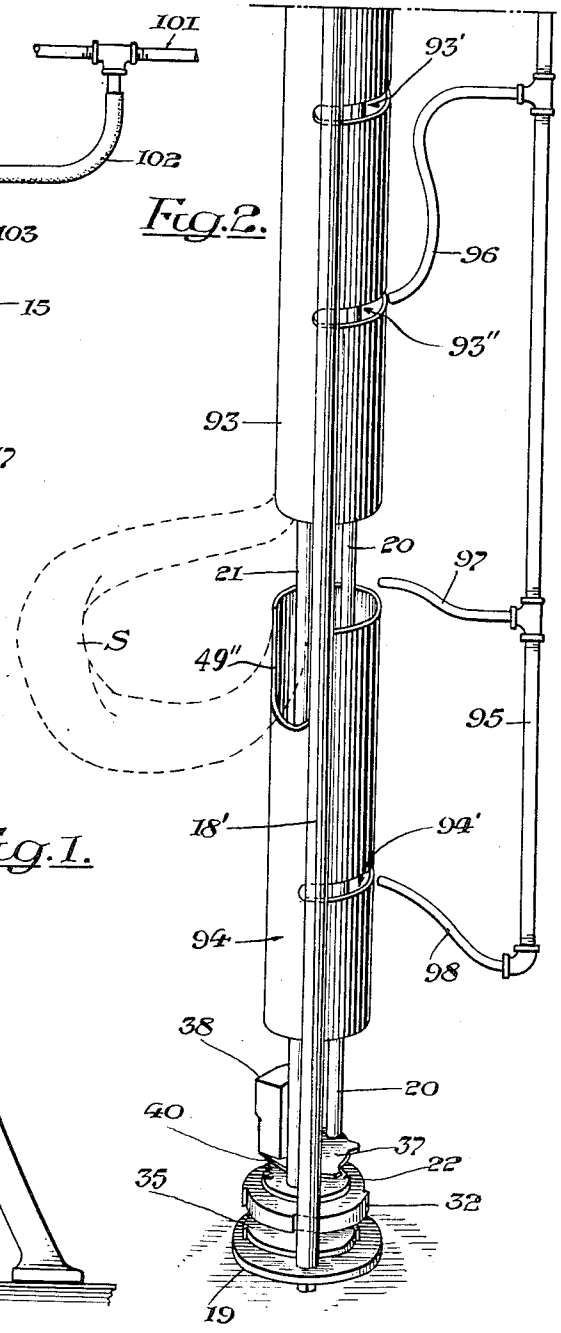


Fig. 2.

Inventor:
VAUGHN HUSTON BUTLER
BY HIS ATTORNEYS,
Darby & Darby

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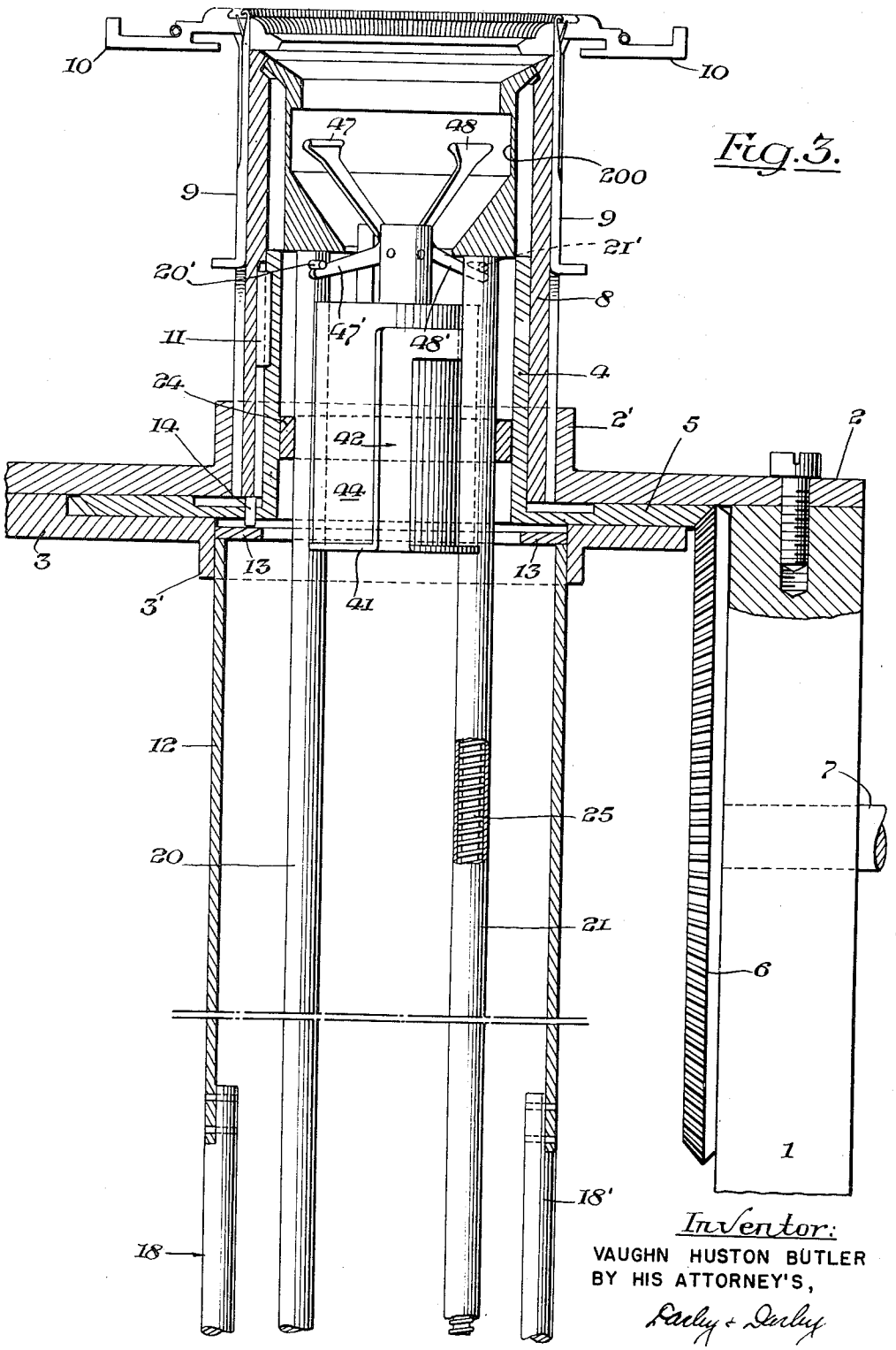


Fig. 3.

Inventor:
VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,
Darby & Darby

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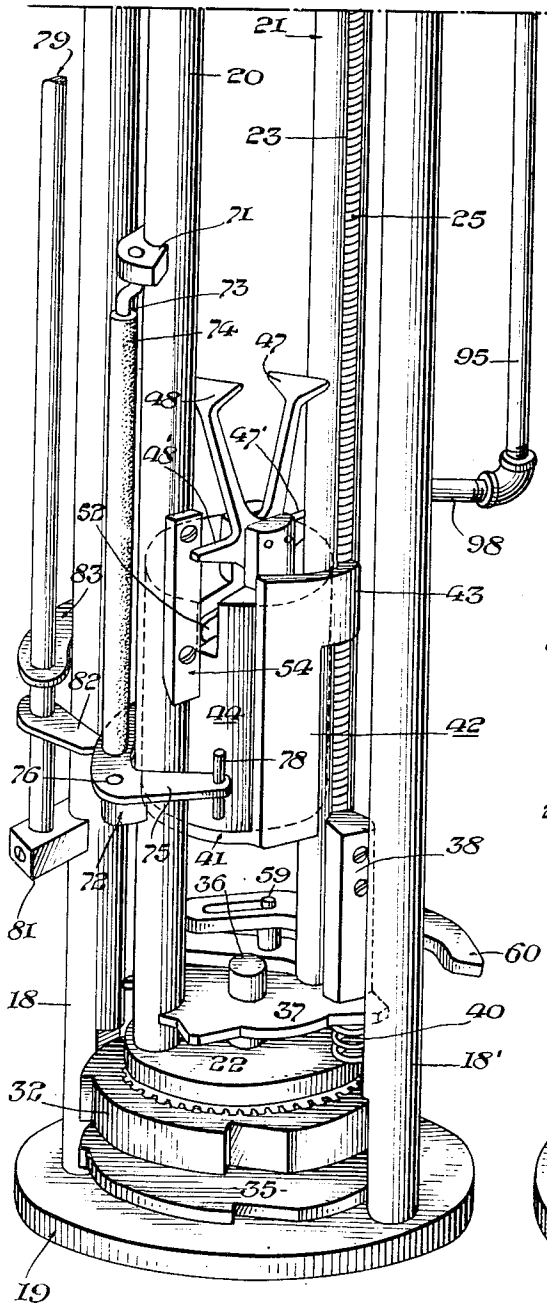


Fig. 4.

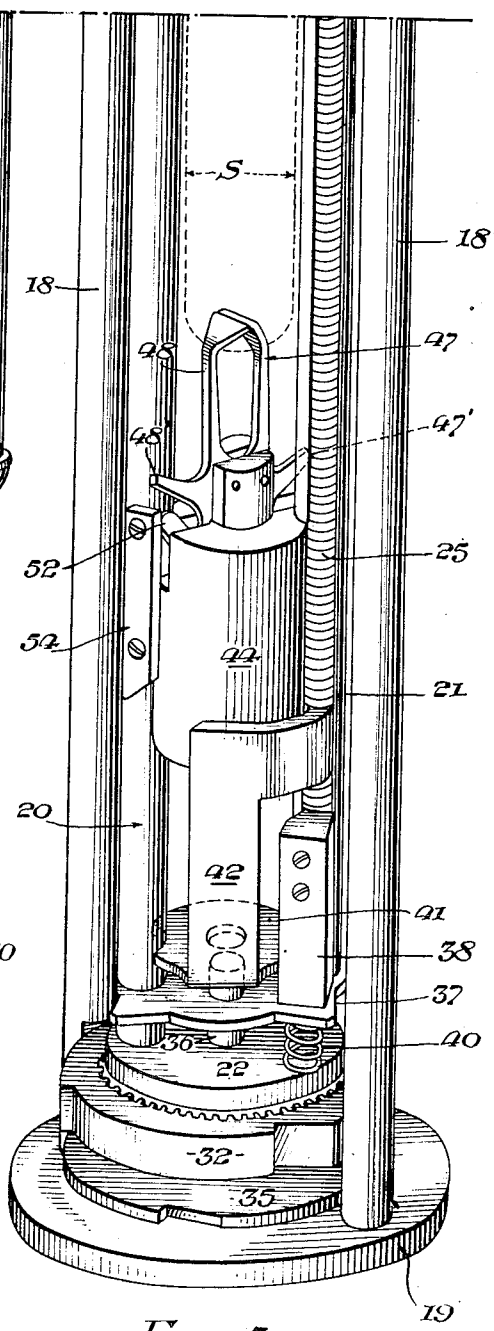


Fig. 5.

Inventor:
VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,
Darby & Darby

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Fig. 6.

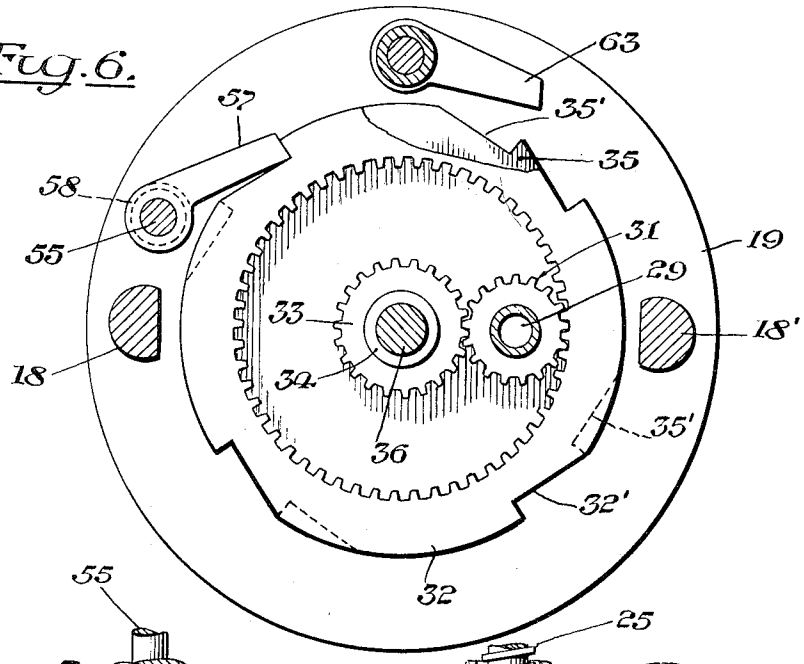
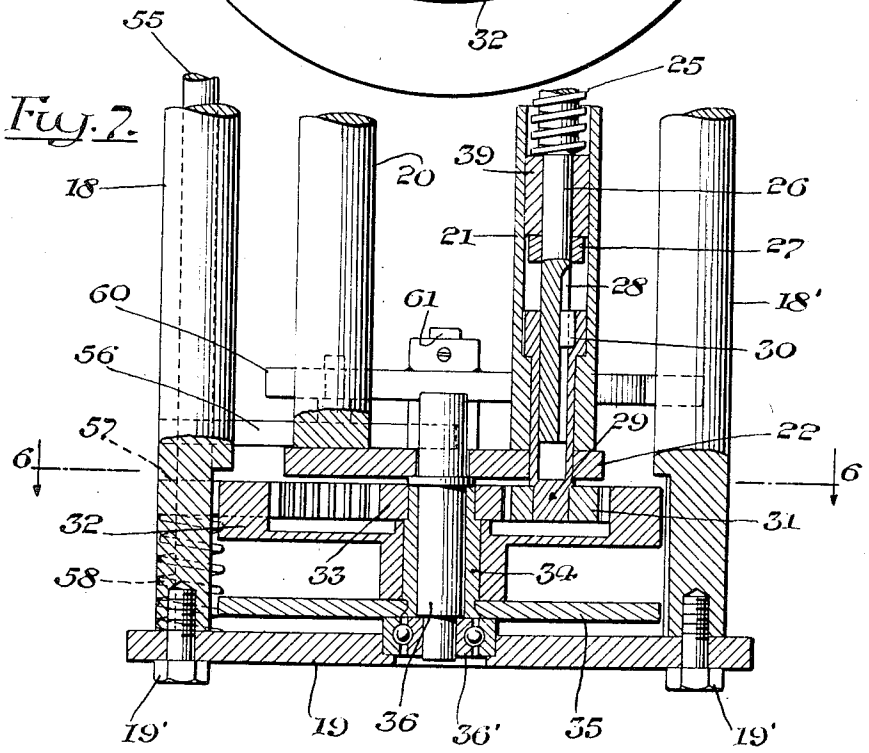


Fig. 7.



Inventor:

VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,

Darby & Darby

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AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

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Fig. 8.

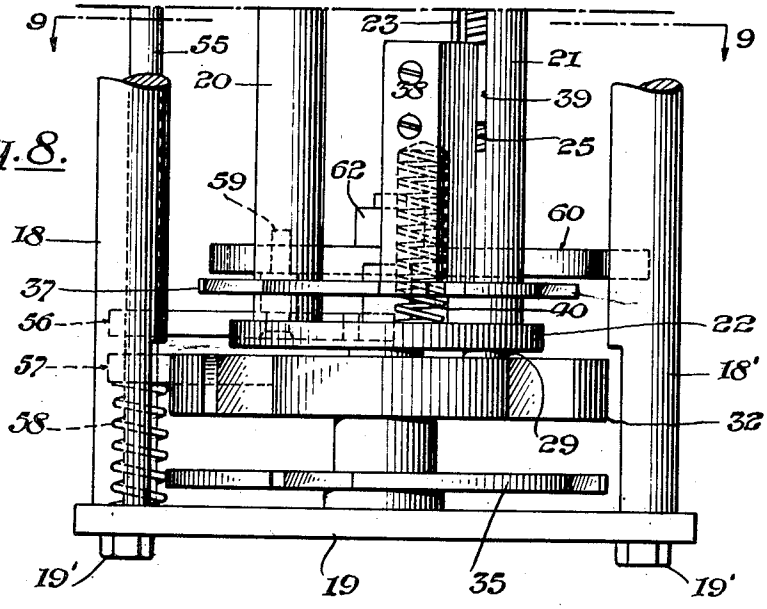
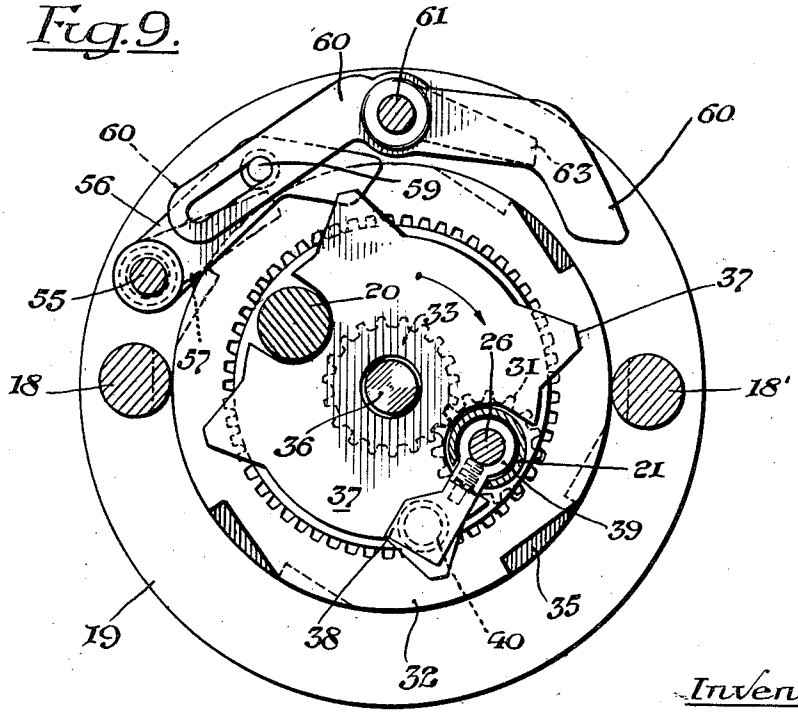


Fig. 9.



Inventor.

VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,
Darby & Darby

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Fig. 10.

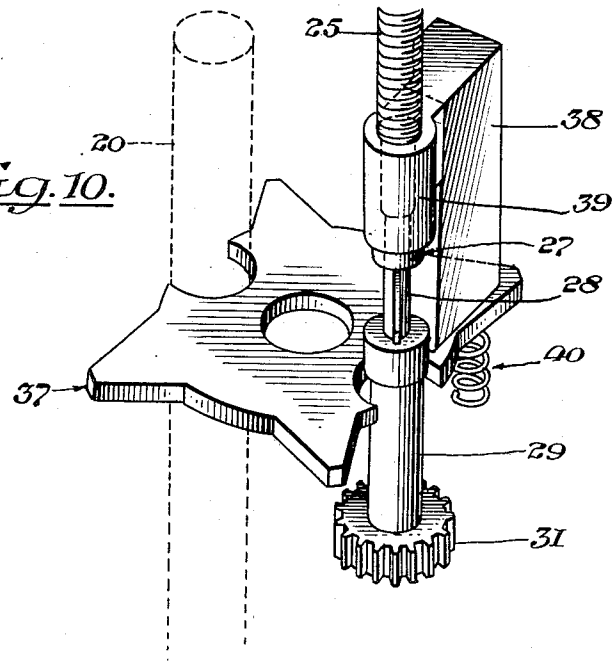
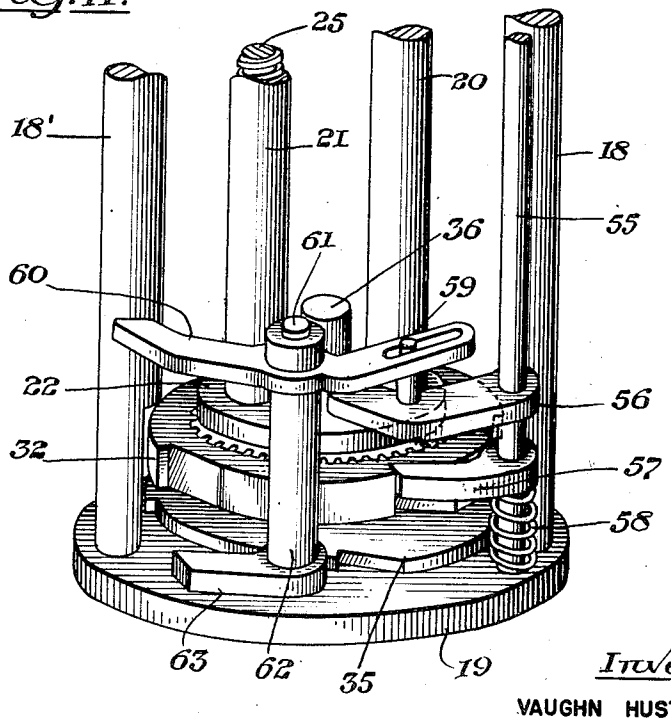


Fig. 11.



Inventor:

VAUGHN HUSTON BUTLER

BY HIS ATTORNEY'S,

Darby & Darby

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AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

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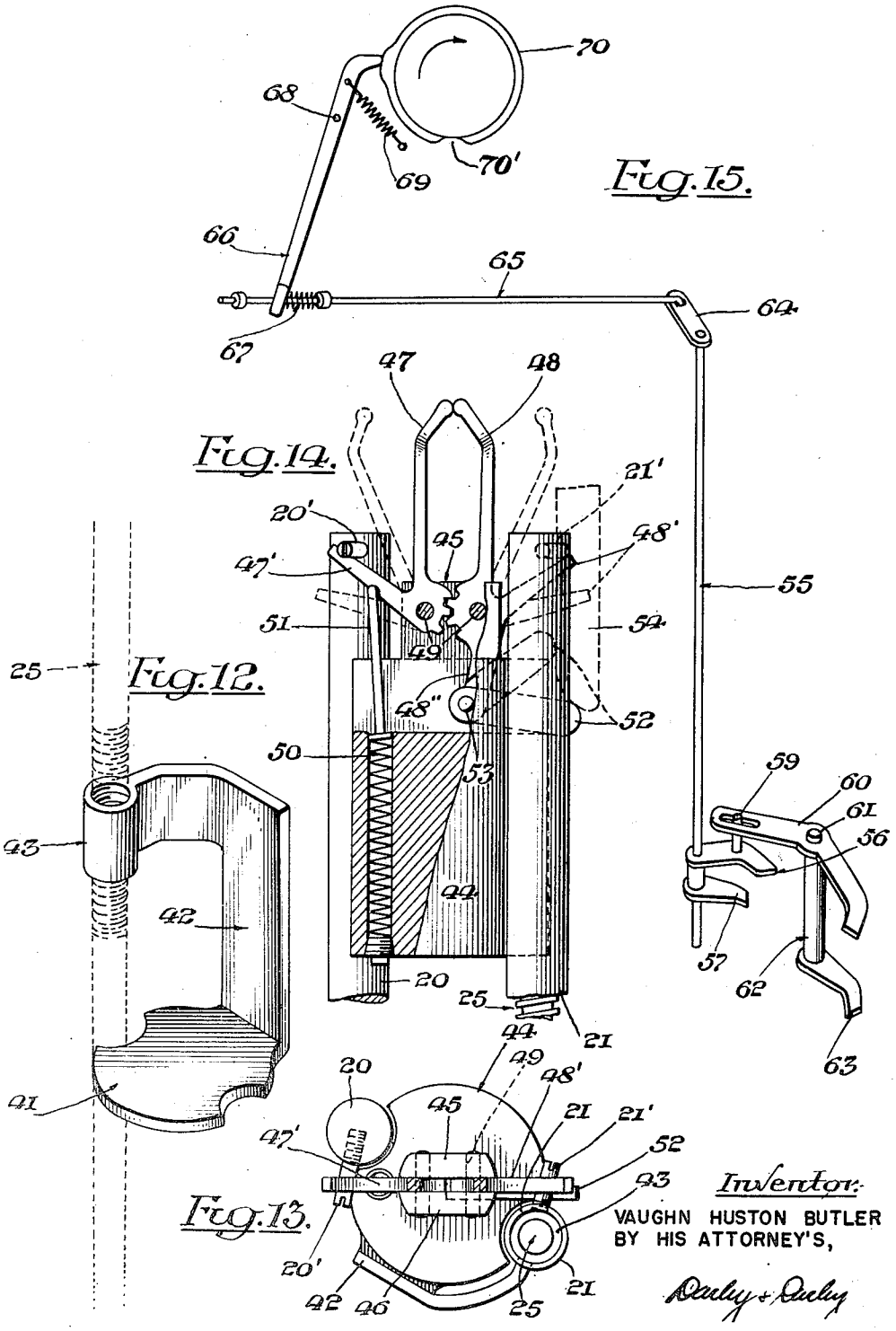


Fig. 15.

Fig. 14.

Fig. 12.

Fig. 13.

Inventor:
VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,
Darby & Darby

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AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

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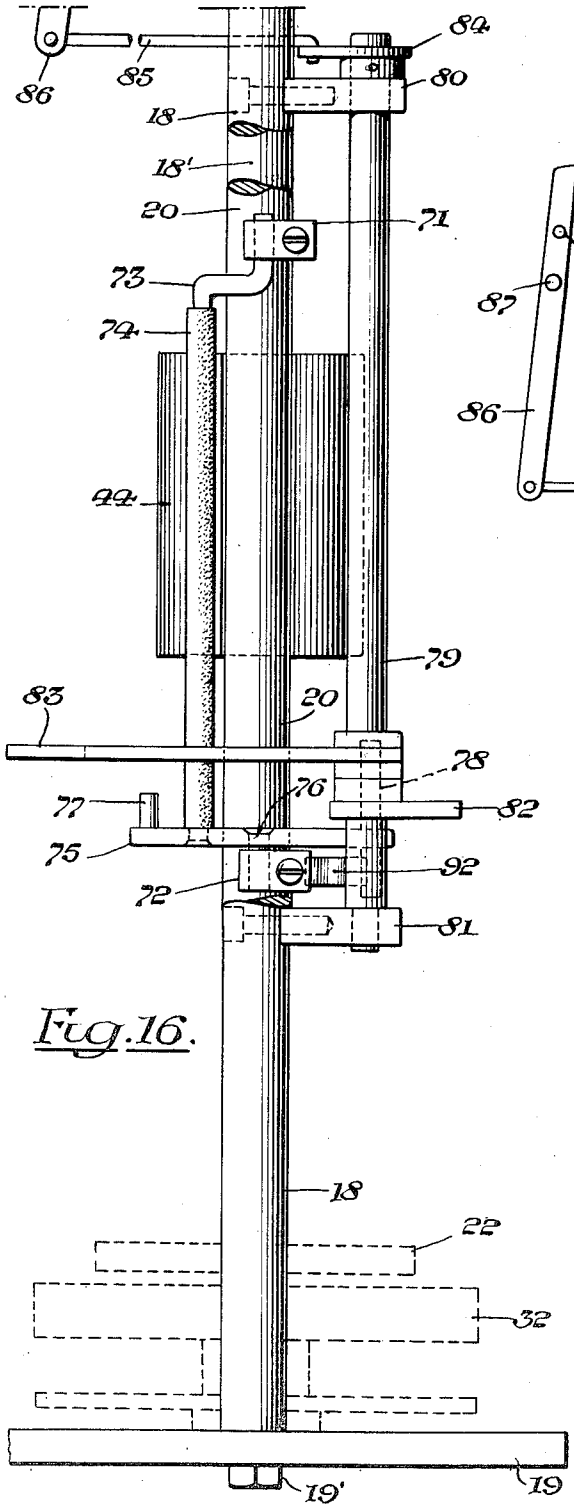


Fig. 16.

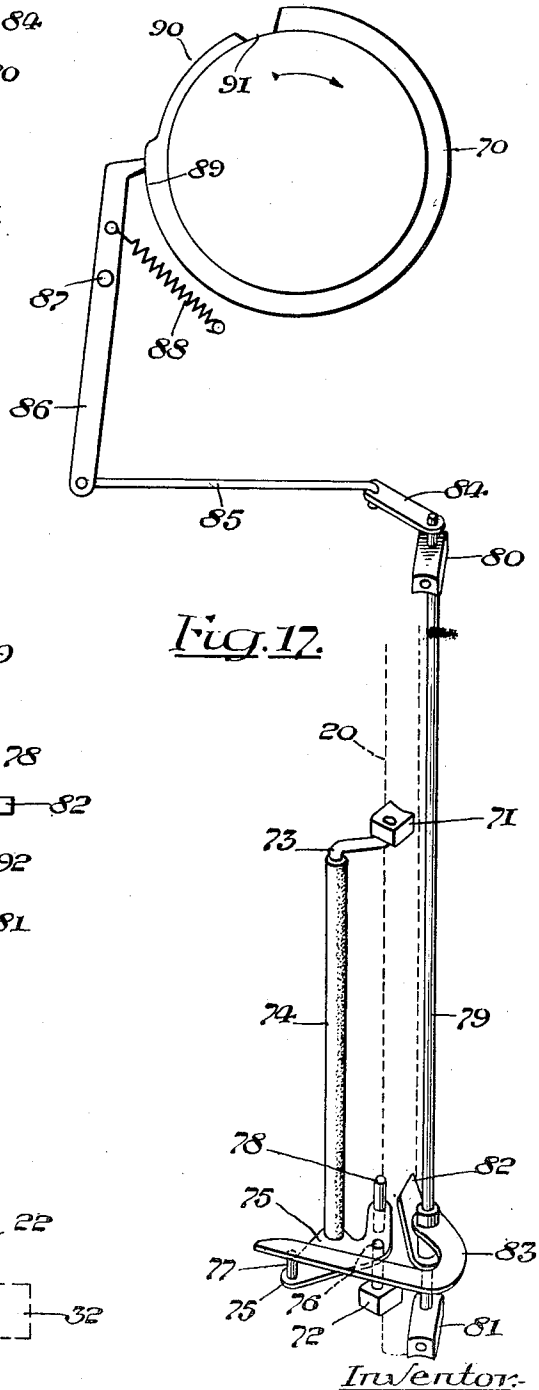


Fig. 17.

Inventor:

VAUGHN HUSTON BUTLER

BY HIS ATTORNEY'S,

Darby & Darby

Nov. 16, 1954 V. H. BUTLER 2,694,304

AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

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Fig. 18.

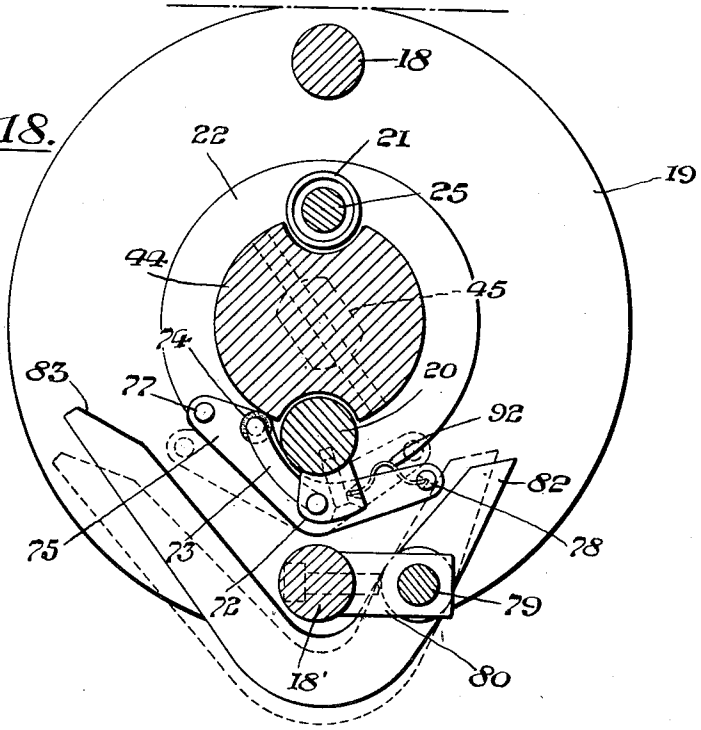
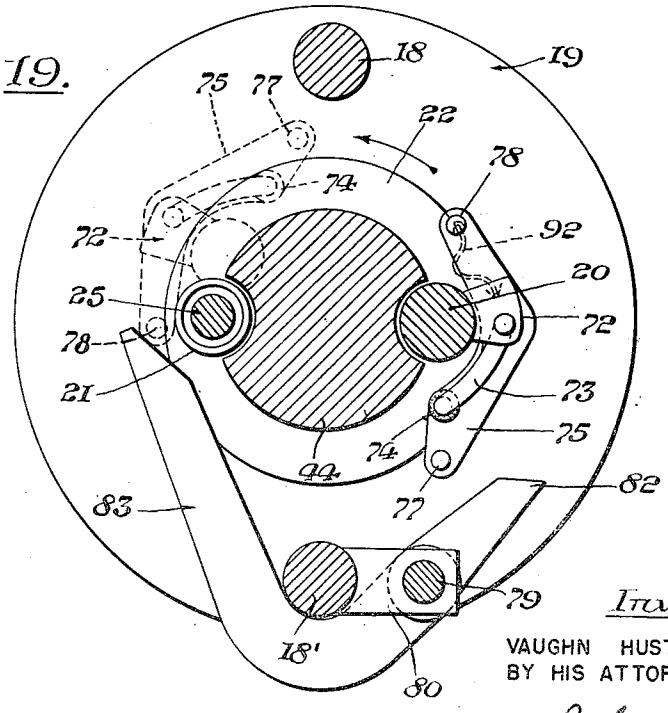


Fig. 19.



Inventor.

VAUGHN HUSTON BUTLER
BY HIS ATTORNEY'S,

Darby & Darby

United States Patent Office 2,694,304 Patented Nov. 16, 1954

2,694,304

AUTOMATIC DRAW-OFF DEVICE FOR CIRCULAR KNITTING MACHINES

Vaughn Huston Butler, Harriman, Tenn., assignor to Burlington Mills Corporation, Greensboro, N. C., a corporation of Delaware

Application March 16, 1950, Serial No. 149,968

51 Claims. (Cl. 66—150)

This invention relates to an automatically acting tensioning device for holding the tubular fabric knit on a circular knitting machine under tension during the knitting thereof.

A broad object of this invention is to provide an automatically acting draw-off device for tensioning the fabric while being produced on a circular knitting machine to produce a more uniform stitch formation in the fabric being knit.

Another object of this invention is to produce an automatic device of this type having the function of tensioning the tubular fabric being knit to aid in the control of streaking, a visual phenomenon in some types of circular knit fabrics such as ladies' circular knit hose.

A general object of this invention is to provide an automatic mechanism, operated by the knitting machine and in conjunction therewith, for positioning a draw-off weight for connection to the beginning end of the fabric, for releasing the weight to tension the fabric during knitting, for locking of the weight during the knitting of the ring-toe, the toe and the looper waste, and for returning the weight to initial position for attachment to the next piece of fabric to be knit.

Another object of this invention is to effect the above operations by means of a mechanism operating automatically in conjunction with the normal operation of a circular knitting machine whereby the knitting machine may be run at normal speed.

Another object of this invention is the provision of means for automatically releasing the finished fabric from the draw-off weight and discharging it from the draw-off mechanism.

Other and more detailed objects of the invention will be apparent from the following description of the embodiment of the invention illustrated in the attached drawings, as exemplary of the invention.

In the accompanying drawings,

Figure 1 is an elevational view of a portion of a circular knitting machine showing in somewhat diagrammatic form the mechanism of this invention and its relation thereto and the control devices for effecting the ejection of the finished fabric from the draw-off mechanism;

Figure 2 is an elevational view of the lower portion of the draw-off mechanism from one side thereof, showing air jet discharge means for the fabric but showing the lower portion of the operating mechanism in somewhat diagrammatic form;

Figure 3 is a vertical, central, cross-sectional view through the needle cylinder of a typical circular knitting machine, showing the draw-off weight in lifted position ready to engage the initial end of the circular knit fabric;

Figure 4 is an enlarged perspective view of a large portion of the draw-off mechanism showing many of the parts thereof and their relative relationship;

Figure 5 is a similar view showing the weight in the position just before its clamping jaws are released;

Figure 6 is a detailed, cross-sectional view taken on the line 6—6 of Figure 7;

Figure 7 is a vertical, central, cross-sectional view through the clutch and drive mechanism of the draw-off device showing some of the parts in elevation;

Figure 8 is an elevational view of the same parts shown in Figure 7 but from the other side;

Figure 9 is a cross-sectional view taken on the line 9—9 of Figure 8;

Figure 10 is a fragmentary, detailed, perspective view of the clutch throwout cam and associated mechanism;

Figure 11 is a perspective view of the clutch and drive mechanism of the device similar to Figure 8, but from the opposite sides thereof;

Figure 12 is a perspective view of the weight lifter;

Figure 13 is a top plan view thereof showing its relationship to the guide rails therefor;

Figure 14 is an elevational view partly in section showing the manner in which the clamping jaws mounted on the weight are caused to open as the weight approaches the upper limit of its travel in preparation for attachment to the fabric;

Figure 15 is a perspective detailed view of the clutch control mechanism;

Figure 16 is a detailed elevational view with some parts broken away showing the weight locking mechanism;

Figure 17 is a perspective view of the actuating mechanism for the weight locking device;

Figure 18 is a horizontal, cross-sectional view showing the relationship of the parts of the mechanism for operating the weight lock and showing the weight lock in locking position; and

Figure 19 shows the relationship of the parts when the weight lock is in unlocked position.

As is well understood in this art, in the knitting of tubular fabrics on circular knitting machines, and particularly in the knitting of ladies' circular knit hose, particularly when using some types of synthetic yarns, there is the tendency to the formation of a streaked condition by reason of the production of a non-uniform stitch. In accordance with this invention this streaked condition is reduced if not eliminated by placing the tubular knit fabric under suitable tension to produce a substantially uniform stitch.

The mechanism of the invention is concerned with means for automatically moving a tensioning weight into position for attachment to the initial end of the fabric and releasing it to place that fabric under the tension of the weight during the subsequent knitting thereof. The mechanism also includes means for locking the weight to take the tension off the fabric during the knitting of the ring-toe, the toe and the looper waste. During the knitting of these portions of the fabric in the case of circular knit hose, enough fabric is knitted after the weight is locked to relieve the tension on the fabric so that the machine may press off with no danger of the fabric running or unraveling. After the fabric has come off the needles the weight is released and it then descends to a point where the clamp by means of which it is attached to the fabric is opened. Thereupon air jets are automatically released to discharge the stocking from the draw-off mechanism. As the machine continues to operate in its normal manner the draw-off weight is lifted again to a position where it may be attached to the end of the next fabric to be knit and the clamping jaws are caused to open for automatic engagement with the fabric.

Having explained in general the operation of the mechanism, this disclosure will now proceed to a full and detailed description of the mechanism illustrated in the attached drawings by means of which these functions may be carried out.

Referring first to Figures 1, 2 and 3, there is illustrated at 1 a fragment of the frame of a circular knitting machine and at 2 the table of such a machine. This table is provided with the usual stationary cam cylinder 2' which is concentric with the needle cylinder 8 on the outer surface of which and in grooves provided therefor are the vertically reciprocable latch needles 9. The needle cylinder 8 is telescoped upon the cylinder sleeve 4 which projects downwardly through an opening in the table 2 concentric with the stationary cam cylinder 2' and is provided at its lower end with a bevel gear 5 adapted to rotate in the bedplate housing 3, which is provided with an opening defined by a down-turned flange 3' concentric with the needle cylinder, all in accordance with the common practice in this art.

Mounted upon the main shaft 7 of the machine is a bevel bull gear 6 meshing with the bevel gear 5 for effecting rotation thereof and of the cylinder sleeve. As is usual a key 11 operating in a longitudinal keyway on

the inner wall of the needle cylinder 8 and attached to the sleeve 4 effects rotation of the needle cylinder with the sleeve while permitting relative vertical movement. Below the sleeve 4 is a thrust bearing ring 13 on which the needle cylinder 8 is supported by a series of hardened pins 14. The ring 13 rests on top of the vertically movable barrel 12 which telescopes within the flange 3' all in accordance with presently available commercial machines of this type. There is diagrammatically illustrated at the top of the needle cylinder the web holders 10 which cooperate with the knitting needles and form part of the usual knitting elements of a circular knitting machine.

Referring to Figure 1, there is illustrated somewhat diagrammatically the remainder of such a knitting machine, including the bedplate 15 normally situated below the table 2 and supporting much of the control mechanism 16 of the knitting machine and in turn supported upon legs or standards 17.

Turning now to the mechanism of this invention there are illustrated a pair of stationary frame rods 18 and 18' the upper ends of which are permanently attached to the lower end of the barrel 12 so as to be vertically movable therewith. These frame rods are connected together at the bottom by means of circular disc forming a base plate 19 and cap screws 19', see for example Figure 7.

A pair of guide rods 20 and 21 extend parallel to the frame rods 18 and 18' and upwardly through the barrel 12 into the lower portion of the needle cylinder sleeve 4 and are attached to the interior thereof by means of a ring 24 which may be secured in the sleeve 4 in any suitable manner and attached near the upper ends of the guide rods as by welding. As will be seen from Figures 3 and 7, guide rod 20 is solid, whereas guide rod 21 is tubular. The rods 20 and 21 are secured, as illustrated in Figure 7, at the lower ends to a disc 22 to which they may be secured in any suitable manner as by welding.

Within the tubular guide rod 21 is an elevator screw 25 which extends to the top thereof and is provided, as shown in Figure 7, at the lower end with reduced circular portion 26 having longitudinal keyway 28 formed therein. A collar 27 is fixed to the reduced circular portion 26 adjacent the upper end of the keyway 28 and is provided for a purpose to which reference will be made later.

The lower end of the portion 26 of the elevator screw projects into a tubular bushing 29 and a key 30 is mounted therein to ride in the keyway 28. The lower end of the bushing 29 is solid and has attached thereto a planet pinion 31 which meshes with an internal gear formed on the inner face of the recess of a disc 32 which, as shown in Figure 6, has notches 32' on the periphery thereof. Also meshing with the planet pinion 31 is a sun pinion 33 secured to the upper end of a bushing 34 which extends through a concentric downwardly projecting sleeve forming a part of the disc 32 and is secured at its lower end to a ratchet disc 35. A shaft 36, journaled at its lower end in a thrust bearing 36' mounted in the base plate 19 is secured to the disc 22 to provide a rotatable support for the guide rail assembly. The shaft 36 projects upwardly through the disc 22 to form a stop for a purpose to be later explained. The ratchet disc 35 is likewise notched, as shown at 35', Figure 6.

Referring to Figures 9 and 10, for example, there is illustrated clearly a clutch throwout cam 37 which is notched at a pair of diametrically opposed points so as to fit partially around the guide rods 20 and 21. Mounted on this cam is a vertically extending block 38 having a lateral extension terminating in a sleeve 39 which fits onto the reduced end 26 of the elevator screw 25 and lies between the shoulder formed thereon and the collar 27 previously mentioned.

As is clear from Figures 5 and 8, the block 38 is provided with a circular recess into which a coil spring 40 extends through a registering opening in cam 37 and which is supported at its lower end, as shown in Figure 5, on the disc 22 to hold the cam 37 resiliently in an intermediate position for a purpose to be explained later.

Referring to Figures 5 and 12, attention is now called to the elevator which consists of a platform 41 having diametrically opposed peripherial notches for vertical movement between the guide rods 20 and 21. Integral with the platform 41 is a vertical arm 42 having a transverse generally arcuate extension terminating in an internally threaded sleeve 43 which engages with the threads of the elevator screw 25. The external diameter of the threaded elevator screw 25 is small enough so that the threaded sleeve 43 can ride up and down in the tubular guide rod 21 and the transverse extension to which the sleeve 43 is attached moves in a longitudinal slot 23 in the tubular guide rod 21 (see Figures 4 and 5).

A weight 44 of suitable mass is shown of generally cylindrical form, likewise having a pair of diametrically arranged longitudinal surface notches for cooperation with the guide rods 20 and 21, as is clear from Figure 13, which allows guided vertical movement of the weight 44 in either direction. This weight has a diametral slot in the top surface and a pair of spaced extensions 45 and 46 between which are pivotally mounted a pair of clamping arms 47 and 48. These clamping arms are mounted on the pivot pins 49 extending between the extensions 45 and 46. The clamping arms 47 and 48 have acutely angled extensions 47' and 48' respectively adapted to cooperate with the stop pins 20' and 21' mounted at the upper ends and on the opposite sides thereof of the guide rods 20 and 21, see particularly Figures 3 and 14. Concentric with the pivot pins 49 the clamping arms are provided with teeth which mesh so that the opening and closing movements of these clamping arms are constrained by these teeth. The weight 44 is provided with a recess in which is mounted a compression spring 50 upon the upper end of which bears a pin 51 whose upper end in turn lies in a notch on the lower surface of the inclined extension 47' of clamping arm 47. Clamping arm 48 extends below the pivot pin 49, as shown at 48'' and is bifurcated at its lower end to pivotally support at 53 an actuating link 52 for cooperation with a fixed cam 54 which will be referred to later.

In Figure 15 is illustrated, detached from the other parts of the mechanism, the clutch control mechanism which includes a vertical shaft 55. The lower end of this shaft is journaled in the base plate 19 (see Figure 11) and the upper end is journaled (not shown) on the adjacent frame rod 18. Secured near the lower end of shaft 55 are the cam follower 56 and pawl 57: Surrounding the lower end of shaft 55 and interposed between the pawl 57 and the base plate 19 is a compression spring 58 (see Figure 11) for resiliently supporting the shaft 55. Attached to the cam follower 56 intermediate its ends and extending vertically thereof is a pin 59 which rides in a slot in one end of a bell crank lever 60. The lever 60 is connected to a sleeve 62 to the bottom end of which is attached a clutch pawl 63. The sleeve 62 is mounted for pivotal movement on a stud shaft 61, mounted in the baseplate 19.

Referring again particularly to Figure 15, it will be seen that the upper end of shaft 55 is provided with a crank arm 64 which is connected by a link 65 to the forked end of a lever 66. A spring 67 is mounted on the link 65 and lies between a collar secured thereto and the forked end of lever 66 so as to provide a lost motion action. Lever 66 is pivotally mounted at 68 and is biased by a spring so that the angularly extending end thereof may engage cams formed on the main cam drum 70 of the knitting machine.

Referring to Figures 4, 16 and 17 a description of the mechanism for operating the lock for the draw-off weight will be given. This mechanism includes a pair of pivot blocks 71 and 72 attached to the guide rod 20. The crank shaped upper end of the locking rod 73 is pivotally mounted in the pivot block 71 and the lower end of this rod is secured to a bell crank lever 75. The straight portion of rod 73 is covered with a rubber tube or sheath to increase its frictional locking contact with the weight, as will be described later. The bell crank lever 75 is pivotally mounted intermediate its ends by means of a pivot pin 76 in the lower pivot block 72. On one end of the bell crank lever 75 is an upstanding pin 77 which is shorter than, and located further from the pivot point 76 than, an upstanding pin 78 mounted on the other end of the bell crank lever 75 and extending through and below the bell crank lever as shown. A U-shaped flat spring 92, see Figure 18, is mounted between the pivot block 72 and the downwardly extending portion of the pin 78 to provide an over center action for the bell crank lever 75.

Rotatably mounted in a pair of pivot blocks 80 and

81 is a vertically extending shaft 79. The blocks 80 and 81 are secured to the frame rod 18, see Figures 4 and 16. Secured on and near the lower end of the shaft 79 are a pair of levers 82 and 83. A crank arm 84 is attached to the upper end of shaft 79 and is pivotally connected by a link 85 to a lever 86 pivotally mounted at a suitable point on the knitting machine at 87. A spring 88 biases the offset terminal end of lever 86 into engagement with the cam surfaces 89, 90 and 91 on the main cam drum 70 of the knitting machine.

The draw-off mechanism extending below the bedplate 15, see Figures 1 and 2, is provided with tubular shields 93 and 94 attached to the guide rods 20 and 21 in any suitable manner, not shown, for rotation therewith. These shields are spaced, as clearly shown in Figure 2, and one side of the upper end of shield 94 is cut away as shown at 94'' in Figure 1 to enlarge the space thus provided. The shield 93 is provided with arcuate slots 93' and 93'' and the shield 94 is provided with an arcuate slot 94'. Disposed opposite these slots respectively are the air jet tubes 99, (see Fig. 1) and 96, and 98 (see Fig. 2), all connected to an air pipe 95. An air jet tube 97 is disposed opposite the space between the shields 93 and 94. As shown in Figure 1, this pipe 95 is connected to the outlet end of a valve 100 mounted on the machine proper. An air pressure supply line 101 from any suitable source is connected by the branch 102 to the input side of valve 100. Valve 100 is of the type which is normally spring closed and is opened by means of a longitudinally slidable stem arranged to be actuated by a lever 103 pivotally mounted at some suitable point on the machine at 104. The other end of lever 103 has a lateral extension arranged to be actuated by cam 105 on one of the cam discs 106 of the knitting machine proper.

In order to describe the operation of this mechanism the starting point will be assumed as that illustrated in Figure 3, at which time the elevator 41 has raised the weight 44 to a position where the lateral extensions 47' and 48' of the clamping arms 47 and 48 respectively have engaged the stop pins 20' and 21', as clearly shown in this figure. The weight has been raised to a point where by reason of this engagement the clamping arms are opened against the action of spring 50 (see Figure 14). At this point it may be noted that in order to protect the knitted fabric from the added mechanism, a cylindrical shield 200 is mounted within the needle cylinder so as to rest upon the upper end of the guide rods 20 and 21. The lower internal surface of this shield is frusto-conical to provide a centralized lower opening through which the knitted fabric S is pulled by the clamping arms 47 and 48 and kept free of the stop pins 20' and 21' to prevent snagging thereon.

When sufficient of the tubular fabric S has been knitted, it will be seen that its initial end will move into position between the clamping arms 47 and 48. At this time the rotation of the elevator screw 25 will be such as to cause the platform 41 to start its descent. As this happens spring 50 bearing on the extension 47' will tend to cause the clamping arms to close, it being remembered that they are geared together as shown in Figure 14. By the time the platform 41 and weight 44 have moved down far enough to permit the clamping arms 47 and 48 to clamp upon the end of the tubular fabric S lying between them and grip it, the extensions 47' and 48' will have moved out of contact with the pins 20' and 21' and the arms will be held closed on the fabric by the spring 50. Continued rotation of elevator screw 25 will cause the elevator 41 to move downwardly and since the weight 44 is now attached to the fabric S by the clamping jaws, platform 41 will move away from the weight so that it is suspended by the fabric, and tension will be applied to the fabric by the weight hanging free.

As the needle cylinder 8 and cylinder sleeve 4 rotate together during the knitting of the fabric the guide rods 20 and 21 attached to the cylinder sleeve by the ring 24, will rotate with the fabric, as will the weight 44 and all the other parts attached thereto. Thus the tubular fabric will not be twisted by the weight. The barrel 12, frame rods 18 and 18' and base plate 19, of course do not rotate with the needle cylinder.

As the machine continues to operate the rotation of elevator screw 25 will cause the elevator 41 to descend until it engages the shaft 36, see Figure 5. As the elevator 41 can go no lower, continued rotation of elevator

screw 25 will cause it to begin to move upwardly in relation to the elevator and its integral collar 43. As a result the clutch throwout cam 37 will move upwardly therewith by reason of the engagement of its sleeve 39 by the collar 27, see Figure 10. Normally this cam 37 is supported by spring 40 so as to lie in a plane between the follower 56 (see Figs. 8 and 9), which is below the cam, and follower lever 60, which is above it. However, when cam 37 is raised, as explained above, it engages lever 60 which moves pawl 63 out of engagement with the ratchet disc 35 previously held stationary by it. As disc 35 is connected to sun pinion 33, see Figure 7, it is now released for rotation.

This is a good point to note that the thrust collar 27 never engages the upper end of sleeve 29. The spring 40, see Figure 10, normally supports the throwout cam 37 in the intermediate position mentioned, and in turn the elevator screw 25 is supported, as shown in Figure 10, by the sleeve 39 attached to the block 38. In fact, elevator screw 25 is supported by the spring 40 through the intermediate elements mentioned at all times except when the elevator 41 engages stop shaft 36, at which time the elevator 41 supports the elevator screw 25, and at which time by reason of the continued rotation of the elevator screw the clutch throwout cam 37 is lifted, as explained above.

For emphasis it will again be noted that when the sun pinion 33 is held against rotation by engagement of pawl 63 with the ratchet disc 35, planet gear 31 rotating as it does with the guide assembly, rolls around the fixed sun pinion 33, and this of course causes elevator screw 25 to rotate in a direction to lower the elevator as explained above, assuming the proper direction of rotation of the guide rail assembly.

When the sun gear 33 is released for rotation, as explained above, the planetary gear transmission comprising the internal gear formed on the inner face of the recess of disc 32, the sun gear 33 and planet pinion 31, rotate with the guide rail assembly as a unit and as a result rotation of the elevator shaft 25 on its axis stops. The parts are so proportioned that the elevator 41 completes its travel from the top to the bottom of the draw-off device in about one-tenth the time required to knit a complete stocking. When the elevator reaches the bottom of its travel as indicated above, it remains there until the stocking is completed and it is time to return the weight for attachment to the next socking.

As previously explained, the locking device is intended to go into action as the knitting machine changes yarn to make the ring-toe and remains locked during the knitting of the ring-toe, the toe and the looper waste. On the movement of the main cam drum 70, Figure 17, by the changing of the yarn for the ring-toe, cam 91 allows the offset end of pivot lever 86 to move inwardly under the influence of spring 88 so as to operate shaft 79 through link 85 and crank 84. As a result cam lever 82 moves into a position to engage with pin 77, causing bell crank 75 to pivot on its pin 76 in a direction so that the locking rod 73 engages the weight under pressure to prevent its further descent.

It will be noted that pin 78 is longer than pin 77 as well as being set closer to pivot 76. Thus, when lever 82 moves into position to engage pin 77 it can do so without hitting pin 78 which latter is close enough to pivot 76 so as not to be engaged by the lever 82. It should be recalled that shaft 79 and its pivot bearing blocks 80 and 81 are secured to the stationary frame rod 18, whereas the pivot blocks 71 and 72 mounted on the guide rod 20 are rotating with it, so that the bell crank 75 with its pins 77 and 78 is also rotating in relation to the levers 82 and 83. When the motion of rod 79 is reversed then lever 83 will contact the longer pin 78 to remove rod 74 from its locking position while pin 77 passes beneath it. Thus, the locking rod 74 can be moved into and out of locking position at will, lever 82 operating on shorter pin 77 which is set at a great enough distance from the pivot so it can be moved without pin 78 engaging this lever, while at another time lever 83 will move rod 74 in the opposite direction by striking the longer pin 78 while shorter pin 77 passes below it.

The rubber covering 74 for the locking rod 73 increases its frictional contact with the weight 44 to aid in its locking action. As the bell crank lever moves it stresses spring 92 and this spring is arranged so that upon its movement the bell crank lever moves over center, so

to speak, and is held in actuated position by the spring 92 until the bell crank lever 75 is again moved to the other side of this over center position. Thus through the agency of spring 92 the locking rod 73 is held in locking position until bell crank 75 is again actuated. As the main cam drum 70 continues to move during the knitting of the ring-toe, toe and looper waste, the cam 90 (Fig. 17) moves under the offset end of lever 86, returning it to an intermediate position against the resistance of spring 88 and actuating lever 82 to an intermediate position. On the cutoff movement of the main drum 70 the looper waste yarn is lifted out of the needles which allows the fabric to be disengaged from the needles. On the last part of the movement of drum 70, cam 89 moves cam lever 86 still further back against the resistance of spring 88, that is in a counterclockwise direction, causing a further rotation of shaft 79 so that cam lever 83 moves into a position to engage the pin 78 when it comes around into position for engagement therewith. In the actual operation lever 86 moves off cam 89 into depression 91 and on to cam 90 in a single racking movement of drum 70. This allows lever 82 to contact pin 77 and then move out of the path of pin 78 to a neutral position.

After lever 83 has been actuated, as explained above, upon the next rotation of the rail assembly and with it the bell crank lever 75, the pin 78 will strike lever 83 and being momentarily held, lever 75 will pivot on pin 76 in the opposite direction so as to move over center and be held there by spring 92. This movement, of course, causes the locking rod 73 to disengage the weight 44 and allows the weight to drop to the bottom of the rail assembly and onto the elevator 41.

Referring to Figure 5, as the weight falls past the cam 54, see Figure 4, the clamp opening bar 52 merely pivots upwardly on the lower end of the clamp extension 48'', see Figure 14, and the clamping arms 47 and 48 remain closed.

The elevator screw at this time starts rotating in a direction to raise the elevator. After the elevator 41 reached its lower limit of travel elevator screw 25 was reversed so as to be rotating in the direction to start the elevator on its upward travel. This reversal of rotation is effected through the actuation of pawl 57 by the main drum cam 70. At this time this cam is in a position so that its raised cam portion, as illustrated in Figure 15, moves under the offset end of lever 66 causing it to rotate in a counter-clockwise direction against the resistance of spring 69. This movement of lever 66 through link 65 and crank 64 rotates shaft 55 in a direction so that pawl 57 engages the nearest tooth 32' on the ring gear disc 32 (see Figure 6). The rail assembly is rotating, according to Figure 6, as a result of the normal operation of the knitting machine, in a counterclockwise direction so that the engagement of pawl 57 therewith causes the ring gear to stop rotating. The rail assembly, however, continues to revolve, with the result that the planet pinion 31 rolls around the internal gear of ring gear disc 32 in a direction to cause the elevator screw 25 to raise the elevator.

When the weight moves to the position where the end of the clamp opening bar 52 engages the cam faced lower end of the cam 54, see Figure 4, the clamp bar 52 is moved inwardly (to the left, Figure 14), causing the clamping arms 47 and 48 to open and thereby release the fabric. At the instant the fabric is released cam 105, see Figure 1, will move into engagement with the offset end of lever 103, which is thus pivoted in a counterclockwise direction to open the air valve 100. Air is supplied under pressure from the source through line 101, branch 102, valve 100, into pipe 95, and from thence is discharged by the nozzles 96, 97, 98 and 99 into the shields 93 and 94, see Figure 2, through the openings provided therefor so as to blow the fabric S from the draw-off device, as illustrated in Figure 2.

The lead screw 25, of course, continues to rotate in the direction to raise the elevator 41, and of course the weight 44, resting on it. As soon as the clamp opening bar 52 passes off the cam faced upper end of the cam 54, spring 50 closes the clamping arms and the weight continues upwardly until it arrives at the starting position for this description, that is the position shown in Figure 3. This is also a good point to note that the splined connection between the reduced end 26 of the lead screw and the sleeve 29 permits the relative vertical movment of the elevator screw shaft with respect to the sleeve 29, as previously described.

As the elevator approaches the top of its run the lateral extensions 47' and 48' of the clamping arms 47 and 48 strike the stop pins 20' and 21', respectively, as noted at the opening of this description to cause the clamper arms to be fully opened, as illustrated in Figure 3 by the time the elevator reaches the top of its run. Under these conditions a resistance to the further upward movement of the elevator is interposed with the result that the continued rotation of the elevator screw 25 depresses the clutch throwout cam 37. Clutch throwout cam 37 moves down so as to engage follower 56, moving it outwardly, see Figure 15, so as to disengage clutch pawl 57 from the engaged tooth 32' of the ring gear disc 32, thus allowing the ring gear disc 32 to revolve with the guide rail assembly. At the time the welt of the stocking is completed the cam drum 70, Figure 15, has again reached the position where its projecting cam allows lever 66 to move in a clockwise direction, causing clutch pawl 63 to engage and lock the ratchet disc 35, thereby locking the sun pinion 33 against rotation. Planetary gear plate 31 now revolves around the sun pinion 33 as a result of the continued rotation of the rail assembly and with it at this time the ring gear disc 32. This coaction of the gear train causes a reversal of the elevating screw as previously mentioned to start the elevator on its downward trip, with the result, as previously explained, that the clamping arms close upon the end of the welt fabric. It will be understood that at the end of each action previously described to raise and lower the throwout cam 37, that is when the operating pressure thereon is released, it returns to its intermediate position which, as previously explained, is in a plane lying between the levels of followers 56 and 60. The throwout cam 37 is returned by gravity to the plane between the followers 56 and 60 when raised above that plane and is returned to that plane when depressed below it by spring 40. At this point it may be noted that the pin 59, see Figure 15, interconnecting the followers 56 and 60 is merely provided to insure that both discs 32 and 35 can be worked by the same control shaft 55, while insuring that only one clutch can be engaged at a time. Follower 56 and lever 60 serve to disengage their respective clutches to a neutral position, that is each disengages its clutch without engaging the other clutch. For clarification it may be noted that the raised cam portion of drum 70 (Figure 15) is effective to operate the shaft 55 to engage the elevating clutch which includes the ring gear disc 32 while the depression 70' of cam 70, shown in Figure 15, effects engagement of the lowering clutch including the ratchet disc 35. When the offset end of lever 66 engages the other portions of the cam 70, as illustrated in Figure 15, the control shaft 55 is held in an intermediate position so that either clutch can be disengaged after the elevator has reached its limit in either direction, by the action of the clutch throwout cam 37, as previously described in detail in each case.

In closing it may be noted, with reference to the structure shown in Figure 15, that the lost motion connection between lever 66 and link 65 is provided to allow either clutch to remain engaged while lever 66 returns to an intermediate position. This feature is necessary in order that these clutches can disengage automatically. Spring 67 is merely provided as a safety feature so that the elevator clutch may disengage if the elevator reaches the top limit of its travel before lever 66 returns to an intermediate position. This is a condition that can only happen when setting the machine over by hand.

The above description of the single embodiment of the invention shown in the drawings is to be taken as illustrative of the nature, scope and operation of this invention. Since those skilled in the art will easily discover many possible changes in the details of construction of this mechanism, I do not desire to be strictly limited to the single illustrative embodiment herein contained, but rather to the scope of the appended claims.

What is claimed is:

1. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, comprising in combination with the needle cylinder of guide means rotatable with said cylinder, a weight vertically movable on said guide means, fabric clamping means

mounted on said weight, and means for moving said weight into position to be supported exteriorly of and by said fabric clamping means by grasping the beginning end of the fabric being knit on said cylinder.

2. In the combination of claim 1, means for attaching the guide means to said cylinder for rotation therewith.

3. In the combination of claim 1, means for attaching the guide means to said cylinder for rotation therewith, and a fixed frame providing a support for the lower end of said guide means.

4. In the combination of claim 1, means for attaching the guide means to said cylinder for rotation therewith, a fixed frame providing a support for the lower end of said guide means, a barrel associated with said needle cylinder, and means for attaching said frame to said barrel.

5. In the combination of claim 1, said fabric engaging means comprising a pair of pivoted clamping arms, and means for normally urging said arms to clamping position.

6. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, comprising in combination with the needle cylinder of guide means, a weight vertically movable on said guide means, fabric clamping means mounted on said weight, means for moving said weight into position to be supported exteriorly of and by said fabric clamping means by grasping the beginning end of the fabric while being knit on said cylinder as it rotates, said fabric engaging means comprising a pair of relatively movable clamping members, means for normally urging the members to clamping position, and means for causing said members to open to receive the end of the fabric being knit on said cylinder as said weight is moved into fabric engaging position.

7. In the combination of claim 6, said means for moving said weight comprising an elevator, an elevating screw for moving said elevator vertically, and a gear train rotatable as a result of the rotation of said guide means with said needle cylinder, to effect rotation of said elevator screw.

8. In the combination of claim 6, said means for moving said weight comprising an elevator, an elevating screw for moving said elevator vertically, a gear train rotatable as a result of the rotation of said guide means with said needle cylinder to effect rotation of said elevator screw, and means actuated upon the arrival of said elevator at the limit of its travel in either direction for effecting reversal of rotation of said elevator screw.

9. In the combination of claims 6, said means for moving said weight consisting of a gear train including an internal gear, a sun pinion and a planet pinion interconnecting said internal gear and sun pinion, an elevator for said weight, an elevating screw connected to said elevator, means for connecting said planet pinion with said elevator screw to effect rotation thereof, and clutch means actuated in timed relation to the operation of the knitting machine for controlling said gear train to effect reversal of said elevating screw at the end of the travel of said elevator in each direction.

10. In the combination of claim 6, said means for moving said weight consisting of a gear train including an internal gear, a sun pinion and a planet pinion interconnecting said internal gear and sun pinion, an elevator for said weight, an elevating screw connected to said elevator, means for connecting said planet pinion with said elevator screw to effect rotation thereof, means controlled in timed relation to the operation of the knitting machine for successively stopping and releasing rotation of said internal gear, and means operated in timed relation to the operation of said last means and to the operation of the knitting machine for successively starting and stopping the rotation of said sun pinion.

11. In the combination of claim 6, said last means releasing said weight for free descent after attachment to said fabric, and means for locking said weight against free descent as it approaches its lower limit of travel to gradually release the tension on the fabric as the knitting thereof continues.

12. In the combination of claim 6, said last means releasing said weight for free descent after attachment to said fabric, means for locking said weight against free descent as it approaches its lower limit of travel to gradually release the tension on the fabric as the knitting thereof continues, and means actuated in timed relation to the operation of the knitting machine for releasing said locking means when the fabric is disengaged from the knitting elements of the knitting machine, whereby the weight drops to the lower level of its travel.

13. In the combination of claim 6, said last means releasing said weight for free descent after attachment to said fabric, means for locking said weight against free descent as it approaches its lower limit of travel to gradually release the tension on the fabric as the knitting thereof continues, means actuated in timed relation to the operation of the knitting machine for releasing said locking means when the fabric is disengaged from the knitting elements of the knitting machine whereby the weight drops to the lower level of its travel, and means actuated upon return upward movement of said weight for releasing the fabric from said fabric engaging means.

14. In the combination of claim 6, said last means releasing said weight for free descent after attachment to said fabric, means for locking said weight against free descent as it approaches its lower limit of travel to gradually release the tension on the fabric as the knitting thereof continues, means actuated in timed relation to the operation of the knitting machine for releasing said locking means when the fabric is disengaged from the knitting element of the knitting machine whereby the weight drops to the lower level of its travel, means actuated upon return upward movement of said weight for releasing the fabric from said fabric engaging means, and means for discharging the fabric from the draw-off device upon release from the fabric engaging means.

15. In the combination of claim 6, said fabric engaging means comprising a pair of normally closed clamping arms, and means operated at the beginning of each upward movement of the weight for opening said clamping arms to release the fabric.

16. In the combination of claim 6, said fabric engaging means comprising a pair of normally closed clamping arms, means operated at the beginning of each upward movement of the weight for opening said clamping arms to release the fabric, and pressure fluid means for discharging the fabric from the draw-off mechanism after said clamping arms are open.

17. An automatic fabric tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable fabric engaging means, means for raising said fabric engaging means and for causing it to grasp the initial portion of an article while the article is being knit, said fabric engaging means thereafter moving downwardly to impart tension to the article during knitting thereof and means for interrupting the application of tension to the article during the knitting of a portion thereof and while the article is engaged by the fabric engaging means.

18. In a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, means for seizing the free end portion of each article while it is being knit and for imparting tension thereto during subsequent knitting, means for automatically interrupting the application of tension to the article during the knitting of a portion thereof and while the article is engaged by said seizing means, and means for releasing the completed article from said seizing means.

19. In a knitting machine having instrumentalities for knitting a stocking, a work tube positioned to receive a knitted stocking, said work tube having a discharge zone, and means for creating a flow of air at said discharge zone for effecting withdrawal of a completed stocking from said work tube.

20. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, power operated means for raising said article grasping means for causing it to grasp the initial portion of an article while the article is being knit, and for releasing it for downward movement by gravity while it grasps the article to impart tension to the article during knitting thereof, and means for interrupting the application of tension to the article during the knitting of a portion thereof and while the article is grasped by said grasping means.

21. In a circular knitting machine having a needle cylinder and adapted to knit separate articles each of

which is pressed off when completed, means for automatically seizing the free end portion of each article while it is being knit and for imparting tension thereto during subsequent knitting, means for automatically releasing the completed article from said seizing means, and means providing a current of air for removing the article from the vicinity of the seizing means.

22. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, automatic controlling means for effecting in sequence raising of said article grasping means, grasping from below without penetration of the fabric of the article, of the initial portion of an article with said grasping means, and downward movement thereof while it grasps the article to impart tension to the article during continued knitting thereof, means for arresting the downward movement of the grasping means sufficiently before completion of the knitting of each article so that the tension in the article is substantially relieved during completion of the knitting thereof, whereby press-off is effected without ravelling.

23. In the combination of claim 22, means to hold the article grasping means during completion of the knitting of the article to relieve the tension in the article, and means to release the grasping means when the article is pressed off to permit said grasping means to complete its downward movement.

24. In the combination of claim 22, means to hold the article grasping means during completion of the knitting of the article to relieve the tension in the article, means for effecting release of the article from the grasping means, and means for removing the article from the vicinity of said grasping means.

25. In an automatic stocking draw-off device for a circular knitting machine having a rotatable needle cylinder and constructed and arranged to knit separate stockings beginning with the welts thereof, comprising, in combination with the needle cylinder, guide means rotatable with said cylinder, a weight vertically movable on said guide means, stocking engaging means mounted on said weight, and means for moving said weight into position for engagement of said engaging means with the welt of a stocking being knit on said cylinder.

26. An automatic stocking tensioning device for a circular knitting machine having a rotary needle cylinder and adapted to knit separate stockings, beginning with the welts thereof, each of which stockings is pressed off when completed, comprising guide means, a weight vertically movable along with said guide means, rotatable stocking engaging means connected to said weight, and power-operated means for moving said engaging means, during rotation of the needle cylinder, into position for engaging the welt of a stocking being knit.

27. An automatic fabric tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable fabric engaging means, means located below the needle cylinder for supporting and raising said fabric engaging means and for causing it to grasp the initial portion of an article while the article is being knit, said fabric engaging means thereafter moving downwardly to impart tension to the article during knitting thereof, while leaving unobstructed the interior of portions of the article knit subsequently to said initial portion, and means for effecting release of the article from the engaging means.

28. An automatic fabric tensioning device for a circular knitting machine having a rotary needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable and rotatable fabric engaging means, means located below the needle cylinder for supporting and raising said fabric engaging means and for causing it to grasp the initial portion of an article while the article is being knit, said fabric engaging means thereafter moving downwardly to impart tension to the article during knitting thereof, while leaving unobstructed the interior of portions of the article knit subsequently to said initial portion, and means for effecting release of the article from the engaging means.

29. An automatic fabric tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable fabric engaging means, means for raising said fabric engaging means and for causing it to grasp the initial portion of an article while the article is being knit, said fabric engaging means thereafter moving downwardly to impart tension to the article during knitting thereof, means for effecting release of the article from the engaging means, and means for automatically removing the article in a direction transverse to the axis of the needle cylinder from the vicinity of said engaging means.

30. In a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, means for automatically seizing the outer face of the free end portion of each article while it is being knit and for imparting tension thereto during subsequent knitting, and means for automatically releasing the completed article from said seizing means.

31. An automatic stocking tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate stockings beginning with the welt thereof each of which stockings is pressed off when completed, comprising vertically movable welt grasping means, and power-operated means for raising said grasping means, for causing it to grasp the welt of a stocking while the stocking is being knit, and means to cause downward movement of said grasping means, while it grasps the welt, to impart tension to the stocking during continued knitting thereof.

32. An automatic stocking tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate stockings beginning with the welt thereof each of which stockings is pressed off when completed, comprising vertically movable welt grasping means, power-operated means for raising said grasping means, for causing it to grasp the welt of a stocking while the stocking is being knit, and means to cause downward movement of said grasping means, while it grasps the welt, to impart tension to the stocking during continued knitting thereof, and means for effecting release of the welt from the grasping means.

33. An automatic stocking tensioning device for a circular knitting machine having a rotary needle cylinder and adapted to knit separate stockings beginning with the welts thereof, each of which stockings is pressed off when completed, comprising vertically movable and rotatable welt grasping means, and power-operated means for raising said welt grasping means, for causing it to grasp the welt of a stocking while the stocking is being knit, and for effecting its release for downward movement while it grasps the welt to impart tension to the stocking during knitting thereof.

34. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, power operated means for raising said article grasping means for causing it to grasp the initial portion of an article while the article is being knit, downward movement of the article grasping means while it grasps the article imparting tension to the article during knitting thereof, means for effecting release of the article from the grasping means, and means for automatically removing the article in a direction transverse to the axis of the needle cylinder from the vicinity of said grasping means.

35. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, means for raising said article grasping means, for causing it to grasp the initial portion of an article while the article is being knit, and releasing it for downward movement to impart tension to the article during knitting thereof, means for effecting release of the article from the grasping means, and means for automatically removing the article in a direction transverse to the axis of the needle cylinder from the vicinity of said grasping means.

36. In a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, means for automatically seizing the free end portion of each article while it is being knit and for imparting tension thereto during subsequent knitting, means for automatically releasing the completed article from said seizing means, and means for removing

the article in a direction transverse to the axis of the needle cylinder from the vicinity of the seizing means.

37. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, automatic controlling means for effecting in sequence raising of said article grasping means, grasping of the initial portion of an article thereby, and downward movement thereof while it grasps the article to impart tension to the article during continued knitting thereof, and means for controlling movement of said grasping means sufficiently before completion of the knitting of each article so that the tension in the article is substantially relieved during completion of the knitting thereof, whereby press-off is effected without raveling.

38. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, automatic controlling means for effecting in sequence raising of said article grasping means, grasping of the initial portion of an article thereby, and downward movement thereof while it grasps the article to impart tension to the article during continued knitting thereof, means for holding the article grasping means during completion of the knitting of the article to relieve tension in the article, and means to release the grasping means when the article is pressed off to permit said grasping means to complete its downward movement.

39. An automatic article tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means, automatic controlling means for effecting in sequence raising of said article grasping means, grasping of the initial portion of an article thereby, and downward movement thereof while it grasps the article to impart tension to the article during continued knitting thereof, means for holding the article grasping means during completion of the knitting of the article to relieve tension in the article, means to release the grasping means when the article is pressed off to permit said grasping means to complete its downward movement, and means for removing the article from the vicinity of said grasping means.

40. An automatic tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means comprising at least two relatively movable clamping members, powered means for raising said grasping means to a predetermined height and for holding it open at said height for reception of the initial portion of an article being knitted, and means for causing said grasping means to close to grasp the article when a predetermined length of the article has been knitted.

41. An automatic tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles each of which is pressed off when completed, comprising vertically movable article grasping means comprising at least two relatively movable clamping members, power-operated means for raising said grasping means into article grasping position and holding said grasping means open to receive the initial portion of an article being knitted, and means for causing said grasping means to close to grasp the article when knitted to a predetermined length and to release said grasping means for downward movement to impart tension to the article as knitting continues.

42. An automatic tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate articles, each of which is pressed off when completed, comprising vertically movable article grasping means and mechanism for automatically raising said grasping means to a predetermined height relative to and below the top of the cylinder for grasping the outer face of the initial portion of a new article being knit.

43. An automtic stocking tensioning device for a circular knitting machine having a needle cylinder and adapted to knit separate stockings having heel and toe pockets, each of which stockings is pressed off when completed, comprising vertically movable stocking grasping means, and automatic controlling means for effecting in sequence raising of said stocking grasping means, grasping the outer face of a stocking thereby, and downward movement thereof while it grasps the stocking to impart tension to the stocking during continued knitting of both leg and foot portions thereof.

44. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, and automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, said last means including a planetary gear transmission actuated by rotation of said needle cylinder and an elevator screw actuated by said transmission for rotation first in one direction and then in the opposite direction.

45. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, and automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, said last means including a planetary gear transmission actuated by rotation of said needle cylinder and an elevator screw actuated by said transmission for rotation first in one direction and then in the opposite direction, and means actuated in timed relation to the operation of the knitting machine for controlling said planetary gear transmission to effect said operation of said elevator screw.

46. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, and means for holding said weight against movement during the final knitting of the fabric to relieve the tension thereon.

47. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, means for holding said weight against movement during the final knitting of the fabric to relieve the tension thereon, and means for releasing said weight upon completion of the knitting of said fabric.

48. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, means for holding said weight against movement during the final knitting of the fabric to relieve the tension thereon, means for releasing said weight upon completion of the knitting of said fabric, and means for releasing said fabric engaging means as the weight moves upwardly to release the fabric therefrom.

49. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging

means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, said fabric engaging means comprising a pair of pivoted clamping arms, means for normally urging said arms to closed position, and means for causing said arms to open when said weight is at the upper limit of its travel.

50. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, said fabric engaging means comprising a pair of pivoted clamping arms, means for normally urging said arms to closed position, means for causing said arms to open when said weight is at the upper limit of its travel, and means for causing said arms to open to release the fabric when said weight begins its return upward movement.

51. In an automatic fabric draw-off device for a circular knitting machine having a rotatable needle cylinder, the combination comprising the needle cylinder, guide means rotatable with said cylinder, a draw-off weight vertically movable on said guide means, fabric engaging means mounted on said weight, automatically operating means actuated by rotation of the needle cylinder for raising said weight into position for engagement of said fabric engaging means with the end of the fabric being knit and for thereafter releasing said weight to leave said weight hanging free on the fabric, said fabric engaging means comprising a pair of pivoted clamping arms, means for normally urging said arms to closed position, means for causing said arms to open when said weight is at the upper limit of its travel, means for causing said arms to open to release the fabric when said weight begins its return upward movement, and air pressure means for discharging the fabric from said draw-off means when said clamping arms are opened.

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