April 18, 1967 W. K. WYATT 3,314,114

APPARATUS FOR PROCESSING TEXTILES

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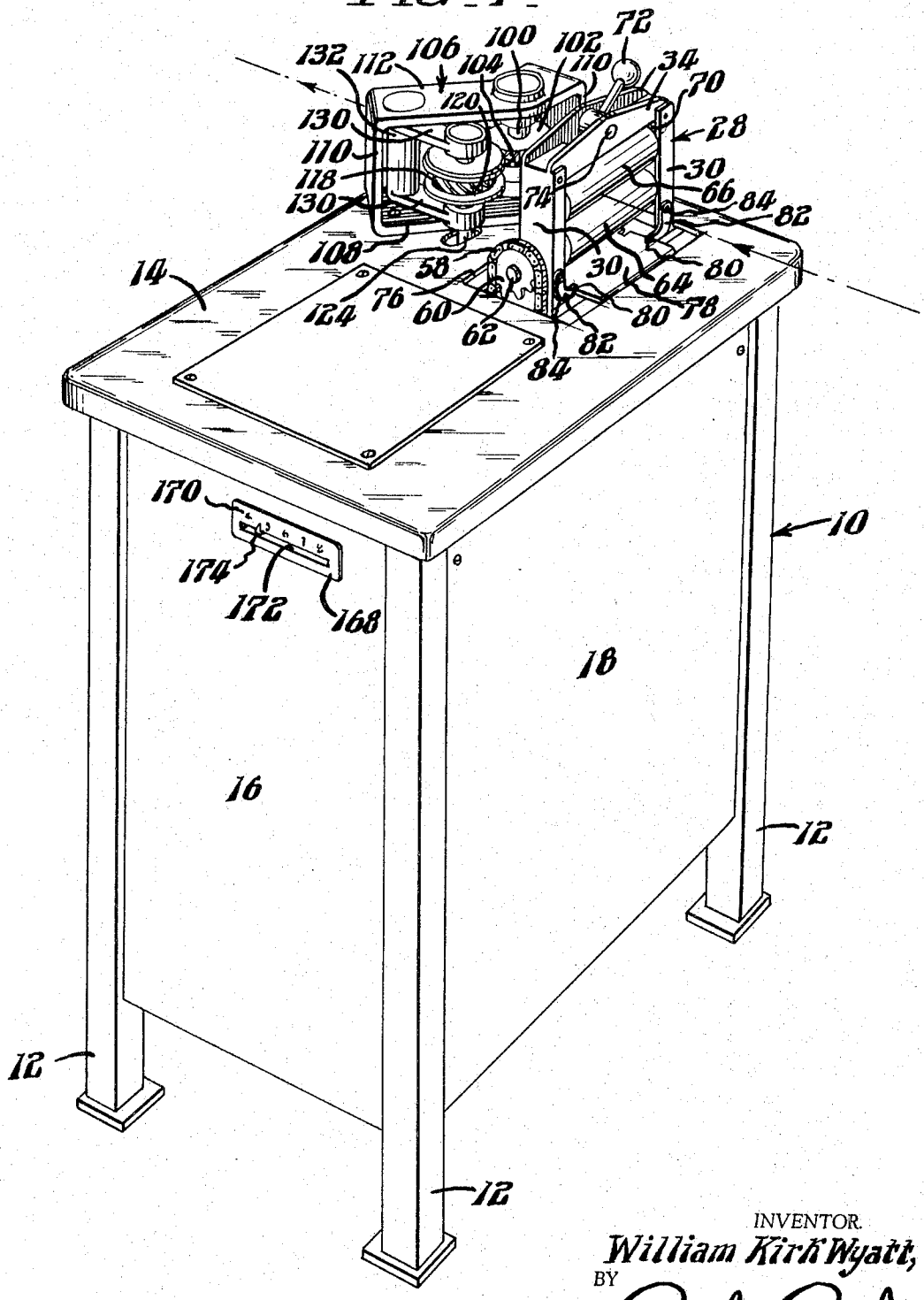
FIG. 1



INVENTOR.
William Kirk Wyatt,
BY
Paul & Paul
ATTORNEYS.

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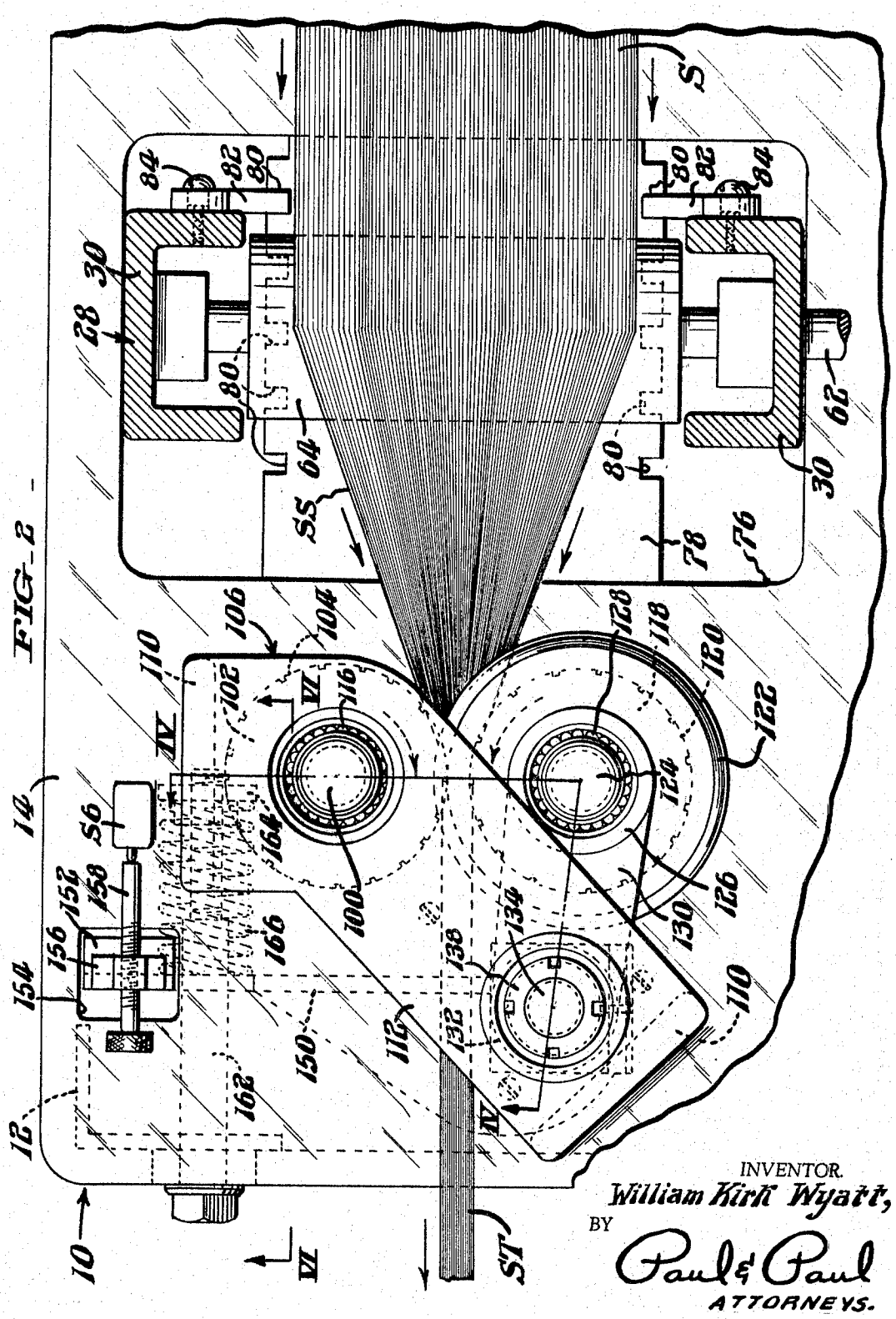
FIG. 2



INVENTOR.
William Kirk Wyatt,
BY
Paul & Paul
ATTORNEYS.

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APPARATUS FOR PROCESSING TEXTILES

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FIG. 3

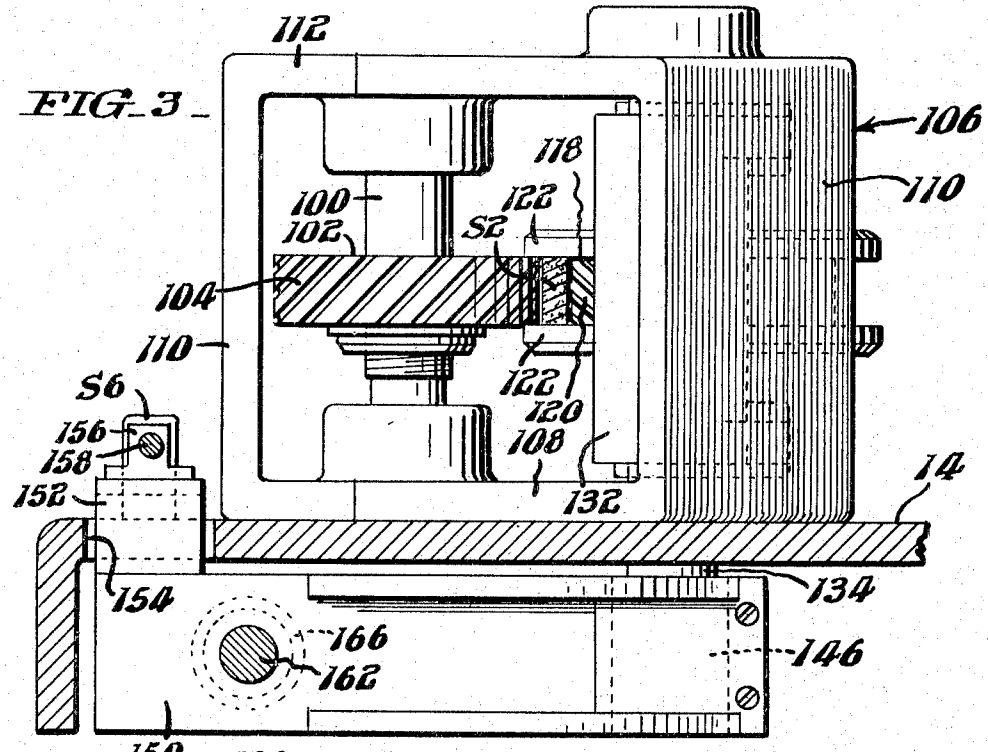
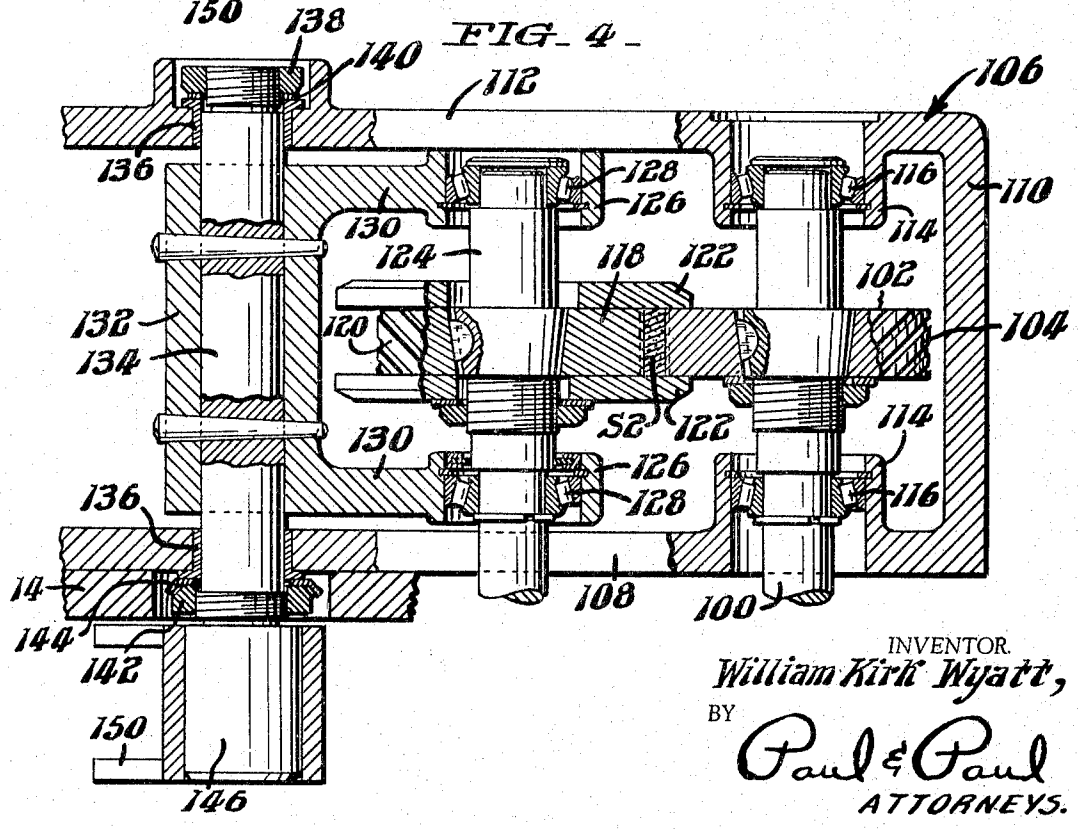


FIG. 4



INVENTOR.
William Kirk Wyatt,
BY
Paul & Paul
ATTORNEYS.

April 18, 1967 W. K. WYATT 3,314,114

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FIG. 5

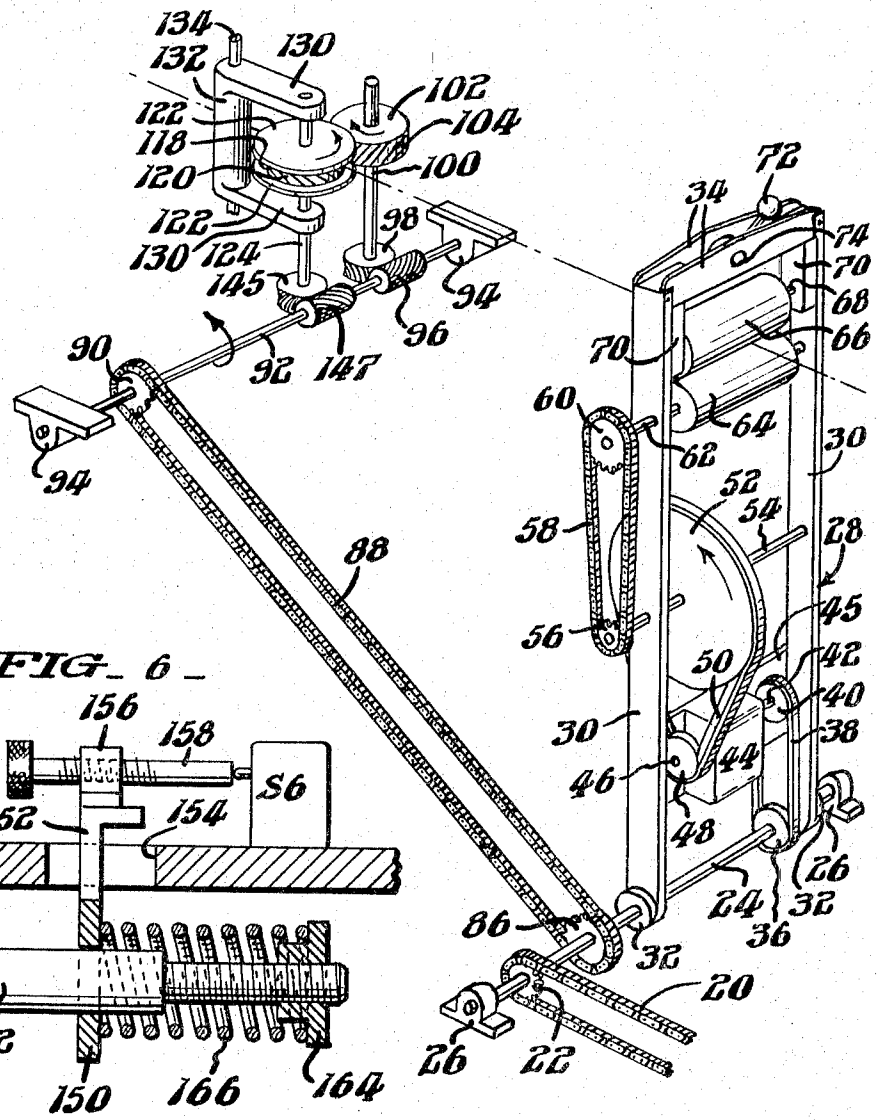

FIG. 6

INVENTOR.
William Kirk Wyatt,
BY
Paul & Paul
ATTORNEYS.

April 18, 1967 W. K. WYATT 3,314,114

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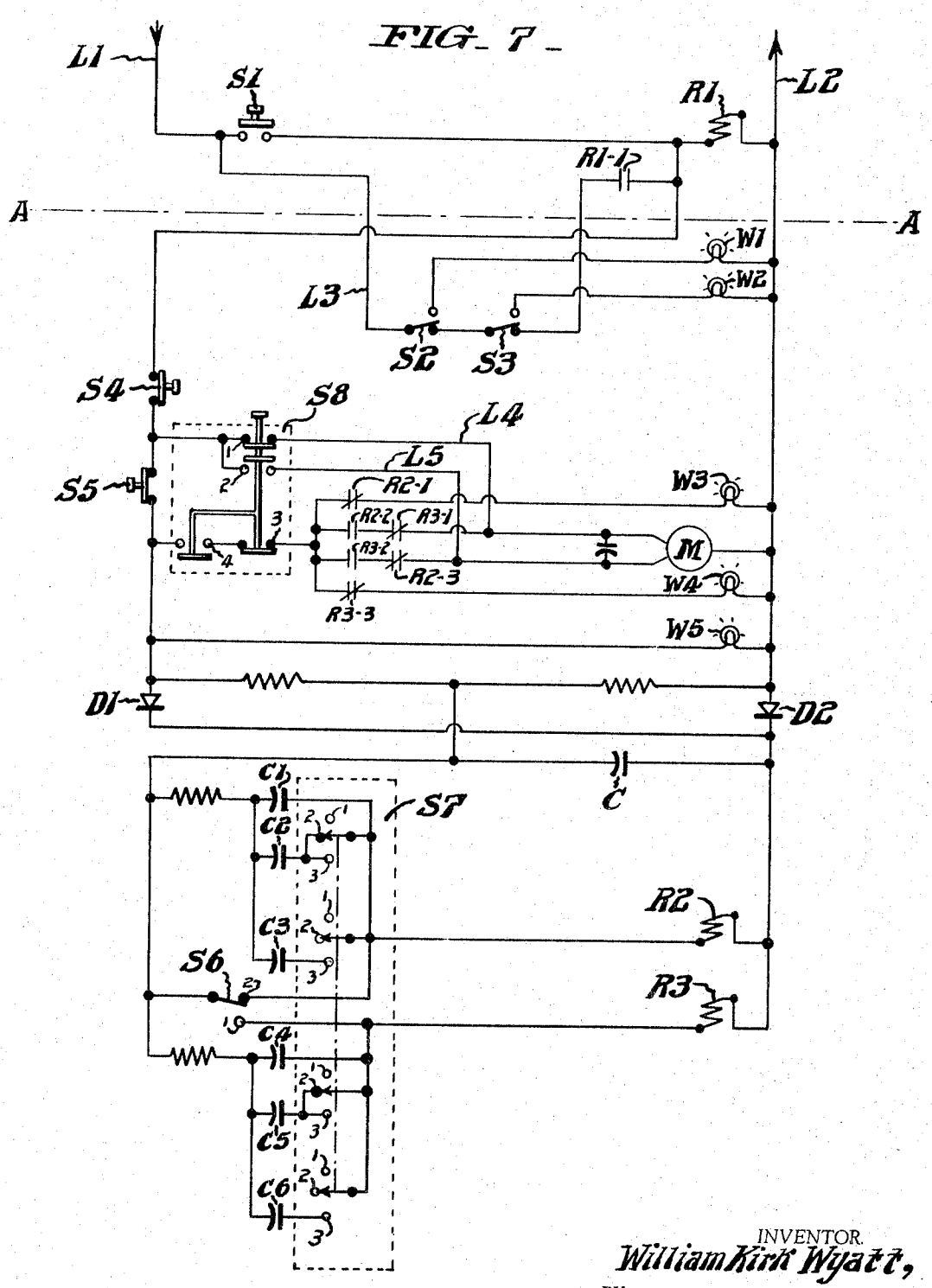
FIG. 7



INVENTOR.
William Kirk Wyatt,
BY
Paul & Paul
ATTORNEYS.

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APPARATUS FOR PROCESSING TEXTILES

William Kirk Wyatt, Lansdale, Pa., assignor to Turbo Machine Company, Lansdale, Pa., a corporation of Pennsylvania

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1 Claim. (Cl. 19—240)

This invention relates generally to method and apparatus for processing textiles and particularly to method and apparatus for drawing and automatically leveling the textile.

In the continuous processing of sliver, short term variations disappear after about five yards, but long term variations persist longer. It is recognized that short term variations are not critical because doubling takes care of this problem satisfactorily. However, doubling does not take care of long term variations satisfactorily. There fore, in accordance with common practice, before final gilling, the sliver is fed into cans and then the net weights are computed and leveled. This practice is not entirely satisfactory because it is awkward, time consuming and expensive.

Accordingly, an important object of the invention is to provide method and apparatus for continuously drawing and automatically correcting solely for long term variations in the weight of sliver in order to reliably maintain uniform can to can weight of sliver.

Another object is to provide such apparatus wherein, in response to variations in sliver thickness, delayed action means changes the rate of sliver feed as required to correct for long term variations in sliver thickness.

Another object is to provide such appartaus with measuring and nip rolls between which the sliver is drawn, and with means for varying the distance between said rolls to accommodate varying lengths of sliver fibers.

Another object of the invention is to provide such apparatus which is flexible in use because it may be set up in an existing line of machines.

Other objects of the invention will become apparent when the following description is read with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of apparatus constructed in accordance with the invention;

FIG. 2 is a fragmentary combination plan view and horizontal section of the apparatus;

FIG. 3 is an end view of the apparatus appearing in FIG. 2, looking upstream of the path of flow of the sliver, with portions of the table and drive structure shown in section for convenience of illustration;

FIG. 4 is a section on line IV—IV in FIG. 2;

FIG. 5 is a perspective view of essential parts of the apparatus;

FIG. 6 is a fragmentary section on line VI—VI of FIG. 2; and

FIG. 7 is a wiring diagram.

The following description is directed to the specific embodiment of the invention illustrated in the drawings and is not addressed to the scope of the invention, which may be practiced in a variety of forms.

Referring to FIGS. 1–7, apparatus constructed in accordance with the invention comprises a rigid frame structure, generally designated **10**. The structure stands upon four upright legs **12** supporting a horizontally extending top **14**. In the front of the structure, between the legs **12**, is a skirt plate **16**, and on each of the opposite sides of the structure, between the legs **12**, is a skirt plate **18**.

A chain drive **20** from a pin drafter (not shown) is trained about a sprocket **22**, which is mounted upon a horizontally extending shaft **24**. The opposite end portions of the shaft are received by bearings **26**, which are carried by the frame **10**.

Mounted upon the shaft **24** is a rigid frame **28** of inverted U-shape. The frame is provided with laterally spaced legs **30** at the lower extremities of which are hubs **32** which receive the shaft **24**. The upper terminal portions of the legs **30** are connected together by laterally spaced bars **34**.

Affixed to the shaft **24** is a pulley **36** about which is trained a V belt **38**. The V belt is also trained about a pulley **40** mounted upon the input shaft **42** of a variable speed unit **44** carried by a bracket **45** affixed to the legs **30**. The output shaft **46** of the variable speed unit mounts a pulley **48** about which is trained a V belt **50**. The V belt is also trained about a pulley **52** affixed to a horizontally extending shaft **54** opposite end portions of which are journalled in the legs **30**. Affixed to the shaft **54** is a chain sprocket **56** about which is trained a chain **58**. The chain is also trained about a sprocket **60** affixed to a horizontally extending shaft **62** opposite end portions of which are journalled in the legs **30**. Mounted upon the shaft **62**, between the legs **30**, is a cylindrical nip roll **64** provided with a rubber surface. Overlying the roll **64** is another cylindrical nip roll **66** provided with a rubber surface. The roll **66** is mounted upon a horizontally extending shaft **68** opposite end portions of which are carried by suitable bearings **70** for vertical shifting movement. A handle **72**, pivoted as at **74**, is provided for raising and lowering the roll **66** relative to the roll **64**.

Formed in the horizontally extending top **14** is a large opening **76** across which extends a keeper plate **78**. The opposite side marginal portions of plate **78** are provided with a series of notches **80** adapted to receive latches **82**, pivoted as at **84** to the legs **30**.

Affixed to the shaft **24** is a sprocket **86** about which is trained a chain **88**. The chain **88** is also trained about sprocket **90** affixed to a horizontally extending shaft **92**, opposite end portions of which are received in bearings **94**, which are carried by the frame **10**. Affixed to the shaft **92** is a worm **96** which meshes with a worm wheel **98** affixed to the lower end portion of a vertically extending shaft **100**. Affixed to the upper end portion of the shaft **100** is a measuring roll **102** provided with a serrated rim **104**.

Seated upon the horizontally extending top **14** and affixed thereto is an open frame, generally designated **106**. The frame is provided with a horizontally extending base **108** and upright opposite end walls **110** supporting a horizontally extending top **112**. Extending upwardly from the base **108** and depending from the top **112** are a pair of sleeves **114** housing a pair of aligned thrust bearings **116**, which receive opposite end portions of the shaft **100**. The measuring roll **102** is disposed between the bearings **116**, while the worm wheel **98** is disposed below the lower bearing **116**.

Aligned with the measuring roll **102** is a measuring roll **118** provided with a serrated rim **120**, and with a pair of flanges **122** which receive therebetween a marginal portion of the measuring roll **102**. The measuring roll **118** is affixed to a vertically extending shaft **124**, opposite end portions of which are received respectively by a pair of thrust bearings **128** housed in sleeves **126** carried by a pair of laterally spaced arms **130** joined together by a cylindrical hub **132**. A worm wheel **145** is affixed to the lower end portion of the shaft **124** and is mounted for meshing with a worm **147** affixed to the shaft **92**. The worms **96** and **147** are of opposite hand.

The hub **132** is affixed to a vertically extending shaft **134**, upper end and intermediate portions of which are journalled in bushings **136** carried respectively by the top and base of the frame **105**. Threaded onto the upper end portion of the shaft **134** is a nut **138** and interposed between the nut and the bushing **136** is a washer **140**.

Threaded onto the lower end portion of the shaft 134 is a nut 142 and interposed between the nut and the bushing 136 is a washer 144.

The lower terminal portion 146 of the shaft 134 is enlarged in diameter to receive the hub portion of a horizontally extending arm 150. The arm 150 mounts an upright extension 152 which extends through an opening 154 in the horizontally extending top 14. Mounted upon the extension 152 is a block 156 through which is threaded a screw 158 arranged to actuate a micro-switch S6. Extending through the proximate leg 12 is a bolt 162, the inner end portion of which is reduced in diameter. Threaded upon the reduced diameter portion of the bolt 162 is a nut 164, and interposed between the arm 150 and the nut 164 is a compression spring 166.

Mounted upon the skirt plate 16, on the front of the apparatus, is a plate 168 bearing indicia 170. Extending through the plate 168 and the skirt plate 16 is an opening 172 for a pointer 174 carried by the frame 28 for indicating the position thereof.

In the operation of the apparatus, sliver S from a creel passes between rubber covered nip rolls 64 and 66 and is spread as much as possible in order that as many fibers as possible are gripped. The distance between the rolls 64 and 66 is adjusted by swinging handle 72 about pivot 74 to raise or lower roll 66 relative to roll 64. Upon leaving the rolls 64 and 66, the fibers are gathered, as at SS, and passed between measuring rolls 102 and 118, being confined therebetween by flanges 122. The fibers issue from the measuring rolls in compacted form, as at ST.

Power may be taken from the following pin drafter, for example, by drive chain 20. The chain, through sprocket 22, drives shaft 24 and pulley 36. The pulley, through belt 38 and pulley 40, drives shaft 42, the input shaft of variable speed drive 44. The output shaft 46 of the variable speed drive, through pulley 48 and belt 50, drives pulley 52 and shaft 54. The shaft, through sprocket 56 and chain 58, drive sprocket 60, shaft 62 and roll 64. Roll 66 is actuated by a portion (not shown) of roll 64 in contact with it.

Sprocket 86 turns with shaft 24, and through chain 88 and sprocket 90 it drives shaft 92 and worms 96 and 147. The worms drive shafts 100 and 124 and measuring rolls 102 and 118. The speed of rotation of the measuring rolls 102 and 118 bears a predetermined relation to the speed of operation of the pin drafter.

Spring 166 urges arm 150 counterclockwise as viewed in FIG. 2. Thus arms 130 are urged counterclockwise, and movable measuring roll 118 is urged toward the fixed measuring roll 102.

Normally, the position of movable measuring roll 118 does not change relative to the measuring roll 102, but when the thickness of the product passing between the measuring rolls is excessive, the measuring roll 118 swings clockwise away from the measuring roll 102 against the action of the spring 166, and when the thickness of the product passing between the measuring rolls is below the desired thickness, the measuring roll 118 swings counterclockwise farther toward the measuring roll 102 under the influence of spring 166.

When the sliver passing between the measuring rolls is too heavy, drafting should be increased, and when the sliver passing between the measuring rolls is too light, drafting should be reduced. The degree of drafting depends upon the surface speed of rolls 64 and 66 relative to the surface speed of rolls 102 and 118.

The adjustable pin 158 shifts back and forth axially in response to movement of the measuring roll 118 and actuates a micro-switch S6. This micro-switch is connected in an appropriate electrical system, to be described hereinafter, which slows up or speeds up operation of rolls 64 and 66 as required to correct the variations in the weight of sliver passing between the measuring rolls. However, the corrections that are effected are delayed sufficiently to take care of long term variations. Short term variations are not corrected.

Referring particularly to FIG. 7, the part of the wiring diagram above the broken line A—A shows a portion of a pin drafter circuit. A start switch is designated S1. A relay is designated R1, and its contacts are designated R1–1.

The portion of the diagram below the line A—A shows the basic circuit of the leveler. Override limit switches are designated S2 and S3. A power "off-on" switch is designated S4 and an automatic control "off-on" switch is designated S5. Diode rectifiers operating to provide a suitable potential across a capacitor C are designated D1 and D2. A rotary switch provided with four arms with three positions for each arm is designated S7. A relay is designated R2, and its contacts are designated R2–1, R2–2 and R2–3. Another relay is designated R3, and its contacts are designated R3–1, R3–2 and R3–3. A series of capacitors associated with the switch S7 are designated C1 through C6. A selector switch having three positions is designated S8. A reversible motor is designated M, and signal lights are designated W1 through W5. The main power supply line is designated L1, L2, and other conductors are designated L3, L4 and L5.

A.C. current is supplied by line L1, L2. When the start switch S1 is closed, the relay R1 is energized. This closes the contacts R1–1, whereupon current is supplied to the conductor L3. With power switch S4 closed and automatic control switch S5 closed, current is supplied to lamp W5, which indicates to the operator that the leveler is set for automatic operation. The arm of switch S6 oscillates between its switch contacts 1 and 2, its movement depending upon variations in the thickness of the sliver passing between measuring rolls 102 and 118.

When the measuring rolls sense that the sliver is less than the desired thickness, i.e., that it is light, the arm of switch S6 engages the upper switch contact 2, as shown. Thereupon, the relay R2 is energized. The capacitors C4, C5 and C6 discharge before the arm of switch S6 engages the upper switch contact 2, in consequence of which when the arm of switch S6 engages the upper switch contact 2, the capacitors C4, C5 and C6 are not charged. Therefore, the relay R3 is energized when relay R2 is energized. Open contacts R2–2 and R3–2 close, and closed contacts R2–1, R3–1, R2–3 and R3–3 open. With the selector switch S8 set for automatic control, its contacts at 1 and 2 are open, and its contacts at 3 and 4 are closed. Consequently, motor M and lamps W3 and W4 are not energized. When the capacitors C4, C5 and C6 are fully charged, the relay R3 is deenergized. Thus contacts R3–1 and R3–3 reclose, and contacts R3–2 reopen. Since the contacts R2–2 and R3–1 are closed, current is supplied to the motor M for running in one direction. Since the contacts R3–3 are closed, current is supplied to the lamp W4, which indicates to the operator that a light material correction is in progress.

When the rolls sense that the sliver exceeds the desired thickness, i.e., that it is heavy, the arm of switch S6 engages the lower switch contact 1. Thereupon, the relay R3 is energized. The capacitors C1, C2 and C3 discharge before the arm of switch S6 engages the lower switch contact 1, in consequence of which when the arm of switch S6 engages the lower switch contact 1, the capacitors C1, C2 and C3 are not charged. Therefore, the relay R2 is energized when relay R3 is energized. The open contacts R2–2 and R3–2 close, and closed contacts R2–1, R3–1, R2–3 and R3–3 open. Therefore, the motor M and lamps W3 and W4 are not energized. When the capacitors C1, C2 and C3 are fully charged, the relay R2 is deenergized. Thus contacts R2–1 and R2–3 reclose. Since contacts R3–2 and R2–3 are closed, current is supplied to the motor M for running in the opposite direction. Since the contacts R2–1 are closed, current is supplied to the lamp W3, which indicates to the operator that a heavy material correction is in progress.

It will be noted that the correction, whether for light material or heavy material, does not take place immediately, but only after a time delay, the delay depending upon setting of the rotary switch S7, which determines the number of effective capacitors. In addition, of course, it depends upon the size of the capacitors. The delay may be in the order of six seconds which is sufficient time for passing five or six yards of the sliver through the measuring rolls.

When the arm of switch S6 is in neutral position, relays R2 and R3 both are energized. Contacts R2–1, R3–1, R2–3 and R3–3 open, and contacts R2–2 and R3–2 close, in consequence of which no current is supplied to the motor M or to the lamps W3 and W4. When the effective capacitors associated with the switch S7 are fully charged, the relays R2 and R3 are deenergized. The contacts R2–1, R3–1, R2–3 and R3–3 reclose, and contacts R2–2 and R3–2 reopen, in consequence of which again no current is supplied to the motor M or to the lamps W3 and W4. The motor M, of course, controls the variable speed unit.

The variable speed unit comprises a pair of flanges axially shiftable relative to each other and controlled by the motor for varying the pitch of the pulley which they conjointly form. The switches S2 and S3 are associated with these flanges so that when the correction called for is beyond the capacity of the unit, one or the other of the switches opens, shutting down the leveler. When the switch S2 opens, its arm engages its upper contact. Thus current is supplied to lamp W1, which indicates to the operator that the material is running too light for correction. When the switch S3 opens, its arm engages its upper contact. Thus current is supplied to lamp W1, which indicates to the operator that the material is running too heavy for correction. If the material is running too light for correction, the automatic control switch S5 is opened by the operator and the selector switch S8 is put on "light," as shown. Thereupon, current is supplied to the motor M through conductor L4 for making the necessary correction. If the material is running too heavy for correction, the automatic control switch S5 is opened and the selector switch S8 is put on "heavy." Thus current is supplied to the motor M through conductor L5 for making the necessary correction.

What is claimed is:

In apparatus for the continuous processing of sliver, the combination comprising a pair of nip rolls at the upstream end and a pair of measuring rolls at the downstream end of a drafting zone, a rigid frame mounting said nip rolls and mounted for pivotal movement for positioning said nip rolls a selected distance from said measuring rolls, means releasably securing said frame with said nip rolls in the selected position thereof, means stationarily mounting one of said measuring rolls, means rockably mounting the other of said measuring rolls, means yieldably biasing the same toward the stationary measuring roll, and means for actuating said nip rolls and measuring rolls in predetermined timed relation to each other for positively advancing said sliver and drafting the same to level the weight thereof per unit of length including a main drive shaft, said rigid frame being pivoted on said main drive shaft, an auxiliary drive shaft driven by said main drive shaft, means gearing said auxiliary drive shaft to said measuring rolls whereby to drive the same in opposite directions, means interposed between said main drive shaft and nip rolls whereby to drive the same in opposite directions including a variable speed unit mounted upon said rigid frame, and means responsive to the movement of said rockable means for varying the speed of operation of said measuring rolls after a predetermined time delay as required to correct for any long term variations in the weight of the sliver.

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MERVIN STEIN, *Primary Examiner.*

DORSEY NEWTON, *Examiner.*