United States Patent [19]

Savageau et al.

[11] **3,869,759**

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[54] **DRIVE MEANS FOR TEXTILE SLIVER DRAFTING ASSEMBLY**

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[21] Appl. No.: **409,217**

[52] **U.S. Cl.** **19/293**

[51] **Int. Cl.** **D01h 5/32**

[58] **Field of Search** 19/293, 260, 200, 240

[56] **References Cited**

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2,335,108	11/1943	Clapperton et al.	19/293
2,589,797	3/1952	Getchell	19/293 X
2,982,083	5/1961	Breitenbach	19/260 X
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FOREIGN PATENTS OR APPLICATIONS

968,980	5/1950	France	19/293

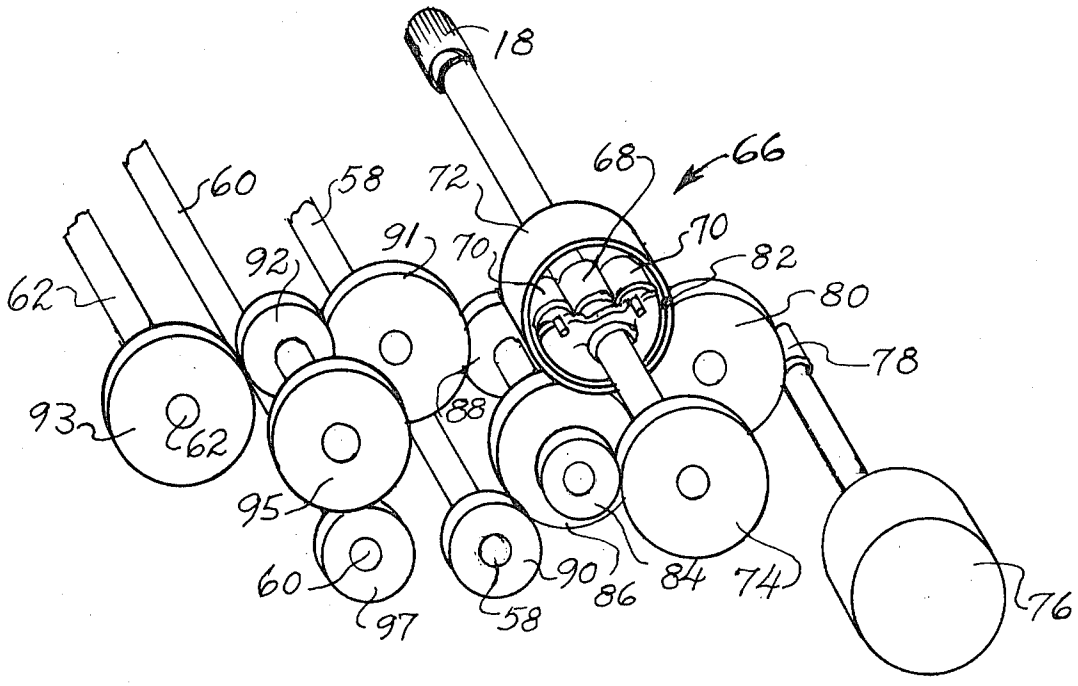
Primary Examiner—Dorsey Newton

Attorney, Agent, or Firm—Joseph H. Heard

[57] **ABSTRACT**

Axially-fixed countershafts mounted beneath and parallel to the rearward drafting rolls are driven from the front drafting roll by gearing disposed to one side of the drafting assembly and including fixed-center change gears and a variable ratio epicyclic gear unit usable in conjunction with a sliver leveler or evener. The rearward drafting rolls are driven from the countershafts by timing belts disposed on the opposite side of the drafting assembly from the aforesaid gearing and having automatically operable tension compensating means associated therewith. Precise changes in the speed and/or position of the rearward drafting rolls may be quickly and easily effected.

8 Claims, 6 Drawing Figures



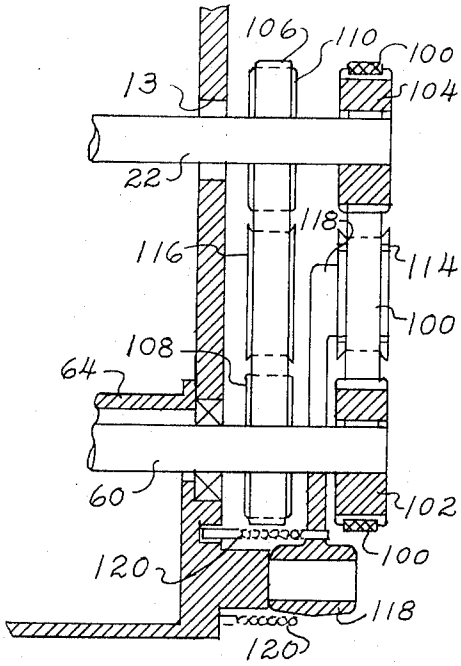


FIG. 6

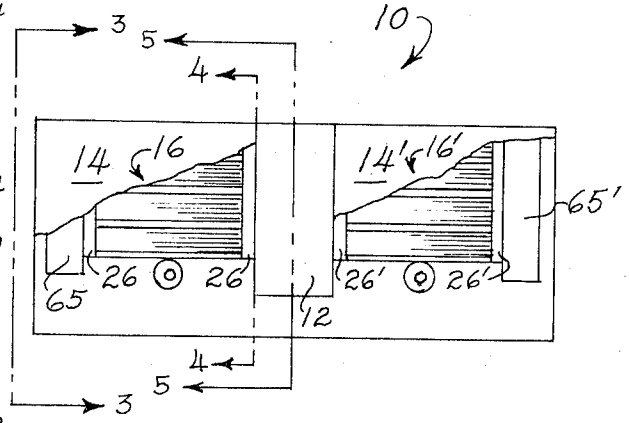


FIG. 1

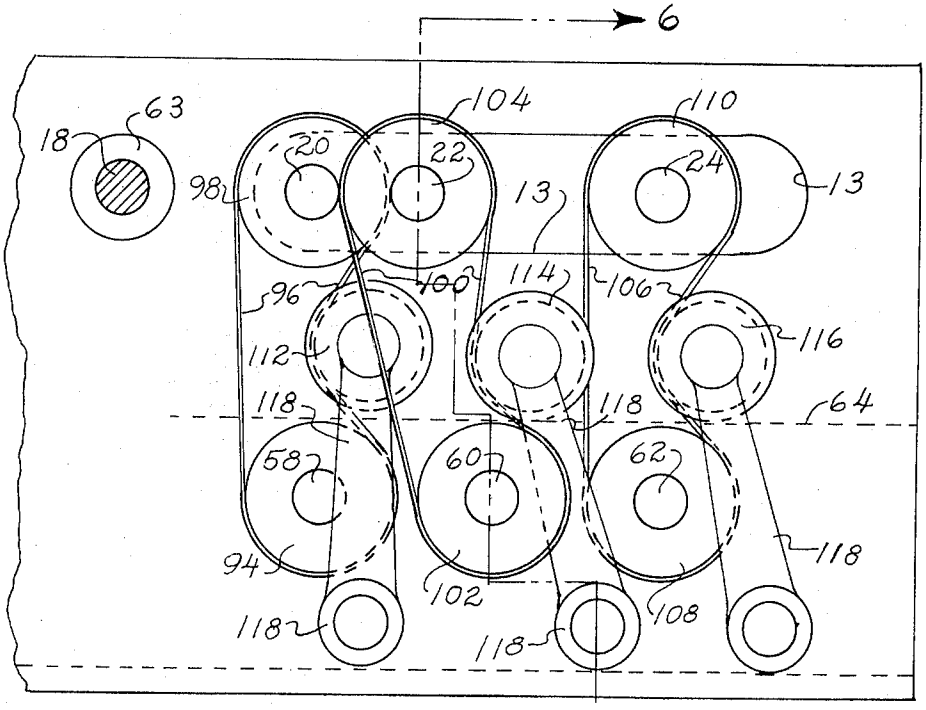


FIG. 5

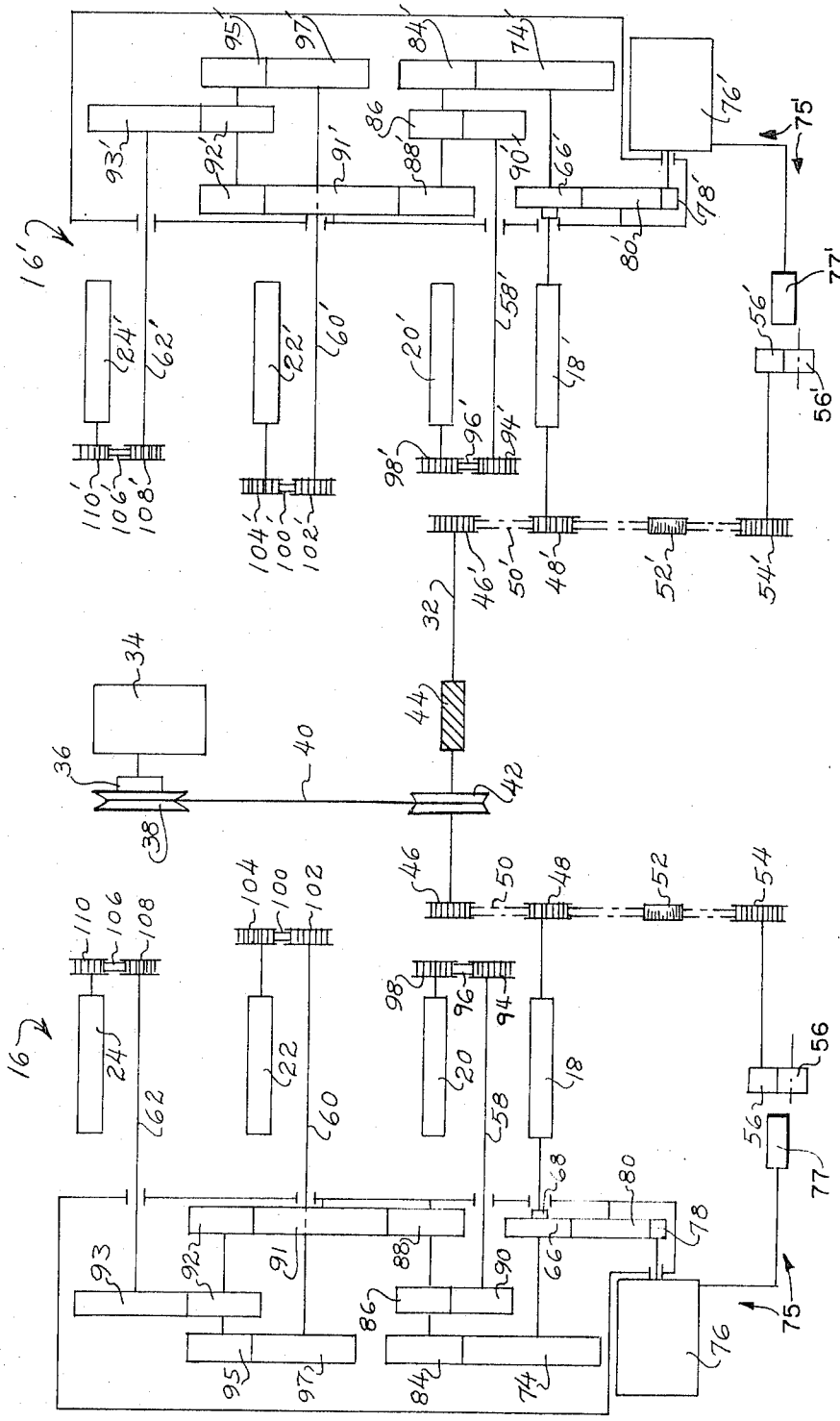


FIG. 2

FIG. 3

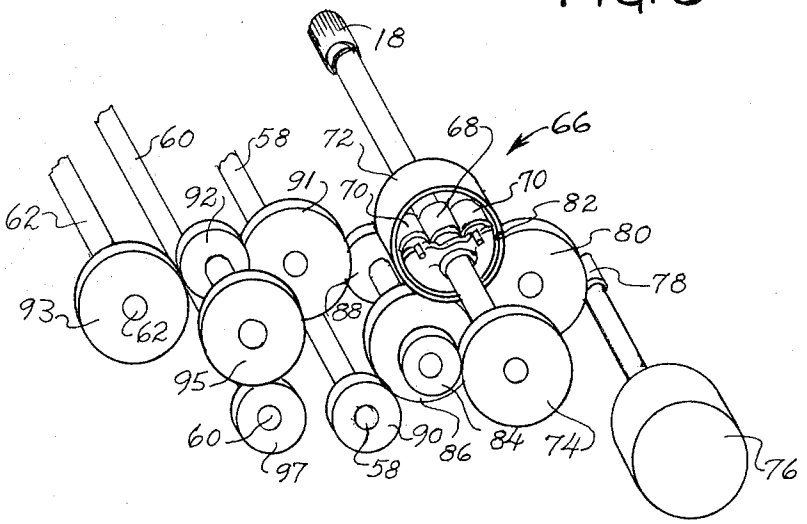

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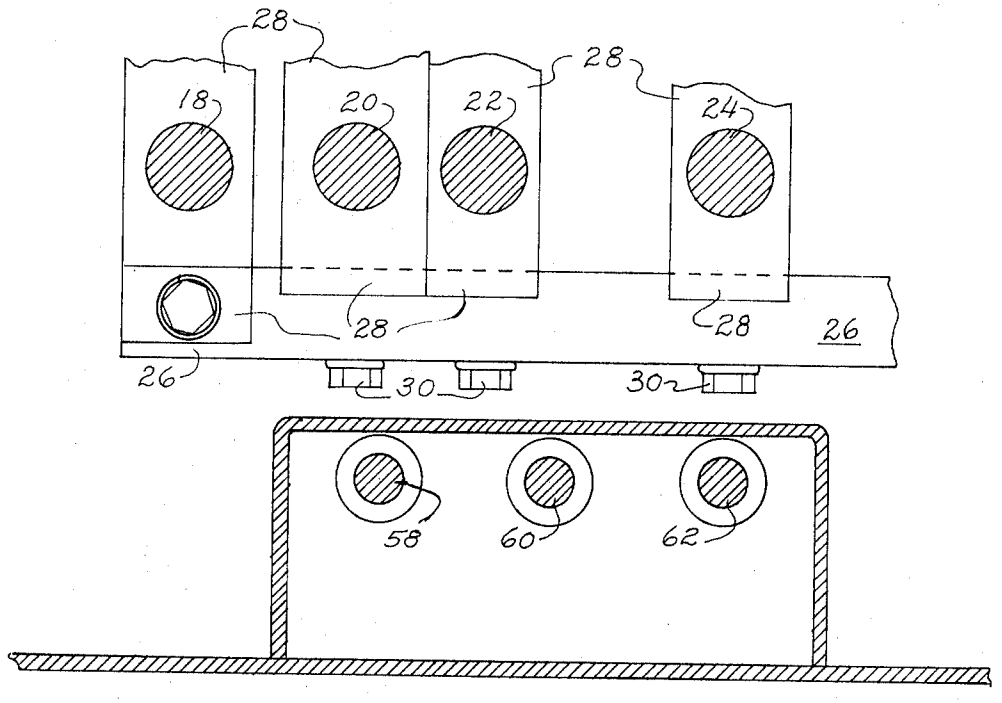
FIG. 4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DRIVE MEANS FOR TEXTILE SLIVER DRAFTING ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to sliver drafting assemblies such as employed in textile drawing machines, and more particularly relates to the drafting roll drive means for such assemblies. Drafting roll drive means of various types are disclosed in U.S. Pat. Nos. 638,975, 1,543,984, 1,912,946, 2,271,191, 2,335,108, 2,589,797, 3,067,471 and in British Patent Specification 1,327,532.

In most textile drafting machines, the making of changes in the relative speeds and/or positions of the drafting rolls of the drafting assemblies is hindered to a significant extent by the machine drive components which impart rotational movement to the rolls. The making of roll speed or positional changes may require adjustment of drive gearing on both sides of the drafting assembly, and such required adjustment may include the required relocation of the "centers," or axes or rotation, of certain gears. Unless the foregoing adjustments are made with considerable care and precision by skilled personnel, the drafting assembly likely will not operate properly when finally restored to service. Additionally, in some instances it may be impossible to effect desired roll speed changes in certain of the drafting zones of a drafting assembly of the machine without at the same time causing undesired speed changes in other drafting zones.

Although attempts have heretofore been made to alleviate some of the aforesaid problems to a certain extent, there still exists a need for a textile drawing machine having drafting assembly drive means so designed and constructed as to permit roll speed and/or positional changes to be conveniently and reliably made with speed and precision even by persons possessing only moderate mechanical skills.

OBJECTS OF THE INVENTION

With the foregoing in mind, the primary object of the present invention is the provision of improved drafting assembly drive means, particularly in association with a textile drawing machine, which is so designed and constructed as to permit a wide range of drafting roll speed and/or positional changes to be conveniently made with speed and precision even by relatively unskilled persons.

Related and more specific objects are the provision of improved drive means of the described type wherein all drive gearing is disposed upon one side only of the drafting assembly, and wherein all speed-modifying change gears are located upon fixed centers and are so arranged as to permit the realization of desired speed changes of certain drafting rolls without the necessity of making additional undesired speed changes of other drafting rolls.

Another related and more specific object is the provision in a drafting assembly drive means of the described type of a variable epicyclic ratio gear unit which may be employed to operatively associate a sliver leveler or evener device with the drafting assembly when desired, but which may be quickly and easily changed to a fixed epicyclic ratio gear unit.

Still another related and more specific object is the provision of a textile drawing machine or the like wherein positional changes of the drafting rolls can be effected without any manual adjustments of the drafting roll drive means or any components associated therewith.

A further object of the invention is the provision of improved drafting assembly drive means which may be conveniently incorporated in a multiple delivery drawing machine or the like to permit each delivery thereof to operate substantially independently if desired, and in which drafting roll speed and/or positional changes at one delivery may be made without affecting the other delivery or deliveries of the machine.

SUMMARY OF THE INVENTION

The drive means of the present invention includes, in association with each sliver drafting assembly of a textile drawing frame or the like, a plurality of axially-fixed countershafts mounted beneath and generally parallel to those adjustably positionable drafting rolls which are disposed rearwardly of the driven front drafting roll of the assembly. The countershafts are driven from the front drafting roll by gearing disposed to one side of the drafting assembly and including a plurality of sets of speed-adjusting change gears which are all rotatable on fixed centers. The rear drafting rolls are driven from the countershafts by flexible drive means disposed on the opposite side of the drafting assembly from the aforesaid gearing and having automatically operable tension compensating means associated therewith for maintaining the flexible drive means under substantially constant tension in all adjustive positions of the rearward rolls. The preferred flexible drive comprises toothed timing belts and pulleys, which afford quiet and precise operation and which require no lubrication. In a preferred embodiment of the invention, the gearing components of the drive means include a variable ratio epicyclic unit which may be employed to operatively associate a sliver leveler or evener device with the drafting assembly when desired but which may be readily changed to a fixed ratio epicyclic gear unit at other times, as when a device of the aforesaid type is not used with the drafting assembly.

DESCRIPTION OF THE DRAWINGS

Other features of the invention will be in part apparent and in part pointed out specifically hereinafter in the following description of an illustrative embodiment thereof, which should be read in conjunction with the accompanying drawings, in which:

FIG. 1 is a somewhat schematic top plan view of a two delivery textile drawing machine, portions of the cover components of which are partially broken away, having drafting roll drive means constructed in accordance with the invention;

FIG. 2 is a diagramatic representation of the drafting roll drive means of the drawing machine of FIG. 1;

FIG. 3 is a partially schematic enlarged perspective view, taken generally in the direction of the arrows 3—3 of FIG. 1, of gearing and some related components of the drive means for one of the drafting assemblies of the drawing machine;

FIG. 4 is an enlarged view, partially in side elevation and partially in vertical section taken generally along the line 4—4 of FIG. 1, showing parts of the drafting roll support means and the countershaft components of the drafting roll drive means at one drafting assembly of the drawing machine;

FIG. 5 is an enlarged side elevational view, looking generally in the direction of the arrows 5—5 of FIG. 1, showing timing belt and associated timing pulley components of the drive means for one of the drafting assemblies of the drawing machine; and

FIG. 6 is a vertical section taken generally along the line 6—6 of FIG. 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 the numeral 10 designates a two delivery textile drawing machine having a center section 12, side sections 14,14' and sliver drafting assemblies 16,16'. Assemblies 16,16' may be and illustratively are of identical conventional construction, and the following description of assembly 16 therefore also applies to assembly 16', the components of which are identified in the drawings by the same reference numerals with the addition of a prime designation thereto. Assembly 16 includes bottom drafting rolls 18,20,22,24 mounted in parallel and approximately coplanar relationship between elongate support arms 26 (FIGS. 1 and 4) by associated pairs of bearing blocks 28 (FIG. 4) carried by such support arms. The bearing blocks 28 for front roll 18 are fixedly secured to their respective support arms 26, and the shaft of roll 18 extends completely through such blocks and has its opposite ends within a gear box 65 and center section 12 of machine 10. The shafts of rearward rolls 20,22,24 terminate at one end short of gear box 65, but project at their other ends into center machine section 12 through a slot 13 (FIG. 5) provided therein. The bearing blocks 28 supporting the shafts of rolls 20,22,24 are slidable longitudinally of support arms 26, upon loosening of retaining bolts 30 associated therewith, to permit each of the rearward rolls 20,22,24 to be moved toward and away from each other and front roll 18 for the purpose of varying as desired the spacing or "ratch" distance therebetween. Those skilled in the art will understand that it is conventional to mount drafting rolls such as rolls 18,20,22,24 in the manner and for the purpose briefly described above, and will also understand that each drafting assembly 16,16' further includes associated top drafting rolls, weighting mechanisms, clearers and other conventional components not shown in the drawings.

Within center machine section 12, and referring now to FIG. 2, there is mounted a main shaft 32 which is driven by the machine's main drive motor 34 through a clutch mechanism 36, pulley 38, V-belt 40 and pulley 42. A worm gear 44 mounted centrally upon shaft 32 provides a power take-off for coiler components (not shown) of machine 10. A toothed timing-belt pulley 46 mounted upon one end of shaft 32 is connected within center machine section 12 to a similar pulley 48 upon the shaft of front roll 18 of drafting assembly 16 by a timing belt 50, which belt 50 also is engaged by an idler pulley 52 and is entrained about a pulley 54 upon the shaft of a driven calendar roll 56 associated with and disposed forwardly of drafting assembly 16 upon machine 10. Corresponding timing belt and pulley components are provided at the other end of shaft 32 in association with the other drafting assembly 16', such that rotation of shaft 32 causes simultaneous rotation of the front rolls 18,18' of both assemblies 16,16' and also effects rotation of the calendar rolls 56,56' forwardly of the respective assemblies.

Identical means are provided for driving the rearward drafting rolls of each drafting assembly 16,16' from the respective front rolls 18,18' thereof. Such means, which will be described with reference to drafting assembly 16, includes countershaft means mounted beneath assembly 16, gearing means disposed entirely to one side of assembly 16 within gear box 65 and interconnecting front roll 18 and the aforesaid countershaft means, and flexible drive means disposed entirely upon the other side of assembly 16 within center machine section 12 and interconnecting the countershaft means and the rearward rolls of drafting assembly 16.

The aforesaid countershaft means provided in association with drafting assembly 16 comprises a plurality of countershafts 58,60,62 (FIGS. 2–5) mounted by suitable bearings 63 (one of which is shown in FIG. 5) in axially-fixed positions beneath assembly 16 and a base plate 64 (FIGS. 4–6) below such assembly. Countershafts 58,60,62 extend parallel to and generally underlie respective ones of the rearward drafting rolls 20,22,24 of assembly 16, and the opposite ends of the countershafts project beyond opposite sides of assembly 16 into center section 12 and gear box 65 of side section 14, respectively, of machine 10.

Within side machine section 14, and referring now particularly to FIGS. 2 and 3, there is provided a gear box 65 containing gearing interconnecting countershafts 58,60,62 and the shaft of front roll 18 of drafting assembly 16. Such gearing includes a variable ratio epicyclic gear unit 66 comprised of an input sun gear 68 affixed to the shaft of front drafting roll 18, planetary gears 70, a ring gear 72, and an output gear 74. In addition to its input from gear 68, ring gear 72 may also receive a modifying input from a servo motor 76, which may be mounted within side section 14 of machine 10 outside of gear box 65, through a gear 78 provided on the servo motor shaft and meshing with an idler gear 80 in turn meshing with external teeth upon ring gear 72. Servo motor 76 comprises a part of a sliver leveling or evening device 75 which further includes a sliver-uniformity sensing unit 77 disposed adjacent calendar rolls 56 and operatively connected to motor 76. Device 75 may be of any suitable construction (various of which are commercially available) usable in a known manner in association with drafting assemblies such as that at hand to correct variations in the uniformity of the sliver drafted thereby. During operation of the sliver leveling or evening device 75, unit 66 receives, in addition to its input from front drafting roll 18, an input from servo motor 76 which so varies the gear ratio of unit 66 as to correct variations detected by sensing unit 77 in the uniformity of the sliver drafted by assembly 16. On the other hand, when correction of the sliver variations is not desired and the leveling or evening device 75 is not used, servo motor 76 has no output and unit 66 receives an input only from front drafting roll gear 68. The speed ratio between such gear 68 and output gear 74 of unit 66 should then be constant. To insure the latter result, a pin or bolt 82 (FIG. 3) is mounted upon a convenient part of gear box 65 adjacent the hub of ring gear 72 for insertion within and removal from a suitable bore (not shown) provided within the ring gear hub. Insertion of bolt 82 within the aforesaid bore obviates all possibility of rotation of ring gear 72, and thereby insures that the speed of output gear 74 will be in constant proportion to the speed of

input gear **68** when the leveler or evener device **75** is not used in association with assembly **16.**

The remaining gearing within gear box **65** includes three gears **84,86,88** mounted upon a common stub shaft rotatable about a fixed axis. Output gear **74** of unit **66** meshes with the outer gear **84** and thus drives it and the remaining gears **86,88.** Gear **86** meshes with and drives a gear **90** affixed to the countershaft **58** associated with intermediate drafting roll **20.** Through intermediate meshing gears **91,92,** gear **88** drives a gear **93** affixed to the countershaft **62** associated with rear drafting roll **24.** A gear **95** affixed to the same stub shaft as gear **92,** and rotatable in unison therewith, meshes with and drives a gear **97** affixed to the remaining countershaft **60** associated with intermediate drafting roll **22** of drafting assembly **16.**

On the opposite side of drafting assembly **16,** flexible drive means within center machine section **12** drivingly interconnects countershafts **58,60,62** with the shafts of associated ones of the rearward drafting rolls **20,22,24.** As is best shown in FIGS. **2,5** and **6,** such flexible drive means comprises a timing belt **96** entrained about timing pulleys **94,98** respectively affixed to countershaft **58** and the shaft of drafting roll **20;** a timing belt **100** entrained about timing pulleys **102, 104** respectively affixed to countershaft **60** and the shaft of drafting roll **22;** and a timing belt **106** entrained about timing pulleys **108, 110** respectively affixed to countershaft **62** and the shaft of rear drafting roll **24.** Timing belts **96,** 100, 106 are engaged intermediate their lengths by tensioning pulleys **112, 114, 116,** respectively. Pulleys **112, 114, 116** are mounted at the upper ends of associated ones of three identical support arms **118,** each of which is mounted adjacent its lower end for pivotal movement about a substantially horizontal fixed axis. As is shown in FIG. **6,** the support arm **118** mounting idler pulley **114** is biased adjacent its lower end by a spring element **120** so as to resiliently maintain pulley **114** in tensioning engagement with timing belt **100** in any forward-rearward adjustive position of the drafting roll **22** driven by such timing belt through pulley **102.** Identical spring means (not shown) provided in association with the support arms **118** mounting idler pulleys **112, 116** similarly maintain such idler pulleys in tensioning engagement with the respective timing belts **96,106** which drive drafting rolls **20,24.**

It will be apparent that positional adjustment of any or all of the adjustably movable drafting rolls **20, 22, 24** requires no manual adjustments of or changes in either the gearing disposed within gear box **65** or the flexible drive means disposed within center machine section **12,** and therefore can be quickly and easily effected. As the position of roll **20, 22** or **24** is changed, the pulley **98, 104** or **110** on the shaft thereof of course changes position therewith, and while the change in position **98,** 104 pulley **98,104** or **110** would normally tend to loosen or tighten the timing belt **96, 100** or **106** entrained thereabout, the tensioning pulley **112, 114** or **116** engaging the involved timing belt automatically and simultaneously undergoes a compensating change in position, due to the biasing effect of spring **120** upon its support arm **118,** which maintains the timing belt under proper tension. A person repositioning drafting rolls **20, 22** and/or **24** therefore need not adjust in any way the drive components within center section **12** or gear box **65** of machine **10,** or even remove the covers from such machine sections.

Various changes in the speeds of the rear drafting rolls of assembly **16** can also be quickly and properly effected, when desired, by virtue of the fact that all of the so-called "change gears" necessary to produce such speed changes are housed within readily-accessible gear box **65** of machine **10** and are rotatable about fixed centers. Changing gears **74, 84** changes the speed ratio between front drafting roll **18** and all of the rearward drafting rolls **20, 22, 24,** Changing gears **86,** 90 changes the speed of only drafting roll **20.** Changing gears **95, 97** similarly changes only the speed of drafting roll **22.** Any or all of the foregoing gear changes can be readily made by a semi-skilled textile mill employee, without danger of the gearing being improperly intermeshed or aligned, since the gears in question all are rotatable about fixed centers and are all readily accessible from one side of machine **10.** There is no necessity, in the latter connection, for a person changing the speed of rolls **20, 22** and **24** to in any way adjust or concern himself with any components within center section **12** of machine **10.** On the other hand, such components are readily accessible when required for purposes of inspection and/or eventual replacement of components.

The same results described above in connection with assembly **16** are also realizable in the same manner in connection with the second drafting assembly **16'** of machine **10.** It will further be apparent that changes in the position and/or speed of the rearward drafting rolls of assembly **16** may be made independently of changes made in association with the rearward drafting rolls of assembly **16',** and vice-versa. If desired, therefore, machine **10** could readily simultaneously process sliver under a first set of drafting conditions through one of its two drafting assemblies **16,16',** while simultaneously processing other sliver through the other drafting assembly under an entirely different set of drafting conditions.

While a preferred embodiment of the invention has been specifically shown and described, it is to be understood that this was for purposes of illustration only, and not for purposes of limitation, the scope of the invention being in accordance with the following claims.

That which is claimed is:

1. In combination with a two-delivery textile drawing machine having first and second sliver drafting assemblies each including a driven front bottom roll and a plurality of additional bottom rolls mounted rearwardly of the parallel to said front roll for independent adjustment toward and away from each other and said front roll to vary the spacing therebetween, first and second drive means respectively associated with said first and second drafting assemblies and each interconnecting said front roll and said rearward rolls of the associated one of said assemblies for driving said rearward rolls of said assembly at desired speeds in any adjustive position of said rolls, each said drive means comprising:

a plurality of axially-fixed countershafts corresponding in number to an underlying said rearward rolls of the associated one of said drafting assemblies and extending in spaced and generally parallel relationship to associated ones of said rearward rolls;

gearing means disposed adjacent one side of said one assembly and drivingly interconnecting said front roll thereof and said countershafts, said gearing means including a plurality of sets of change gears all rotatable about fixed axes, one of said sets being

adapted to control the speed of all said rearward rolls of said assembly, another of said sets being adapted to control the speed of only one of said rearward rolls of said assembly, and still another of said sets being adapted to control the speed of only another one of said rearward rolls of said assembly;

flexible timing belt drive means disposed adjacent the other side of said drafting assembly and drivably interconnecting respective ones of said countershafts and said rearward rolls, said timing belt means including a plurality of timing belts corresponding in number to said rearward rolls of said assembly and each interconnecting one of said rearward rolls and an associated one of said countershafts;

and a plurality of tension compensating assemblies corresponding in number to and each operatively associated with one of said timing belts, each of said tension compensating assemblies including a swing arm pivotally mounted adjacent one end thereof, an idler pulley mounted adjacent the other end of said arm for pivotal movement therewith, and spring means adjacent said one end of said arm biasing said arm in a direction urging said idler pulley into tensioning engagement with the associated one of said timing belts.

2. Apparatus as in claim **1,** including sliver leveling or evening devices operable in association with associated ones of said drafting assemblies when correction of variations in the uniformity of the sliver drafted by said assemblies is desired, and wherein said gearing means further includes an epicyclic gear unit driven by said front roll of said one assembly and adapted to also receive an output-modifying input from the associated one of said sliver leveling or evening devices during operation thereof in association with said one assembly.

3. In combination with a textile sliver drafting assembly having a driven front bottom roll and a plurality of additional bottom rolls mounted rearwardly of and parallel to said front roll for independent adjustment toward and away from each other and said front roll to vary the spacing therebetween, drive means interconnecting said front roll and said rolls rearwardly thereof for driving said rearward rolls at desired speeds in any adjustive position thereof, said drive means comprising:

a plurality of axially-fixed countershafts corresponding in number to and each extending generally parallel to an associated one of said rearward rolls;

gearing means drivably interconnecting said front roll and said countershafts, said gearing means including a plurality of change gears all rotatable about fixed axes;

flexible drive means drivably interconnecting said countershafts and associated ones of said rearward rolls;

tension compensating means biased into engagement with said flexible drive means and movable toward and away therefrom in response to tension variations therein for automatically maintaining said flexible drive means under proper tension in all adjustive positions of said rearward rolls;

said rearward rolls of said drafting assembly including a back roll and two intermediate rolls between said front roll and said back roll, and said gearing means further including a plurality of sets of said change gears for controlling the speeds of desired ones of said rearward rolls, one of said sets being adapted to control the speed of all of said rearward rolls, a second of said sets being adapted to control the speed of only one of said intermediate rolls, and a third of said sets of said change gears being adapted to control the speed of only the other of said intermediate rolls.

4. Apparatus as in claim **3,** wherein said countershafts underlie said drafting assembly and said gearing means is disposed adjacent and entirely to one side of said assembly and said flexible drive means is disposed distal from said gearing means adjacent and entirely to the other side of said assembly.

5. Apparatus as in claim **4,** wherein said flexible drive means comprises a plurality of timing belts and associated timing pulleys.

6. Apparatus as in claim **5,** wherein said tension compensating means comprises a plurality of tension compensating assemblies each operatively associated with a corresponding one of said timing belts, each of said tension compensating assemblies including a swing arm pivotally mounted adjacent one end thereof, an idler pulley mounted adjacent the other end of said arm for pivotal movement therewith, and spring means adjacent said one end of said arm biasing said arm in a direction urging said idler pulley into engagement with an associated one of said timing belts.

7. Apparatus as in claim **3,** wherein said countershafts underlie said rearward rolls, and wherein said flexible drive means include a plurality of timing belts each interconnecting associated ones of said countershafts and said rearward rolls.

8. In combination with a textile sliver drafting assembly and a sliver leveling or evening device operable in association with said drafting assembly to correct variations in the uniformity of the sliver drafted by said assembly, said assembly having a driven front bottom roll and a plurality of additional bottom rolls mounted rearwardly of and parallel to said front roll for independent adjustment toward and away from each other and said front roll to vary the spacing therebetween, drive means interconnecting said front roll and said rolls rearwardly thereof for driving said rearward rolls at desired speeds in any adjustive posistion thereof, said drive means comprising:

a plurality of axially-fixed countershafts corresponding in number to and each extending generally parallel to an associated one of said rearward rolls in underlying relationship to said rearward rolls;

gearing means disposed adjacent one side of said assembly and drivably interconnecting said front roll and said countershafts, said gearing means including a plurality of change gears all rotatable about fixed axes, and further including an epicyclic gear unit driven by said front roll and adapted to also receive an output-modifying input from said sliver leveling or evening device when said device is operable in association with said drafting assembly;

means associated with said epicyclic gear unit for rendering said unit responsive only to the driving input received thereby from said front roll when said sliver leveling or evening device is not operable in association with said assembly;

flexible drive means drivably interconnecting said countershafts and associated ones of said rearward rolls;

and tension compensating means biased into engagement with said flexible drive means and movable toward and away therefrom in response to tension variations therein for automatically maintaining said flexible drive means under proper tension in all adjustive positions of said rearward rolls.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,869,759 Dated 11 March 1975

Inventor(s) Richard J. Savageau et al

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

Col. 5, line 55, "98," should read -- of --; line 56, the first numeral "104" should be deleted.
Col. 6, line 49, "the" should read -- and --; line 59, "an" should read -- and --.
Col. 8, line 29, "include" should read -- includes --.

Signed and sealed this 6th day of May 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks