

March 2, 1971

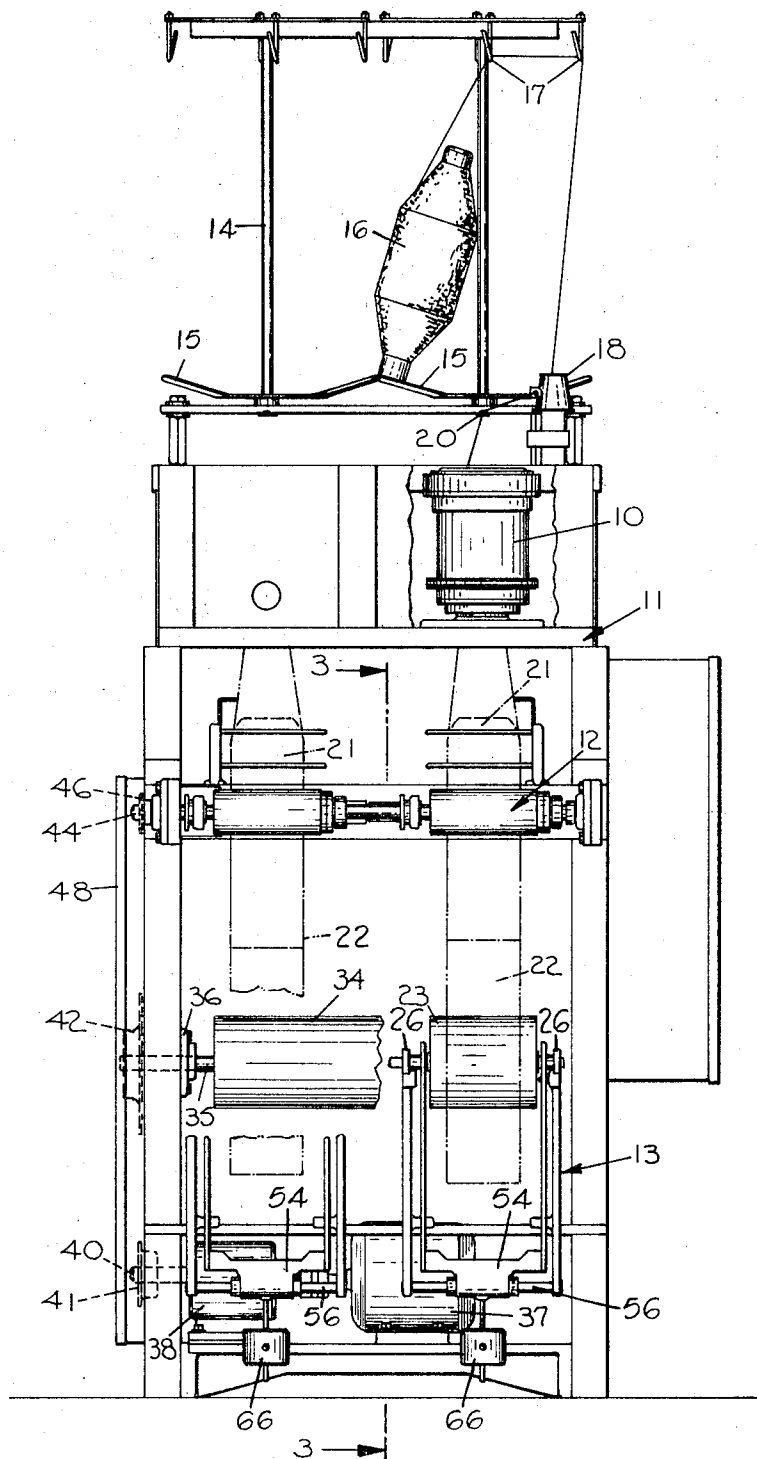
V. A. IANNUCCI  
APPARATUS FOR FORMING A ROLL OF FABRIC  
CONTINUOUSLY WITH THE KNITTING THEREOF

3,566,622

Filed Dec. 16, 1968

4 Sheets-Sheet 1

FIG. 1



March 2, 1971

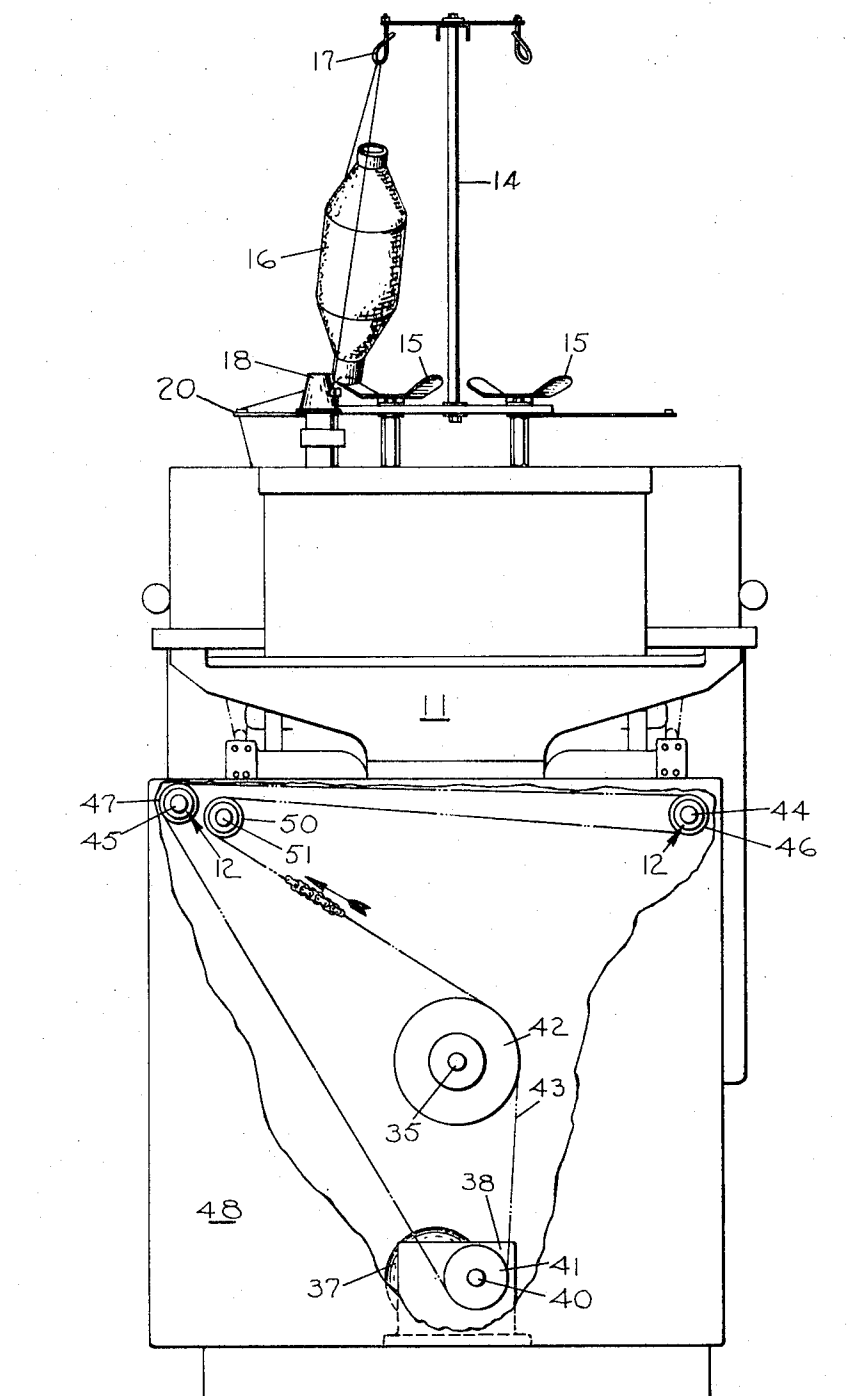
3,566,622

Filed Dec. 16, 1968

V. A. IANNUCCI  
APPARATUS FOR FORMING A ROLL OF FABRIC  
CONTINUOUSLY WITH THE KNITTING THEREOF

4 Sheets-Sheet 2

FIG. 2



March 2, 1971

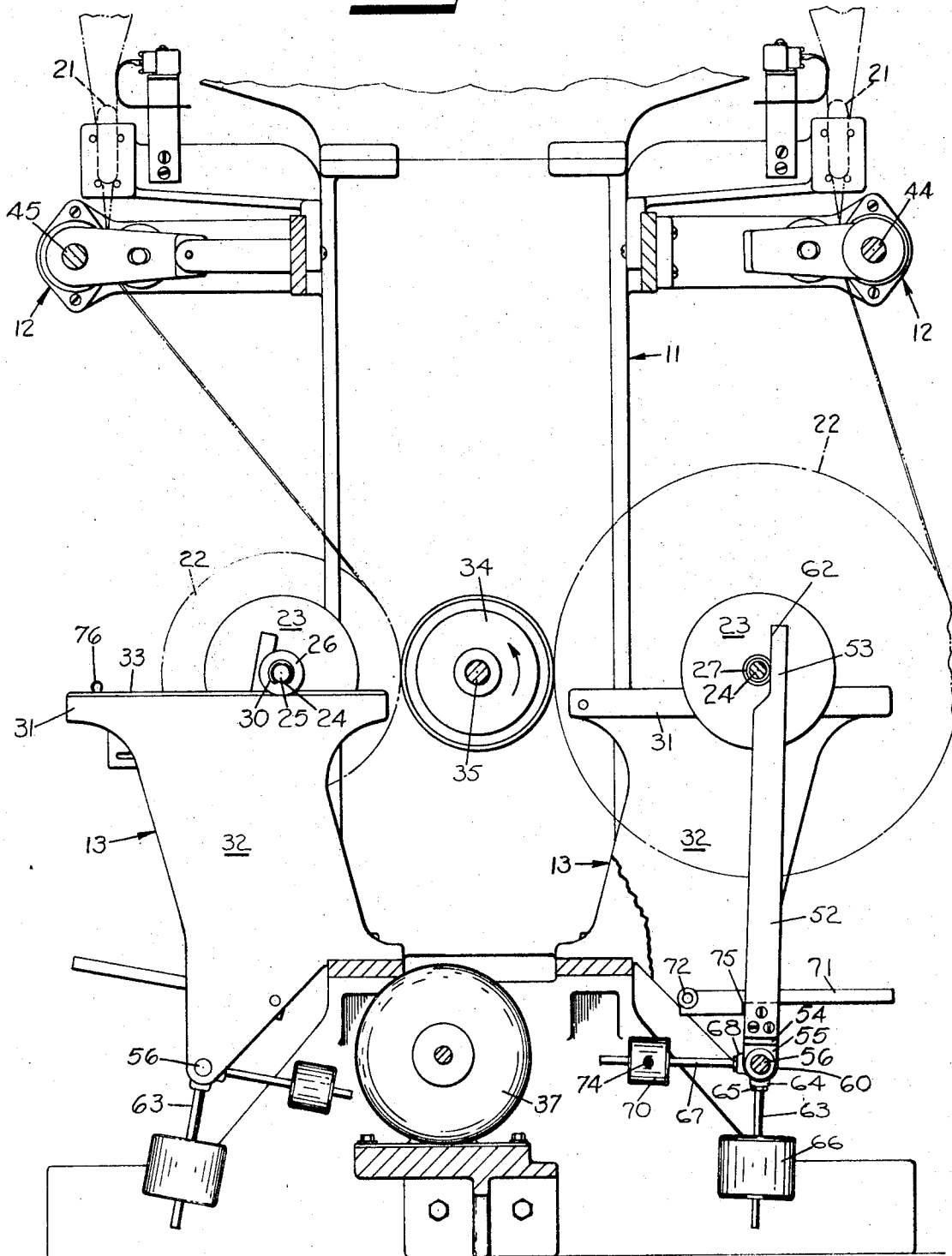
V. A. IANNUCCI  
APPARATUS FOR FORMING A ROLL OF FABRIC  
CONTINUOUSLY WITH THE KNITTING THEREOF

3,566,622

Filed Dec. 16, 1968

4 Sheets-Sheet 3

**FIG. 3**



March 2, 1971

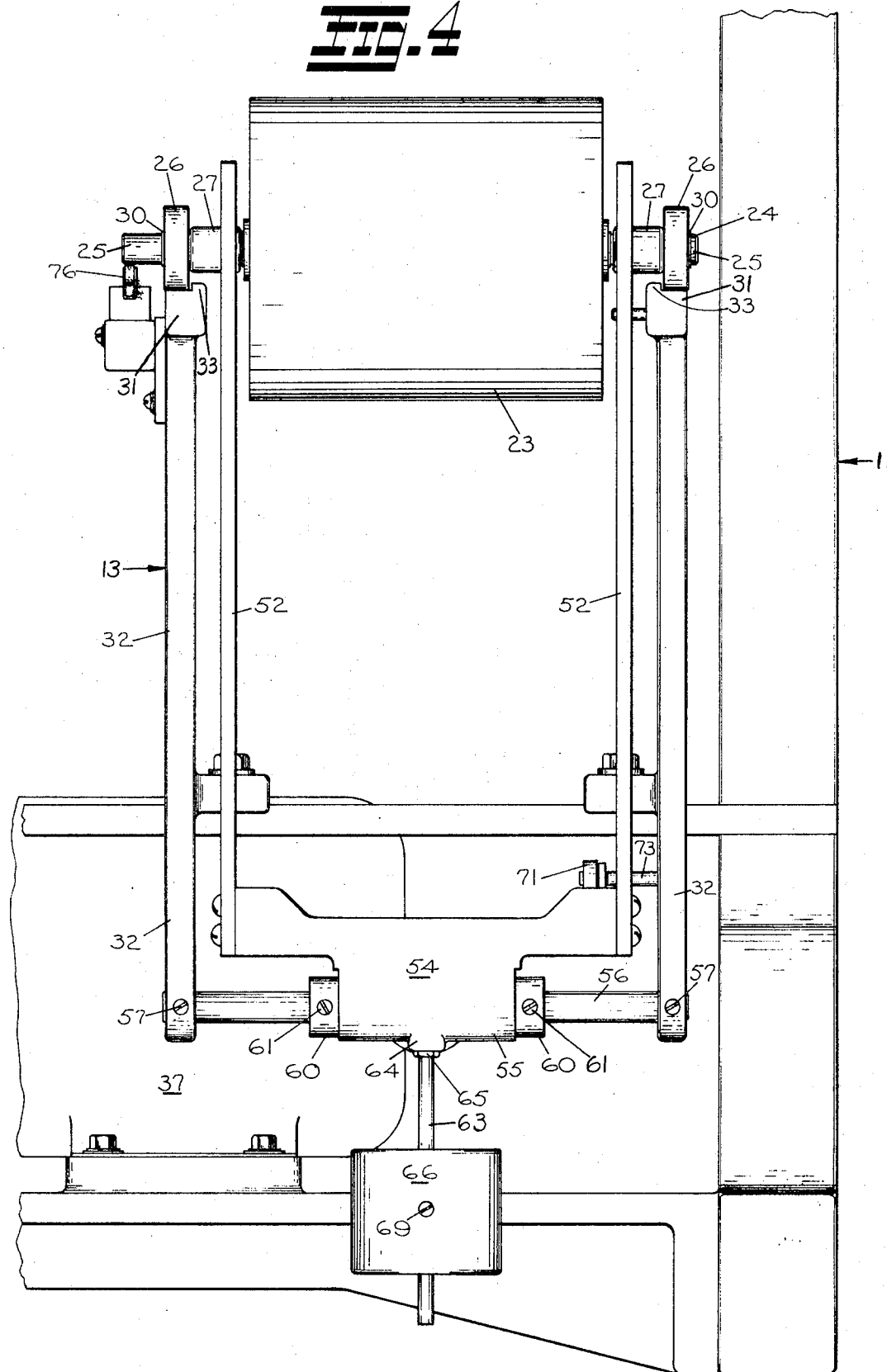
3,566,622

V. A. IANNUCCI  
APPARATUS FOR FORMING A ROLL OF FABRIC  
CONTINUOUSLY WITH THE KNITTING THEREOF

Filed Dec. 16, 1968

4 Sheets-Sheet 4

**FIG. 4**



1

3,566,622

## APPARATUS FOR FORMING A ROLL OF FABRIC CONTINUOUSLY WITH THE KNITTING THEREOF

Vincent A. Iannucci, Lincoln Park, and Ronald S. Schartel, Whitfield, Pa., assignors to North American Rockwell Corporation, Pittsburgh, Pa.

Filed Dec. 16, 1968, Ser. No. 783,992

Int. Cl. D04b 15/88

U.S. Cl. 66—151

5 Claims

### ABSTRACT OF THE DISCLOSURE

Mechanism for winding a flattened knitted tube, as it is delivered by the knitting machine, into a roll of substantially uniform density, the mechanism including a driving roll, a shafted core on which the fabric is wound, rollers mounted for rotation on the ends of the core shaft, substantially horizontal rails for supporting the rollers for movement therealong and means to maintain a surface layer of fabric on the core against the driving roll with a substantially uniform pressure as the layers of fabric build up on the core.

### BACKGROUND OF THE INVENTION

For certain treatments of knitted fabric it is highly desirable that the fabric be collected in a relatively loose roll of substantially uniform density directly as it is produced by the knitting instrumentality such as a circular knitting machine. An example of such treatments is found in the so-called knit-deknit process of producing crinkled yarn. In such process a stationary cylinder type circular knitting machine is preferably employed to produce a fabric tube from a heat, settable yarn such as a polymeric yarn as for example nylon, Orlon or Dacron or other synthetic yarns as for example phenolic and acrylic resin yarns and yarns composed of organic derivatives of cellulose. After the knitted fabric tube is formed the fabric is heat set and then unraveled or deknit. While the heat setting operation may be performed continuously with the production of the fabric as disclosed in the prior U.S. patent of Soussloff et al. No. 3,333,441, issued Aug. 1, 1967, in some instances it is preferred to first collect the fabric in the form of a roll and thereafter subject the roll of fabric to the heat treatment in an autoclave. In order to secure uniform heat setting the convolutions of the roll must be sufficiently loose to permit shrinkage and also the roll must be of substantially uniform density throughout.

Heretofore in the collection of the knitted fabric in rolls for the knit-deknit process, normally reels have been employed which are driven at an r.p.m. uniformly related to the rate of production of the fabric. With the use of such apparatus a continuous increase in the tension of the knitted fabric is inherent as the diameter of the roll builds up resulting in a non-uniform compaction of the fabric of the roll. It has also been proposed to collect the fabric on a rotatable core carried by pivotally mounted arms whereby the core and fabric thereon are positioned to at least partially overlie a drive roll adapted for frictional contact with the fabric. With this construction as the fabric builds up on the core the weight of the roll being formed necessarily increases with the resultant increase in the compaction of the fabric.

The instant invention has for its principal object the provision of means for collecting the fabric in the form of a cored roll through surface contact of the fabric on the core with a drive roll the arrangement being such that neither the increased weight of the roll as it builds up nor other factors have any appreciable effect on the

2

relative pressure between the fabric and the drive roll the latter remaining substantially uniform.

### SUMMARY OF THE INVENTION

Briefly described an apparatus in accordance with the instant invention comprises a fabric collecting means associated with a knitting head the fabric collecting means comprising a core on which the fabric is wound, and a drive roll or the like adapted to rotate the core and bobbin thereon by frictional contact with the outer winding of the fabric. The driving roll is in a relatively fixed position and the core is mounted for traveling movement away from the drive roll along a substantially horizontal path as the diameter of the fabric on the core increases. The core with the fabric thereon is maintained in surface contact with the drive roll under substantially uniform pressure by suitable means such as extending lever arms pivotally mounted at positions remote from the core the lever arms being adapted to bias the core toward the drive roll.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of an apparatus including multiple knitting heads and a fabric collecting means for each head constructed in accordance with the instant invention;

FIG. 2 is an end elevational view of the apparatus of FIG. 1;

FIG. 3 is a sectional view on an enlarged scale taken on the line 3—3 of FIG. 1 with parts broken out for clearness of illustration; and

FIG. 4 is a detail view on an enlarged scale of a portion of the apparatus illustrated in FIG. 1.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and particularly to FIGS. 1 and 2 there is disclosed an apparatus particularly adapted for the production and collection of flattened tubes of knitted fabric of the type which is to be heat set and then unravelled or deknit to produce crinkled yarn. For this purpose and as previously stated the yarn may be a linear polymere or other type of thermoplastic yarn such as vinyl or acrylic resin yarn or a yarn composed of an organic derivative of cellulose or the like.

The apparatus preferably comprises a plurality of knitting heads 10 supported by a frame indicated generally at 11, means indicated generally at 12 for drawing off the fabric of each head as the fabric is knit and means indicated generally at 13 for collecting the fabric of each head in the form of a roll said last named means incorporating the improvements of the instant invention. While the knitting heads may be of any suitable construction they are preferably of the type shown and described in the co-pending application of Moyer et al. Ser. No. 515,555, filed Dec. 22, 1965, now Pat. No. 3,421,344, issued Jan. 14, 1969. In any event each knitting head includes a stationary needle cylinder, needles mounted therein for reciprocation through a knitting wave, and a cam cylinder mounted for rotation about the needle cylinder and carrying the cams carried to cause the needles to move through their knitting motions, none of said known parts being shown in detail. Each knitting head is preferably driven by an individual motor (not shown). The apparatus illustrated incorporates four of the knitting heads in two rows the heads being supported in elevated positions on the frame 11. As will be understood the rows may contain a greater or lesser number of heads as desired.

A yarn rack indicated generally at 14 is supported from the frame 11 above the knitting heads the yarn rack having a double row of pirn holders 15 on which yarn

pirns 16 are carried there being one or more pirns for each knitting head. Each pirn provides the yarn supply for a yarn feed finger (not shown) of its associated knitting head the yarn being drawn through guides 17 by a feed roll 18 of any suitable type. The yarn leads from the feed roll through a guide 20 to the yarn feed means (not shown) of the knitting head.

A fabric spreader 21 suitably of the type illustrated in Pat. No. 3,333,441, previously referred to, is preferably provided in the path of the fabric below each knitting head, the spreader being inserted within the fabric tube and serving to spread the fabric and form a flattened tube thereof. Fabric take-off 12 may be of any suitable or conventional type but preferably is of the construction illustrated in said Pat. No. 3,333,441 in which one of the rolls between which the fabric is confined is positively driven at a surface speed somewhat in excess of the rate of fabric production with the result that slippage occurs between the driven roll and the fabric.

In accordance with the instant invention the flattened fabric tube as it is delivered by the take-off means 12 of each knitting head is collected in the form of a roll 22 by an associated collector means 13, previously mentioned, individual to that head. Each collector means (see particularly FIGS. 1, 3 and 4) includes a cylindrical core 23 having a length somewhat in excess of the width of the flattened tube which is to be wound thereon. The core is of the type conventionally employed for the formation of fabric rolls and includes suitable means (not shown) for releasably attaching the end of the fabric thereto. A shaft 24 extends axially of the core and is fixed thereto for rotation therewith. Rollers 26 are mounted for rotation on extending ends 25 of the shaft in anti-friction bearings of any suitable type, the positions of the rollers being fixed axially of the shaft by sleeves 27 and snap rings or other conventional means 30. Rollers 26 ride on horizontal tracks 31 formed by the upper edges of brackets 32 the brackets being supported in fixed position on the machine frame (see FIGS. 3 and 4). The tracks 31 are provided with upwardly extending flanges 33 to confine the paths of movement of the rollers.

Referring particularly to FIGS. 2 and 3 a common drive roll 34 for the several fabric collecting means is carried by a shaft 35 mounted for rotation in suitable bearings, one being shown at 36 in FIG. 1, supported by the machine frame. Drive roll 34 is provided with a cork or other friction surface for driving contact with the fabric to be wound on the cores. Shaft 35 and hence drive roll 34 is driven in a counterclockwise direction, as viewed in FIG. 2, by a motor 37 through a gear reduction unit 38 having an output shaft 40 carrying a sprocket 41, a sprocket 42 secured to an extending end of shaft 35 and a sprocket chain 43. The motor and sprocket chain also serves to drive the driven rolls of the draw-off means 12 for the several knitting heads. Thus the driven rolls of the draw-offs on the opposite sides of the machine are carried by common shafts 44 and 45 respectively the shafts being supported in suitable bearings in the framework of the machine, the two shafts carrying sprockets 46 and 47, respectively. Sprocket chain 43 leads from sprocket 41 around an idler sprocket 50 supported for rotation on a stub shaft 51 projecting from the machine frame and from thence around sprockets 46 and 47 (see FIGS. 1 and 2). As illustrated in FIGS. 1 and 2 the sprocket chain, sprockets and other elements of the driving mechanism are preferably enclosed within a housing 48.

Referring now particularly to FIGS. 3 and 4 means are provided for biasing the core of each fabric collecting means toward drive roll 34 to maintain the outer surface of the roll of fabric on the core in frictional contact with the drive roll under substantially uniform pressure as the roll of fabric builds up. This means comprises a pair of arms 52 positioned to have their upper ends projecting past and in alignment with collars 27 on shaft

ends 25. The lower ends of the arms are affixed to a bracket 54 the bracket having a bearing sleeve 55 in which is received a horizontal shaft 56. The projecting ends of shaft 56 are secured in fixed positions in brackets 32, as by set screws 57. Shaft 56 extends at right angles to tracks 31 and its center line lies in the vertical plane of the halfway point of travel of shaft 24 along the tracks as the roll of fabric builds up from its initial turn on the core to a fully wound roll of the largest desired diameter. Bearing sleeve 55 which is dimensioned for free rotation or rocking movement on shaft 56 is confined against longitudinal shifting movement on the shaft by collars 60 secured to the shaft as by set screws 61. The upper ends of arm 52 are preferably recessed or cut back to define edge portions 62 for contact with the collars 27 on shaft 25.

A rod or lever arm 63 projects from the bearing sleeve in a direction diametrically opposite to that of arms 52, a threaded end of the rod being received in a threaded opening in a boss 64 and secured in adjusted position therein by a lock nut 65. Rod 63 carries a counter balance weight 66 bored to receive the rod. The weight is adapted to be secured in any adjusted position on the rod by a set screw 69.

A second rod or lever arm 67 similarly has an end threadably received in a threaded opening of a boss 68 projecting from bearing sleeve 55 at right angles to boss 64, rods 67 and 63 hence also projecting at right angles to each other. Rod 67 is adapted to carry a weight 70 bored to receive the rod, the weight being securable in any adjusted position on the rod by a set screw 74.

The lengths of arms 52 and of rods 63 and 67 and the masses of said parts and of the associated elements including bracket 54 and weight 66 in its adjusted position on rod 63 are such that, with weight 70 removed from rod 67, the system is in equilibrium, that is in the absence of an outside force arms 52 will remain in any position to which they are rotated. The distance between shaft 56 and the collar contacting edge portions 62 bears such relationship to the distance that the portions 62 travel during the build up of the fabric roll from the bare core 23 to a fully wound roll that the angular movement of the arms is relatively small and preferably does not exceed thirty degrees.

As illustrated particularly in FIGS. 3 and 4 a latch lever 71 is suitably pivotally mounted as at 72 on a rod 73 projecting inwardly from one of the brackets 32 (the right-hand bracket as illustrated in FIG. 4) the latch lever having an abutment surface 75 adapted to bear against the inner wall of bracket 54 and maintain arms 52 in outer rotated positions when for example the particular knitting head served by a fabric collecting means is idle. By manually rotating the latch 71 in a counterclockwise direction from its position as illustrated in FIG. 3 the arms are freed for operation. Where desired a switch means 76 (see FIG. 4) forming a part of an electrical circuit (not shown) controlling any suitable or conventional stop motion for the knitting head, or controlling the operation of a visual signal, may be mounted on one of the brackets 32 in position to be closed by shaft end 25 when the fabric rolls have reached the desired diameter.

In the operation of the apparatus described above the knitting heads, or a selected one or more of the knitting heads, are operated to knit sufficient fabric to reach their respective cores 23 the end of each of such fabrics being then secured to its associated core in any suitable manner. Latches 71 associated with the active knitting heads are then released permitting arms 52 under the influence of weights 70, to swing in a direction, counterclockwise for the right-hand units and clockwise for the left-hand units as viewed in FIG. 3, to bring the cores into contact with drive roll 34, rollers 26 supporting the shaft ends of the cores rolling freely on horizontal tracks 31. Operation of the knitting heads is then resumed and as it continues additional fabric is produced and delivered to the collect-

5

ing devices by draw-off means 12, the cores 23 and fabric thereon being rotated by the frictional contact of drive roll 34 with the fabric. The rolls of fabric move away from the drive roll 34 as the fabric builds up, the sole resistance to such movement, except for an immaterial frictional resistance, being the bias provided by weights 70 on their respective lever rods 67. Such bias is maintained relatively constant inasmuch as the effective lengths of the lever arms associated with the weights are varied only to the extent effected by the movement of the weights through one-half their arc of travel. As will be noted the increased weight of the roll as it is built up has no appreciable effect on the pressure of the fabric roll against the drive roll 34 such pressure being controlled solely by weight 70 and its position on its associated lever arm, the latter being adjusted as desired to insure the required frictional contact between the cloth roll and the driving roll and the desired tension on the fabric. Suitably drive roll 34 is driven at a surface speed somewhat greater than the rate of production of the fabric, similarly as the driven rolls of the take-off 12, whereby continuous slip-page of the roll on the fabric occurs.

Having thus described the invention in rather complete detail it will be understood that these details need not be strictly adhered to and that various changes and modifications may be made all falling within the scope of the invention as defined by the subjoined claims.

What is claimed is:

1. In an apparatus comprising a knitting head for converting yarn into a knitted fabric and means for collecting said fabric in the form of a roll, the improvement wherein said means for collecting said fabric comprises a core on which said fabric is wound, means in fixed position relatively to said core for rotating said core through frictional contact with an outer winding of fabric thereon, means supporting said core for movement away from said rotating means in a substantially horizontal plane as the diameter of the wound fabric on said core increases, and means for maintaining said rotating means in contact with the fabric on said core with a substantially uniform pressure during said increase in the diameter of the wound fabric, said means for maintaining said rotating means in contact with said fabric comprising lever

6

arms having portions in contact with said core, means pivotally supporting said lever arms at points remote from said portions, means counterbalancing said lever arms whereby in the absence of added biasing means said lever arms will substantially remain in any rotated position, and means biasing said lever arms to swing in a direction to urge said core toward said rotating means.

2. In an apparatus as defined in claim 1 wherein said means biasing said lever arms comprises a projecting lever arm associated with said first mentioned lever arms for angular movement therewith and there is means for biasing said projecting lever arm.

3. In an apparatus as defined in claim 2 wherein said projecting lever arm extends at substantially right angles to said first mentioned lever arms.

4. In an apparatus as defined in claim 3 wherein said arms are subjected to a swinging movement through an arc, as the fabric winds up on said core from a minimum to a maximum number of turns thereon, and wherein said means pivotally supporting said lever arms lies in substantially the vertical plane of the mid point of said swinging movement.

5. In an apparatus as defined in claim 4 wherein said means for biasing said projecting lever arm comprises weight means adjustably mounted on said projecting lever arm.

#### References Cited

##### UNITED STATES PATENTS

|           |         |                  |         |
|-----------|---------|------------------|---------|
| 186,256   | 1/1877  | Jones            | 242—65  |
| 421,147   | 2/1890  | Scott et al.     | 66—149X |
| 519,669   | 5/1894  | Dill             | 242—65  |
| 790,770   | 5/1905  | Wildman          | 66—151X |
| 1,039,989 | 10/1912 | Morley           | 66—153X |
| 1,285,706 | 11/1918 | Hoe              | 242—65  |
| 2,984,427 | 5/1961  | Rockstrom        | 242—65  |
| 3,191,883 | 6/1965  | Wells            | 242—65X |
| 3,258,217 | 6/1966  | MacArthur et al. | 242—65  |

WM. CARTER REYNOLDS, Primary Examiner

U.S. Cl. X.R.

242—65

UNITED STATES PATENT OFFICE  
CERTIFICATE OF CORRECTION

Patent No. 3,566,622 Dated March 2, 1971

Inventor(s) Vincent A. Iannucci et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 61, "carried" should read -- required -  
line 63, "a" should read -- in --.

Signed and sealed this 14th day of September 1971.

(SEAL)  
Attest:

EDWARD M. FLETCHER, JR.  
Attesting Officer

ROBERT GOTTSCHALK  
Acting Commissioner of Patent