Sept. 6, 1966 D. P. WHITACRE 3,270,979

WIRE COILING MACHINE HAVING GROOVED BLOCK

Filed Dec. 14, 1964

2 Sheets-Sheet 1

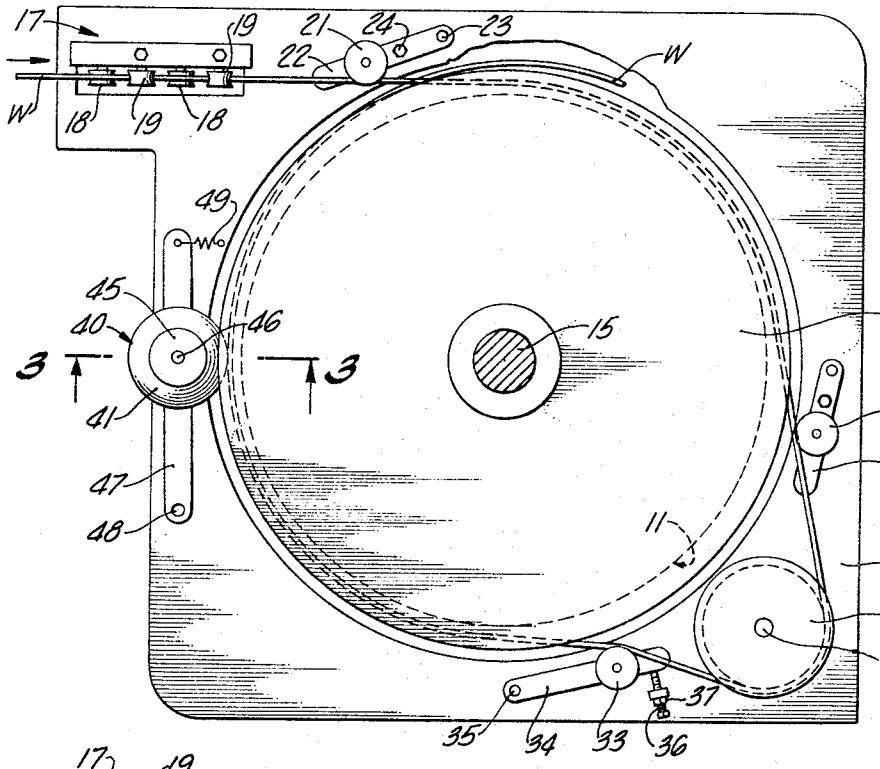


FIG. 1.

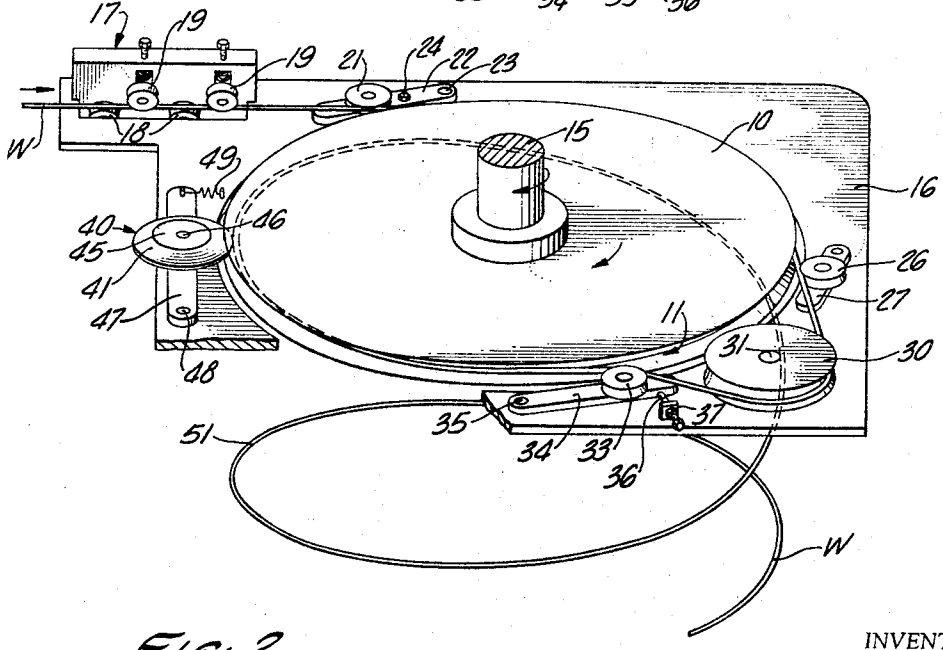


FIG. 2.

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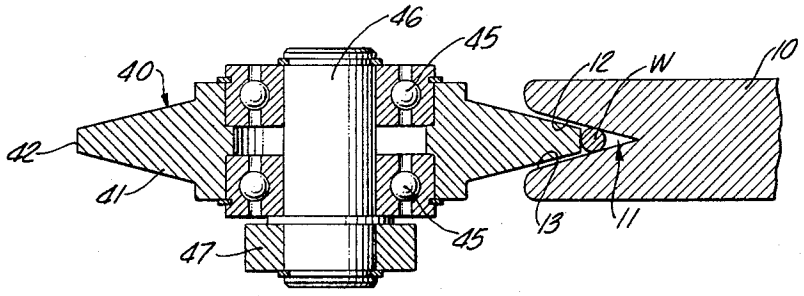


FIG. 3.

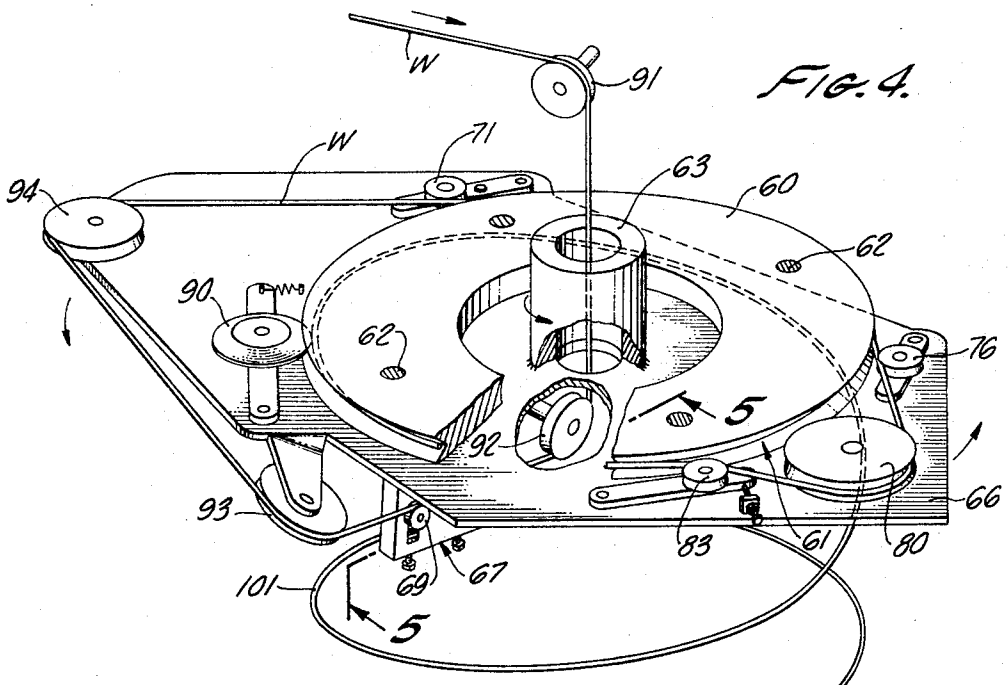
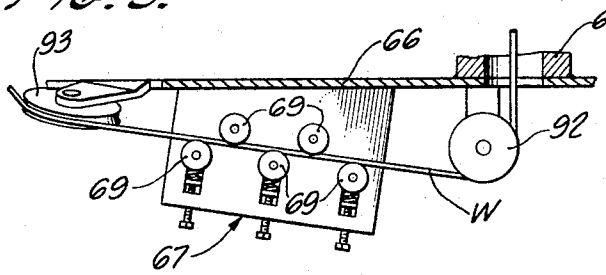


FIG. 4.

FIG. 5.



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WIRE COILING MACHINE HAVING GROOVED BLOCK

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This invention relates to apparatus for feeding or regulating the feed-rate of wire or other filamentary material, and is particularly directed to improvements in a wire coiling machine.

Conventional wire coiling apparatus commonly employs a capstan or block comprising a generally cylindrical drum with a flange at one end. The drum tapers slightly with the flange at the large end. The flange is also tapered. The wire makes several wraps around the drum surface and the incoming wire first engages the drum surface at the junction of the flange. The incoming wire crowds in between the flange and the last wound convolution of wire and forces the previously wound convolutions axially along the drum and away from the flange. This axially sliding movement of the wire relative to the drum surface causes the convolutions gradually to loosen their gripping engagement with the drum surface so that some circumferential slipping action also takes place between the wire and the drum. This combination of axial slipping and circumferential slipping of the wire relative to the drum surface results in substantial wear of the drum surface after a period of use.

It is an important object of this invention to provide a wire coiling machine which substantially eliminates any relative sliding movement between the wire and the capstan or block.

Another object is to provide such a wire coiling device which employs a block having a continuous peripheral groove for reception of the wire, together with novel means for preventing slippage between the wire and the sides of the groove.

Another object is to provide a wire coiling device of this type which employs either a rotating block or a stationary block.

Other objects and advantages will appear hereinafter.

In the drawings:

FIGURE 1 is a plan view showing a preferred embodiment of my invention and employing a rotating block.

FIGURE 2 is a perspective view of the device shown in FIGURE 1.

FIGURE 3 is a sectional detail taken substantially on the lines 3—3 as shown in FIGURE 1.

FIGURE 4 is a perspective view partly broken away showing the invention as applied to a wire coiling machine having a stationary block and a rotating support or flyer.

FIGURE 5 is a fragmentary detail taken substantially along the lines 5—5 as shown on FIGURE 4.

Referring to the embodiment of the invention shown in FIGURES 1, 2 and 3, the rotating capstan or block **10** is provided with a continuous peripheral groove **11** defined between tapered surfaces **12** and **13**. The proportions of the groove **11** are such as to receive any one of a series of sizes of wire to be coiled. The wire is continuous and is indicated by the legend W.

The block **10** is rotatably supported in any convenient manner, not shown, and is driven by means of a central shaft **15**. The stationary support **16** may be carried by a suitable frame, not shown. Upon this support **16** is a "killer"-block assembly generally designated **17** which has the combined functions of straightening the wire W and of adjusting the helix angle of the wire coil to be formed. The rollers **18** on one side of the wire W alternate with rollers **19** on the other side and the rollers **19** are adjustably mounted on the support **16**.

A grooved guide roller **21** is rotatably mounted upon an arm **22** pivoted to the support **16** at **23**. The guide roller **21** may be adjustably positioned along the length of the arm **22**, and the angular position of the arm may be clamped in adjusted position by means of the clamp **24**. The guide roller **21** contacts the wire W after it has passed through the killer block assembly **17** and guides it into the peripheral groove **11** in the rotating block **10**.

A similar guide roller assembly is mounted on the support **16** at a location circumferentially spaced from the guide roller **21**. This assembly includes guide roller **26** adjustably mounted on pivoted arm **27**. The roller **26** guides the wire W as it exits from the peripheral groove **11** to pass over the grooved pulley **30**. This grooved pulley **30** is rotatably mounted at **31** on the support **16** and it has an effective diameter which is substantially smaller than the effective diameter of the grooved block **10**. The wire W passes around the portion of the pulley **30** which is remote from the block **10** and the relatively small diameter of the pulley **30** causes the wire to receive a bend or permanent set in the direction of the circular cast of the coil to be formed.

The wire W then passes from the pulley **30** under the cast adjusting roller **33** which bends the wire in the other direction and thereby reduce the amount of permanent set of the bend in the wire W. The cast controlling roller **33** is mounted on a swinging arm **34** pivoted to the support **16** at **35**. An adjusting screw **36** secured by a lock nut **37** holds the arm **34** in the desired position. The position of the cast controlling roller **33** along the length of the swinging arm **34** may be adjusted by means not shown.

After passing between the roller **33** and the block **10** the wire W reenters the continuous peripheral groove **11**. The wire is maintained in the groove by means of a pressure roller **40** having a tapered periphery **41** shaped to enter into the peripheral groove **11** on the block **10**. The extreme peripheral surface **42** of the pressure roller **40** contacts the wire W, as shown in FIGURE 3 and holds it in the contact with the surfaces **12** and **13** which define the groove **11**. While the groove **11** shown in the drawing is symmetrical about a central plane this is by way of illustration only and the faces **12** and **13** may have different inclinations or one of them may comprise a radial surface, with all of the taper provided on the other face. In any event the tapered roller **40** is shaped so that a portion of its periphery may enter into the groove **11** and contact the wire W. The pressure roller **40** is mounted by means of spaced bearing assemblies **45** upon the stub shaft or post **46** which is fixed to the swinging arm **47**. This arm **47** is pivotally mounted on the support **16** at **48** and a spring **49** is provided for resiliently urging the pressure roller **40** into contact with the wire W.

The guide rollers **23**, **26**, the pulley **30**, the cast controlling roller **33** and the pressure roller **40** are all mounted in the plane of the peripheral groove **11** of the rotary block **10**. After the wire W passes under the pressure roller **40** it emerges from the peripheral groove and passes downwardly by gravity in convolutions **51** to form a coil not shown on any supporting device.

The wedging action of the wire W between the faces **12** and **13** of the peripheral groove **11** prevents any slipping of the wire in the groove. Substantially less than one full turn or wrap is required around the block **10**, and accordingly, the wire W may enter into one part of the groove and after passing under the pressure roller **40** exit from another part of the groove all within a circumferential extent of less than one full turn.

In the modified form of the invention shown in FIGURE 4 the capstan or block **60** is held stationary while

the support or flyer **66** rotates. The stationary block **60** is provided with a continuous peripheral groove **61** and the wire W is received in this groove. The block **60** is supported in any convenient way such as by means of the posts **62** carried by stationary frame not shown. The support or flyer **66** has a central hollow hub **63** and the axis of this hub is concentric with respect to the block **60** and its peripheral groove **61**. The hub **63** is fixed to the flyer **66** and forms a means by which the flyer may be supported and rotated. The flyer **66** supports the guide rollers **71** and **76**, the pulley **80**, the cast adjusting roller **83** and the pressure roller **90** which are constructed and operated in the same fashion respectively as described above for parts of the same name mounted on the stationary support **16**. The pulley **80** is substantially smaller than the grooved block **60** and the circular cast is controlled by the adjustable roller **83**. The tapered pressure roller **90** operates in the same manner as the pressure roller **40** described above.

A wire W first passes over a direction changing pulley **91** mounted on a stationary support not shown. The wire then passes down through the central opening in the hollow hub **63** and around the pulley **92** which is carried on the rotary flyer **66**. The wire W then passes through the killer block assembly **67** in which the alternate rollers **69** are adjustable to control the helical cast. The wire then passes around the inclined pulley **93** and the pulley **94**. The killer block assembly **67** and the pulleys **93** and **94** are all mounted on the rotary flyer **66**. The wire W then passes under the guide roller **71** into the peripheral groove **61** and emerges from the peripheral groove to pass under the guide roller **76** and around the pulley **80**, and then back around the cast adjusting roller **83** to reenter the peripheral groove **61**. The wire W then passes under the pressure roller **90** and then emerges from the peripheral groove **61** to form convolutions **101** descending by gravity to form a coil or any suitable support. In other respects the apparatus shown in FIGURE 4 is similar in construction and operation to that illustrated in FIGURES 1, 2 and 3.

Having fully described my invention it is to be understood that I am not to be limited to the details herein set forth but that my invention is of the full scope of the appended claims.

I claim:

1. Apparatus for controlling the feed rate of a continuous wire, comprising: a block having a continuous peripheral groove, means to guide the wire into the groove, a pulley positioned adjacent the periphery of the block and having a diameter substantially less than the diameter of the block, a casting roller, a pressure roller, the said guide means, pulley, casting roller and pressure roller being circumferentially spaced about said block in the order named and supported substantially in the plane of said groove, the wire passing from said groove around a portion of the pulley remote from the block, then around a portion of the casting roller adjacent said block, and then back into said groove, said pressure roller having a peripheral portion extending into the groove and contacting the wire under pressure to hold it in the groove, the wire then emerging from said groove.

2. The combination set forth in claim **1** wherein the block rotates.

3. The combination set forth in claim **1** wherein the block is stationary.

4. Apparatus for controlling the feed rate of a continuous wire, comprising: a block having a continuous peripheral groove, means to guide the wire into the groove, a pulley positioned adjacent the periphery of the block and having a diameter substantially less than the diameter of the block, a casting roller, a pressure roller, a support, the said guide means, pulley, casting roller and pressure roller being mounted on said support and circumferentially spaced about said block in the order named and supported substantially in the plane of said groove, the wire passing from said groove around a portion of the pulley remote from the block, then around a portion of the casting roller adjacent said block, and then back into said groove, said pressure roller having a peripheral portion extending into the groove and contacting the wire under pressure to hold it in the groove, the wire then emerging from said groove, and means on the support for adjusting the position of the casting roller.

5. The combination set forth in claim **4** wherein the block rotates and the support is stationary.

6. The combination set forth in claim **4** wherein the block is stationary and the support rotates.

7. Apparatus for controlling the feed rate of a continuous wire, comprising: a block having a continuous peripheral groove, means to guide the wire into the groove, a pulley positioned adjacent the periphery of the block and having a diameter substantially less than the diameter of the block, a casting roller, a tapered pressure roller, a support, the said guide means, pulley, casting roller and pressure roller being mounted on said support and circumferentially spaced about said block in the order named and supported substantially in the plane of said groove, the wire passing from said groove around a portion of the pulley remote from the block, then around a portion of the casting roller adjacent said block, and then back into said groove, the tapered pressure roller having a peripheral portion extending into the groove and contacting the wire under pressure to hold it in the groove, the wire then emerging from said groove, and means for resiliently urging said tapered roller into contact with the wire.

8. The combination set forth in claim **7** wherein the block rotates and the support is stationary.

9. The combination set forth in claim **7** wherein the block is stationary and the support rotates.

10. Apparatus for controlling the feed rate of a continuous wire, comprising: a block having a continuous peripheral groove, means to guide the wire into the groove, a grooved pulley positioned adjacent the periphery of the block and having a diameter substantially less than the diameter of the block, a casting roller, a tapered pressure roller, the said guide means, grooved pulley, casting roller and pressure roller being circumferentially spaced about said block in the order named and supported substantially in the plane of said groove, the wire passing from said block groove around a portion of the grooved pulley to bend the wire in one direction, then around a portion of the casting roller to bend the wire in the other direction and then back into said groove, the tapered pressure roller having a peripheral portion extending into the groove and contacting the wire under pressure to hold it in the groove, the wire then emerging from said groove, and means for adjusting the relative positions of the casting roller and the grooved pulley .

11. The combination set forth in claim **10** wherein the block rotates.

12. The combination set forth in claim **10** wherein the block is stationary.

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