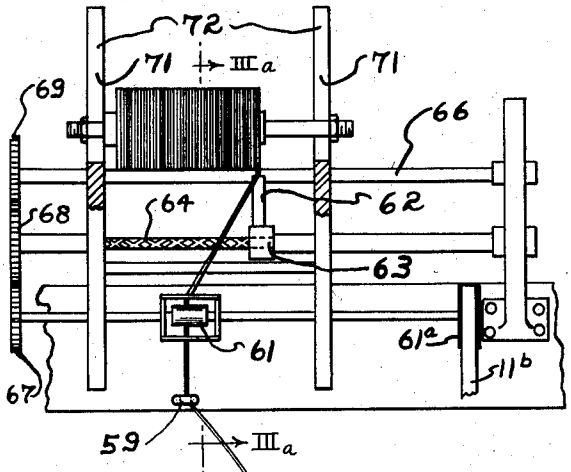
Jan. 13, 1959 E. W. STARNES 2,867,967

APPARATUS FOR MAKING YARN

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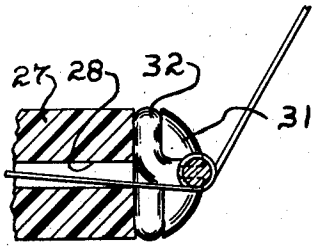


Fig. 7

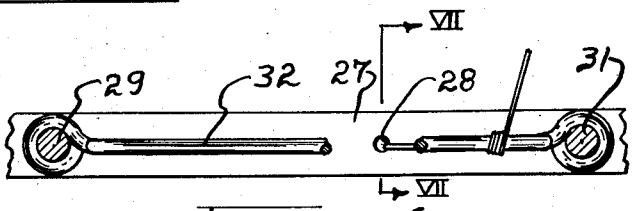


Fig. 6

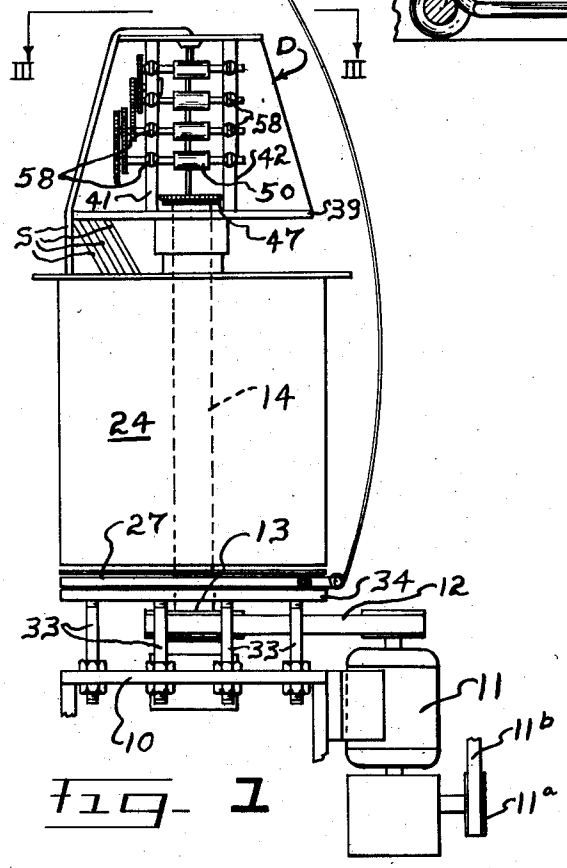


Fig. 1

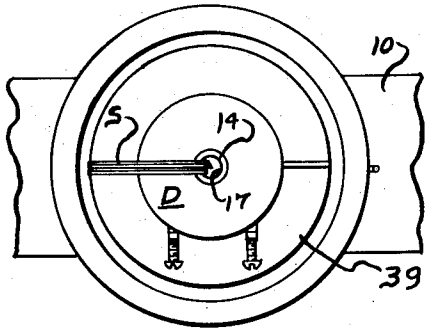


Fig. 3

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APPARATUS FOR MAKING YARN

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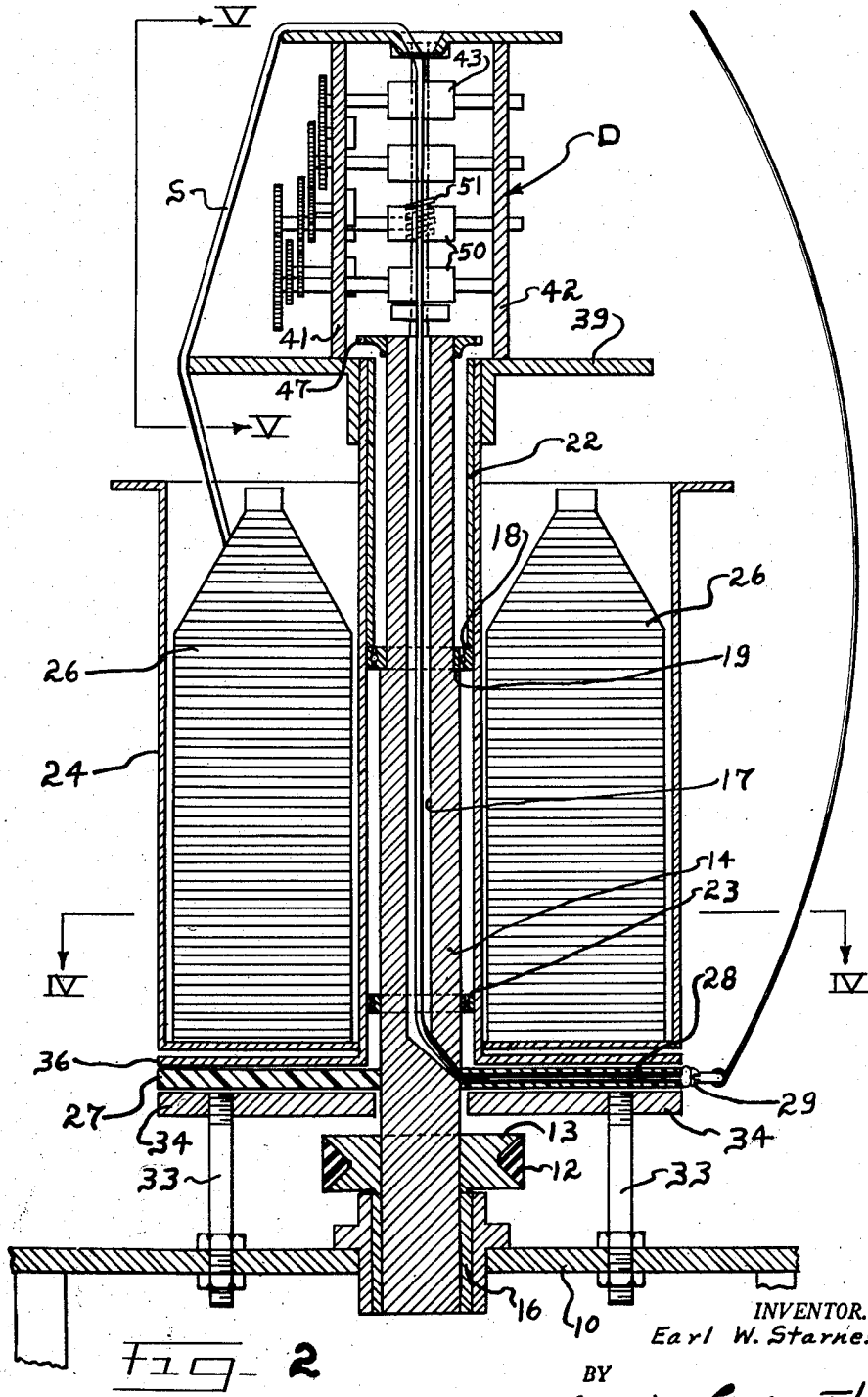


Fig. 2

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APPARATUS FOR MAKING YARN

Filed Nov. 20, 1956 3 Sheets-Sheet 3

Fig. 5

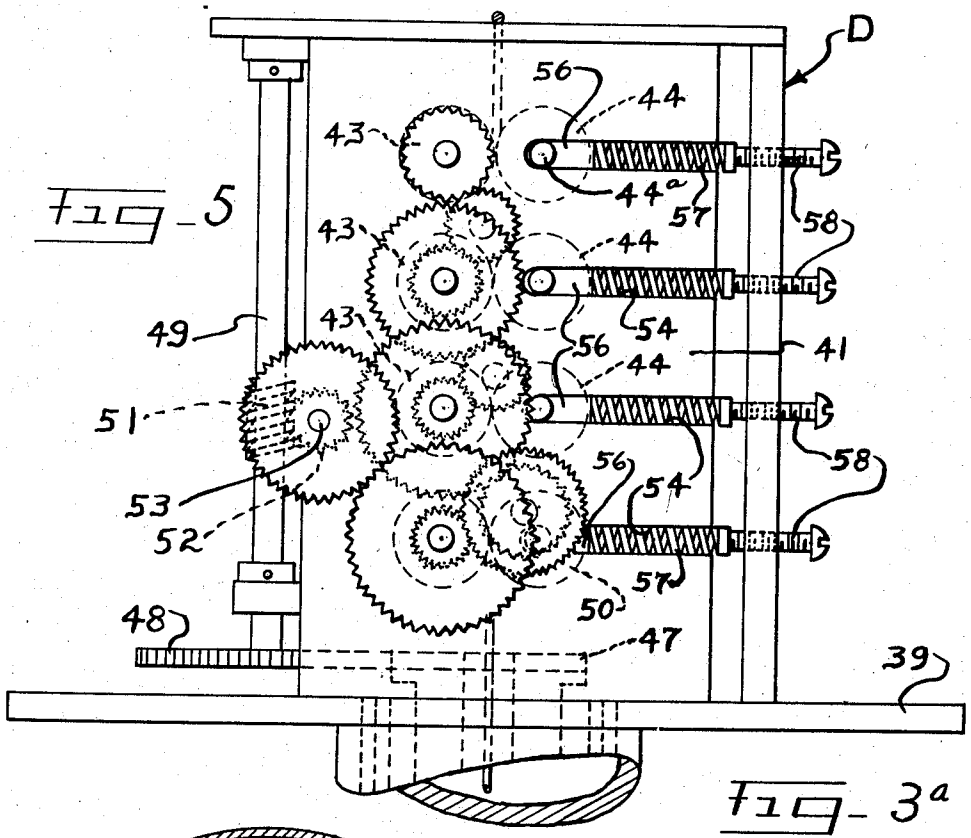
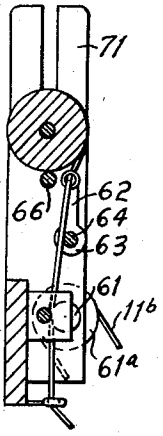


Fig. 3a



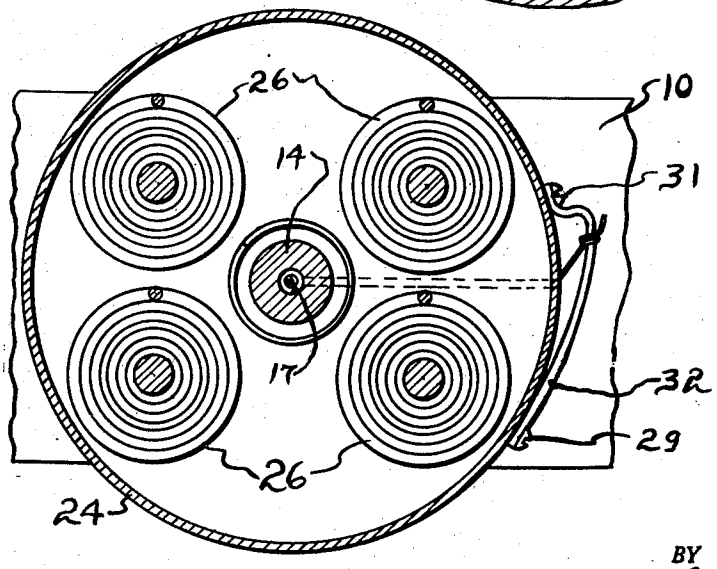


Fig. 4

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United States Patent Office

2,867,967

Patented Jan. 13, 1959

2,867,967

APPARATUS FOR MAKING YARN

Earl W. Starnes, Alexander City, Ala.

Application November 20, 1956, Serial No. 623,440

10 Claims. (Cl. 57—36)

This invention relates to apparatus for making yarn and relates particularly to apparatus of the character designated which shall utilize, in association with the actual attenuating apparatus, the twisting principle of the so-called "two for one" twisting apparatus.

An object of my invention is to provide apparatus for attenuating and twisting a strand which may be used to produce a yarn package of unlimited size.

Another object is to provide apparatus for drawing and spinning yarn in which the size of the balloon of the yarn coming from the flyer remains substantially constant, thereby attaining the important advantage of uniformity in the finished yarn through the elimination of the irregularities known to result in present practice from the change in the balloon of the yarn during the building of the package.

Another object is to provide yarn attenuating and spinning apparatus in which the ring and traveler are completely eliminated, thereby to provide apparatus in which the speed of twisting is substantially unlimited, in effect, the only limitation on the speed being the amount of centrifugal force that the ballooning yarn will stand.

Another object is to provide apparatus of the character designated in which finished yarn may be made either from silver directly from the card, or from roving which has been passed through one or more intermediate processes.

Another object is so to construct the entire apparatus that the fiber attenuating portion and the fiber twisting portion are compact and so relatively located that during the first one-half of the twist being applied to the yarn, the yarn passes directly from the attenuating rolls to the twisting mechanism, thereby eliminating considerable wear and tear on the yarn which takes place in the present day spinning frame.

Another object is to provide yarn making apparatus in which the drawing rolls are located wholly within the confines of the figure of revolution generated by the ballooning yarn.

A further object is to provide completely self-contained, individually powered fiber attenuating and twisting apparatus so constructed and arranged that its operation does not affect the operation of any additional similar apparatus in the spinning room, whereby the stoppage of one such unit in the spinning room has no effect whatever upon the remaining units.

Briefly, my invention contemplates apparatus in which there is employed, for the twisting part thereof, a substantially standard and heretofore known "two for one" twisting apparatus. The actual fiber attenuating or drawing roll part of my improved apparatus is mounted relative to the flyer of the twister so that the drawing apparatus is wholly within the figure of revolution generated by the ballooning yarn. Thus, the strand to be drawn and spun is passed from a supply package directly to the first of the drawing rolls of the set. The strand then passes from the last of the drawing rolls directly to the rotating

flyer, and from the flyer passes to a package builder on which the drawn and twisted yarn is wound. The winding mechanism may be located considerably above or otherwise axially spaced from the drawing and spinning apparatus just mentioned, whereby the package may be of unlimited size. It will be apparent from what has just been said that my invention thus embodies the combination of fiber attenuating apparatus and twisting apparatus in which the drawn fiber passes from the drawing rolls to the flyer of the twisting apparatus and thence to a yarn package builder. The last roll of the attenuating apparatus thus serves as one holder for the strand while it is being twisted, whereas the package building apparatus serves as the other holder, the flyer operating on the strand between these two points.

Apparatus illustrating features of my invention is shown in the accompanying drawing forming a part of this application, in which:

Fig. 1 is an elevational view of my improved apparatus showing the yarn as it stands out to form the balloon during the twisting process;

Fig. 2 is an enlarged detail fragmental view of the spinning and attenuating apparatus;

Fig. 3 is a plan view taken generally along line III—III of Fig. 1;

Fig. 3*a* is a detail sectional view taken along line III*a*—III*a* of Fig. 1;

Fig. 4 is a detail sectional view taken generally along line IV—IV of Fig. 2;

Fig. 5 is a side elevational view of the draft gearing and roll arrangement taken generally along line V—V of Fig. 2;

Fig. 6 is an enlarged detail fragmental view showing a form of tensioning means on the flyer; and,

Fig. 7 is an enlarged detail sectional view taken generally along line VII—VII of Fig. 6.

Referring now to the drawings for a better understanding of my invention I show in Fig. 1 a supporting framework **10** on which is mounted an electric motor or the like **11**. The motor is operatively connected by a belt **12** to a pulley **13** fast on the end of a vertically disposed shaft **14**. The shaft **14** is mounted in suitable bearings **16** on the suppport **10** and is provided with an axially extending passageway **17**, the purpose of which will later appear.

Mounted on a thrust bearing **18** which fits on a shoulder **19** on the shaft is an outer tubular column **22**. A second bearing **23** is provided whereby the shaft **14** is rotatable within the column **22**. Carried by the column **22** is a support in the form of a can **24** for holding a plurality of supply packages **26** of the fiber strand S to be drawn and twisted. The can **24** preferably is large enough to hold a plurality of the packages **26** whereby yarn may be formed from a plurality of such ends.

Mounted on the shaft **14** is a flyer disc **27**. The disc **27** has a passage **28** therein in communication with the passage **17**, thus forming a complete passageway for the yarn direct from the last roll of the attenuating apparatus, presently to be described. Mounted by means of screws **29** and **31** on the periphery of the disc **27** is a tensioning device **32** in the form of a piece of wire or the like having eyes through which the screws pass.

Mounted on supports **33** are magnets **34**, either of the permanent or electrically excitable type. The tubular post **22** has a disc **36** of ferrous material on its lower end. In view of the fact that the flyer disc **27** is made of some material such as plastic which will not generate eddy currents, the magnetic attraction between the magnets **34** and the disc **36** holds the can and the column **22** against rotation. Therefore, from what has been described it will be apparent that the shaft **14** is free to rotate within the tubular column and that the column is held against rotation by the magnets.

At the top of the column is a support disc **39**. Mounted on top of the support disc **39** is a drawing unit indicated generally by the letter D. This unit may comprise side plates **41** and **42** in which are mounted a plurality of bottom rolls **43** and a plurality of cooperating top rolls **44**. The bottom rolls are driven by means of the gearing shown, power being initially applied to the train by means of a gear **47** on top of the driven shaft **14**. In mesh with gear **47** is a large gear **48** mounted on the lower end of a shaft **49** which is journalled in suitable manner in the supporting plate work for the drafting unit D. A worm **51** mounted on the shaft **49** is in mesh with a gear **52** on a countershaft **53**. Through the various gears shown the bottom rolls are driven at the correct drafting speeds. The drafting rates may be changed by changing the gears.

The top rolls **44** have their shafts **44***a* extending outwardly of the side plates **41** and **42** and project through slots **54** therein. Bearing blocks **56** are slidably mounted in the slots **54** and are pressed against the shafts **44***a* by means of springs **57** which are adjustably compressed by means of set screws **58**. Thus, the "tension" of the drafting rolls can be regulated simply by varying the position of the set screws **58**.

While any suitable form of package building apparatus may be used with my improved spinning and drafting apparatus, I show one form of the same in Fig. 1. This apparatus may consist of a guide **59** through which the yarn passes from the flyer. The yarn may pass under a takeup roll **61** and thence through the guide **62** of a level winding nut **63** in turn mounted on a level winding screw **64**. The roll **61** is driven at substantially the same surface speed as the last rolls **50** of the drafting unit D. The drive is indicated diagrammatically as being from a pulley **11***a* driven by motor **11** and a belt **11***b* to a pulley **61***a* on the shaft supporting roll **61**. The package is mounted for the periphery of the yarn wound thereon frictionally to engage a driven shaft **66** to which power is supplied by gears **67**, **68** and **69**, the level winding screw **64** being driven by the gear train. It will be understood that the package is supported on a shaft mounted in slots **71** in supporting standards **72**. The package thus can increase in size as the yarn is wound thereon in the manner well understood for such package building devices. It will also be noted that the guide **59** and roll **61** are located on a line which is substantially an extension of the path of movement of the strand through the drafting unit D.

From the foregoing the method of constructing and using my improved apparatus and the advantages thereof may now be explained and understood. With the packages **26** or a coil of silver in place in the can the strand S from one, some, or all of them may be led to the upper or back rolls of the drafting unit D. The strand passes downwardly through the successive series of drafting rolls where it is attenuated and thence passes from the last rolls **50** through the hollow shaft **14** out the opening **28** in the flyer disc **27**. From this point the yarn passes to the guide **59** thence to the roller **61**. With the flyer rotating at high speed it will be apparent that the yarn is held between the last rolls **50** of the drafting unit D and the roll **61**, whereby a twist is placed in the yarn. Furthermore, two twists will be placed in the yarn for each revolution of the flyer as is understood. The ballooning yarn completely encloses the drafting apparatus D as well as the can **24**. It will also be noted that the figure of revolution generated by the yarn ballooning out remains of constant configuration inasmuch as the package is being built by the apparatus shown. Thus, my improved apparatus utilizes the inherent advantages of a two for one twisting system in association with drafting apparatus, the latter being located within the figure of revolution generated by the ballooning yarn. This is accomplished in such manner that the last rolls of the drafting apparatus hold the yarn against twisting at one point whereas the package take up mechanism holds the yarn against twisting at the other point.

My improved apparatus is particularly characterized also by the fact that a minimum amount of power is required for the drafting. It will be apparent that in my apparatus there is no loss of power in friction as in conventional spinning frames wherein power is transmitted from one end through an entire series of rolls. Sufficient "weighting" of the rolls **44** is afforded by the small springs **57**. All of these features afford yarn making apparatus in which the entire system including the package building mechanism is an individual piece of equipment. It will be readily apparent that the addition of suitable stop motion mechanisms is quite feasible in my improved apparatus. Stoppage of one individual spinning apparatus thus does not affect, and is not affected by, the stoppage or continued operation of any one of a plurality of others located in a common spinning room.

In actual operation my invention has proved to be extremely satisfactory. I have spun yarn from sliver direct from the cards as well as from roving. My experience to date indicates that by reducing the diameter of the flyer disc **27** I can spin very fine size yarn. Quality for quality the yarn made on my improved apparatus is just as good, if not better than yarn made on conventional frames. The possible speed of the flyer in my improved apparatus appears to be limited only by the strength of the yarn in withstanding the centrifugal force imposed on it at the balloon. In practice I have operated a flyer disc 12 inches in diameter at a rate of four thousand R. P. M. This is equivalent to approximately eight thousand R. P. M. of the spindle in conventional spinning.

While I have shown my invention in but one form it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are specifically set forth in the appended claims.

What I claim is:

1. In apparatus for producing packages of yarn, combined yarn twisting and attenuating apparatus comprising a non-rotatable holder for an untwisted strand package, fiber drawing means mounted adjacent the holder, a flyer rotating in a circular path relative to the holder and said drawing means, means to feed the strand from the untwisted package thereof first through the drawing means and thence to the flyer, and means to hold the strand against twisting located on the same side of the flyer as the drawing apparatus and at such distance that the strand being twisted generates a figure of revolution larger in diameter than the overall dimensions of the holder.

2. In apparatus for attenuating and twisting a strand of fiber, an untwisted strand supply package, attenuating apparatus to which the strand is delivered from the package, a rotating flyer positioned to receive the drawn strand from the attenuating apparatus and through which the strand passes from the attenuating apparatus, and means holding the strand against twisting at a point removed from the flyer on the attenuating apparatus side thereof, whereby the fiber generates a figure of revolution enclosing the attenuating apparatus.

3. The combination with a two for one fiber strand twisting apparatus of the kind in which the strand generates a ballooning figure of revolution during the twisting thereof, of strand attenuating means located wholly within the figure of revolution of the strand.

4. The combination with a two for one fiber strand twisting apparatus of the kind having a strand supply package located within a figure of revolution generated by the ballooning fiber strand, of strand attenuating apparatus located wholly within the confines of said figure of revolution, and means for supplying power to the attenuating apparatus.

5. In apparatus for drawing and twisting a fiber strand into yarn, the combination of a set of drawing rolls, means to feed the strand to the drawing rolls there to be

drawn, a flyer positioned to receive the drawn strand from the drawing rolls and rotating in a plane generally normal to the path of movement of the strand through the drawing rolls, a hollow spindle on which the flyer is mounted, means to feed the strand directly from the drawing rolls through the hollow spindle and thence to the flyer, and package forming apparatus having a yarn receiving guide located substantially on a line which is an axial extension of the path of movement of the strand through the drawing rolls.

6. Apparatus as defined in claim 5 in which the hollow spindle is mounted with its longitudinal axis substantially parallel to the path of movement of the strand through the drawing rolls.

7. In apparatus for drawing and subsequently twisting a strand of fiber to form yarn, a strand supply package, a set of drawing rolls to which the strand is delivered from the supply package, a rotatable flyer positioned to receive the drawn strand directly from the drawing rolls and form a figure of revolution about the package and drawing rolls, power means to drive the flyer, means operatively connecting the said power means in driving relation to the drawing rolls, and yarn package building means having a part disposed at the apex of the ballooning yarn which holds the yarn against twisting at that point, said part being located substantially in axial alignment with the path of the yarn passing through the drawing rolls.

8. Apparatus as defined in claim 7 in which the flyer is mounted on a hollow spindle through which the yarn from the drawing rolls passes to said flyer, and in which said spindle is driven, and power take off means adjacent

the top of the spindle operatively connected to the drawing rolls, whereby the drawing rolls are driven from said spindle.

9. Apparatus as defined in claim 8 in which the supply package is mounted on a member surrounding the spindle, means supporting said member from the spindle and means holding said member and hence the package against rotation.

10. In apparatus for drawing and twisting a strand of fiber to form yarn, a vertically disposed hollow spindle, means mounting the spindle for rotation, a flyer on said spindle disposed to receive a drawn strand passing downwardly through said spindle, a supply package for the strand to be drawn mounted alongside the spindle, a set of drawing rolls located adjacent the upper end of the spindle and mounted whereby the spindle may rotate relative thereto, power take off means operatively connecting the drawing rolls to the rotating spindle whereby the drawing rolls are driven, common means for holding the supply package and the drawing rolls against rotation with the spindle, and yarn package building apparatus located above the drawing apparatus to which the yarn leads from the flyer, whereby the ballooning yarn generates a figure of revolution about the supply package and the drawing rolls.

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