July 4, 1939. W. E. SOMERVILLE 2,164,630

HIGH SPEED STRANDING OR WIRE ROPE MACHINE

Filed Feb. 25, 1939 7 Sheets-Sheet 1

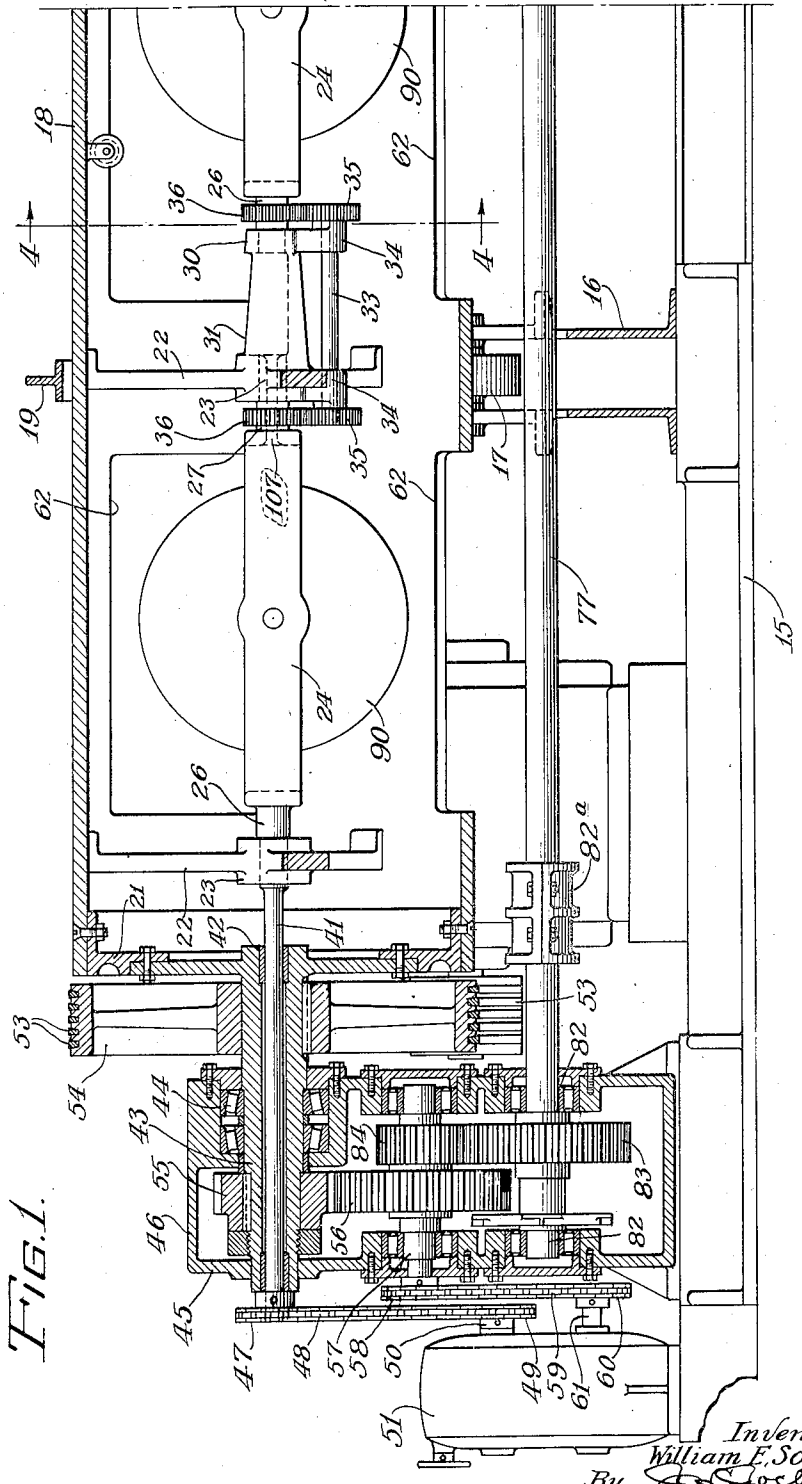


FIG. 1.

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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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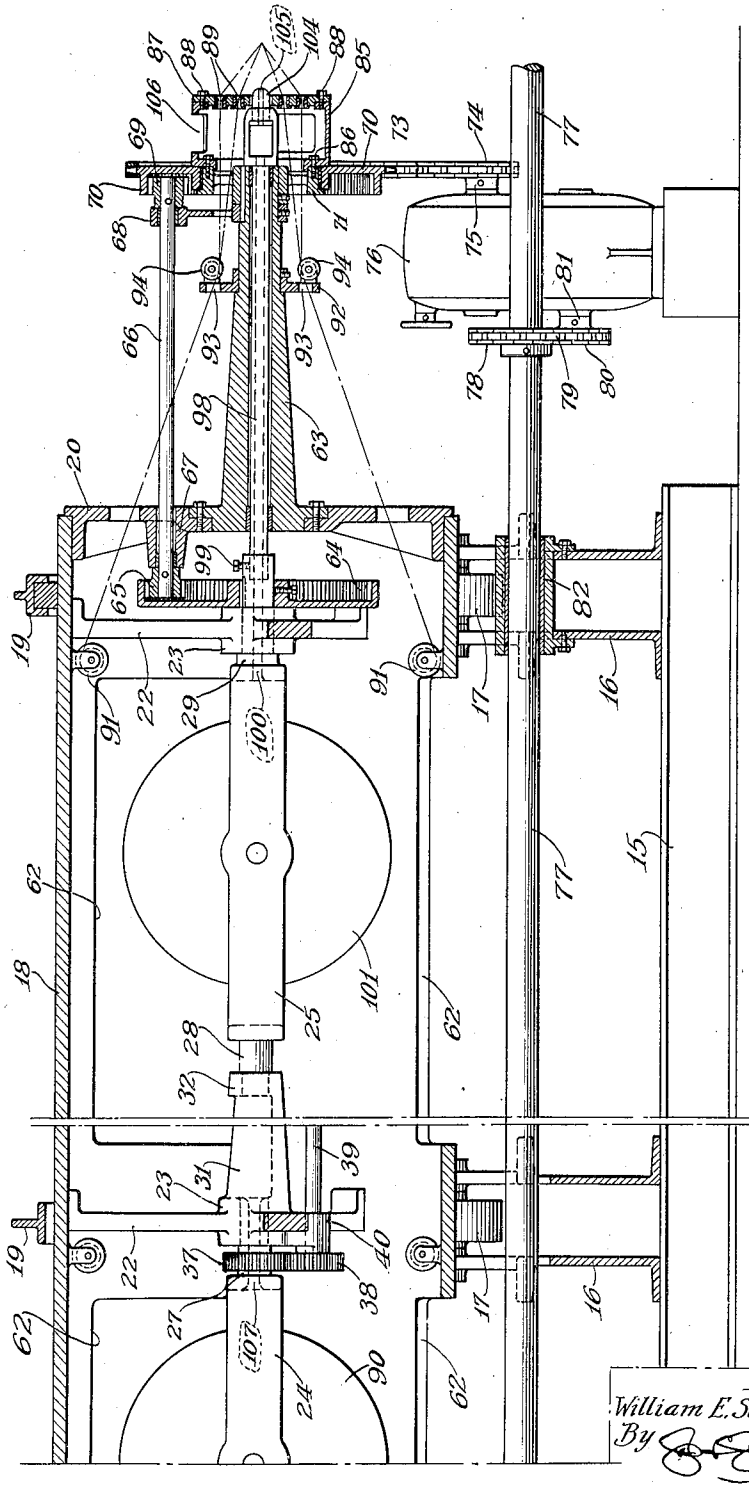


Fig. 2.

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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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Fig. 3.

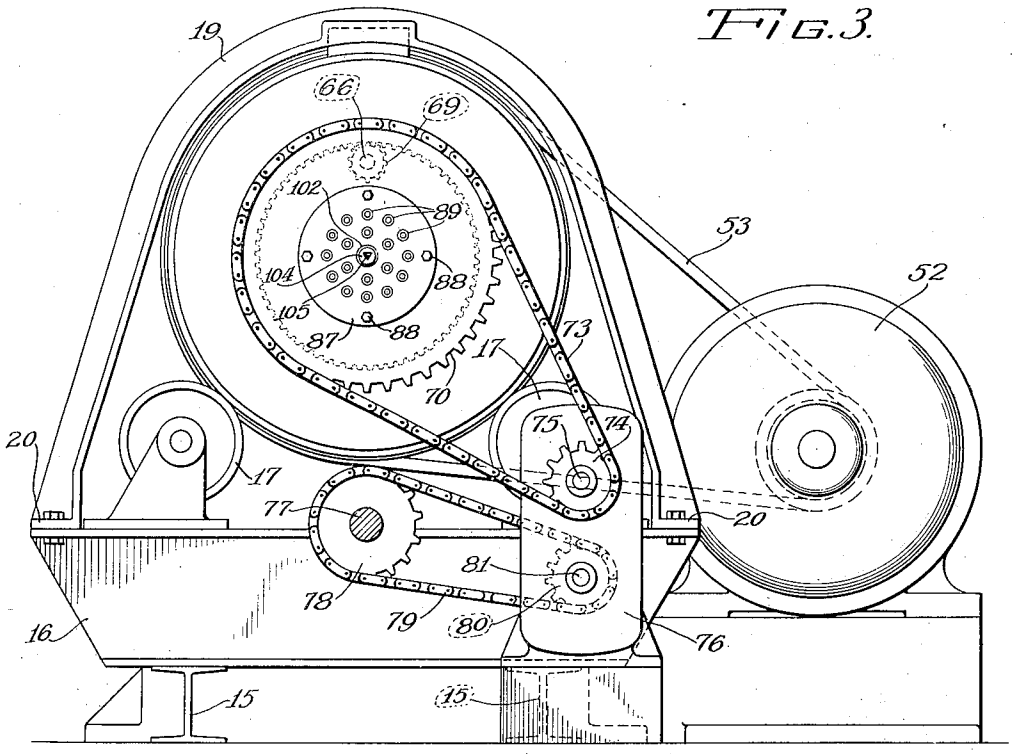
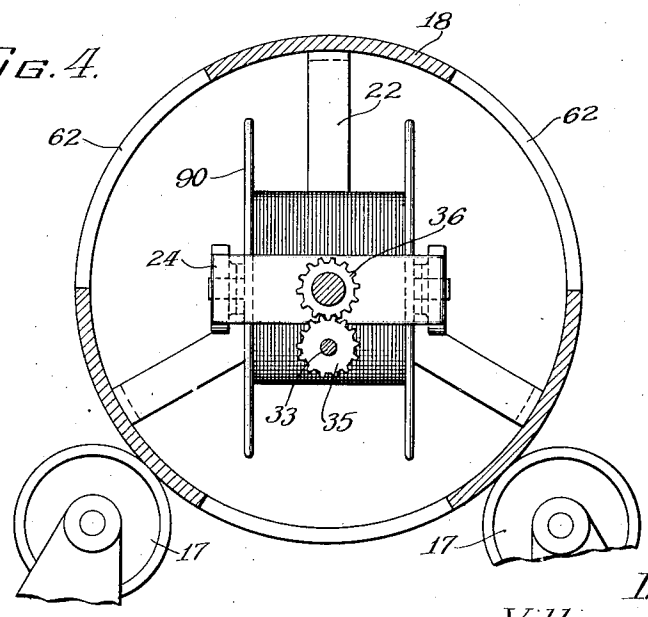


Fig. 4.



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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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Fig. 5.

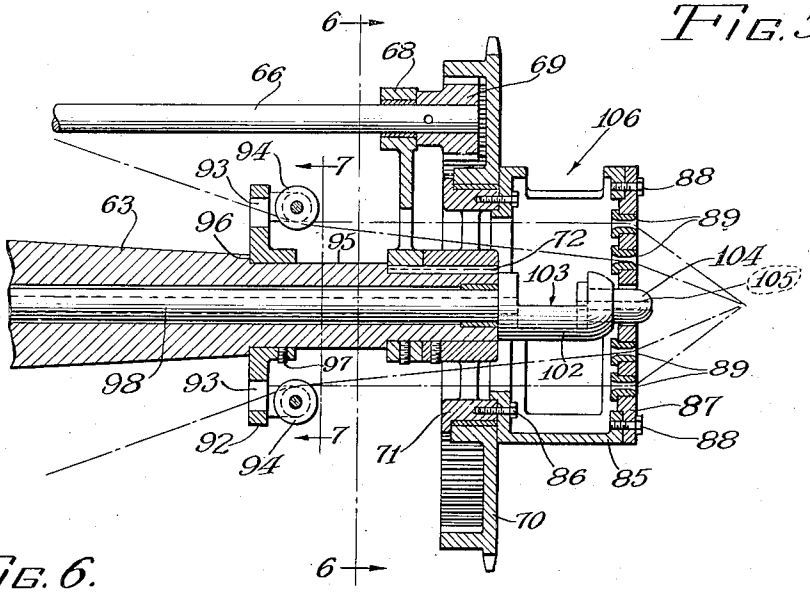


Fig. 6.

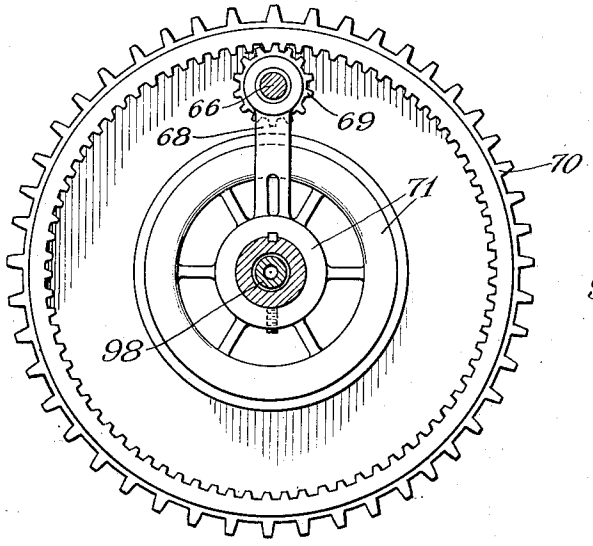


Fig. 7.

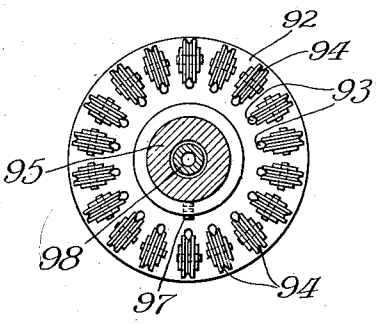


Fig. 10.

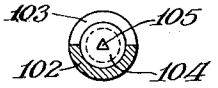


Fig. 8.

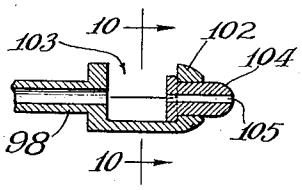
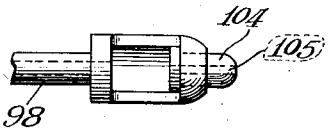


Fig. 9.



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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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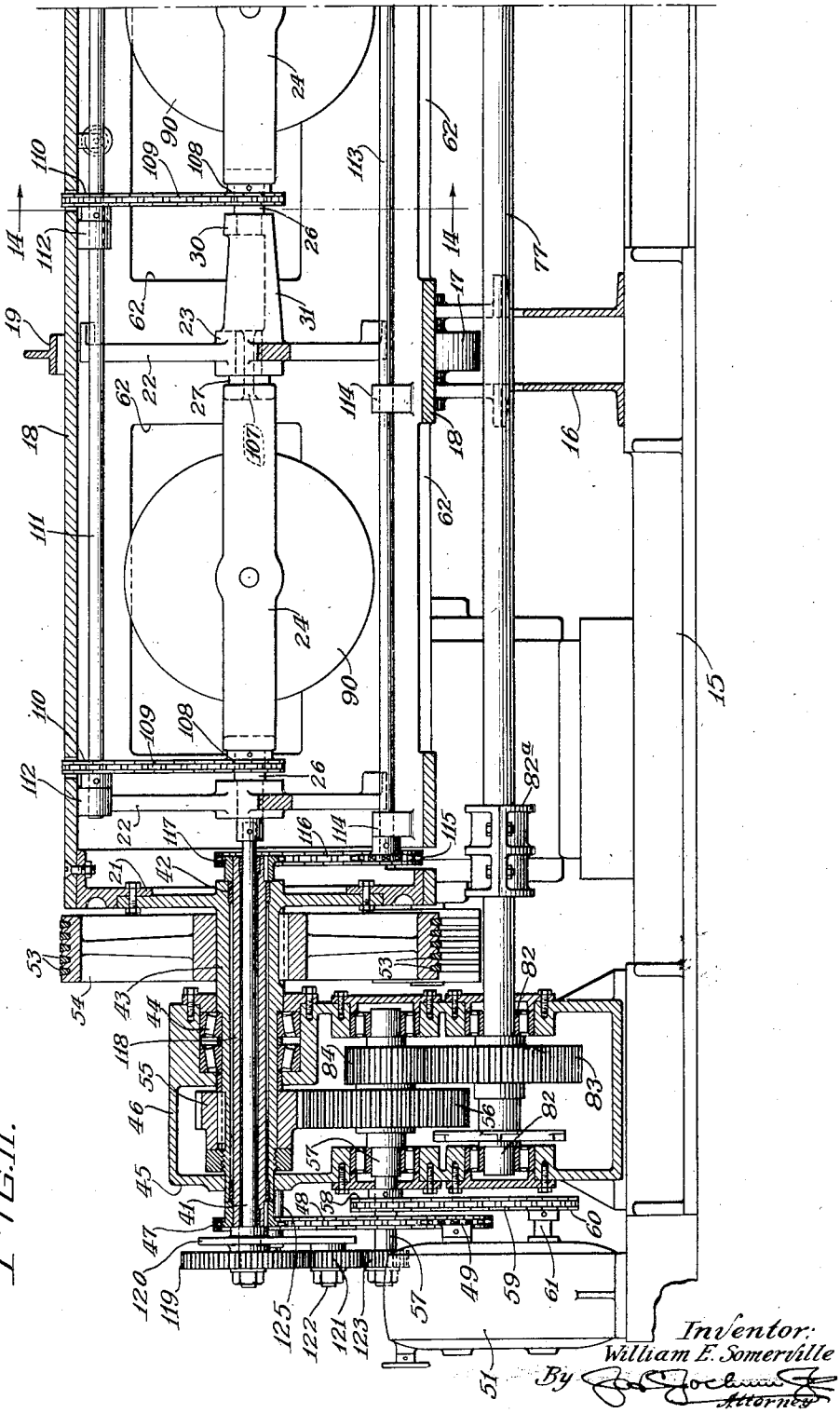


FIG. 11.

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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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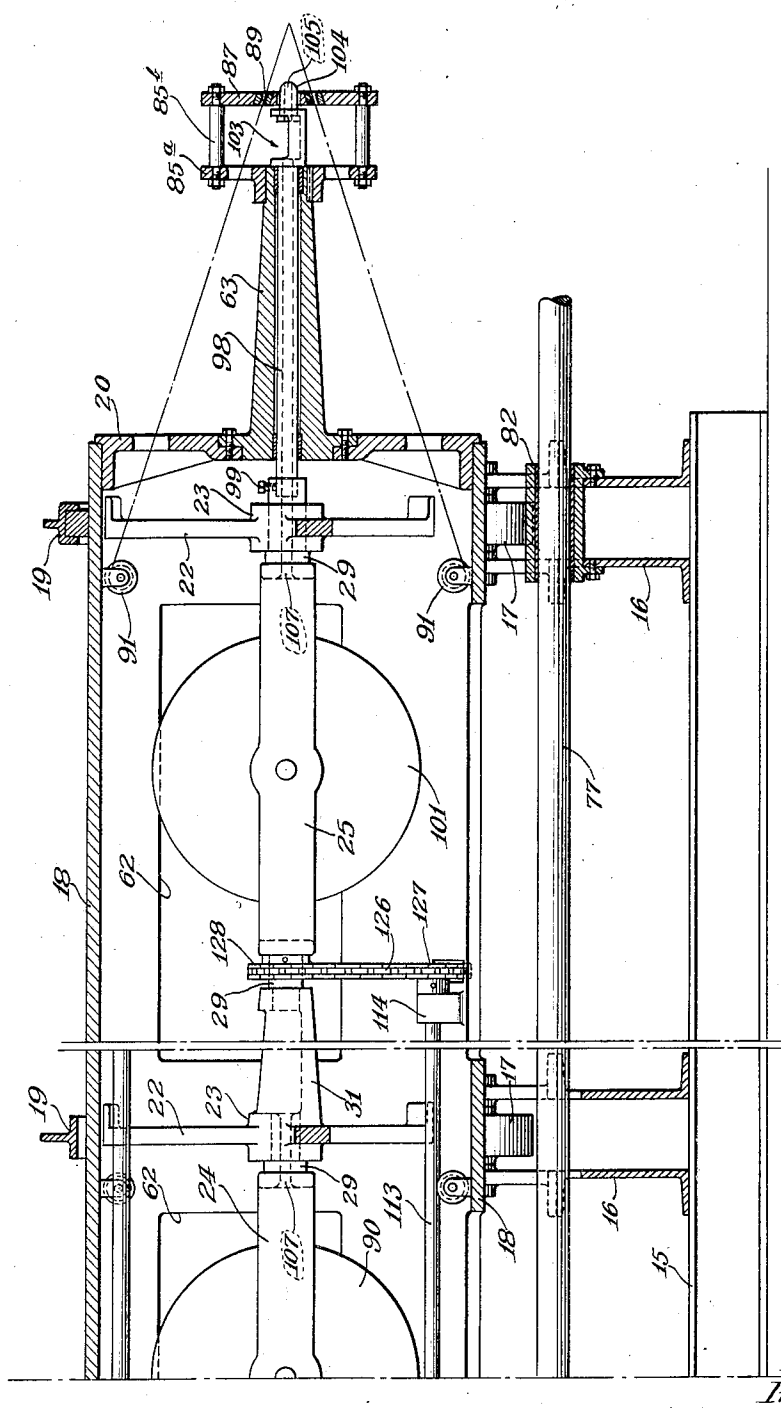


FIG. 12.

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HIGH SPEED STRANDING OR WIRE ROPE MACHINE

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Fig. 13.

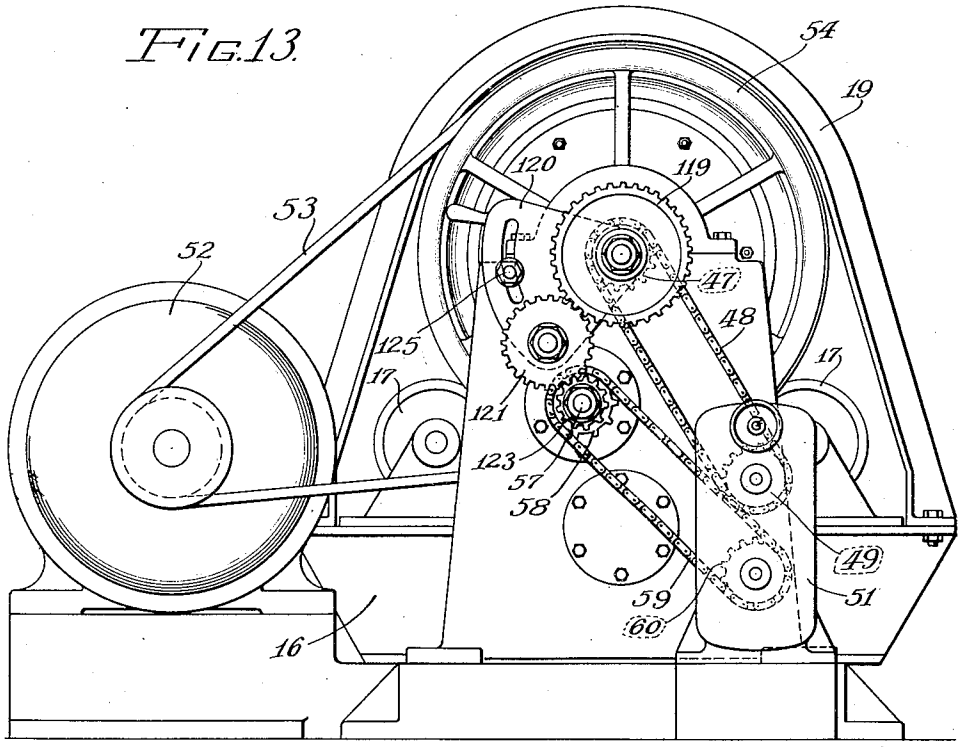
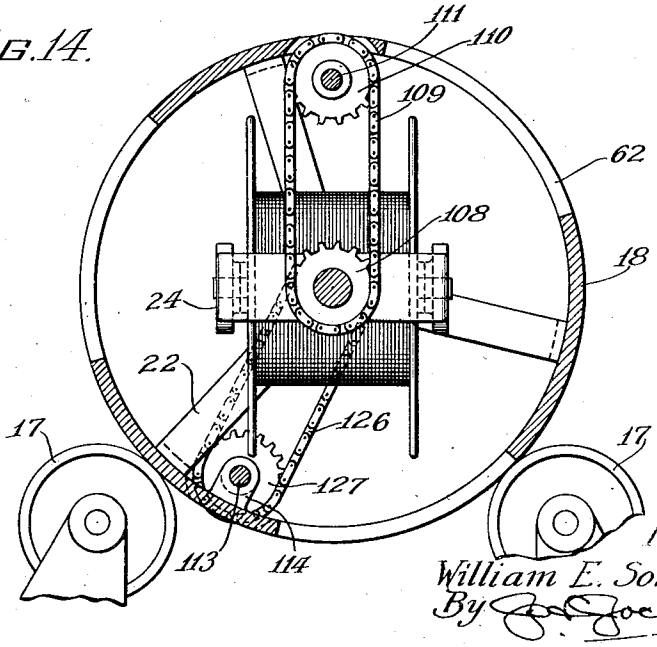


Fig. 14.



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Patented July 4, 1939 2,164,630

UNITED STATES PATENT OFFICE

2,164,630

HIGH SPEED STRANDING OR WIRE ROPE MACHINE

William E. Somerville, Coal City, Ill.

Application February 25, 1939, Serial No. 258,503

14 Claims. (Cl. 57—65)

This invention relates to improvements in high speed stranding or wire rope machines of the floating cradle type, and one of the objects of the invention is to produce in a machine of this character a shaped stranded rope or cable and to provide improved means for causing the machine to rotate in one direction and the cradles in the opposite direction, the cradles rotating at different rates of speed from the rate of speed of rotation of the machine, whereby the opposite twist or back turn will be taken out of the strands as they are being laid around the core.

A further object is to provide in a machine of this character embodying a plurality of cradles, improved means for imparting to the cradles rotation with respect to the rotation of the machine, and improved means for causing certain of the cradles to be rotated at different rates of speed with respect to the machine and with respect to each other, whereby to produce in the finished rope or cable the proper lay of the strands.

To the attainment of these ends and the accomplishment of other new and useful objects as will appear, the invention consists in the features of novelty in substantially the construction, combination and arrangement of the several parts hereinafter more fully described and claimed and shown in the accompanying drawings illustrating this invention, and in which

Figure 1 is a vertical, longitudinal sectional view of one end of the machine.

Figure 2 is a view similar to Figure 1 of the other end of the machine.

Figure 3 is a right hand end elevation of Figure 2.

Figure 4 is a vertical sectional view taken on line 4—4 Figure 1.

Figure 5 is a detail vertical longitudinal sectional view, on an enlarged scale of the end of the machine shown in Figure 2.

Figure 6 is a vertical sectional view taken on line 6—6 Figure 5.

Figure 7 is a vertical sectional view taken on line 7—7 Figure 5.

Figure 8 is a longitudinal sectional view of the die at the forward end of the machine.

Figure 9 is a top plan view of Figure 8.

Figure 10 is a detail sectional view taken on line 10—10 Figure 8.

Figure 11 is a vertical sectional view similar to Figure 1 of one end of the machine constructed in accordance with the principles of this invention and showing a modified form.

Figure 12 is a vertical sectional view of the front end of the machine as shown in Figure 11.

Figure 13 is a left hand end elevation of Figure 11.

Figure 14 is a vertical sectional view taken on line 14—14 Figure 11.

Referring more particularly to the drawings and the form of the invention shown in Figures 1 and 2, the numeral 15 designates a suitable supporting base and mounted upon the base at suitable intervals are supporting members 16 which extend transversely with respect to the base, and any suitable number may be employed.

Mounted upon these members 16 and in suitable bearings are rollers 17 arranged in pairs and the rollers of the pairs are laterally spaced from each other to form a cradle for a tubular body portion 18 which rests upon the rollers.

This body portion is held against displacement in any desired or suitable manner, such as by means of yokes or substantially U-shaped members 19 extending over the body portion with the ends thereof resting upon the respective bearing members 16 and which yoke members 19 are anchored in any desired or suitable manner.

The body portion 18 is hollow and one end thereof is closed by a plate or head 20 and the other end thereof is closed by a plate 21 secured in position in any desired or suitable manner and these plates or heads may be of any desired or suitable construction.

Arranged within the tubular body portion and at desired and spaced intervals are brackets 22 supported in any suitable manner and these brackets are provided adjacent the diametric center of the body portion 18 with bearings 23.

Reel carrying cradles 24—25 are provided within the tubular body and each of the cradles 24 is provided with trunnions 26—27 and the cradle 25 is provided with trunnions 28—29.

The trunnions 26—27 of the cradle 24 are journaled in the respective bearings 23 of the brackets 22 while the trunnions 26 of the next cradle 24 is journaled in a bearing 30 constituting a portion of an arm or extension 31 on the bracket 22.

The other end of this cradle 24 is journaled in the bearing in the next adjacent bracket 22 while the trunnion 28 of the cradle 25 is journaled in a bearing 32 of one of the arms or extensions 31 of one of the brackets 22.

The proximate ends of the first two cradles 24 terminate short of each other and a shaft 33 journaled in suitable bearings 34 extends across the space therebetween. This shaft 33 carries gears 35 which mesh with gears 36 secured to the respective cradles.

The trunnion 27 at the opposite end of one of the cradles 24 has secured thereto a gear 37 which meshes with a gear 38 carried by a shaft 39 journaled in a suitable bearing 40 so that when one of the cradles is rotated about its axis motion will be imparted to the other cradles 24.

Connected to the trunnion 26 of the end cradle 24 is a shaft 41 journaled in a bearing 42 in the head or end plate 21. Projecting laterally from the head 21 is a trunnion 43 journaled in suitable bearings 44 and extending through a wall 45 in a casing 46.

Connected to the shaft 41 for rotation therewith is a sprocket gear 47 over which a drive chain 48 passes and which drive chain in turn passes over a sprocket wheel 49 on a shaft 50 of a variable speed drive mechanism designated generally by the reference numeral 51, the latter being mounted upon a suitable portion of the base.

Rotation is imparted to the tubular body portion 18 by means of a suitable driving motor 52 through the medium of a driving belt 53 which passes over a pulley 54 secured to the extension 43 of the head 21.

Connected to this extension 43 for rotation therewith is a gear 55 which in turn meshes with a gear 56, which is mounted upon a shaft 57, the latter being journaled in a suitable bearing in the wall 45 of the casing 46. To this shaft 57 is connected a sprocket wheel 58 over which a sprocket chain 59 passes and this sprocket chain in turn passes over a pulley 60 that is connected to a shaft 61 of the variable speed drive mechanism 51.

It will therefore be manifest that when the pulley 54 is rotated the extension 43 on the head 21 will be rotated and this in turn will rotate the tubular body portion 18. At the same time the gear 55 will be rotated and this gear 55 meshing with the gear 56 will through the medium of the sprocket wheel 58, chain 59, sprocket 60, shaft 61, variable speed drive mechanism 51, sprocket wheel 49, sprocket chain 48 and sprocket wheel 47, rotate the shaft 41 and with it the foremost cradle 24. This cradle will through the medium of the gears 36—35 and shaft 33 rotate the next adjacent cradle 24, both the cradles rotating in directions opposite to the direction of rotation of the body portion and at a different rate of speed with respect thereto.

Suitable openings 62 may be provided in the body portion 18 to permit access to the cradles.

The end cradle 25 will be rotated independently with respect to the cradles 24 and to that end there is provided an extension or bearing 63 (see Figure 2) secured to and projecting laterally from the head or end 20. Secured to the trunnion 29 of the cradle 25 for rotation therewith is an internally toothed gear 64 with which a gear 65 secured to a shaft 66 meshes. The shaft 66 is journaled in suitable bearings 67—68 and projects beyond the end 20. Secured to the shaft 66 for rotation therewith is a gear 69 which meshes with the teeth of the internally toothed sprocket 70, the latter being mounted upon a bearing 71 that is secured, as at 72, to the extension 63 for rotation therewith, and passing over the sprocket 70 is a sprocket chain 73 which also passes over a sprocket wheel 74 secured to a shaft 75 of a variable speed reduction gearing mechanism 76. Motion is imparted to the sprockets 74 by means of a shaft 77 on which shaft is secured a sprocket wheel 78 and a sprocket chain 79 passes over the sprocket wheel 78 and also over a sprocket 80 secured to a shaft 81 of the reduction gearing mechanism 76.

The shaft 77 is journaled in suitable bearings 82 and is rotated preferably by means of a gear 83 secured thereto and which gear meshes with a gear 84 that is connected with the gear 56 for rotation therewith.

It will be seen that when the pulley 56 is rotated the hollow body portion 18 will be rotated in one direction while the cradles 24 will be rotated in the opposite direction and at a different rate of speed with respect thereto. At the same time through the medium of the intermeshing gears 84—83, shaft 77 will be rotated and through the medium of the variable speed drive gearing 76, sprocket chain 73, sprocket wheel 70, gear 69, shaft 66, gear 65, gear 64, the cradle 25 will also be rotated and the rotation of this cradle 25 will be in a different direction with respect to the body portion 18 and at a different rate of speed with respect to such body portion and also a different rate of speed with respect to the cradles 24.

Carried by the bearing 71 is a frame 85 which is preferably secured to the lateral face of the bearing in any suitable manner to rotate therewith, such as by means of screws or bolts 86 and this frame projects for any desired or suitable distance beyond the bearing 71. The frame is hollow and secured to the front end thereof is a die or nose plate 87 which may be removably secured in position by suitable fastening devices 88. In this plate are arranged dies 89 through which the strands from the reels 90, which are carried by the cradles 24, pass. These strands are guided by suitable pulleys 91 supported by and arranged within the tubular body 18 at desired points.

Carried by the extension 63 on the head 20 is a supporting disc or member 92 having openings 93 therethrough, through which the wire strands pass and supported by the plate 92 are pulleys 94 for guiding the strands to the dies 89. This plate 92 may be secured in position by telescoping over a reduced portion 95 of the extension 63 on the head or plate 20 and rests against a shoulder 96 being held in position in any suitable manner such as by means of a fastening device 97 so that the plate or member 92 will rotate with the head 20 and the body 18 of the machine.

Supported by the trunnion 29, preferably by telescoping thereinto is a hollow shaft or tube 98 being held in position by a fastening screw 99, and is arranged to register with an opening 100 in the trunnion 29.

The reel 101 which is supported by the cradle 25 carries a preformed core and is paid out from the reel and passes through the opening 100 in the trunnion 29 and through the tubular shaft 98.

Supported by the free end of the shaft 98 is a housing 102 provided with a laterally opening entrance 103, and supported by one wall of the housing 102 is a die 104 through which there is provided an opening 105 that is arranged in alinement with the opening in the tubular shaft 98. This opening 105 is shaped to correspond to the shape of the core and is preferably irregular in cross-section so that the core passing through the opening 105 of the die 104 will, when the die is rotated, be axially rotated, as it is necessary in a machine of this character to rotate the core as the strands are being laid around it for the purpose of taking out the

opposite twist or back turn as the strands are being laid around the core.

The frame 85 is provided with an opening 106 to permit access to the die 104 and the die 104 projects through the die or nose plate 87 and is encompassed by the dies or guides 89.

With this construction as the strands are being advanced and drawn together to be taken up by the haul-off mechanism, the strands encompass the core.

Obviously any desired number of guides 89 may be provided according to the number of strands desired in the finished rope or cable.

In the form of the invention shown in Figures 11 and 12 there is shown a different form of driving or actuating mechanism for rotating the cradles and consists of a sprocket wheel 108 secured to the trunnions 26 of the respective cradles 24, and over each of which sprocket wheels a sprocket chain 109 passes. Each of these sprocket chains passes over another sprocket wheel 110 secured to a shaft 111 for rotation therewith and which shaft 111 is housed within the body portion 18 to extend lengthwise thereof adjacent the inner periphery and which shaft is journaled in suitable bearings 112.

As the shaft 41 is rotated the first cradle 24 will be correspondingly rotated and through the medium of the sprocket wheel 108 secured thereto the shaft 111 will be rotated by means of one of the sprocket chains 109. As the shaft 111 is rotated the remaining sprocket chains 109 will rotate the other cradles 24.

In this form of the invention, however, the foremost cradle 25 is provided with a separate driving mechanism so that it will be rotated at a different rate of speed from the speed of rotation of the cradles 24. To that end there is provided a shaft 113 arranged adjacent the inner periphery of the housing 18 and journaled in suitable bearings 114.

To one end of this shaft 113 is secured a sprocket wheel 115 over which a sprocket chain 116 passes, and this sprocket chain in turn passes over a sprocket wheel 117 that is secured to a tubular shaft 118 for rotation therewith. This tubular shaft 118 passes through and is journaled in the end or head 43 of the body portion 18 and projects beyond the end of the latter and also beyond the sprocket wheel 47.

Secured to the shaft 41 in this form of the invention is a gear 119. A supporting member 120 is mounted upon the shaft 41 for rotative adjustment with respect thereto and supports a gear 121 mounted upon a stub shaft 122. These gears 121—119 mesh with each other and also with a gear 123 that is secured to an extension of the shaft 57, the gear 123 also meshing with the gear 121.

When the shaft 57 is rotated the shaft 41 will also be rotated through the medium of the intermeshing gears 123—121 and 119.

The support 120 for the gear 121 is rotatably adjustable on the shaft 41 in order to render it possible to interchange the gear 121 with another gear to produce a different rate of speed. This is accomplished by swinging the plate or support 120 about its pivot to accommodate a larger or smaller gear for the gear 121. The adjustment is effected by means of providing a slot 124 in the supporting member 120 through which a fastening bolt 125 passes and which fastening bolt engages a stationary part of the machine.

The cradle 25 in this form of the invention is rotated by means of the shaft 113 through the medium of a sprocket chain 126 which passes over a sprocket wheel 127 secured to the shaft 113 and a sprocket 128 which is secured to the trunnion 29 of the cradle 25.

The shaft 113 is rotated as before stated through the medium of the chain and sprocket connection 115—116—117.

It will therefore be seen that in both of the forms of the invention the cradles 24 as well as the cradle 25 will be rotated in a direction opposite to the direction of rotation of the tubular housing or body 18 and at different rates of speed with respect thereto and that the cradle 25 will also be given a speed of rotation different from the speed of rotation of the cradles 24 within the housing 18.

With this construction the twist or back turn will be taken out of the strands as well as out of the core as the strands are laid about the core and all of this is produced in a high speed machine, the preshaped core being carried by one of the cradles and is surrounded by the strands from the strand carrying cradles.

With this construction and by rotating the core as well as the cradles, some of the cradles rotating at a different rate of speed with respect to each other and with respect to the rotation of the machine, the lay of the strands in the finished product will be proper and accurate.

In the present exemplification of the invention the reel carrying cradles are shown as having a direction of rotation opposite to the direction of rotation of the machine or tubular body, but it is to be understood that the cradles may be rotated either in such direction or in the same direction of rotation as the machine or tubular body, and also that the foremost cradle may be rotated in the same direction as, or in a different direction from the direction of rotation of the cradles and at any desired rate of speed, with respect thereto.

While the preferred forms of the invention have been herein shown and described, it is to be understood that various changes may be made in the details of construction and in the combination and arrangement of the several parts within the scope of the claims, without departing from the spirit of this invention.

What is claimed as new is:

1. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of the said body, means for supporting and means for rotating said body, and means for rotating said cradles in directions opposite to the direction of rotation of said body and at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles.

2. A high speed machine of the character described embodying a body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported by said body and spaced from each other in directions lengthwise of the body, means for supporting and means for rotating said body, means for rotating said cradles in directions opposite to the directions of rotation of said body and at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed

of rotation from the speed of rotation of the other cradles, and driving means common to the said rotating means.

3. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of the said body, means for supporting and means for rotating said body, means for rotating said cradles in directions opposite to the direction of rotation of said body and at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, a core carrying reel mounted upon one of said cradles, and strand carrying reels mounted upon the other of said cradles.

4. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of the said body, means for supporting and means for rotating said body, means for rotating said cradles in directions opposite to the direction of rotation of said body and at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, a core supporting reel carried by one of said cradles, strand carrying reels mounted upon the other of said cradles, a die for the core rotatable with the core reel carrying cradle, and guides for the strands rotatable with respect to and about the said die.

5. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of the said body, means for supporting and means for rotating said body, and means for rotating said cradles in directions opposite to the direction of rotation of said body and at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, the axes of rotation of the said cradles being in alinement.

6. In a high speed machine of the character described embodying a tubular body, strand reel carrying cradles within and rotatable with respect to said body, a core reel carrying cradle also within the said body for rotation with respect thereto, means for rotating all of the cradles with relation to and in a different direction from the direction of rotation of said body, the last said means embodying mechanism for also rotating the core reel carrying cradle at a different rate of speed with respect to the speed of rotation of the strand reel carrying cradles, and means for bringing all of said strands together to be simultaneously twisted or laid about the core and about each other.

7. In a high speed machine of the character described, a tubular body mounted to rotate upon a horizontal axis, a plurality of reel carrying cradles within the body and spaced in directions lengthwise of the body, means for rotating said body, means for rotating certain of the cradles from one end of said body, the said rotating means embodying power mechanism operatively connected to one of said cradles and gearing connections between the proximate ends of adjacent cradles, the said cradles rotating in a different direction from and at a speed different from the rate of speed of said body, means at the other end of the body for rotating another of said cradles independently of the other of said cradles, the last said means embodying driving means and a gear connection between the driving means and the last said cradle whereby to rotate the last said cradle at a different rate of speed and in the opposite direction from the direction of rotation of said body, and also at a different rate of speed with respect to the other cradles, and means connecting the last said driving means with the first said power means.

8. In a high speed machine of the character described, a tubular body mounted to rotate upon a horizontal axis, a plurality of reel carrying cradles within the body and spaced in directions lengthwise of the body, means for rotating said body, means for rotating certain of the cradles from one end of said body, the said rotating means embodying power mechanism operatively connected to one of said cradles and gearing connections between the proximate ends of adjacent cradles, the said cradles rotating in a different direction from and at a speed different from the rate of speed of said body, means at the other end of the body for rotating another of said cradles independently of the other of said cradles, the last said means embodying driving means and a gear connection between the driving means and the last said cradle whereby to rotate the last said cradle at a different rate of speed and in the opposite direction from the direction of rotation of said body, and also at a different rate of speed with respect to the other cradles, means connecting the last said driving means with the first said power means, a die connected to and rotatable with the last said cradles, and guiding means for strands from reels supported by certain of said cradles, said guiding means encompassing said die.

9. In a high speed machine of the character described a tubular body mounted to rotate about a horizontal axis, a plurality of reel carrying cradles within and spaced in directions lengthwise of the body, a driving shaft within and extending lengthwise of said body, a driving connection between said shaft and one of said cradles, a second shaft also within and extending lengthwise of said body, driving connection between the last said shaft and a plurality of said cradles, power mechanism, means forming a connection between said power mechanism and the first said shaft, and means forming a connection between said driving means and one of said cradles, the said cradles rotating in a direction opposite to the direction of rotation of said body and at a different rate of speed, one of said cradles also rotating at a different rate of speed with respect to the other cradles.

10. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions transverse of the said body, means for supporting and means for rotating said body, and means for rotating said cradles at different rates of

speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles.

11. A high speed machine of the character described embodying a body rotatable on a horizontal axis, a plurality of reel carrying cradles, rotatably supported by said body and spaced from each other in directions lengthwise of the body, means for supporting and means for rotating said body, means for rotating said cradles at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, and driving means common to said rotating means.

12. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each in directions lengthwise of said body, means for supporting and means for rotating said body, means for rotating said cradles at a different rate of speed from the speed of rotation of said body, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, a core carrying reel mounted upon said cradles and strand carrying reels mounted upon the other of said cradles.

13. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of said body, means for supporting and means for rotating said body, and means for rotating said cradles, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles.

14. A high speed machine of the character described embodying a tubular body rotatable on a horizontal axis, a plurality of reel carrying cradles rotatably supported within said body, said cradles spaced from each other in directions lengthwise of said body, means for supporting and means for rotating said body, means for rotating said cradles, the last recited means embodying mechanism for imparting to one of said cradles a different rate of speed of rotation from the speed of rotation of the other cradles, a core carrying reel mounted on one of said cradles and strand carrying reels mounted upon the other of said cradles.

WILLIAM E. SOMERVILLE.