Feb. 22, 1938. J. R. CLAY 2,109,247

VARIABLE SPEED DRIVE FOR DRAFTING MACHINERY

Filed June 18, 1937 3 Sheets-Sheet 1

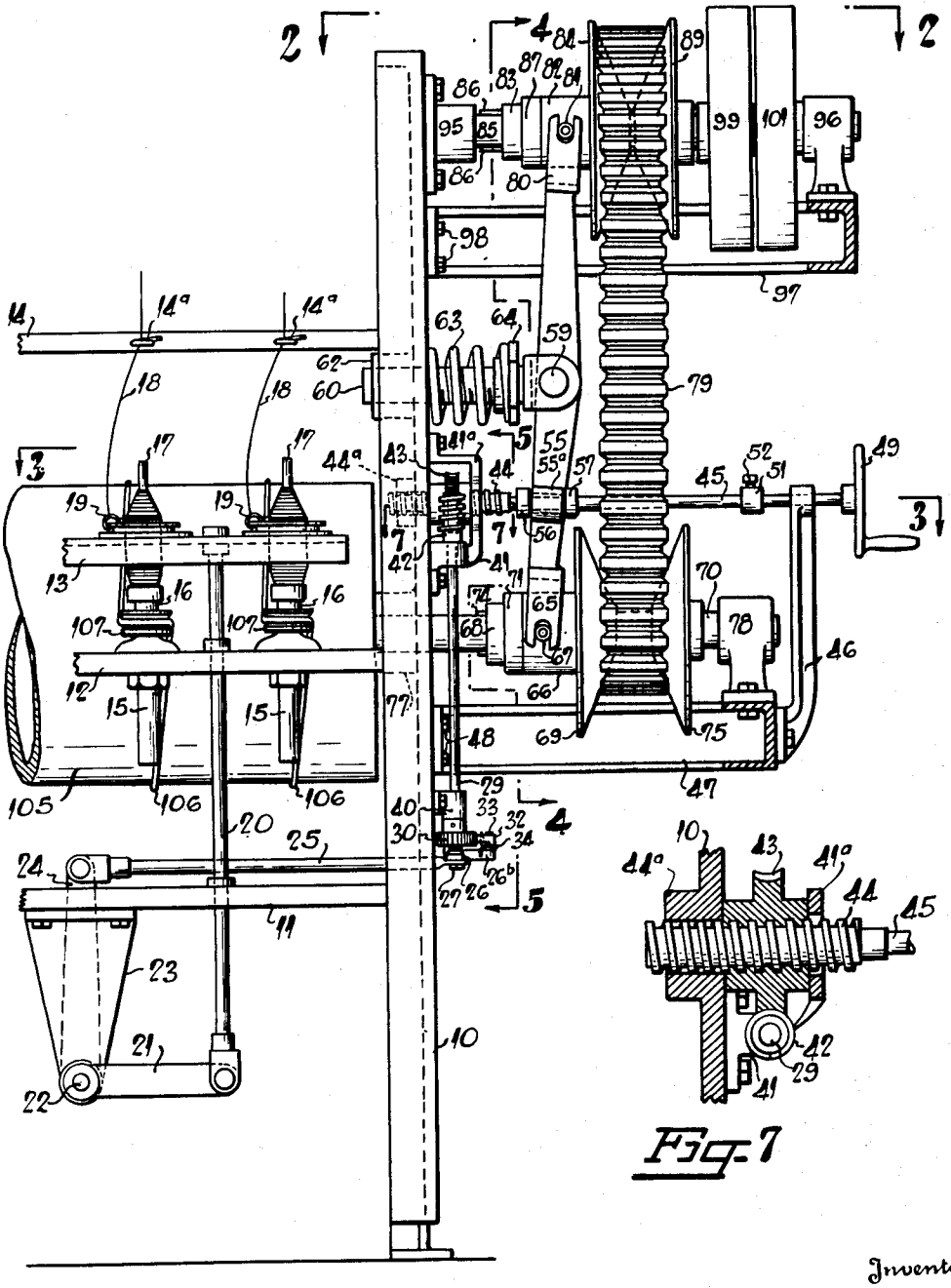

Fig. 1

Fig. 7

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VARIABLE SPEED DRIVE FOR DRAFTING MACHINERY

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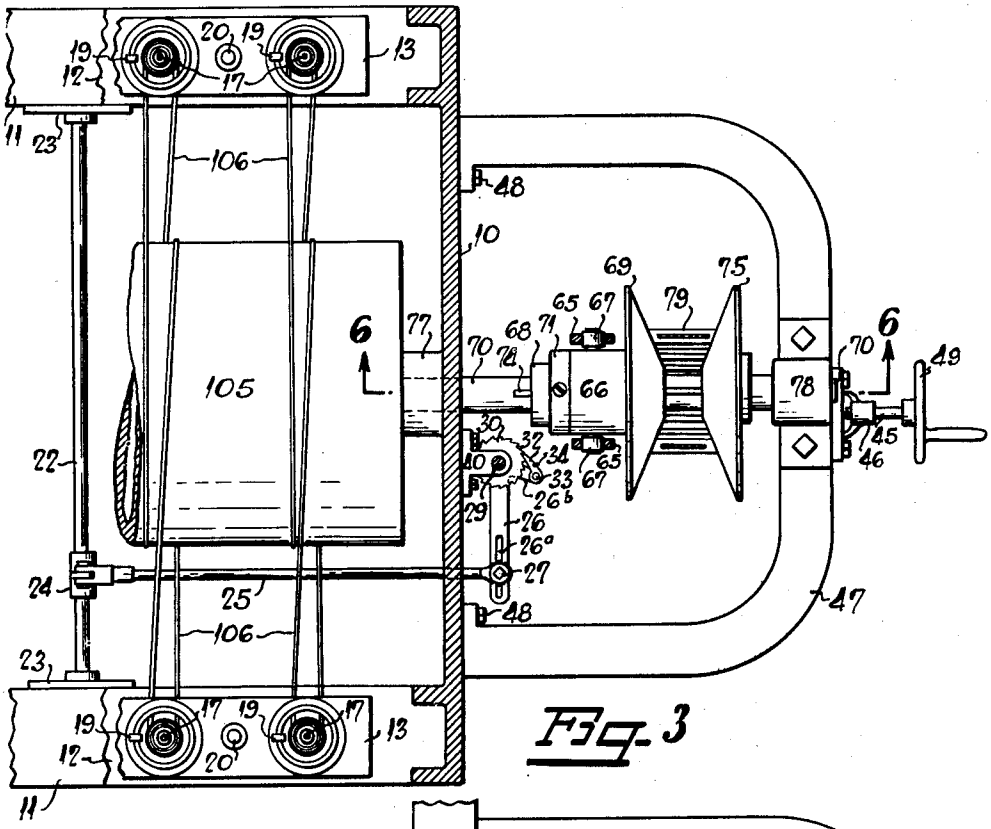

Fig. 3

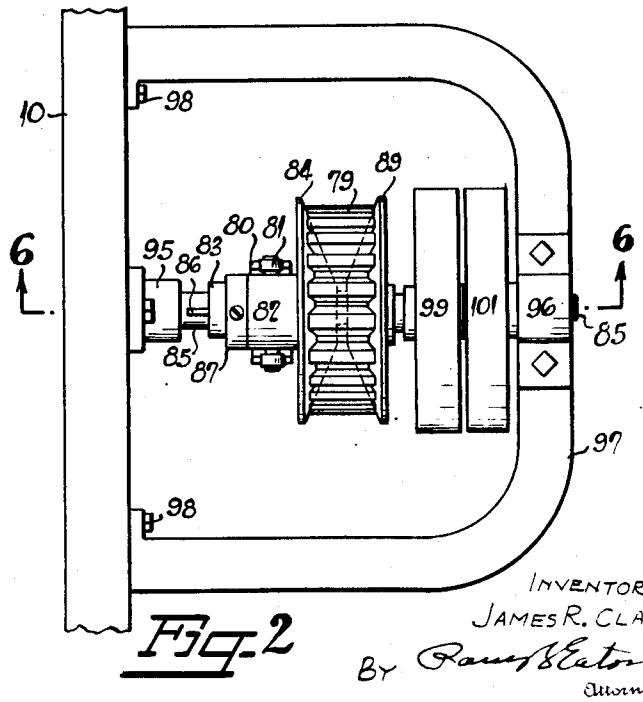

Fig. 2

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VARIABLE SPEED DRIVE FOR DRAFTING MACHINERY

Filed June 18, 1937 3 Sheets-Sheet 3

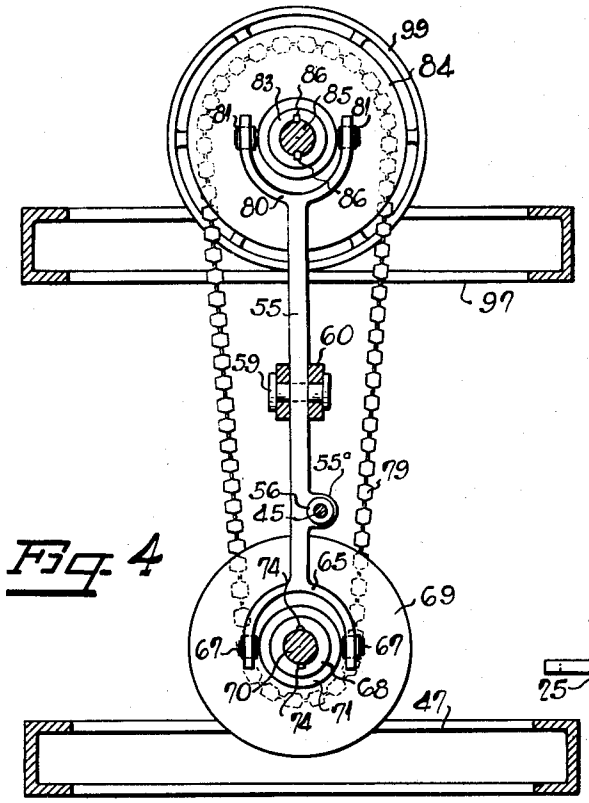

Fig. 4

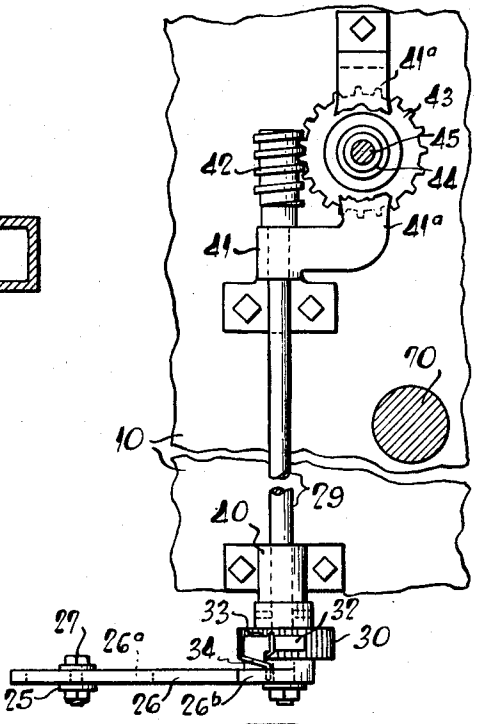

Fig. 5

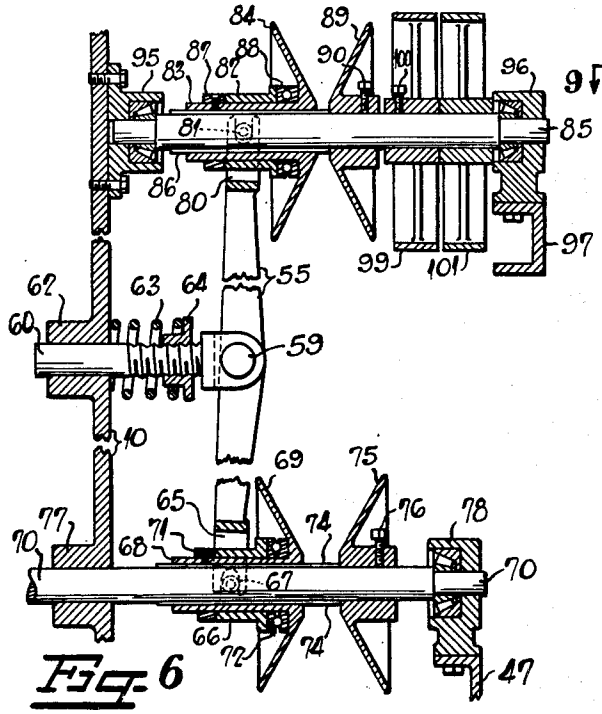

Fig. 6

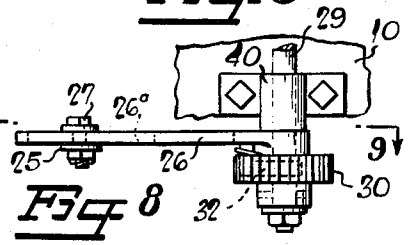

Fig. 8

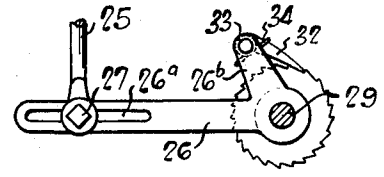

Fig. 9

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Patented Feb. 22, 1938 2,109,247

UNITED STATES PATENT OFFICE

2,109,247

VARIABLE SPEED DRIVE FOR DRAFTING MACHINERY

James R. Clay, Granite Falls, N. C., assignor of one-half to Perry L. Moore, Granite Falls, N. C.

Application June 18, 1937, Serial No. 148,982

1 Claim. (Cl. 118—32)

This invention relates to a variable speed drive for drafting machinery such as spinning frames, cotton twister frames, roving frames, and the like, and more especially to a drive which is capable of gradually increasing or decreasing the speed of the machine as the strands are built up on the bobbins.

It is a well known fact that when yarn is being wound around bobbins on spinning frames, the ring rail reciprocates about one-fourth the length of the bobbin at the beginiing, and as the yarn is being built on the bobbin to form the appearance of an inverted cone at the lower end thereof, the ring rail gradually rises relative to the bobbin until the doffing point is reached. In other words, the last reciprocation of the ring rail traverses the upper fourth of the bobbin. At this point the length of the strand of yarn which is disposed between the traveler and the eyelet on the guide rail is considerably shorter than when the bobbin is first started.

The length of the strand between this eyelet and the traveler on the ring rail is subject to a great deal of wind resistance as it is being wound around the bobbin. The greater the length of this portion of the yarn, the greater will be the balloonage and windage. It is therefore, necessary that the speed of the spinning frame be much slower at the beginning of the bobbin than when the doffing point is reached because there is greater resistance at the beginning than there is as the package is being completed.

There are other factors which necessitate a slow beginning and a gradually increasing speed on a spinning frame. For example, the size of the quill or bobbin on which the yarn is wound must necessarily be small in order to get the maximum amount of yarn thereon. Due to this small size of the quill the angularity of the yarn between the bobbin and the traveler is greater than when the yarn has been built on the quill up to a larger diameter. This angularity creates an additional friction consequently, if the packages of yarn are started at a maximum speed many of the ends will be broken down resulting in inefficient operation of the machine.

It is therefore, an object of this invention to provide a variable speed drive for spinning frames, comprising means for gradually increasing the speed of the machine as the yarn is being wound on the bobbins until the bobbins are ready to be doffed, at which time the maximum speed is attained. Means have also been provided whereby the speed can be manually adjusted to any desired point should it be desired to re-set the speed at any time due to atmospheric conditions within the mill or for other reasons.

When the variable speed drive is used upon a twister frame it is necessary that the machine start with a maximum speed and gradually decrease in speed until the minimum is reached at the doffing point. This result is obtained in one form of this invention by merely setting the variable speed drive at maximum speed and then reversing the ratcheting mechanism. When this is done, the speed of the machine will gradually decrease as the package increases in size, instead of increasing the speed, as in the case of spinning frames.

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 an elevation of one end of a spinning frame with portions thereof shown in section, showing my invention applied thereto;

Figure 2 is a top plan view taken along line 2—2 in Figure 1;

Figure 3 is a sectional, plan view taken along line 3—3 in Figure 1;

Figure 4 is a vertical, sectional view taken along line 4—4 in Figure 1;

Figure 5 is an enlarged, sectional, detail elevation taken along line 5—5 in Figure 1;

Figure 6 is a vertical, sectional, detail view taken along line 6—6 in Figures 2 and 3, the belt being omitted;

Figure 7 is a sectional, detail view taken along line 7—7 in Figure 1;

Figure 8 is an elevation of a slightly modified form similar to the lower portion of Figure 5, but showing the ratcheting mechanism reversed so as to be adaptable for use on twister frames;

Figure 9 is a sectional, plan view taken along line 9—9 in Figure 8.

Referring more specifically to the drawings, the numeral 10 denotes the end support of a suitable spinning frame which has connected thereto suitable bottom rails 11, bolster rails 12, spinnings rails 13 and thread guide rails 14. Each bolster rail 12 has secured therein suitable bolsters 15 in which rotate spindles 16 and each of said spindles has a bobbin 17 removably mounted thereon. A strand of yarn 18 is drawn downwardly from the drafting rolls, not shown, through an eyelet 14a and then to the traveler 19 from whence it is deposited upon the bobbin 17.

Since the speed of the bobbin must be relatively slow when the yarn is first started because

of the windage and the angularity, it is necessary to provide means for gradually increasing the speed of the spinning frame as the yarn upon the bobbin builds up and as the ring rail 13 moves upwardly relative to the bobbin. This variable speed mechanism is controlled by vertically disposed plunger rod 20 which has its upper end secured in ring rail 13 and its intermediate portions slidably mounted in bottom rail 11 and bolster rail 12. The lower end of rod 20 is pivotally secured to lever 21 which, in turn, is fixedly secured around ring rail cross shaft 22. This cross shaft is mounted for oscillation in suitable brackets such as 23 which, in turn, are secured to the bottom rails 11. Also, fixedly secured around the cross shaft 22 is a vertically disposed lever 24 which has pivoted to its upper free end a horizontally disposed link 25. The right-hand end of link 25 is adjustably secured to the end of ratchet lever 26 by means of a bolt 27 which penetrates a slot 26a in the ratchet lever 26 and the end of the link 25.

The lever 26 is loosely mounted for oscillation around the lower end of vertically disposed shaft 29 and is disposed adjacent to the ratchet wheel 30 which wheel is fixedly secured on the lower end of this shaft. A pawl 32 is pivotally secured as at 33 to a projection 26b of ratchet 26, and has its free end normally engaging the teeth in ratchet wheel 30. In order to hold the free end of dog 32 in engagement with the ratchet wheel 30 a torsion spring 34 is employed which has one end thereof engaging this dog and its other end engaging the arm 26b. It is observed by referring to Figures 1, 3 and 5, that as the ring rail 13 reciprocates up and down, a reciprocatory motion will be imparted to the link 25 to cause the lever 26 to rotate the rod 29 through the pawl 32 and the ratchet wheel 30. In other words, the rod 29 will be rotated in a counter-clockwise manner in Figure 3 due to the reciprocatory movement of the ring rail 13.

The rod 29 is rotatably mounted in bearings 40 and 41 which in turn, are secured to the end frame 10. On the upper end of the rod 29 a worm 42 is fixedly secured which engages worm gear 43, said pinion being threadably secured upon threaded portion 44 of a shaft 45.

By referring to Figures 1, 5 and 7, it will be noted that the bearing 41 has an upwardly extending portion 41a which encircles the threaded portion 44 and has the left-hand face thereof normally engaging the right-hand hub of the worm gear 43. This portion normally holds the worm gear 43 in a fixed position so that it will not be allowed to move longitudinally of the shaft 45 but may have rotative movement only on the threaded portion 44. The shaft 45 has adjustably secured thereon a collar 51 by means of set screw 52. This collar may be positioned so as to act as a stop when the operator winds the wheel 49 back to the starting point. At this time, the collar will engage the bearing 46. Since the threaded portion is slidably mounted in bearing 44a of the end frame 10, the rotative movement of the gear 43 will move the shaft 45 and its associated parts about its longitudinal axis, one way or the other, dependent upon the direction of rotation of the shaft 29. The shaft 45 has its right-hand end rotatably mounted in an upwardly extending bracket 46 which is secured to a U-shaped support 47, said support 47 being fastened to the end frame 10 by means of bolts 48. A hand wheel 49 is secured on the extreme right hand end of shaft 45 so that the shaft 45 may be manually turned when the conditions require such movement to be made.

The intermediate portion of shaft 45 penetrates a lug 55a which extends outwardly from vertically disposed lever 55. Suitable collars 56 and 57 are fixedly secured on shaft 45 and on opposed sides of this lug. The lever 55 is pivoted as at 59 to pin 60 which pin is slidably mounted in a bearing 62 in end frame 10. The intermediate portion of the pin 60 is encircled by a compression spring 63, one end of said spring pressing against the end frame 10 and the other end pressing against a nut 64 which is threadably secured on the intermediate portion of the pin 60. This spring will normally tend to force the pin 60 and lever 55 to the right in Figures 1 and 6 to cause the proper tension to be exerted upon the belt which will be later described.

If it is desired to increase or decrease the tension upon the belt it is only necessary to manipulate the nut 64 and thereby place the proper compression upon the spring 63.

The lower end of lever 55 has a forked portion 65 which rests astride a hub 66. Suitable rollers 67 are disposed on opposed sides of the hub 66 and are engaged by the lower prongs of forked member 65. Since the hub 66 is rotataby mounted around a hub 68 of a movable conical disk 69 it is necessary to prevent any longitudinal relative movement between these two members in order that the movement of the lower end of lever 55 will move a disk 69 longitudinally of a cylinder shaft 70. Therefore, a suitable collar 71 has been placed around the hub 68 and adjacent the left-hand end of hub 66, and a thrust bearing 72 has been disposed between the right-hand portion of hub 66 and the disk 69. As the disk 69 is slidably secured on the cylinder shaft 70 by means of key ways 74, any rotation imparted to the disk 69 will likewise impart rotation to the shaft 70. A movable conical disk 69 is adapted to cooperate with a fixed disk 75 which is secured on shaft 70 by any suitable means such as a set screw 76. These two disks 69 and 75 form a split V-pulley.

It will be noted by referring to Figures 1, 3 and 6 that the intermediate portion of shaft 70 is rotatably mounted in a bearing 77 of end frame 10, whereas, the right-hand end of this shaft is rotatably mounted in a suitable thrust bearing 78 which is mounted on the top of U-shaped support 47. This thrust bearing is provided in order to take care of any longitudinal thrust which may be produced due to the pressure of spring 63 upon the belt 79 which is mounted between the disks 69 and 75.

The upper end of lever 55 has another forked portion 80 which is similar to forked portion 65 on the lower end thereof. The ends of this forked portion normally engage suitable rollers 81 which are secured on opposed sides of a hub member 82. This hub member is rotatably mounted upon a hub 83 of movable conical disk 84 which is slidably keyed on a shaft 85 by means of key ways 86. Relative longitudinal movement between the hub 83 of disk 84, and the hub 82 is prevented by means of collar 87 which is secured around the left-hand end of hub 83. A thrust bearing 88 is disposed between the right-hand end of the hub 82 and the disk 84. The disk 84 cooperates with a fixed conical disk 89 which is secured on the shaft 85 by any suitable means such as set screw 90. The disks 84 and 89 also form a split V-pulley. The belt 79 is also mounted between the disks 84 and 89 and it is evident that upon

rotation of the shaft **45** due to the reciprocatory motion of the ring rail **13**, the lever **55** will be rotated slightly in a clockwise manner which will cause the disk **69** to move away from disk **75** and at the same time cause the disk **84** to move towards disk **89**, resulting in belt **79** traveling upon a greater circumference on the lower disks. Of course, this will mean that the lower shaft **70** will be rotated at an increasing rate of speed since the shaft **85** is the drive shaft and the shaft **70** is the driven shaft.

The shaft **85** has its ends rotatably mounted in thrust bearings **95** and **96** which are secured to the end frame **10** and an arcuate support **97** respectively, said arcuate support being secured to the end frame **10** by any suitable means such as bolts **98**. The shaft **85** also has fixedly secured thereon a drive pulley **99** by any suitable means such as a set screw **100**. Adjacent the pulley **99** and rotatably mounted on the shaft **85** is a loose pulley **101**. During the normal operation of the machine a suitable source of power is connected to the drive pulley **99** which in turn, will rotate the shaft **95** and the shaft **70** through the belt **79**. The rotation of the shaft **70** will likewise rotate a cylinder **105**, which is fixedly secured on the shaft, and this cylinder will rotate the spindle **15** through bands **106**. The bands are mounted around the cylinder **105** and whorls **77**, these whorls being fixedly secured on the spindles **16**.

As the bobbins are rotated, the builder motion causes the ring rail **13** to reciprocate over a portion of the bobbin and at the same time gradually move the rail towards the top while maintaining the same stroke. This reciprocation will rotate the shaft **29** in a counter-clockwise manner in Figure 3, through the ratchet lever **26** and the ratchet **30**, and the rotation will cause the shaft **45** to be moved to the left in Figure 1, thereby rotating the lever **55** in a clockwise manner to gradually change the position of the belt between the disks **69**, **75**, and the disks **83** and **89**, resulting in a gradual increase in the speed of the shaft **70**.

When the bobbin is completed and ready to be doffed, the maximum speed has been attained consequently, it will then be necessary to move the variable speed mechanism back to a slow speed position by means of the hand wheel **49**. When in this position, the disks **69** and **75** will be close together whereas, the disks **84** and **89** will be spread apart. This movement may be effected while the spinning frame is still in operation, if the atmospheric conditions in the mill or other factors demand that the speed be changed during the winding of the bobbins.

Figures 8 and 9 show a slightly modified form of the invention where the same apparatus is being used upon twister frames instead of spinning frames. As heretofore stated, the twister frames start off at a maximum speed and gradually decrease to a minimum when the packages of yarn are doffed. In order to produce this effect it is only necessary to turn the ratcheting mechanism upside down to a reversed position from that shown in Figures 1, 3 and 5. In this position, the ratcheting mechanism comprising lever **26**, ratchet **30** and pawl **32** will assume the position shown in Figures 8 and 9, and due to its reversal, the shaft **29** will be rotated in a clockwise direction instead of a counter-clockwise direction as was the case when the same mechanism was used in conjunction with a spinning frame. Of course, this reverse rotation of the shaft **29** will produce a reverse rotation of the shaft **45** and the lever **55**. Therefore, the disks **69** and **75** will be gradually closed while the disks **84** and **89** will be gradually opened resulting in a gradual dimunition of the speed of shaft **70**.

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 set forth in the appended claim.

I claim:

In a spinning frame, twisting frame and the like having a reciprocating ring rail, a drive shaft, a driven shaft for driving the frame, a conical disk fixed on the drive shaft, a second conical disk fixed on the driven shaft, a sliding conical disk keyed for sliding movement on each of said shafts and each having its conical face disposed reversely to the conical face of the fixed conical disks to thereby provide a grooved pulley on each of the shafts, a lever having its ends connected to said sliding disks, a bolt slidably penetrating a portion of the frame, resilient means normally forcing said bolt away from said frame, means pivotally connecting an intermediate point of said lever with said belt, a member penetrating one end of said lever and having a worm gear threadedly secured on one end thereof, a shaft having a worm thereon meshing with said worm gear, a ratchet wheel on the other end of said shaft having the worm thereon, a rod reciprocable by the reciprocating ring rail and having a pawl for engaging said ratchet wheel and whereby said lever is moved and said sliding disks are moved in opposed directions to vary the relative speeds between the drive shaft and the driven shaft.

JAMES R. CLAY.