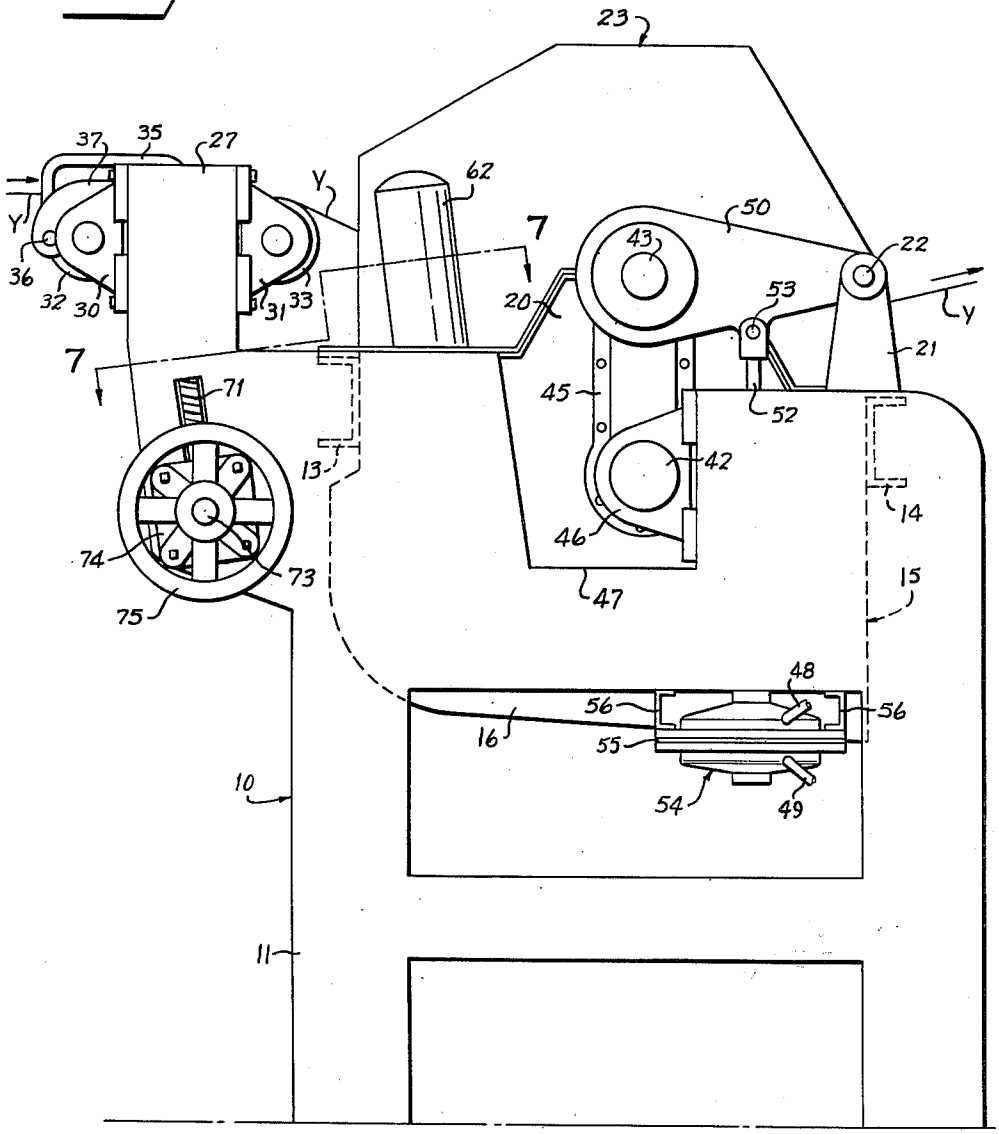
Jan. 11, 1955 I. L. GRIFFIN 2,698,984

APPARATUS FOR SIZING YARN

Filed May 12, 1952 7 Sheets-Sheet 1

Fig. 1



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BY Eaton & Bell

ATTORNEYS

Jan. 11, 1955 I. L. GRIFFIN 2,698,984

APPARATUS FOR SIZING YARN

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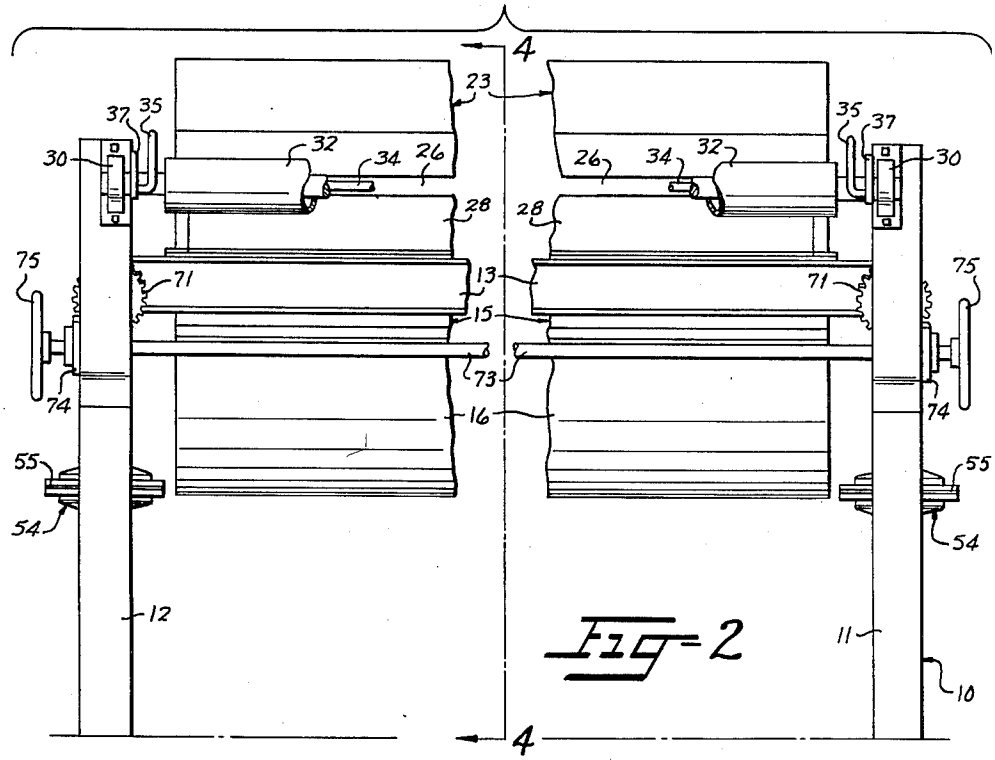

Fig. 2

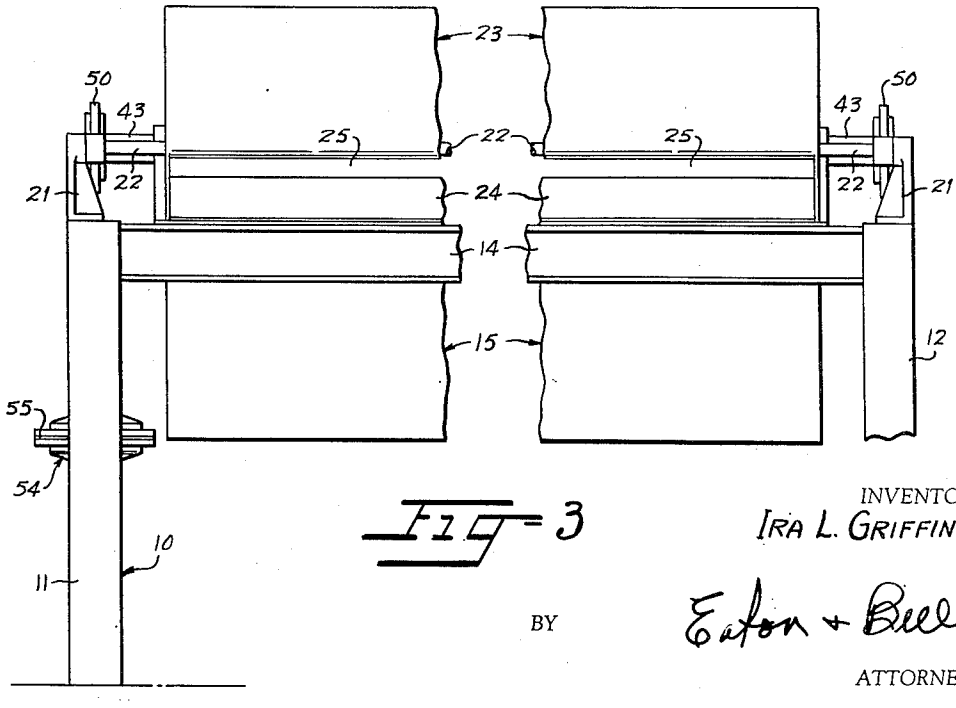

Fig. 3

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APPARATUS FOR SIZING YARN

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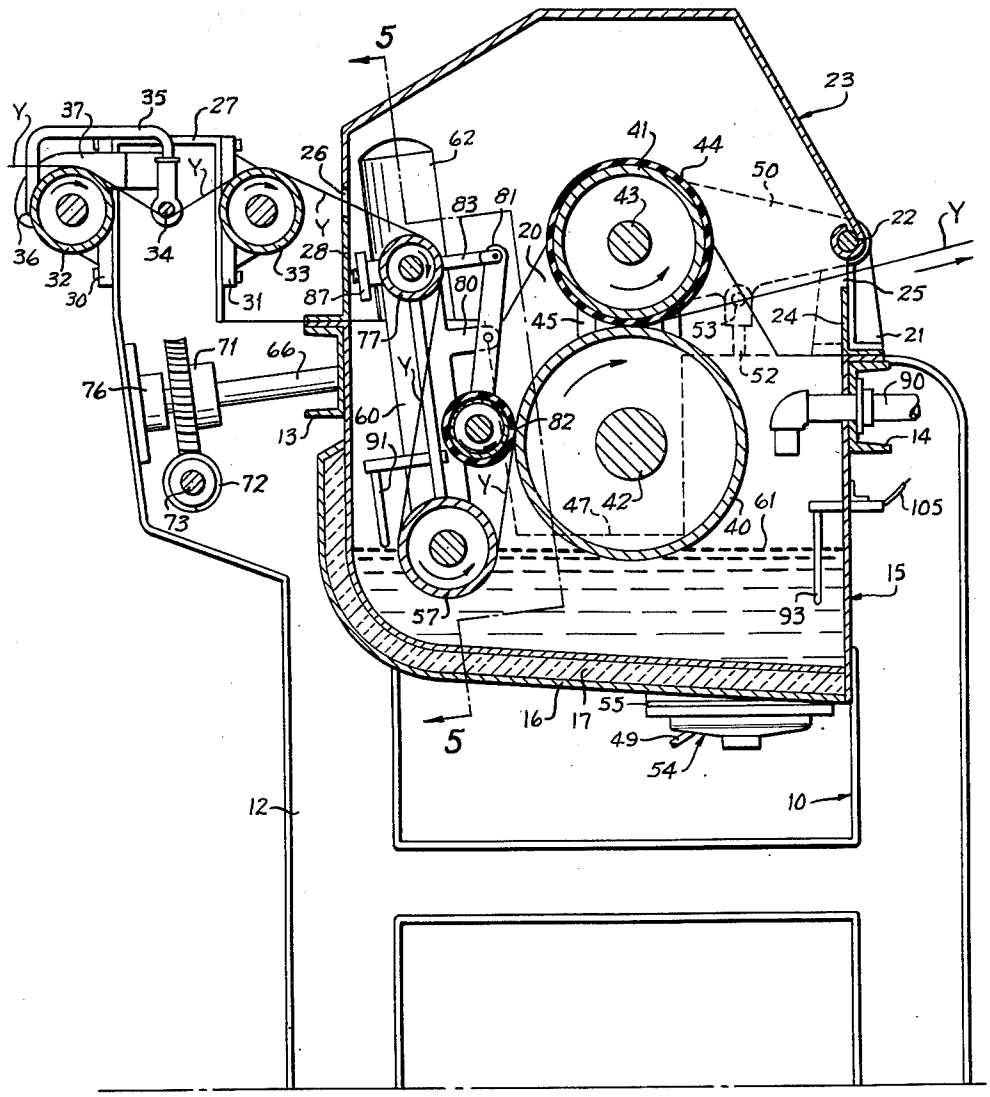
Fig. 4



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Jan. 11, 1955 I. L. GRIFFIN 2,698,984

APPARATUS FOR SIZING YARN

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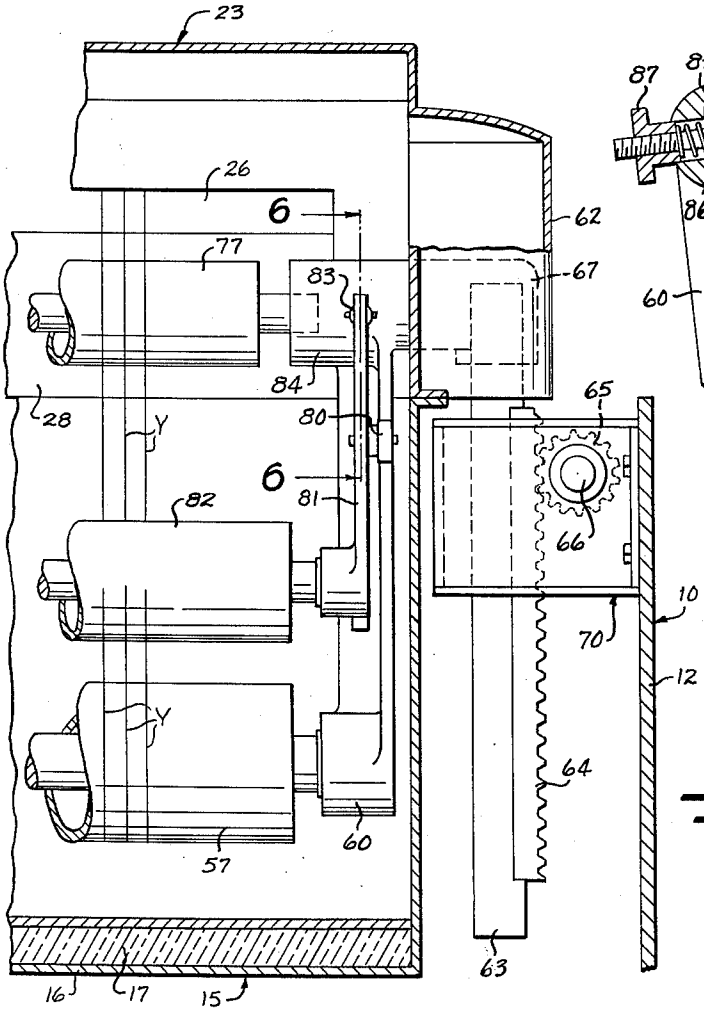

Fig. 5

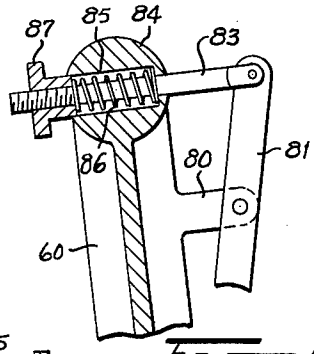

Fig. 6

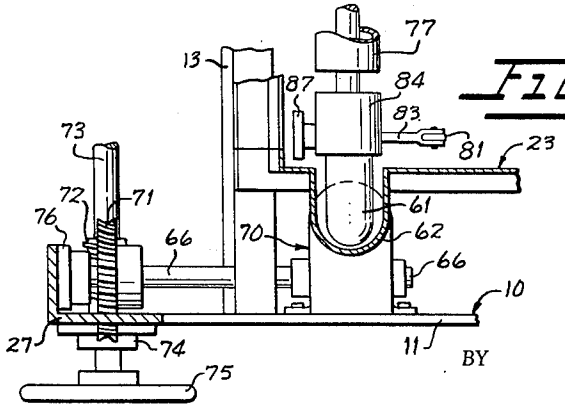

Fig. 7

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APPARATUS FOR SIZING YARN

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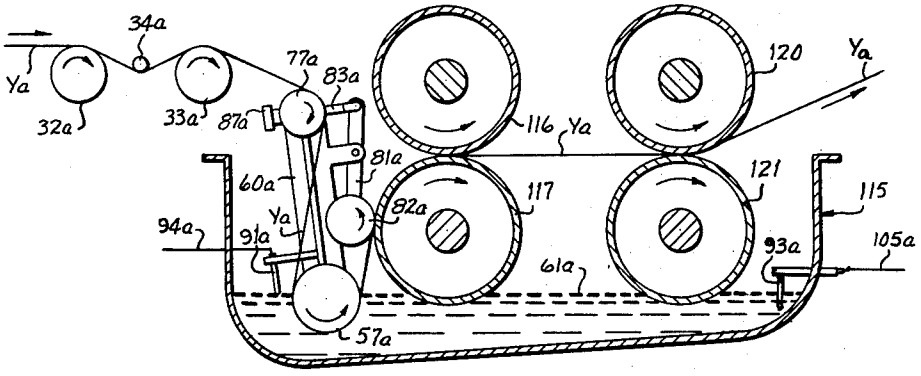
Fig- 9



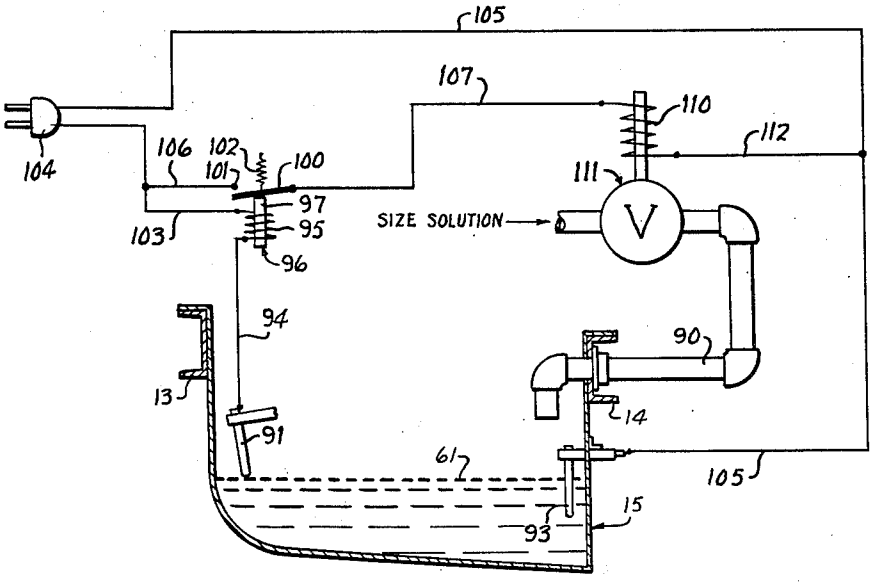


Fig- 8

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APPARATUS FOR SIZING YARN

Filed May 12, 1952 7 Sheets-Sheet 6

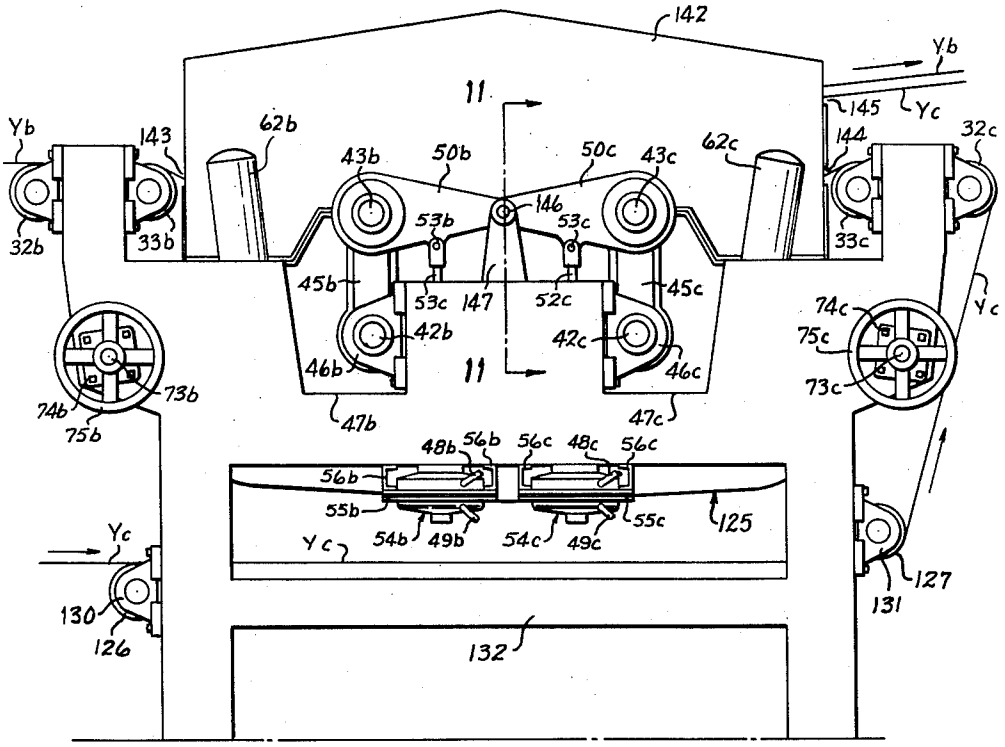

Fig-10

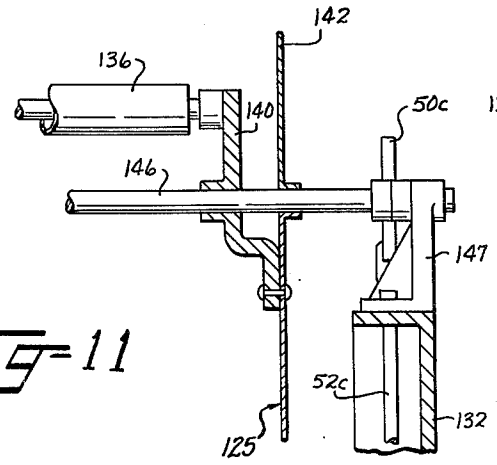

Fig-11

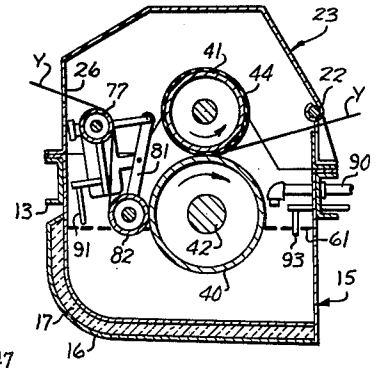

Fig-13

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APPARATUS FOR SIZING YARN

Filed May 12, 1952 7 Sheets-Sheet 7

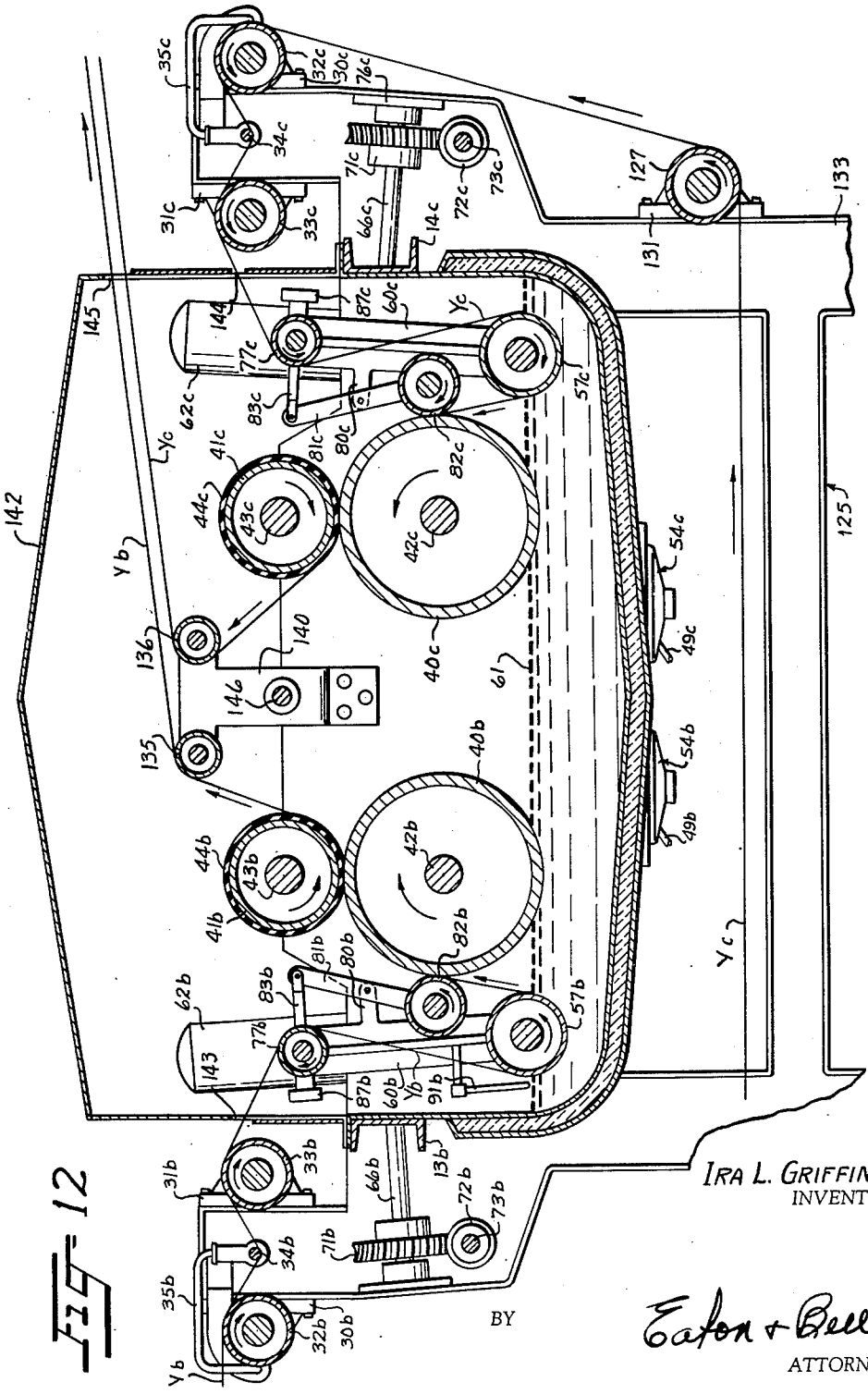

Fig. 12

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ATTORNEYS.

United States Patent Office 2,698,984
Patented Jan. 11, 1955

2,698,984

APPARATUS FOR SIZING YARN

Ira L. Griffin, Charlotte, N. C.

Application May 12, 1952, Serial No. 287,349

14 Claims. (Cl. 28—28)

This invention relates to the sizing of yarn and more especially to an improved apparatus and method for applying sizing solution to the yarn as it passes through the size box of a slasher.

This invention is a continuation in part of my copending application entitled Apparatus for Sizing Yarn, Serial Number 262,780, filed December 21, 1951, now abandoned.

In the early days of sizing, yarns were passed through a size box of a slasher at speeds of from five to ten yards per minute. They are now passed through the size box of a slasher at speeds of from ninety to one hundred yards per minute and, in some instances, they travel at speeds in excess of one hundred yards per minute. It is evident that the faster the yarns travel from the immersion roll to the squeeze rolls, the greater the amount of sizing solution picked up by the yarns and, consequently, a large amount of this solution will be positioned and trapped between the yarns and the lower squeeze roll, and as the yarns move up to the nip between the upper and lower squeeze rolls, and pressure is applied by the upper squeeze roll, this sizing solution can only seep out upwardly between the yarns. This tends to balloon the yarn or separate the webbed sheet formed by the sizing solution and to form the yarns into ropes or tapes.

In attempting to overcome these defects, the pressure on the upper squeeze rolls has been relatively increased, but this has still not been effective. Consequently, these closely grouped yarns in rope and tape form carry an excessive amount of sizing solution when they pass out of the size box of a slasher, and, when dried, this excess solution has formed a film of such density and strength as to cause breakage of yarn at the dry lease rods where separation of one yarn or thread from another is effected. Also, at this point of separation, the film of dry size has ruptured, causing roughness and shedding of the size film. On the other hand, when the yarn or thread is broken, as the yarns are separated at the dry lease rods, the broken yarn or thread would adhere to another yarn or thread or yarns or threads thereby producing a double yarn or thread and, finally faulty cloth.

Heretofore, the first nip of the conventional size box of a slasher has been placed at the wrong place for a high speed operation, and, it is therefore an object of this invention to overcome the defects heretofore present, by changing the position of the first nip, by adding a new pressure roll which contacts the yarns at the same time that the yarns are contacted by the lower squeeze roll. Thus, the excess sizing solution is pressed therefrom at a point in advance of the nip of the upper and lower squeeze rolls and where the excess sizing solution can drop, by gravity, back into the size tank and will not be carried along with the yarn.

The usual immersion roll is supported by brackets which are adjustable vertically and it is another object of this invention to provide an electrode which is attached to one of the immersion roll supporting brackets for controlling the level of the sizing solution within the size tank so the level of the sizing solution is maintained constant relative to the immersion roll.

Thus, the level of the sizing solution within the tank may be maintained so that the yarn contacts the immersion roll before it contacts the level of the sizing solution. This prevents splits in the yarn sheets or rolling of the yarn, and helps to insure a uniform spread of the yarn as it travels beneath and around the immersion roll

on its way to the first nip for removal of surplus sizing solution. Obviously, this results in a more uniform application of size to all of the yarns in the sheet.

The new pressure roll, which may also be termed as a stripper regulator roll, is mounted to move vertically in fixed relation to the immersion roll when it is adjusted. The stripper regulator roll has a rubber or other impervious covering and, since it is mounted to move vertically in fixed relation to the immersion roll, it contacts the yarn at the point at which the yarn meets the lower squeeze roll. The pressure of the stripper regulator roll against the lower squeeze roll may be of any amount, but is preferably less than the pressure of the upper squeeze roll against the lower squeeze roll. This stripper regulator roll maintains the ends or yarns alined in side by side relation and causes the excess sizing solution to drop back into the box thus limiting the amount of sizing solution which continues up to the nip of the upper and lower squeeze rolls.

There is a certain amount of sizing solution which is carried on the yarns to the nip of the upper and lower squeeze rolls, and at high speed operation, it has been found that this is largely on the top of the yarn sheet and that it will balloon backwardly from the nip of the upper and lower squeeze rolls to form a well or puddle approximately two or three inches wide extending across the top of the yarn just rearwardly of the nip of the upper and lower squeeze rolls. This assists in applying the sizing solution to the yarns in an even manner.

It is preferable that the upper squeeze roll be covered with rubber rather than employing a normal blanket covered squeeze roll. The blanket covered upper squeeze roll could be used but, in using the improved stripper regulator rolls to squeeze excess solution from the yarns before the yarns meet the squeeze rolls, it has been found that the rubber covered roll is sufficient and results in a better product and it does not have to be changed often.

It is still another object of this invention to provide a pair of the improved stripper regulator rolls in conjunction with a double entry size box also resulting in an improved double entry size box wherein the principles of the present invention apply as above-noted. The improved double entry size box has one housing, one size tank, and one set of controls. The purpose of the double entry size box is to permit yarns in dense warps to be processed with the same evenness and quality and at high speed by dividing the yarn into two separate sheets, one sheet entering the front of the size box and the other passing beneath the size box and entering the back side of the size box. When the two sheets of yarn pass from between the nip of the corresponding sets of upper and lower squeeze rolls, each of the sheets of yarn passes over its own guide roll, which guide roll may or may not have a woolen sleeve thereon. One end of each of the guide rolls is slidably mounted in a socket so that it can be lifted out to remove the sleeve for cleaning purposes. The sleeve is of knitted material and acts as a blanket. It serves as a blotter for the yarns after they leave the nips of the corresponding rubber covered squeeze rolls.

It has been found that, when more than approximately twenty-eight hundred strands of yarn are used on a fifty-four inch width creel, the yarns or ends are so close together that the sizing solution is not evenly blotted or the surplus solution is not evenly removed, and frequently bridges between the adjacent yarns or ends and causes the same to adhere together, which causes obvious defects when the yarns reach the dry lease rods. When the yarns reach the dry lease rods, the bridging size breaks and causes uneven surfaces on the yarns. By the use of the double entry size box, the benefits of single end sizing are approached by not crowding the yarn.

It is another object of this invention to provide a somewhat modified form of means for stripping excess sizing solution from the yarns in advance of the yarn passing between the upper and lower squeeze rolls of the size box, which means is embodied in a combination immersion roll and stripper regulator roll, and wherein the yarns pass over an idler roll and then beneath the at least partially submerged combination immersion and

stripper regulator roll, the combination immersion and striper regulator roll being resiliently pressed against the adjacent bottom squeeze roll to thus squeeze the excess sizing solution from the yarn in advance of the yarn passing between the squeeze rolls.

The yarn in this form of the invention also contacts the combined immersion roll and stripper regulator roll before the yarn enters the sizing solution. This prevents the yarn from sticking to the stripper roll.

It is another object of this invention to direct the yarn to the immersion roll in a size box at such an angle that the yarn contacts the immersion roll at a point above the liquid level of the size solution.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds, when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of one type of size box with which the improved apparatus is adapted to be associated;

Figure 2 is an elevation on a reduced scale looking at the left-hand side of Figure 1 and showing the ingress or front end of the size box and with the central portion thereof broken away;

Figure 3 is a view looking at the opposite end of the size box from that shown in Figure 2, this being the discharge end of the size box;

Figure 4 is an enlarged longitudinal sectional view taken along line 4—4 in Figure 2 and showing the improved apparatus disposed therein;

Figure 5 is an enlarged fragmentary vertical sectional view taken substantially along the line 5—5 in Figure 4;

Figure 6 is a fragmentary vertical sectional view taken substantially along the line 6—6 in Figure 5;

Figure 7 is a fragmentary sectional plan view taken substantially along the line 7—7 in Figure 1;

Figure 8 is a schematic illustration showing the liquid level control apparatus;

Figure 9 is a schematic view showing the improved apparatus applied to a conventional size box;

Figure 10 is a side elevation of a double entry size box particularly adapted to accommodate the improved apparatus or stripper regulator roll;

Figure 11 is a fragmentary vertical sectional view taken substantially along the line 11—11 in Figure 10;

Figure 12 is a vertical longitudinal sectional view through the double entry size box shown in Figure 10 and showing the improved apparatus disposed therein both at the front and rear ends thereof for simultaneously processing two webs or sheets of yarns;

Figure 13 shows a modified form of apparatus for stripping excess sizing solution from the yarn in advance of the yarns passing between the upper and lower squeeze rolls and wherein a single roll presses against the lower squeeze roll and serves as a combination immersion roll and stripper regulator roll.

Referring to Figures 1 through 7, there is shown a single entry type of size box assembly comprising a frame broadly designated at 10 and including side frame members 11 and 12 which are spanned by transverse frame members 13 and 14, these transverse frame members 13 and 14 being suitably secured at opposite ends thereof to the side frame members 11 and 12. The transverse frame members 13 and 14 support a size box broadly designated at 15, which size box is jacketed, as at 16, in a conventional manner, and has insulation material 17 therein for minimizing radiation of heat.

Opposite side walls of the size box 15 are spaced inwardly from the side frame members 11 and 12 and each of these side walls has an upwardly projecting portion 20 through which the lower portion of the shaft of a top squeeze roll, to be later described, extends. The side frame members 11 and 12 each has a bearing stand 21 secured to the upper surface thereof at the rear of the machine and in which opposite ends of a pivot shaft 22 are journaled. The pivot shaft 22 pivotally supports the rear end of a lid, top or cover 23, opposite side walls of which are cut away to conform to the uprising portions 20 at each side of the size box to thereby provide a substantially closed size box.

The rear wall of the size box 15 has an upwardly extending transverse plate 24 removably secured in position, the upper edge of which terminates in spaced relation to the corresponding lower edge of the top, lid or cover 23 to thereby provide an egress slot 25 through

which a sheet of warp yarns Y passes from within the size box 15. The plate 24 can be removed, if desired, to assist in threading the warp threads through the apparatus.

The front wall of the lid 23 has a transverse slot 26 therein for ingress of the sheet of yarns Y. The slot 26 extends to the lower front edge of the cover and is partially closed by a plate 28, removably secured in position. The structure of the front and rear ends of the cover 23 is more fully shown in my co-pending application, Serial No. 247,342, filed September 19, 1951.

The front end of each of the side frame members 11 and 12 has an upstanding portion 27 integral therewith (Figure 1), the front and rear surfaces of which have respective bearing blocks 30 and 31 suitably secured thereto. Opposite ends of a pair of spaced parallel feed rolls 32 and 33, which are preferably tubular and have head members in the ends thereof, are journaled in the respective bearing blocks 30 and 31. The sheet of yarns Y passes over these feed rolls 32 and 33 in advance of passing through the opening 26 into the size box 15. A suitable tension or dancing rod 34 rests upon the sheet of yarns Y between the rollers 32 and 33, this roller being supported at opposite ends thereof in arms 35 which project rearwardly and are pivoted at 36 in brackets 37. The brackets 37 are suitably secured to the upstanding portions 27 of the side frame members 11 and 12. This tension rod 34 is provided for taking up the slack in the yarn which may develop when the speed is reduced and holds the yarn Y in contact with the rollers 32 and 33.

Now, disposed within the size box 15 is a lower squeeze roll 40 and an upper squeeze roll 41 which are fixed on respective shafts 42 and 43. The upper squeeze roll 41 is preferably covered with a tube of rubber 44. These squeeze rolls are preferably tubular with suitable head means in each end thereof.

The shafts 42 and 43 extend through suitable sealing members or stuffing boxes 45 suitably secured to the opposite side walls of the size box 15. It will be noted that the side walls of the size box 15 are spaced inwardly of the side frame members 11 and 12 and the shaft 42 is journaled at opposite ends thereof in bearing blocks 46 suitably secured to the side frame members 11 and 12, each of the side frame members 11 and 12 being cut away at 47 to accommodate the corresponding bearing block 46. The structure of the size box and cover are substantially the same as that shown in my said co-pending application, Serial No. 247,342. The opposite ends of the shaft 43 of the upper squeeze roll 41 are rotatably mounted in pivoted arms or brackets 50 which extend rearwardly and are pivotally supported by the pivot shaft 22 heretofore described. The side walls of the lid 23 and the side box 15 are suitably slotted to permit the up and down movement of the shaft 43 therein and, in order to cause the upper squeeze roll 41 to bear against the upper surface of the lower squeeze roll 40 under pressure, each of the brackets 50 has the uper end of a tension rod 52 pivotally connected thereto at 53.

Each of the tension rods 52 extends downwardly and penetrates a cylinder or diaphragm mechanism generally designated at 54. In this instance, each element 54 is shown as a housing having a diaphragm 55 therein and pipes 48 and 49 are connected to the upper and lower portions of the housing of each element 54. Suitable manually controlled compressed air means, not shown, may be connected to pipes 48 and 49 for controlling the pressure of the top roll 41 against the bottom roll 40. Each of the cylinder or diaphragm mechanisms 54 is supported by one or more brackets 56 suitably secured to the corresponding side frame members 11 and 12. The cylinder or diaphragm assemblies 54 may be of conventional or any other desired construction and, therefore, a detailed description and illustration thereof is deemed unnecessary.

Also, disposed within the size box 15 forwardly of the lower squeeze roll 40, is an immersion roll 57 which is preferably tubular and has suitable head members in each end thereof which are rotatably mounted at opposite ends thereof in brackets 60, only one of which is shown in Figures 4 and 5. This immersion roll 57 is partially immersed in a liquid sizing solution, the upper level of which is indicated by the dotted line 61 in Figure 4. The brackets 60 are disposed inwardly of and immedi-

ately adjacent the side walls of the size box **15** and it will be observed in Figure 5 that the upper end of each of the brackets **60** is disposed above the horizontal plane of the corresponding portion of the upper end of the side wall of the size box **15** and has an outwardly projecting portion **67** integral therewith.

Each of the side walls of the lid **23** is provided with an outwardly bulging shield portion **62** within which the corresponding projection or portion **67** of the corresponding bracket **60** may have vertical movement. The upper end of a bar **63** is fixed in each of the projections **67** and each of the bars **63** has a rack **64** suitably secured thereto which meshes with a pinion **65**. Each of the pinions **65** is fixed on a shaft **66** (Figures 4, 5 and 7). Each of the pinions **65** is disposed within a suitable housing generally designated at **70** and which is suitably secured to the inner surfaces of the corresponding side frame members **11** and **12**. The shafts **66** extend rearwardly, their front ends being rotatably mounted in the corresponding gear housing **70** and the medial portions thereof penetrate the front transverse frame members **13**. The front end of each of the shafts **66** has a worm gear **71** fixed thereon which meshes with worm **72**, the worms **72** being fixed on a common transverse shaft **73**. The transverse shaft **73** is rotatably mounted in bearing blocks **74** suitably secured to the side frame members **11** and **12**. Opposite ends of the transverse shaft **73** have suitable hand wheels **75** fixed thereon for manipulation by an operator for adjusting the brackets **60** and the corresponding immersion roll **57** vertically. It will be noted in Figure 4 that the front end of each of the shafts **66** is rotatably mounted in a bearing block **76**, these bearing blocks **76** being suitably supported by the side frame members **11** and **12**. The upper ends of the brackets **60** have rotatably mounted therein opposite ends of a guide roller **77** over which the sheet of yarns Y passes on its way from the roller **33** to the immersion roll **57**. The roller **77** is preferably tubular and has head members in each end thereof for rotatably mounting the same in the brackets **60**. It is to be noted that the yarns Y contact the immersion roll at a point above the liquid level and thus will not be imbedded in a sheet of the sizing solution. This prevents the yarns from sticking to the immersion roll **57**.

Each of the brackets **60** has a rearwardly projecting portion **80** intermediate the upper and lower ends thereof to which an intermediate portion of a lever **81** is pivotally connected. The lower ends of the levers **81** rotatably support opposite ends of a stripper or regulating roll **82** adapted at all times to engage the front surface of the lower squeeze roll **40**. The stripper roll **82** is preferably tubular and has head members in each end thereof. The upper ends of the levers **81** each has a tension control arm **83** pivotally connected thereto which extends forwardly and slidably penetrates an enlarged portion **84** integral with the upper end of each of the brackets **60**.

The enlarged portion **84** is counterbored at **85** to accommodate a compression spring **86** (Figure 6) surrounding each of the arms **83**. One end of each of the compression springs bears against the bottom of the counterbore **85** and the other end thereof bears against an adjusting nut **87** threadably mounted on the free end of the corresponding arm **83**, each of the adjusting nuts **87** being reduced at one end thereof in order to have sliding movement in the corresponding counterbore **85**. Thus, suitable spring means, in the form of the compression springs **86**, are provided for normally urging the upper ends of the levers **81** in a counterclockwise direction in Figures 4 and 6.

As heretofore stated, the sheet of yarns Y after leaving the feed roller **33**, passes over the idler roller **77** and then downwardly beneath the immersion roll **57**. The sheet of yarns then passes upwardly between the stripper regulator roll **82** and the lower squeeze roll or dressing roll **40** and then between the lower squeeze roll **40** and the upper squeeze roll **41** after which the sheet of yarn Y passes outwardly through the egress opening **25** to a suitable drying mechanism of a slasher such as an air dryer or heated drums for drying the same in sheet form.

Now, the heated liquid sizing solution is introduced to the size box **15** by any suitable means such as through a pipe **90** (Figure 4) penetrating the transverse frame member **14** of the frame **10** as well as the rear wall of the size box **15**.

At least one of the brackets **60** has a suitable electrode **91** fixed thereon for regulating the level of the sizing solution in the size box **15**. This electrode **91** is a conventional mechanism and is usually mounted in a fixed position in the size box. However, the electrode **91** is supported by one of the brackets **60** in order that the level of the sizing solution may be determined according to the position of the immersion roll **57** relative to the sizing solution. It is evident that means other than the electrode may be provided for controlling the level of the sizing solution in accordance with the position of the immersion roll **82**, such as a float mechanism or the like. By referring to Figures 4 and 8, it will be seen that there is also provided a second electrode **93** which is supported by the rear wall of the size box **15** and the lower end of which is normally partially immersed in the sizing solution and, when the electrode **91** contacts the sizing solution, the sizing solution serves as an electrical conductor between the electrodes **91** and **93**. The electrode **91** has a wire **94** extending therefrom to a coil **95** of a relay **96**. The coil **95** surrounds a core **97** which magnetically attracts a switch member **100** when the coil **95** is energized. This switch member is normally urged into engagement with a contact **101** by any suitable means such as a tension spring **102**. The end of the coil **95** remote from the end to which the wire **94** is connected has one end of a lead wire **103** connected thereto which extends to a plug **104** adapted to be connected to a suitable source of electrical energy, not shown. The other side of the plug **104** has a lead wire **105** connected thereto which extends to and is connected to the electrode **93**.

The contact **101** has a wire **106** connected thereto which is also connected to an intermediate point on the wire **103**. The switch member **100** has one end of a wire **107** connected thereto, the other end of which is connected to a coil **110** of a solenoid valve mechanism **111**. The other end of the coil **110** has one end of a wire **112** connected thereto, the other end of which is connected intermediate the ends of the lead wire **105**. The valve **111** is of any desired construction which, upon energization of the coil **110**, assumes an opened position to permit the heated liquid sizing solution to flow from a suitable source, not shown, to the size box **15**, the valve **111** being interposed in the pipe **90** between the source and the end of the pipe disposed within the size box **15**. Thus, as the sizing solution is used up by the sheet of yarn Y passing therethrough, the level **61** of the sizing solution in the size box **15** is lowered to a point below the lower end of the electrode **91**. This causes the normally energized coil **95** of the relay **96** to become deenergized thus permitting the switch member **100** to move into engagement with the contact **101** to thereby complete the circuit to the coil **110** and to open the valve **111**. When a sufficient amount of sizing solution has entered the size box **15** to cause the level **61** of the sizing solution to contact the electrode **91**, the circuit is then completed through the sizing solution between the electrodes **91** and **93** to energize the coil **95** of the relay **96** and the core **97** will attract the switch arm or member **100** to cause the switch arm **100** to move out of engagement with the contact **101** thus de-energizing the coil **110** to permit the valve **111** to close. It will be noted that the lower end of the electrode **91** is so positioned that the level **61** of the sizing solution remains substantially the same as the level of the axis of the immersion roll **57** or the level at the point at which the sheet of yarn Y leaves the immersion roll **57** in its course to the lower squeeze roll **40**.

Now, as has already been pointed out, the yarn passes directly from the immersion roll **57** to a point between the uppermost portion of the lower squeeze roll **40** and the lowermost portion of the upper squeeze roll **41** or in other words, at the bite or nip of the lower and upper squeeze rolls **40** and **41**. The excess sizing solution normally builds up at the left-hand side of these two squeeze rolls **40** and **41** in Figure 4 and causes great disadvantages which have heretofore been set forth. The reason for this is that the sizing solution being squeezed from the sheet of yarn Y cannot escape downwardly by gravity and has to spew out or balloon out through the sheet of yarns Y resulting in splitting the web of yarns apart or producing a taping effect when the yarn sheet is split.

It is evident that by placing the stripper or regulator roll **82**, which might also be called a doctor roll, at a point slightly above or at the horizontal center line

of the lower squeeze roll **40**, excess size solution which is carried along by the sheet of yarn Y as it leaves the sizing solution is stripped by passing between the roll **82** and the roll **40** and then falls downwardly, by gravity, there being plenty of space between the nip or bite of the rolls **82** and **40** to allow it to fall downwardly into the size box on both sides of the sheet of yarn. This eliminates the disadvantages which have heretofore been present by stripping the excess sizing solution at the point of contact between the upper and lower squeeze rolls of a size box. The pressure exerted by the stripper or regulator roll **82** on the roll **40** not only can be varied by adjustment of the nut **87** but also is regulated by the position of the brackets **60** as the brackets **60** are moved downwardly short of the center line of the squeeze roll **40**, the pressure of roll **82** against roll **40** will be increased.

In Figure 9, there is shown a conventional size box having two sets of squeeze rolls or dressing rolls and this size box is indicated broadly at **115**, the first squeeze rolls or dressing rolls being indicated at **116** and **117** while the other set of squeeze rolls are indicated at **120** and **121**. The invention theretofore described in relation to Figures 1 through 8 is installed in this conventional size box **115** in advance of the first set of squeeze rolls **116** and **117** and is mounted in the same manner as it is described in Figures 1 through 8. Therefore, like reference characters will apply with the letter *"a"* affixed thereto since additional description of the parts shown in Figure 9 which are identical to the parts in Figures 1 through 8 is not deemed necessary.

The sheet of yarns Y*a* after leaving the immersion roll **57***a* passes between the stripper or regulator roll **82***a* and the lower squeeze roll **117** and then between the upper and lower squeeze rolls **116** and **117**. The sheet of yarns Y*a* then passes between the additional squeeze rolls or dressing rolls **120** and **121** in the same manner as in any conventional size box. The main difference in the structure shown in Figure 9 and a conventional size box is the mounting of the immersion roll on brackets which are vertically adjustable and having the stripper or regulator roll **82***a* contacting the lower squeeze roll **117** at the point indicated to squeeze the excess sizing solution from the sheet of yarns Y*a* as has heretofore been described.

In Figures 10 to 12, inclusive, there is shown a size box which is similar to that shown in Figures 1 through 4, except that it has means whereby two different sheets of yarns may be passed through the same size box and the mechanism at the left-hand side of Figures 10 and 12 is identical to that shown in Figures 4 and 9 and those parts at the left-hand side of Figure 12 which are identical to the parts at the left-hand side of Figure 4 will bear the same reference characters with the letter *"b"* affixed thereto. The mechanism at the right-hand side of Figure 12 is also identical to the structure at the left-hand side of Figure 12 except that it is opposite hand and like reference characters will apply with the small letter *"c"* added.

In the form of the invention shown in Figures 10 through 12, there are two sheets of yarn Y*b* and Y*c*.

The sheet of yarns Y*b* is directed to the nip or bite of the upper and lower squeeze rolls **41***b* and **40***b* in the identical manner in which the sheet of yarns Y is directed to the nip or bite of the upper and lower squeeze rolls in Figure 4. However, the sheet of yarns Y*c* initially passes beneath pan of the size box which size box is indicated broadly at **125** in Figures 10 and 12, over an idler roll **126**, beneath the size box **125** and then partially around another idler roll **127** and then upwardly over the feed rollers **32***c* and **33***c*. The idler rollers or rolls **126** and **127** are rotatably mounted in respective bearing blocks **130** and **131** suitably secured to the side frame members of the size box assembly, which side frame members are indicated at **132** and **133**.

The path of travel of the sheet of yarns Y*c* upon leaving the rollers **32***c* and **33***c* is identical to that described for the sheet of yarns Y in Figure 4, in that the yarns pass over the idler rollers **77***c* and beneath the immersion roller **57***c* and then upwardly between the stripper or regulator roll **82***c* and the lower squeeze roll **40***c*. The sheet of yarns Y*c* is then passed between the nip of the lower and upper squeeze rolls **40***c* and **41***c*. Now, in order to direct the two sheets of yarns Y*b* and Y*c* out of the size box **125**, a pair of idler rolls **135** and **136** are provided, which idler rolls are disposed at a higher level than the upper squeeze rolls **41***b* and **41***c*. Opposite ends of these rolls **135** and **136** are rotatably mounted in brackets **140**, only one of which is shown in Figure 12, and each of the brackets **140** extends downwardly and is suitably secured to the inner surface of the corresponding side walls of the size box **125**.

It will be noted that the size box **125** also has a cover or lid **142** thereon which is similar to the cover or lid **23** shown in Figure 4 and is provided with a pair of ingress openings **143** and **144** disposed at opposite ends of the cover or lid **142** and is also provided with an egress opening **145** spaced above the opening **144** and through which the sheets of yarns Y*b* and Y*c* pass upon passing in engagement with the rolls **135** and **136** as they pass upwardly from the upper squeeze rolls **41***b* and **41***c*.

It will be noted in Figure 10 that the arms **50***c* and **50***b* which are identical to the arms **50** in Figure 1, extend towards each other and are pivotally mounted on a common transverse pivot shaft **146**, opposite ends of which are secured in upstanding brackets **147**. The upstanding brackets are suitably secured to the upper surfaces of the side frame member **132** and **133** intermediate the front and rear ends of the machine. Otherwise, the same reference characters shall apply to the structure shown in Figures 10 through 12 and that shown in Figure 4 with the reference character *"b"* affixed to the parts corresponding to the immersion roll **57***b* and the letter *"c"* shall be affixed to the reference characters associated with the parts corresponding to the immersion roll **57***c*. Also, the lid or cover **142** is not pivotally supported by the size box **125** but, instead, may be raised by a suitable hawser or the like to facilitate access to the parts disposed within the size box **125** when desired.

Referring to Figure 13 there is shown, somewhat schematically, a size box of the type shown in Figures 1 to 8, inclusive. Since all of the parts shown in Figure 13 are substantially the same as the parts shown in Figure 4, like reference characters will apply.

It will be noted that the form of the invention shown in Figure 13 differs from that shown in Figure 4 in that the usual immersion roll **57** is omitted and the bracket **60** may be cut away, since the lower portion thereof is not used in this instance. Of course, the electrode **91** is fixed to the bracket **60** in Figure 13 at a relatively higher elevation from that shown in Figure 4 to thus maintain a level of the liquid **61** slightly below, the axis of the roll **82**.

In this instance, the roll **82** in Figure 13 may be termed a combination immersion and stripper regulator roll or an auxiliary roll, since this single roll functions in substantially the same manner as the two rolls **57** and **82** in Figure 4. To this end, the sheet of yarns Y passes over the idler roll **77** and then downwardly beneath the combination immersion and stripper regulator roll **82** to saturate the yarn with the sizing solution **61**.

Now, as in the form of the invention shown in Figure 4, the combination immersion and stripper regulator roll **82** is resiliently urged against the lower squeeze roll **40** in Figure 13 and the sheet of yarns Y passes substantially half way around the combination immersion and stripper regulator roll **82** whereupon the yarns are pressed against the lower squeeze roll **40** by the combination immersion and stripper regulator roll **82** in Figure 13. The sheet of yarns Y then passes upwardly and between the upper and lower squeeze rolls **40** and **41** and, thus, out of the size box **15**.

It is preferable that the level of the sizing solution **61**, in the form of the invention shown in Figure 13, be at a slightly lower level than the point at which the yarns pass between the combination immersion and stripper regulator roll **82** and the lower squeeze roll **40** to thereby permit the excess sizing solution carried by the sheet of yarns Y to drop back into the solution in the size box **15**, although the level of the sizing solution **61** may be the same as the bite of the combination immersion and stripper regulator roll **82** and the lower squeeze roll **40**. However, in any event, the level of the sizing solution **61** should not be higher than the level of the bite of the combination immersion and stripper regulator roll **82** and the lower squeeze roll **40**.

It is thus seen that I have provided an apparatus of various forms, all of which operate upon the same principle in stripping the excess sizing solution from a sheet

or sheets of yarn at a point where the excess size solution can fall back into the size box. This obviates the serious defects hereinbefore outlined, such as taping, rolling and grouping of the yarns rather than permitting the yarns to pass through the nip of the squeeze rolls in a uniform webbed sheet.

In the drawings and specification, there has been set forth a preferred embodiment of the invention and although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

I claim:

1. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll spaced substantially above the immersion roll and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, and adjustable means for supporting the immersion roll and the stripper regulator roll in spaced relationship, and the stripper regulator roll being so positioned relative to the lower squeeze roll and the immersion roll as to cause the yarn to engage the stripper regulator roll and the lower squeeze roll at substantially their point of contact.

2. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll spaced from the immersion roll and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, the immersion roll being positioned at a lower elevation and at least partially underlying the stripper regulator roll, and means for pressing the stripper regulator roll against the lower squeeze roll.

3. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, adjustable means for supporting the immersion roll and the stripper regulator roll, said immersion roll and stripper regulator roll being so positioned relative to each other and relative to the lower squeeze roll as to cause the yarn to contact the lower squeeze roll and stripper regulator roll at substantially their point of contact, and resilient means for pressing the stripper regulator roll against the lower squeeze roll.

4. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, vertically adjustable means for supporting the immersion roll and the stripper regulator roll, and a liquid level control means mounted on the vertically adjustable means for supporting the immersion roll and the stripper regulator roll.

5. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll spaced above the immersion roll and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, the arrangement of the immersion roll and stripper regulator roll being such

that the sheet of yarn will contact the stripper regulator roll and the lower squeeze roll at substantially their point of contact, a second pair of upper and lower squeeze rolls, a second immersion roll, a second stripper regulator roll spaced above the second immersion roll engaging the second lower squeeze roll, and means for guiding a second sheet of yarn beneath the second immersion roll and between the second lower squeeze roll and the second stripper regulator roll associated therewith, and the second immersion roll and second stripper regulator roll being so arranged as to cause the second sheet of yarn to contact the second stripper regulator roll and a second lower squeeze roll at substantially their point of contact.

6. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper regulator roll spaced from the immersion roll and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing material from the yarn, common means for supporting the immersion roll and the stripper regulator roll, and resilient means for pressing the stripper regulator roll against the lower squeeze roll.

7. In a size box adapted to contain a supply of sizing solution and having upper and lower squeeze rolls therein between which a sheet of yarn is passed and also having an immersion roll at least partially submerged in the sizing solution and beneath which the yarn is passed prior to its being passed between the squeeze rolls and also having vertically adjustable brackets therein in the lower ends of which the immersion roll is rotatably mounted, the combination of a pair of arms pivotally mounted on the brackets, a stripper regulator roll rotatably mounted in corresponding ends of said arms and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing solution from the yarn, and resilient means urging said arms in such a direction as to resiliently maintain the stripper regulator roll in engagement with the lower squeeze roll.

8. In a size box adapted to contain a supply of sizing solution and having upper and lower squeeze rolls therein between which a sheet of yarn is passed and also having an immersion roll at least partially submerged in the sizing solution and beneath which the yarn is passed prior to its being passed between the squeeze rolls and also having vertically adjustable brackets therein in the lower ends of which the immersion roll is rotatably mounted, the combination of a pair of arms pivotally mounted on the brackets, a stripper regulator roll rotatably mounted in corresponding ends of said arms and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing solution from the yarn, resilient means urging said arms in such a direction as to resiliently maintain the stripper regulator roll in engagement with the lower squeeze roll, and means for adjusting the pressure exerted on said arms by the resilient means to thereby vary the pressure of the stripper regulator roll against the lower squeeze roll.

9. In a size box adapted to contain a supply of sizing solution and having upper and lower squeeze rolls therein between which a sheet of yarn is passed and also having an immersion roll at least partially submerged in the sizing solution and beneath which the yarn is passed prior to its being passed between the squeeze rolls and also having vertically adjustable brackets therein in the lower ends of which the immersion roll is rotatably mounted, the combination of a pair of arms pivotally mounted on the brackets, a stripper regulator roll rotatably mounted in corresponding ends of said arms and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing solution from the yarn, and a liquid level control means mounted on at least one of said brackets to maintain the sizing solution at a predetermined level relative to the immersion roll and the stripper regulator roll although the brackets are adjusted relative to the squeeze rolls.

10. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and being adapted to contain a supply of sizing solution therein, the combination of an auxiliary roll engaging the lower squeeze roll at a point in advance of the point of contact between the upper and lower squeeze rolls, means to immerse the sheet of yarn in the sizing solution before the sheet of yarn passes between the point of contact of said auxiliary roll and the lower squeeze roll whereby the auxiliary roll removes excess sizing material from the yarn in advance of the yarn passing between the upper and lower squeeze rolls, adjustable means for supporting the auxiliary roll, the axis of the auxiliary roll being at an elevation at least as high as the axis of the lower squeeze roll during operation of the size box, and means for resiliently pressing the auxiliary roll against the lower squeeze roll.

11. In a size box having upper and lower squeeze rolls between which a sheet of yarn is passed and being adapted to contain a supply of sizing solution therein, the combination of an auxiliary roll engaging the lower squeeze roll at a point in advance of the point of contact between the upper and lower squeeze rolls, means to immerse the sheet of yarn in the sizing solution before the sheet of yarn passes between the point of contact of said auxiliary roll and the lower squeeze roll whereby the auxiliary roll removes excess sizing material from the yarn in advance of the yarn passing between the upper and lower squeeze rolls, vertically adjustable means for supporting said auxiliary roll, and a liquid level control means mounted on the vertically adjustable means for supporting the auxiliary roll.

12. In a size box adapted to contain a supply of sizing solution and having upper and lower squeeze rolls therein between which a sheet of yarn is passed and also having an immersion roll at least partially submerged in the sizing solution and beneath which the yarn is passed prior to its being passed between the squeeze rolls and also having vertically adjustable brackets therein in the lower ends of which the immersion roll is rotatably mounted, the combination of a pair of arms pivotally mounted on the brackets, a stripper regulator roll rotatably mounted in corresponding ends of said arms and engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls for pressing the yarn against the lower squeeze roll to remove excess sizing solution from the yarn, a liquid level control means mounted on at least one of said brackets to maintain the sizing solution at a predetermined level relative to the immersion roll and the stripper regulator roll although the brackets are adjusted relative to the squeeze rolls, and means for guiding the yarn to the immersion roll to cause it to contact the immersion roll before the yarn contacts the sizing solution.

13. In a size box having upper and lower squeeze rolls between which a sheet of yarns is passed and also having an immersion roll beneath which the yarn is passed prior to its being passed between the squeeze rolls, the combination of a stripper roll engaging the lower squeeze roll at a point between the immersion roll and the point of contact between the upper and lower squeeze rolls, vertically adjustable means for supporting the stripper roll, pressure means for pressing the stripper roll against the lower squeeze roll, the stripper roll being so positioned relative to the lower squeeze roll and the immersion roll as to cause the yarn to engage the stripper roll and the lower squeeze roll at substantially their point of contact.

14. In a size box having upper and lower squeeze rolls between which a sheet of yarns is passed and being adapted to contain a supply of sizing solution therein, the combination of an auxiliary roll engaging the lower squeeze roll at a point in advance of the point of contact between the upper and lower squeeze rolls, means to immerse the sheet of yarns in the sizing solution before the sheet of yarn passes between the point of contact of said auxiliary roll and the lower squeeze roll, said auxiliary roll being so positioned relative to the lower squeeze roll and the immersion means as to cause the yarn to contact the auxiliary roll and the lower squeeze roll at substantially the same time, whereby the auxiliary roll removes excess sizing material from the yarn in advance of the yarn passing between the upper and lower squeeze rolls, adjustable means for supporting the auxiliary roll, and resilient means for pressing the auxiliary roll against the lower squeeze roll.

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