Feb. 21, 1956 R. H. CARTER 2,735,160

YARN STRETCHING DEVICE

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FIG. 1.

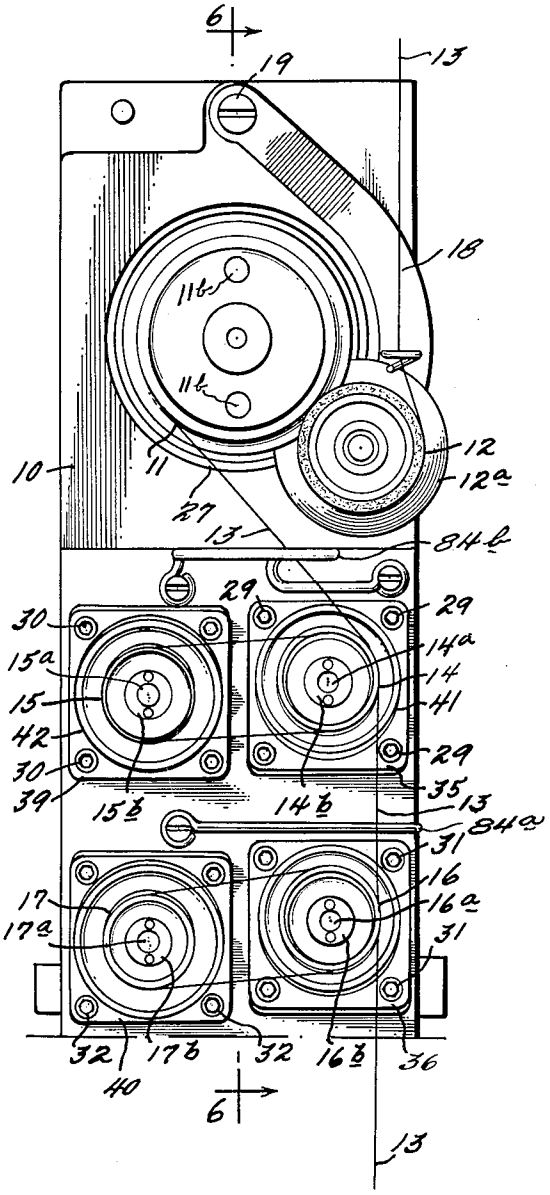
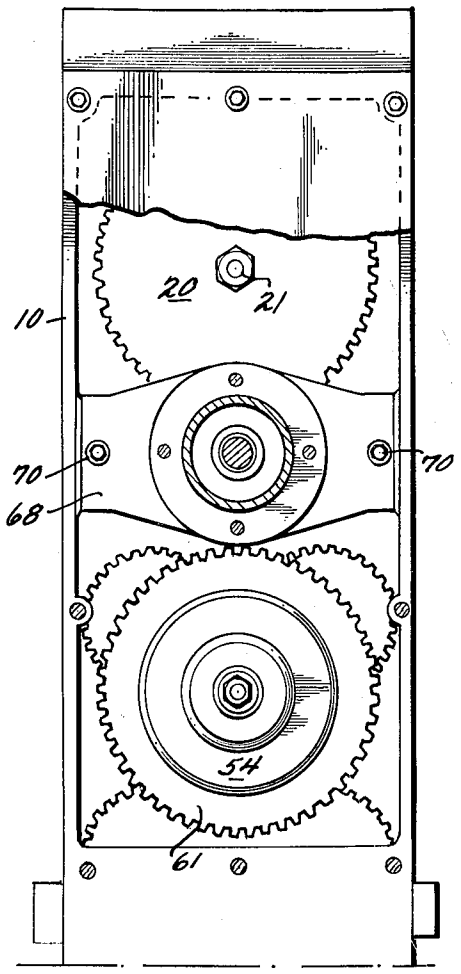


FIG. 3.



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YARN STRETCHING DEVICE

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FIG. 2.

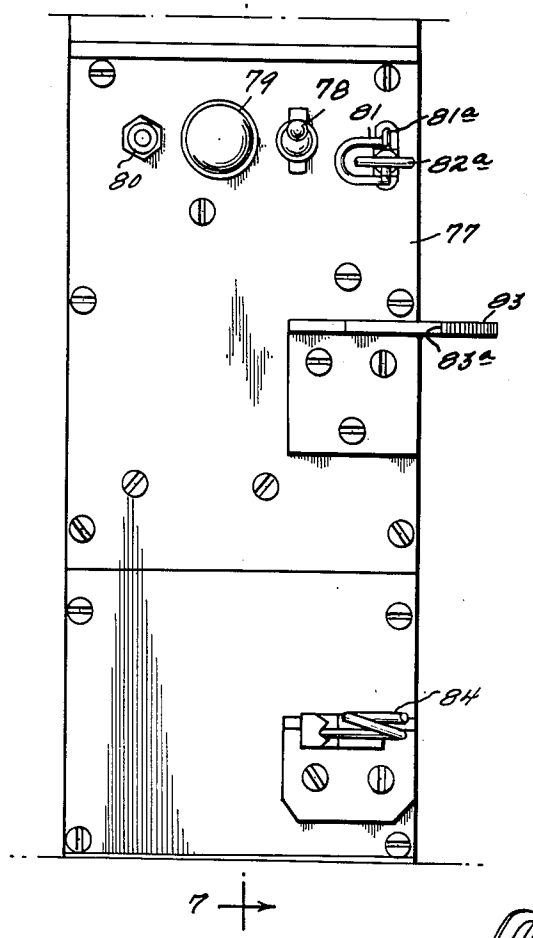
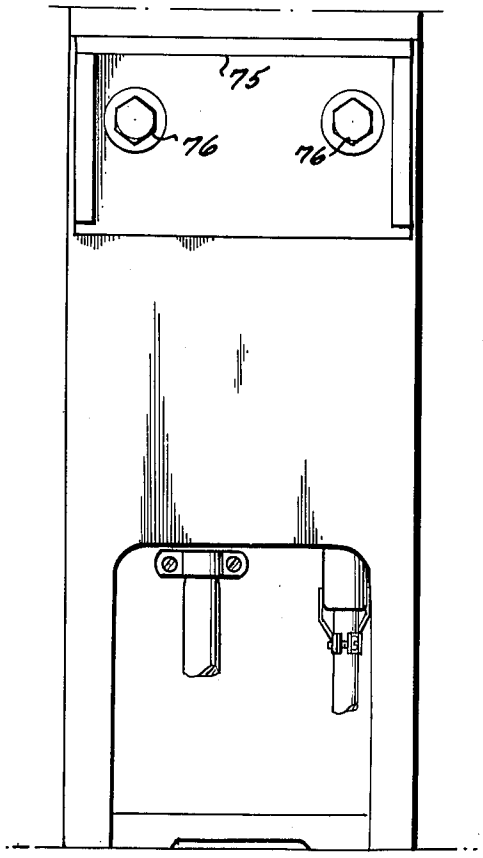


FIG. 4.



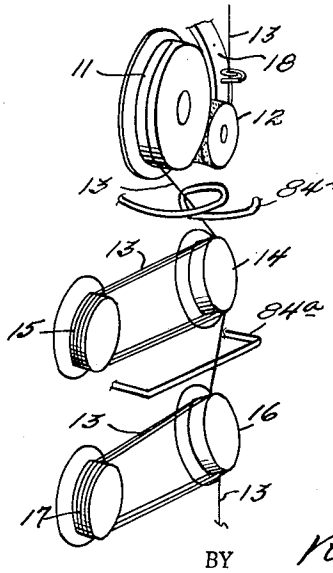


FIG. 8.

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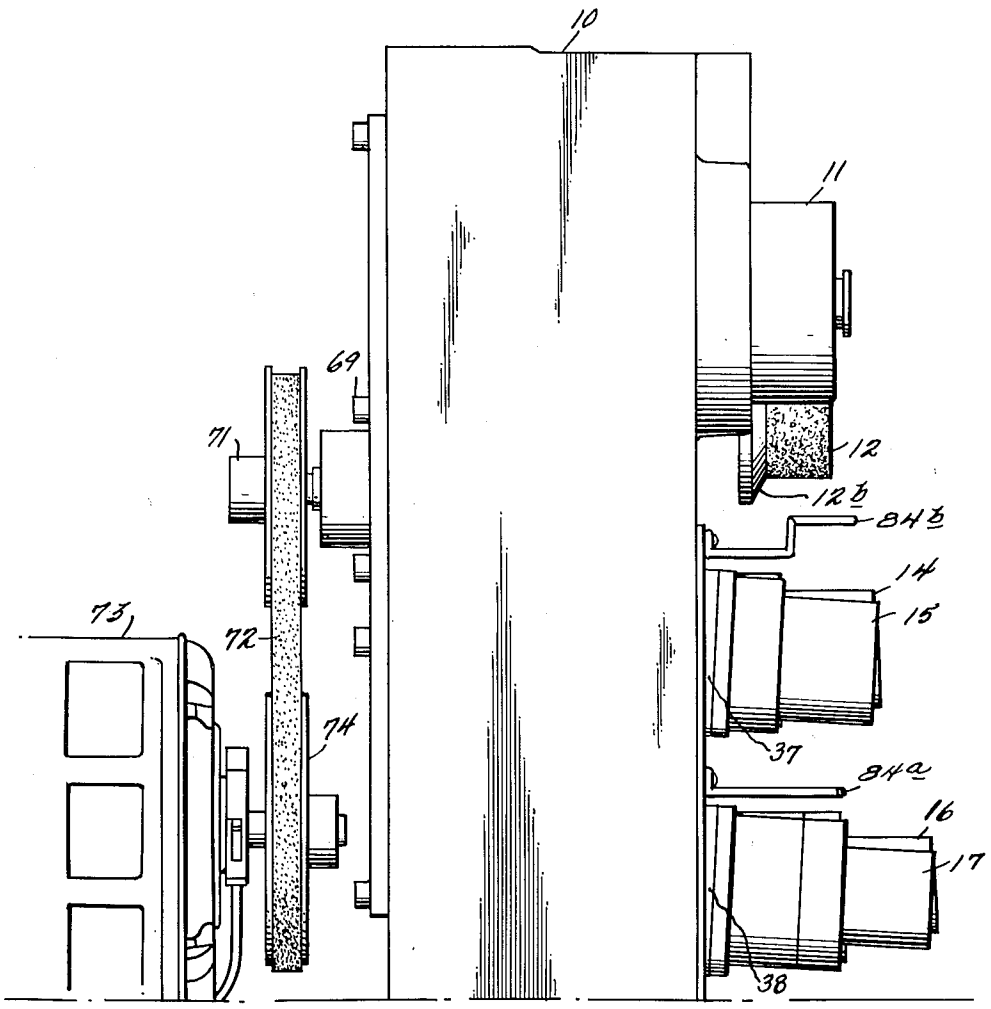
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YARN STRETCHING DEVICE

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FIG. 5.



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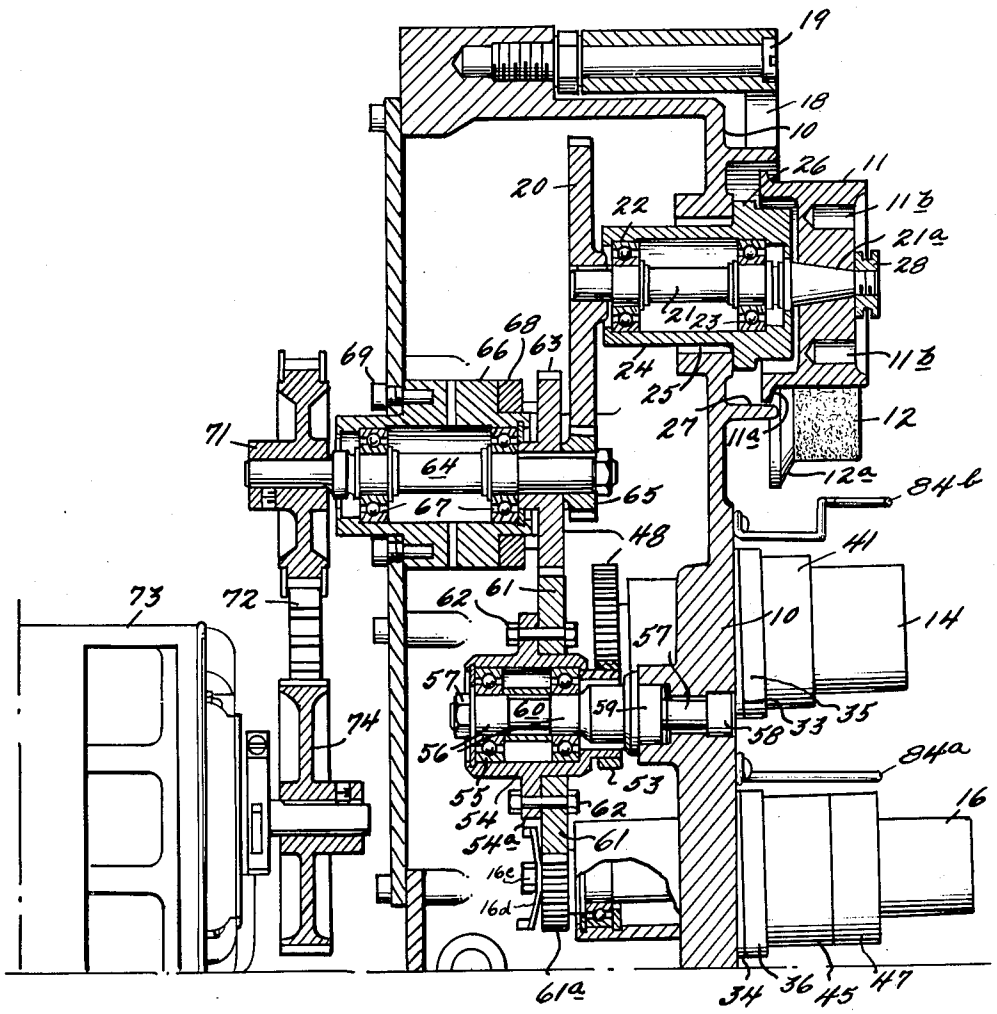
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YARN STRETCHING DEVICE

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FIG. 6.



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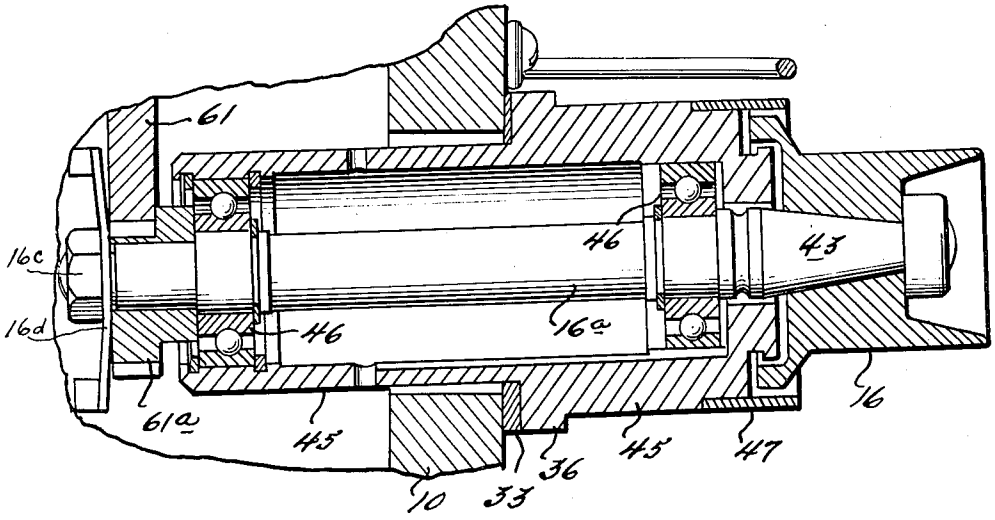
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FIG. 6a.



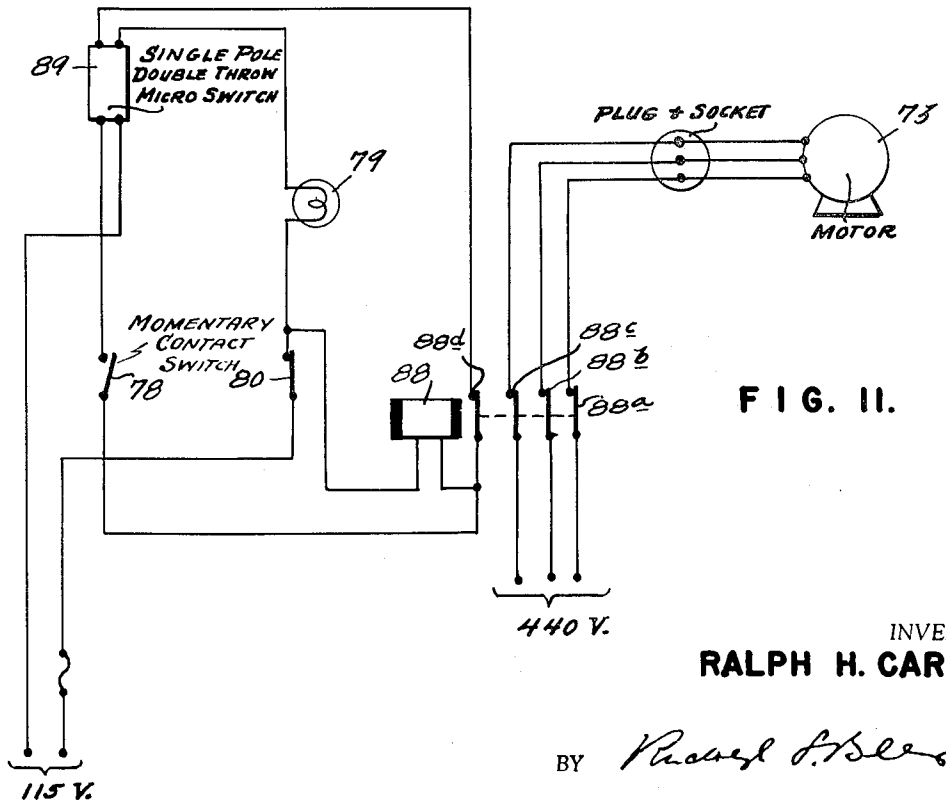


FIG. 11.

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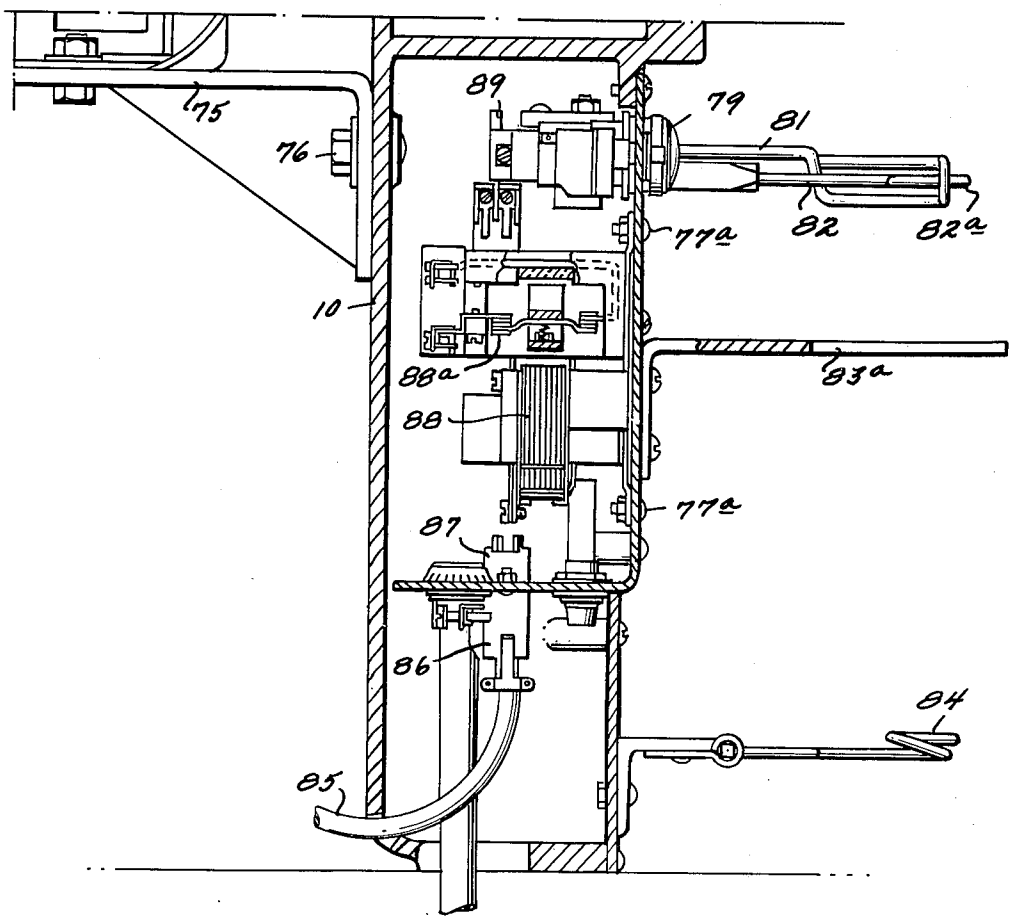
ATTORNEY

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YARN STRETCHING DEVICE

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FIG. 7.



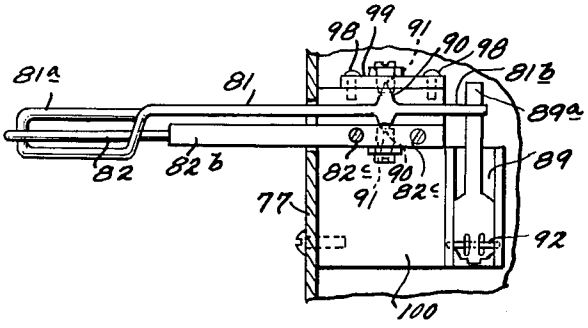
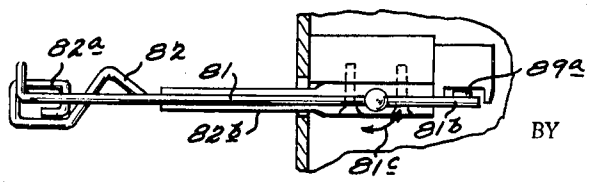


FIG. 9.

FIG. 10.



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ATTORNEY

United States Patent Office 2,735,160 Patented Feb. 21, 1956

2,735,160

YARN STRETCHING DEVICE

Ralph H. Carter, Johnson City, Tenn., assignor to North American Rayon Corporation, New York, N. Y., a corporation of Delaware

Application December 8, 1954, Serial No. 473,781

15 Claims. (Cl. 28—71.4)

This invention relates to yarn stretching devices in general. More particularly, this invention relates to yarn stretching devices for stretching synthetic yarn of the nylon type.

An object of this invention is to provide an improved stretching device for stretching yarn of the nylon type in a positive and accurate manner.

Another object of this invention is to provide an improved stretching device for stretching nylon or other similar synthetic yarns which may be run at high speed and high efficiency with comparatively little operator attention.

Another object of this invention is to provide an improved stretching machine for stretching nylon or other similar synthetic yarns, said machine being constructed so that the parts thereof are easily accessible for cleaning and servicing.

Still another object of this invention is to provide an improved yarn stretching machine for stretching nylon or other similar synthetic fiber yarns, said machine being constructed so that removal of broken yarn filaments from the stretch rollers thereof is readily accomplished.

Another object of this invention is to provide an improved stretching of nylon or other synthetic fiber yarns, said machine employing two pairs of angle axis stretch rollers which eliminate the necessity of employing the conventional stretch pin.

Another object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarn, said machine being adapted to stretch yarns of different types of finishes applied thereto on the yarn spinning machine.

Still another object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarns, in which each individual stretching position of a multiple unit stretching machine may be individually stopped and serviced independently of the other units thereby greatly increasing the efficiency and economy of operation of the entire stretching machine.

Still another object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarns, in which the unstretched yarn is fed by a power driven feed roller to a first pair of angle axis rollers around which it is wound a plurality of times and from which the yarn is fed to a second pair of angle axis rollers around which it is also wound a plurality of times, the surface speed of the second pair of rollers being greater than that of the first pair whereby the main stretching of the yarn is positively controlled between the two pairs of angle axis rollers.

Still another object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarn, the machine being provided with two pairs of driven angle axis rollers that are readily interchangeable so that the stretch ratio of the machine may be quickly and easily changed for different types of yarn or for replacement of worn or damaged rollers.

A further object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarns any single unit of which may be threaded up independently of any other unit by rotating the stretch control rolls. This eliminates the possibility of unstretched yarn reaching the take up package.

Still another object of this invention is to provide an improved stretching machine for stretching nylon or other synthetic fiber yarns in which long longitudinal stretch roll drive shafts are eliminated. Thus all torsional oscillation of the stretch rolls is eliminated resulting in a more uniform denier of the stretched yarn.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification and claims.

In accordance with this invention there is provided an improved stretching machine for stretching nylon or other synthetic fiber yarns. This machine is constructed to be highly efficient and economical in operation. This is made possible by the novel construction and assembly of the stretching rollers and individual driving mechanism for each of the stretching units embodying this invention. Two pairs of angle axis stretching rollers comprise each of the stretching units and each of these units is driven by an individual motor. Cantilever type of mounting is employed for these rollers so that the machine is easily threaded up and furthermore, if thread becomes wrapped around these rollers it can be removed without difficulty and without disturbing other stretching units in the machine. Also, because of this construction the rollers can be easily removed and changed. Thus, the stretch ratio can be changed simply by employing rollers of different diameters. This construction also simplifies replacement of worn or damaged rollers and the machine may thus be maintained in operation a large percentage of the time since replacement of parts is greatly simplified.

The yarn is fed to the first pair of angle axis rollers by a driven feed roller, the diameter and speed of which is such that a small predetermined stretch is obtained between the feed roller and the first set of angle axis rollers. Thus, yarn driven rollers have been avoided in this apparatus with the result that yarn from 210 to 30 denier and below may be stretched without difficulty at yarn delivery speeds up to 600 meters per minute.

The construction of the stretching apparatus of this invention is also such as to eliminate long shafts and drives whereby irregular motion of the stretching device such as is caused by torsional oscillations of long shafting have been avoided. As a result, more uniformly stretched yarn is produced by this machine. Feeding the yarn from the delivery package to the first set of angle axis rollers by power driven feed roller also contributes to the uniform stretching of the yarn by this apparatus.

Each stretching unit is also provided with a stop motion so that in case of a yarn break between the last stretch roller and the take up spindle, the stretching unit is automatically stopped thereby preventing an excessive build up of waste yarn on the take up spindle. When a unit is stopped a suitable signal or alarm is energized so that the operator is informed of the fact that a particular unit is stopped.

Further details of this invention are set forth in the following specification, claims and drawing.

Referring to the drawing briefly;

Fig. 1 is a front view showing the top half a unit of the stretching machine of this invention;

Fig. 2 is a front view of the bottom half of this unit;

Fig. 3 is a back view of the top portion of this unit with part of the back plate cut away;

Fig. 4 is a back view of the lower portion of this unit;

Fig. 5 is a side view of the upper portion of this unit with a portion of the driving motor cut away;

Fig. 6 is a vertical sectional view taken along the line 6—6 of Fig. 1;

Fig. 6*a* is a sectional view of one of the shaft and bearing assemblies of the angle axis rollers;

Fig. 7 is a vertical sectional view taken along the line 7—7 of Fig. 2;

Fig. 8 is a schematic view showing the direction in which a unit of this machine is threaded up;

Fig. 9 is a detail side view of the stop motion leverage;

Fig. 10 is a top view of the leverage shown in Fig. 9; and

Fig. 11 is a schematic wiring diagram showing the connections of the stop motion and other controls for the electric motor driving the unit.

Referring to the drawings in detail, the same reference numerals are employed in each of the views for corresponding parts and there is shown in the several views of the drawing one unit of the stretching device of this invention. Where a plurality of ends are to be stretched, a plurality of such units may be arranged side by side so that the stretching rollers of each unit are readily accessible for operation and servicing.

Each of these units consists of a frame **10** on the front of which are mounted the feed rollers **11** and **12** that cooperate together to feed the yarn **13** to the upper right hand stretch roller **14**. The stretch rollers **14**, **15**, **16** and **17** are arranged in pairs although they are individually mounted. The right hand rollers **15** and **17** are mounted so that their axes are inclined upwardly with respect to the horizontal and the left hand rollers **14** and **16** are inclined downwardly with respect to the horizontal.

The roller **12** is preferably cork covered and is swung on the arm **18** that is pivoted from the top of the frame **10** on the bolt **19** as shown in Figs. 1 and 6, so that the cork surface of this roller is pulled by gravity into frictional engagement with the roller **11**. Thus the roller **12** is caused to rotate by frictional contact with the roller **11** which is driven by means of the gear **20** that is attached to the shaft **21** as shown in Fig. 6.

This shaft is supported by two sets of ball bearings **22** and **23** that are fitted into the tubular member **24** which is positioned in a hole formed in the front of the frame **10**. The sleeve **24** is provided with a shoulder **26** that abuts the surface of the support **10** surrounding this hole and is fastened thereto by four machine screws (not shown) that are positioned in holes formed in corner portions of the shoulder **26**. Spaced from this hole and surrounding the flange **11***a* that is formed on the inner end of the roller **11**, there is positioned a circular flange **27** that extends forward from the front of the frame **10** so as to encircle the inner end of the roller **11** including the flange **11***a* thereof so as to prevent lint and yarn from getting into the shaft and becoming entangled thereon. A similar flange **12***a* supported by the pivoted arm **18** is positioned around the inner end of the cork lined roller **12** to prevent lint and yarn from getting under this roller as much as possible.

The forward end of the shaft **21** is provided with a tapered portion **21***a* that is adapted to fit into the conical hole provided in the roller **11** and this roller is held assembled upon this tapered shaft portion by the nut **28** that is threaded to the end of the shaft **21**. The roller **11** is provided with two holes **11***b* that are adapted to receive the prongs of a suitable wrench so that the roller may be removed from the tapered shaft portion after the nut **28** is removed from said shaft when it is desired to service the machine. These holes **11***b* are also used to rotate the unit by hand while threading up the device.

The pair of stretch rollers **14** and **15** is mounted on the front of the frame **10** directly below the feed rollers **11** and **12**. Each of these stretch rollers is mounted as a unit, thus the roller **14** together with the shaft and bearing assembly thereof are mounted by the four bolts **29** on the front of the frame **10** as shown in Fig. 1. Likewise, the

rollers **15**, **16** and **17** are each held by groups of four bolts, designated by the reference numerals **30**, **31** and **32** respectively, on the front of the frame **10** in the same manner.

The right hand rollers **14** and **16** of the stretch roller pairs **14—15** and **16—17** are mounted so that the axes thereof are inclined upwardly at predetermined angles with respect to the horizontal axis and the axes of the left hand rollers **15** and **17** are inclined downwardly when viewing the device from the front thereof, as shown in Fig. 1. This is accomplished by providing wedge shaped shims **33** and **34** between the frame **10** and the roller supports **35** and **36** of the rollers **14** and **16** respectively, as shown in Fig. 6. Similar wedges **37** and **38** are provided to tilt the rollers **15** and **17** downwardly as shown in Fig. 5. These wedge shaped shims subtend relatively small angles of about two (2) degrees and the sizes of these angles of course determine the amount of inclination of the shafts and rollers **14**, **15**, **16** and **17**.

The upper pair of stretch rollers **14** and **15** project forward a short distance in front of the feed rollers **11** and **12** and the bottom pair of stretch rollers **16** and **17** project forward a short distance ahead of the upper pair of stretch rollers **14** and **15**. The purpose of this staggered arrangement will be discussed hereinafter in greater detail.

Each of the rollers **14** and **15** project outward from the partially encircling flange members **41** and **42** that are attached to the roller support plates **35** and **39** respectively. These flanges encircle the inner ends of the rollers **14** and **15** and function to keep lint and other undesirable material from accumulating on the insides of these rollers.

Each of the stretch rollers **14**, **15**, **16** and **17** is mounted upon the tapered end of the shaft that is provided with roller bearings positioned in a suitable housing and one of these assemblies is shown in sectional view Fig. 6*a*. Only one is illustrated since the shafts **15***a*, **16***a* and **17***a* of these rollers are provided with the same type mounting except that the shafts **16***a* and **17***a* are longer and therefor require a longer mounting. Thus, the roller **16** is provided with a tapered aperture that fits on the tapered end **43** of the shaft **16***a* that is supported in the housing **45** by the roller bearings **46**. This housing **45** is made integral with the supporting plate **36** which is bolted to the frame **10** and held against the shim **33** by the four bolts **29** as shown in Fig. 1. A sleeve **47** is fitted to the outer end of the housing **45** and this sleeve extends to the front of the housing **45** so as to encircle the flange extending from the roller **16** thereby functioning to reduce the tendency of lint and thread getting wound around the shaft.

The stretch rollers **14**, **15**, **16** and **17** are held in place on the tapered end portions of the shafts **14***a*, **15***a*, **16***a* and **17***a* by means of the nuts **14***b*, **15***b*, **16***b* and **17***b* respectively, and these are threaded to the threaded end portions of the respective shafts. Thus, different size rollers may be employed on the stretcher unit since the rollers are readily removable so that different stretch ratios may be obtained between the upper and lower pairs of stretch rollers. This may be quickly accomplished by changing roller sizes and it is not necessary to change the gear ratios of the gears driving these rollers.

A gear such as the gear **48** is provided to each of the shafts of the rollers **14** and **15** for driving these rollers at a constant and uniform number of revolutions per minute. These gears mesh with the gear **53** that is supported on one end of a hollow shaft arrangement **54**. This hollow shaft arrangement **54** is supported by ball bearings **55** on the sleeves **56**. A bolt **57**, the head **58** of which is sunk into the frame **10**, is employed for supporting these sleeves. This bolt **57** passes through a flanged sleeve **59** that is clamped into a recess formed in the inner wall of the frame **10** in order to provide a rigid and stable support for the bearings **55**. A suitable spacer **60** is provided between the bearings **55** so that

when the bolt 57 is tightened, pressure is brought to bear against the inner races of the bearings 55, the spacer 60, the sleeve 59 and the wall portions of the frame 10 that are engaged by the head 58 of the bolt and the sleeve 59. Thus, this bolt forms a rigid support for the ball bearings 55 and the hollow shaft 54.

The hollow shaft 54 is provided with a flange 54*a* to which is bolted the gear 61 and bolts 62 are employed for this purpose. The gear 61 meshes with the gear 63 that is fixed by means of a suitable key to the shaft 64. This gear 61 also meshes with the gears 61*a* that are fixed to the shafts 16*a* and 17*a* and one of these gears 61*a* is shown in Figs. 6 and 6*a*. Each of these gears is held on its shafts by a suitable nut and washer arrangement employing a nut 16*c* threaded to the shaft 16*a* and the washer 16*d* as shown in Figs. 6 and 6*a*.

Another gear 65 is also fixed by a suitable key on the shaft 64 and this latter gear meshes with the gear 20 that is attached to the shaft 21. The shaft 64 is supported in the housing 66 by two sets of ball bearings 67 and this housing is in turn supported on the plate 68 that is provided with a hole for receiving one end of the sleeve 66 as shown in Fig. 6. The ends of the plate 68 are in turn attached to the frame 10 by the bolts 70 as shown in Fig. 3.

The shaft 64 is also provided with a pulley 71 that is fixedly attached thereto and this pulley is provided with a series of teeth on the peripheral surface which mesh with teeth formed in the belt 72. Motor 73 is provided for driving this unit and for this purpose this motor is provided with a pulley 74 which also has teeth on its peripheral surface to mesh with the teeth of the belt 72.

The electrical controls for the electric motor 73 are positioned in the lower part of the frame 10 that is illustrated in Figs. 2, 4 and 7. The front panel 77 of the lower part of the frame 10 supports the electrical devices comprising a toggle switch 78, the pilot light 79 and a push button switch 80. The thread guide elements 81 and 82 of the stop motion device project to the front of the panel through a suitable hole but these are supported on the rear of the panel by a bracket 100 shown in Figs. 9 and 10.

In addition there is attached to this panel the shield plate 83 which is positioned so that the U-shaped aperture thereof is below the thread engaging portions of the stop motion elements 81 and 82 for the purpose of protecting the elements 81 and 82 from sudden up thrust of the yarn collecting bobbin (not shown) that is positioned below the pivoted thread guide 84. When the yarn collecting bobbin is removed from its spindle by the operator, sudden up thrust of the bobbin might damage the elements 81 and 82, particularly element 81 which is rather delicately pivoted, and the plate 83 is provided to protect these elements from any such sudden up thrust of the bobbin.

Additional thread guides 84*a* and 84*b* are provided to the apparatus. Guide 84*a* is in the form of a wire member positioned to guide the thread from the first pair of stretch rollers 14—15 to the second pair 16—17. Guide 84*b* is in the form of a wire hook that is positioned to guide the thread from the feed roller 11 to the first pair of stretch rollers 14—15.

The stop motion device is provided with thread engaging elements 81 and 82 that extend out to the front of the panel 77 as shown in Figs. 7, 9 and 10. The element 81 is provided with a substantially rectangular loop at one end thereof that is looped around on the end portion of the element 82 and during normal operation of the device the yarn 13 passes between the looped portion 81*a* and through the inside of the hook 82*a* of the element 82.

The element 81 is provided with pointed bearing surfaces 90 which engage the bearing members 91 so that this element 81 is pivoted on these bearings and may be rotated through a small arc sufficient to permit the blade 89*a* of the micro-switch 89 to operate this switch. For this purpose the element 81 is provided with an extension 81*b* that extends over to the blade 89*a*.

The element 82 is supported from one end of the rod 82*b* that extends out to the front of the panel 77 and this rod 82*b* is attached to the side of the metal bracket 100 by means of the screws 82*c*. The lower bearing 91 is threaded into the rod 82*b* and forms the lower bearing for the pivoted element 81. The upper bearing 91 is threaded into the metal plate 99 that is attached to the top of the bracket 100 by the screws 98. The micro-switch 89 is attached to the back end of the bracket 100 by means of suitable screws that are not shown. This switch is provided with the blade 89*a* as mentioned above and this blade is made of resilient material and applies pressure to the extension 81*b* of the element 81 tending to rotate this element in the direction shown by the arrow 81*c* in Fig. 10. The blade 89*a* is pivoted near one end thereof on the pivot pin 92, the ends of which are supported in the side walls of the switch housing.

In Fig. 11 there is shown a wiring diagram of connections employed on the apparatus illustrated in Figs. 7, 9 and 10. Two sources of electric power are employed by this apparatus, one being a 115 volt source and the other being a 440 volt three phase alternating current source. Current from the 440 volt source is supplied to the electric motor 73 illustrated in Fig. 6 and the current to this motor is controlled by three sets of contacts 88*a*, 88*b*, and 88*c* of the relay 88 as shown in schematic diagram Fig. 11. One set of these contacts 88*a* is shown in Fig. 7. The 115 volt supply is employed for energizing the winding of the relay 88 and the signal lamp 79.

One side of the 115 volt supply is connected to one terminal of the toggle switch 80 and the other side of this switch is connected to one terminal of the winding of the relay 88 and also to one terminal of the lamp 79. The other terminal of the winding of the relay 88 is connected to one of the relay contacts 88*d* and also to one terminal of the momentary contact switch 78. The other terminal of the momentary contact switch 78 is connected to the switch blade of the micro-switch 89 and also to the other side of the 115 volt source of current supply.

The micro-switch 89 is a single pole double throw type wherein the lower contact shown in Fig. 11 is connected to the switch blade which may make contact with either one of the contacts connected to the upper terminals. The right hand one of these terminals is connected to the top terminal of the lamp 79 and the left hand terminal is connected to the upper contact of the set 88*d*.

As described above, the micro-switch 89 is controlled by the element 81 of the stop motion device and when thread is normally running through this stop motion device so that the position of the element 81 thereof with respect to the element 82 is that shown in Fig. 10, the circuit of the micro-switch 89 will be closed through the left hand contact thereof so that the winding of the relay 88 will be energized from the 115 volt source through the micro-switch 89, the contacts 88*d* and the toggle switch 80. However, should the yarn 13 break or lose tension so that the element 81 of the stop motion may swing clock-wise around its pivot in the direction shown by the arrow 81*c* in Fig. 10, then the microswitch 89 will close the circuit to its upper right hand terminal thereby disconnecting the winding of relay 88, and connecting the lamp 79 to the 115 volt source. The relay 88 functions to open the power supply to the motor 73 when the relay winding is deenergized. The lamp 79 signals to the operator the fact that the thread 13 passing through the stop motion has been broken or has suffered abnormal loss of tension. After the operator has remedied the difficulty and has rethreaded the yarn through the stop motion, as described above, he must close the momentary contact switch 78 to energize the

relay winding which functions to close the contactors 88*a*, 88*b*, 88*c* and 88*d*. The motor 73 is thus started and the energization of the relay winding is continued through the contactor 88*d* and the left hand contact of the micro-switch 89 which is now closed since the yarn is rethreaded through the stop motion elements 81 and 82.

In Fig. 8 there is shown a schematic diagram of the manner in which the yarn 13 is threaded around the various rollers of this device. The yarn 13 is fed from a yarn supply (not shown) down to the cork lined roller 12 that is pivotally supported on the arm 18 which is itself supported on a pivot attached to the top of the frame of this device. The arm 18 is pivoted in such manner that the surface of the cork lined roller 12 is pressed by the force of gravity against the lower portion of the feed roller 11. The feed roller 11 is driven by a suitable gearing arrangement described above and itself functions to drive the cork lined roller 12. The yarn 13 is threaded around the bottom of the roller 12 and upward between this roller and the roller 11 so that these two rollers nip the yarn as they are rotated and thus feed the yarn forward. The yarn passes over the top of the roller 11 and almost completely encircles this roller before being passed through the thread guide 84*b* to the upwardly inclined roller 14 of the first pair of stretch rollers 14—15. The yarn is wound around this first pair of stretch rollers 14—15 a plurality of times as shown in Fig. 8 and these stretch rollers are driven at a speed such that a slight stretch is imparted to the yarn between this first pair of stretch rollers and the feed rollers 11—12. The rollers 14 and 15 are both of the same size and they are both driven at the same speed. The axis of the roller 14 is disposed at a slightly upwardly inclined angle and the axis of the roller 15 is inclined downwardly so as to insure the proper yarn distribution on these two rollers. In other words, the yarn wrapped around these two rollers must assume the shape of a flattened helix, the convolutions of which are spaced apart so that the yarn advances over these rollers from the inner ends of the rollers to the outer ends thereof during rotation of the rollers. The outer convolution of the yarn after passing over the roller 14 is fed over the thread guide 84*a* to the inner end of the upwardly inclined stretch roller 16 of the second pair of stretch rollers 16—17. This second pair of stretch rollers extends to the front of the first pair of stretch rollers so that yarn fed from the outer end of the roller 14 passes to the inner end of the roller 16. The yarn is wound a plurality of times around the rollers 16—17 to form a flattened helix similar to that formed by the yarn wound around the rollers 14—15. The rollers 16—17 are also of the same size and are both driven at the same speed by the gearing arrangement described above. These rollers however, are driven so that the peripheries thereof travel faster than the peripheral speed of the rollers 14 and 15 so that a certain stretch is applied to the yarn 13 as it passes between these two pairs of stretch rollers.

All the above threading up is accomplished by rotating the roll assembly slowly by hand or other means while applying the yarn to the various rolls. By this method of threading up unstretched yarn is prevented from reaching the take up bobbin.

While I have described this invention in detail with respect to certain preferred embodiments thereof, it is, of course, not desired to limit the invention to the exact details described and illustrated except in so far as those details are defined by the claims.

What I claim is:

1. An apparatus for stretching thread comprising in combination a frame, a first thread feed roller, a shaft for supporting said feed roller near the top of said frame, a second thread feed roller, means for supporting said second feed roller so that the peripheral surface thereof is driven from the peripheral surface of said first feed roller, a first pair of stretch rollers, shafts attached to said stretch rollers, means for supporting said stretch rollers and the shafts thereof on the front of said frame so that the axis of one of said stretch rollers is disposed at a slight upwardly inclined angle with respect to the axis of the other of said stretch rollers, a second pair of stretch rollers positioned below said first pair, means including shafts for said second pair of stretch rollers for supporting said second pair of stretch rollers offset to the front of said first pair of stretch rollers, the axes of said second set of stretch rollers also being disposed at slight angles with respect to each other so that one of said second pair of stretch rollers is inclined upwardly, means for driving said first feed roller, means for driving both pairs of said stretch rollers, and means for feeding yarn to said second feed roller so that said yarn passes around the bottom of said second feed roller, between said feed rollers, and over the top of said first feed roller toward the bottom thereof and to the upwardly inclined stretch roller of said first pair of stretch rollers, said yarn being wound around said first pair of stretch rollers a plurality of times, said second pair of stretch rollers being offset to the front of said first pair far enough so that yarn progressing over the upwardly inclined roller of said first pair to the front thereof is advanced in position to be fed therefrom to the inner end of the upwardly inclined one of said second pair of stretch rollers, said driving means driving said pairs of stretch rollers at different predetermined speeds so that the yarn may be stretched a predetermined amount in passing over said stretch rollers, and means for receiving and collecting the stretched yarn from said second pair of stretch rollers.

2. The apparatus as set forth in claim 1 further characterized in that the means for supporting both of said pairs of stretch rollers includes tubular housings, each of said housings having flanges adapted to be bolted to the front of said frame.

3. The apparatus as set forth in claim 2 further comprising wedge shaped shims positioned between the flanges of selected ones of said housings for holding the corresponding ones of said stretch rollers inclined upwardly.

4. The apparatus as set forth in claim 3 further comprising means for detachably attaching said first and second pairs of stretch rollers on the shafts associated therewith so that different size stretch rollers may be substituted when it is desired to change the amount of stretch to be imparted to the yarn.

5. The apparatus as set forth in claim 4 further characterized in that the portions of the shafts for said stretch rollers which engage said stretch rollers are tapered to engage corresponding conical surfaces of said stretch rollers and means engaging said shafts beyond the tapered portions thereof for retaining said stretch rollers thereon.

6. The apparatus as set forth in claim 2 further comprising circular guard members encircling short inner portions of said stretch rollers to reduce the amount of lint and waste yarn entering behind the inner portions of the stretch rollers, said circular guard members being attached to the flanges of said housings.

7. The apparatus as set forth in claim 1 further comprising gears attached to each of the said shafts of said rollers and means for driving all of said gears from a common power source.

8. The apparatus as set forth in claim 1 further characterized in that the means for driving said first feed roller and said stretch rollers comprises individual gears attached to the shafts of said stretch rollers, an auxiliary shaft attached to said frame and gear means supported by said auxiliary shaft for driving said stretch rollers, said gear means being arranged so that substantially greater peripheral speeds are imparted to said second pair of stretch rollers.

9. The apparatus as set forth in claim 8 further comprising a hollow shaft and bearings for supporting said

hollow shaft on said auxiliary shaft, said gear means being supported on said hollow shaft and said gear means comprising a gear for driving both of the stretch rollers comprising said first pair of stretch rollers, said gear means also comprising a substantially larger gear for driving both of the stretch rollers of said second pair of stretch rollers.

10. The apparatus as set forth in claim 9 further comprising an additional motor driven shaft having a gear mounted thereon for engaging and driving said substantially larger gear.

11. The apparatus as set forth in claim 10 further comprising an additional gear mounted on said additional shaft and a gear mounted on the shaft of said first feed roller so as to mesh with said additional gear for driving said first feed roller.

12. An apparatus as set forth in claim 11 further comprising a housing for said additional shaft, bearing means for supporting said additional shaft in said housing and bracket means for supporting said housing on said frame.

13. An apparatus as set forth in claim 1 further comprising an arm pivoted to the top of said frame so that said arm may swing over a portion of the front of said frame and means for supporting said second feed roller near the bottom of said arm so that said second feed roller is brought into engagement with said first feed roller by the force of gravity.

14. An apparatus as set forth in claim 13 further comprising a guard supported on the lower end of said arm, said guard substantially encircling the inner portion of said second feed roller to reduce the amount of lint and waste yarn entering the bearing of said second feed roller.

15. An apparatus for stretching thread comprising in combination a frame, a first thread feed roller, a shaft for supporting said feed roller near the top of said frame, a second thread feed roller, means for supporting said second feed roller so that the peripheral surface thereof is driven from the peripheral surface of said first feed roller, a first pair of stretch rollers, shafts attached to said stretch rollers, means for supporting said stretch rollers and the shafts thereof on the front of said frame so that the axis of one of said stretch rollers is disposed at a slight upwardly inclined angle with respect to the axis of the other of said stretch rollers, a second pair of stretch rollers positioned below said first pair, means including shafts for said second pair of stretch rollers for supporting said second pair of stretch rollers offset to the front of said first pair of stretch rollers, the axes of said second set of stretch rollers also being disposed at slight angles with respect to each other so that one of said second pair of stretch rollers is inclined upwardly, means for driving said first feed roller, means for driving both pairs of said stretch rollers, and means for feeding yarn to said second feed roller so that said yarn passes around the bottom of said second feed roller, between said feed rollers, and over the top of said first feed roller toward the bottom thereof and to the upwardly inclined stretch roller of said first pair of stretch rollers, said yarn being wound around said first pair of stretch rollers a plurality of times, said second pair of stretch rollers being offset to the front of said first pair far enough so that yarn progressing over the upwardly inclined roller of said first pair to the front thereof is advanced in position to be fed from one of said first pair of stretch rollers directly to the inner end of one of said second pair of stretch rollers, said driving means driving said pairs of stretch rollers at different predetermined speeds so that the yarn may be stretched a predetermined amount in passing over said stretch rollers, and means for receiving and collecting the stretched yarn from said second pair of stretch rollers.

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