March 12, 1929. O. A. FREDERICKSON 1,704,888

BRAIDING AND WRAPPING MACHINE

Original Filed Jan. 15, 1927 4 Sheets-Sheet 1

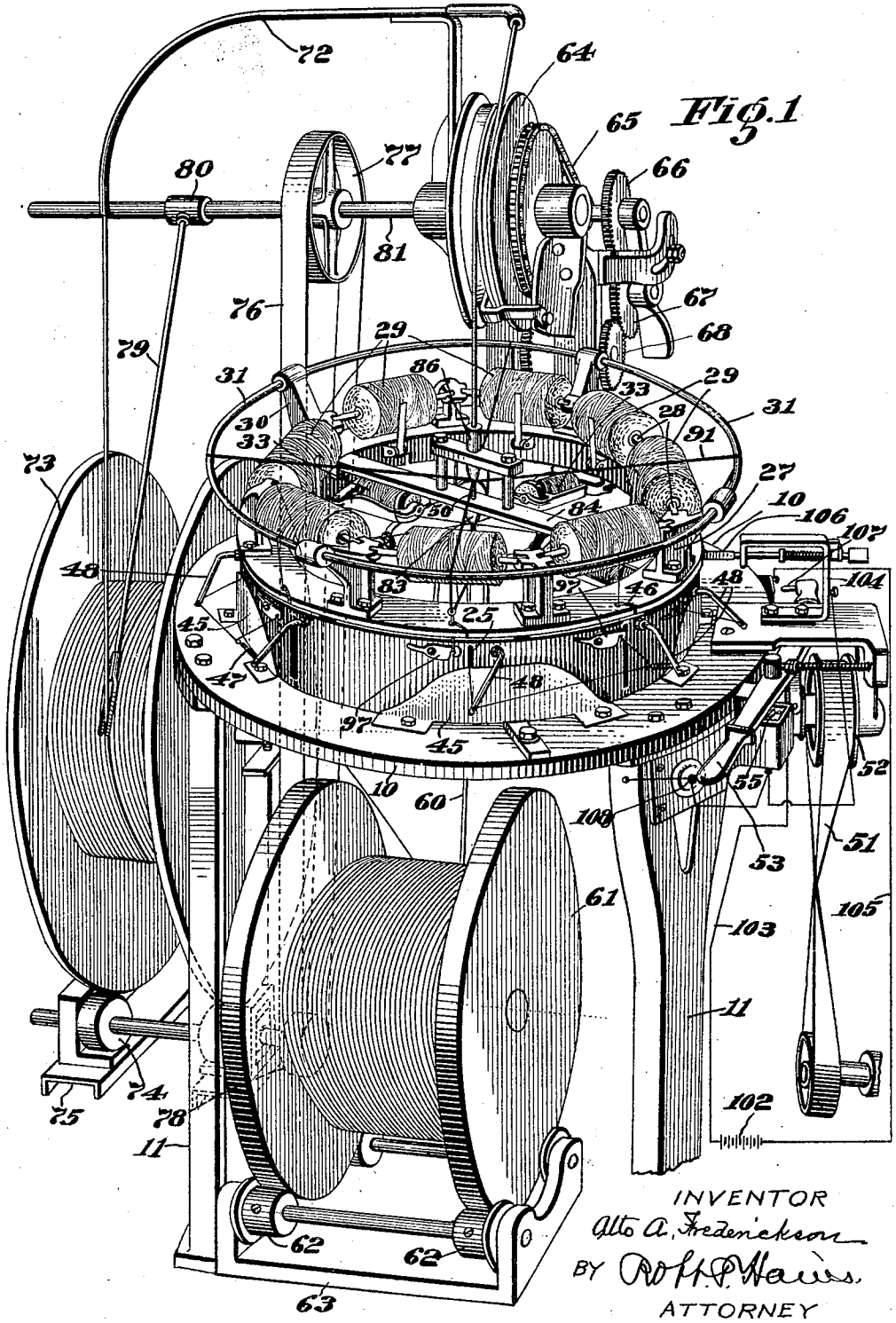


Fig. 1

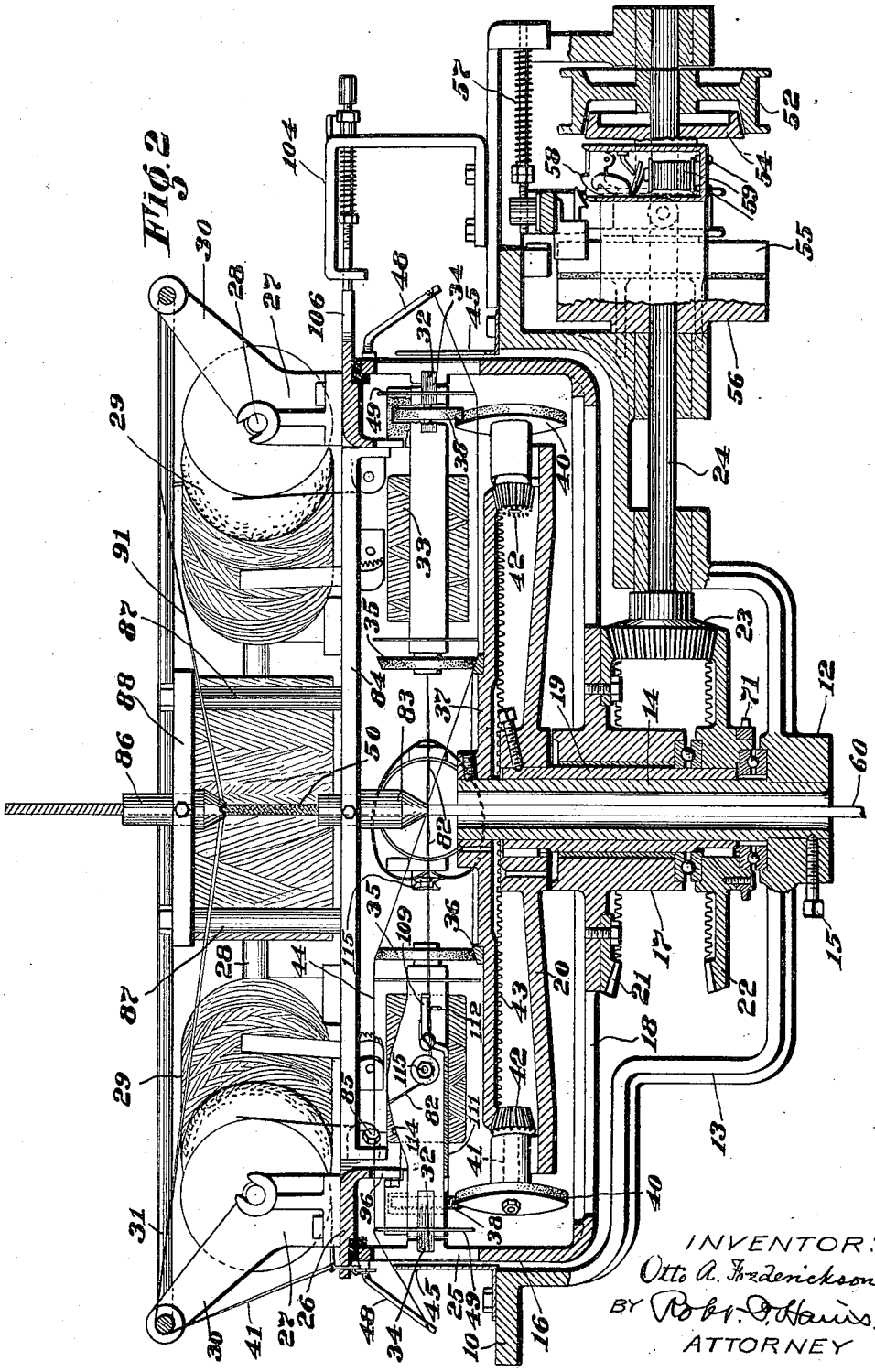
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BRAIDING AND WRAPPING MACHINE

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Fig. 2



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BRAIDING AND WRAPPING MACHINE

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Fig. 3

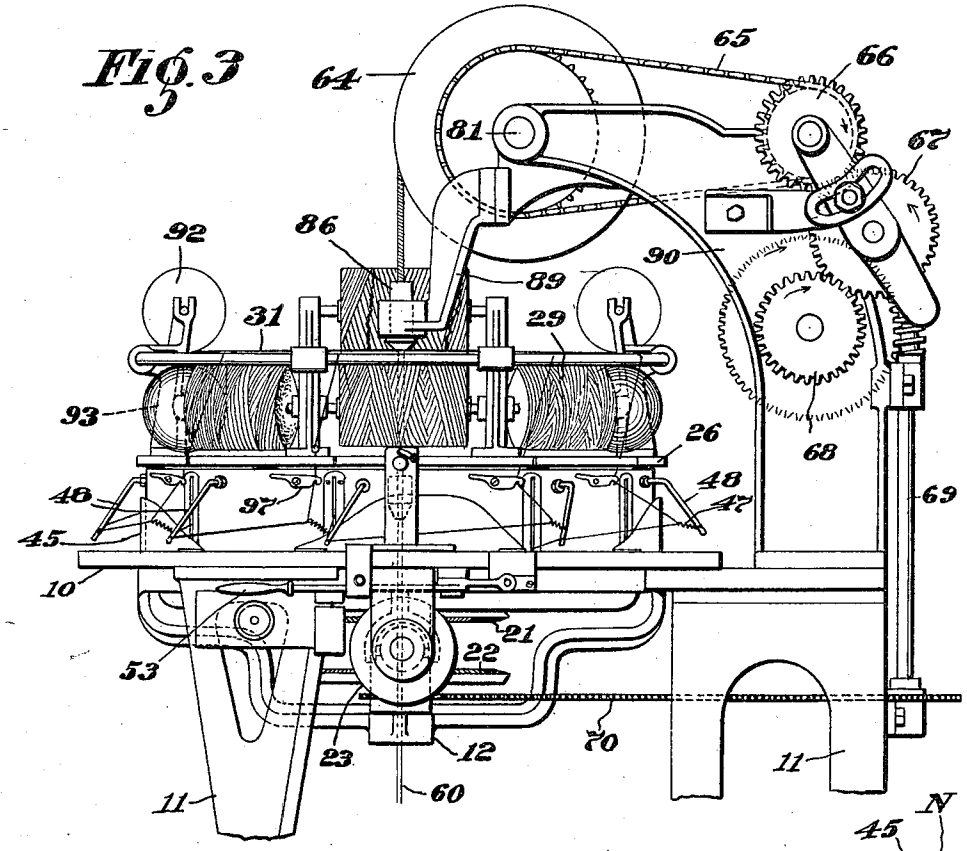


Fig. 4

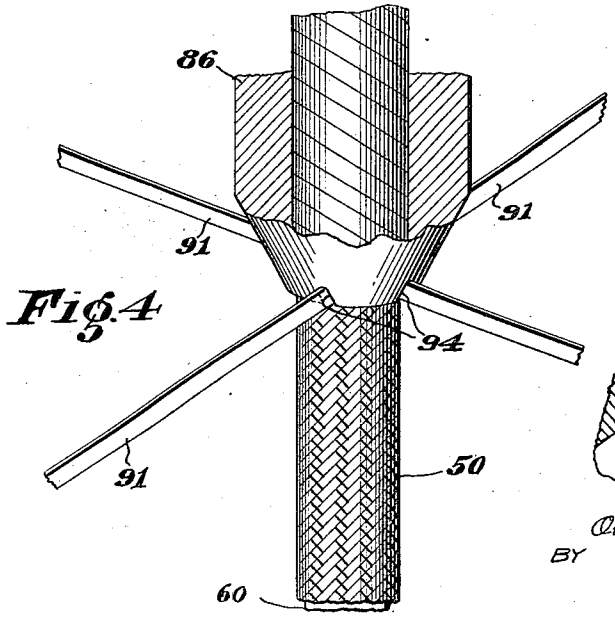


Fig. 5

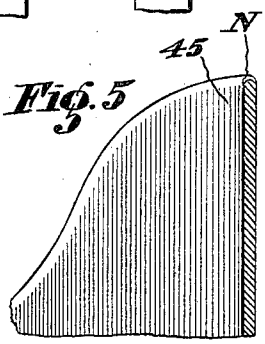
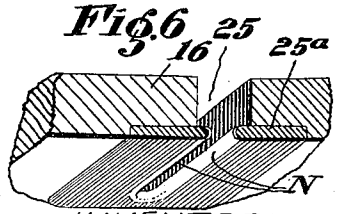


Fig. 6



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BRAIDING AND WRAPPING MACHINE

Original Filed Jan. 15, 1927 4 Sheets-Sheet 4

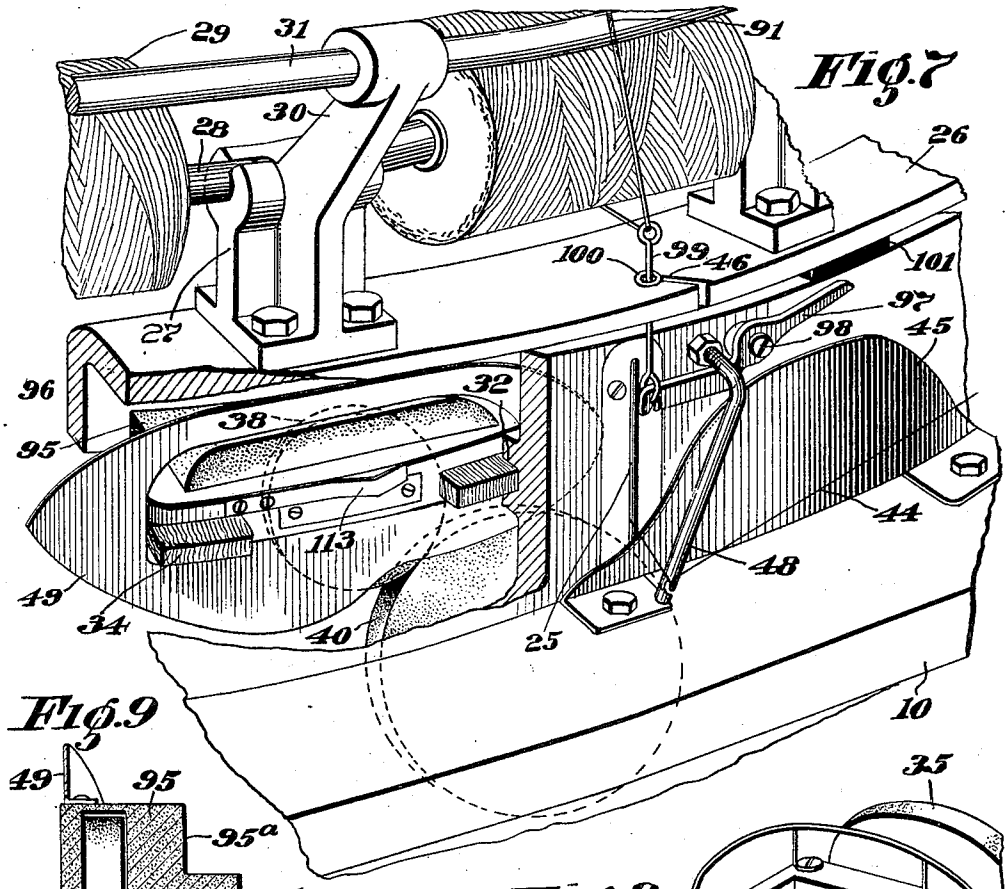


Fig. 7

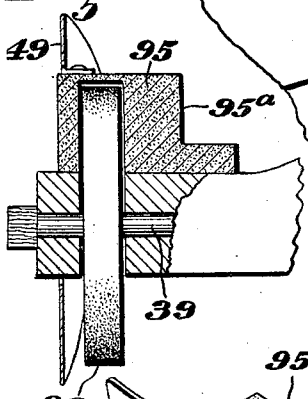


Fig. 9

Fig. 8

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Patented Mar. 12, 1929. 1,704,888

UNITED STATES PATENT OFFICE.

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BRAIDING AND WRAPPING MACHINE.

Application filed January 15, 1927, Serial No. 161,303. Renewed September 11, 1928.

This invention relates to improvements in the construction of a braiding machine and also to a combined braiding and wrapping machine.

In certain fields of manufacture, such for example, as in the production of insulated electrical conductor wires, it is desirable to form a braid about the conductor wire and to place over this braid a protecting wrapper formed of strands wound about the braid. Heretofore this braid has been formed about the wire by a braiding machine and then the protecting wrapper has been wound about the braid in a separate and independent operation and upon a separate machine.

One important feature of the present invention therefore resides in the novel construction whereby the braid and protecting wrapper above mentioned may be placed about a conductor wire in a single machine and at the same time.

Another important feature of the invention resides in the use of thread deflectors having thread guiding surfaces which are provided with a special finish that serves to reduce to a minimum the friction between the braiding strands and the surfaces they engage during the braiding operation.

Various types of deflectors have been used heretofore upon braiding machines but they have not been satisfactory on high speed machines, because the rapid movement of the stretched strands along the guiding surfaces has exerted an excessive tension or drag upon the strands which causes them to break frequently, so that it has been impossible to braid low grade yarn upon the deflector type of braiding machine unless such machine has been operated at relatively low speed.

In the ordinary type of braiding machine the outer yarn carriers are rotated in one direction and the inner yarn carriers are rotated in the opposite direction with the result that the outer and inner carrier pass each other at twice the speed at which either set of carriers is traveling. This makes it necessary to shift the outer strands rapidly to their positions above and below the inner carrier, but the rapid action of the deflectors on the stretched strands exerts a dragging pull on the strands that tends to break them.

The deflectors and guiding surfaces employed heretofore have usually been formed of steel or brass and the strand engaging edges of these deflectors have been highly polished to reduce the friction, but such metal appears to have a slight affinity for the braiding strands with the result that the strands will not slide freely along the edges of the guides no matter how highly these edges may be polished; furthermore, any tendency of the guides to corrode or rust due to the presence of moisture or gases in the air will increase their dragging action upon the strands.

It is found that the difficulties experienced heretofore in the use of deflectors upon braiding machines is entirely overcome by forming the strand engaging edges of the deflectors of nickel or of a nickel alloy which is given a high polish. The nickel finish not only takes a high polish which will not rust or corrode, but it is entirely free from any affinity for the strands, and as a result the strands even when advanced at high speed will slide smoothly along the deflectors without being subjected to the objectionable drag experienced heretofore.

This new finish for the deflectors has proved extremely valuable in practice because through its use the deflector type of braiding machines working on low grade yarn may be operated at a much higher speed than was possible heretofore.

Another important feature of the invention resides in a novel construction for holding the inner carriers in place so that the inner ends of the carriers are prevented from lagging behind or otherwise getting out of their proper position.

Still another feature of the invention resides in the construction whereby the upper portion of the pushed roll is housed to exclude lint and dust from the same.

Other features of the invention and novel combination of parts in addition to the above will be hereinafter described in connection with the accompanying drawings which illustrate good practical forms of the invention.

In the drawings:—

Fig. 1 is a perspective view of a combined braiding and wrapping machine constructed in accordance with the present invention;

Fig. 2 on an enlarged scale is a vertical sectional view through the machine of Fig. 1;

Fig. 3 is a side elevation of the braiding machine of Fig. 1 but provided with modified features;

Fig. 4 on an enlarged scale is a perspective view of the upper braid guide of Fig. 1;

Fig. 5 is a sectional perspective view of a novel strand deflector;

Fig. 6 is a sectional perspective view of one of the strand slots and associate guides of the outer drum;

Fig. 7 is an enlarged perspective view of portion of the machine of Fig. 1;

Fig. 8 is a perspective view of one of the inner carriers; and

Fig. 9 is a vertical sectional view through portion of the carrier of Fig. 8.

In the embodiment of the invention illustrated the wrapping feature of the present invention has been associated with a braiding machine in an extremely simple manner due to the fact that the type of braiding machine shown lends itself admirably to this combined operation. It should be understood however that the wrapping feature of the present invention may be associated with other types of braiding machines than that shown and described.

In the embodiment of the invention illustrated the braiding machine shown is provided with an annular table or support 10 which is supported the desired distance from the floor by the legs 11. The table 10 is provided with a central hub 12 which is connected to the table by the radially extending spokes or arms 13. Within the hub 12 is mounted a fixed hollow shaft 14 which may be rigidly secured within the hub by the bolt 15, and this shaft forms the central axis about which the operating parts of the braiding machine revolve.

Within the annular frame 10 is rotatably mounted the outer revolving drum 16 which is provided with the hub portion 17 that is secured to the outer portion of the drum by the horizontally extending flange portion 18. Within the hub 17 is mounted a hollow rotating shaft 19 which is journaled upon the fixed shaft 14 and to the upper end of the rotating shaft 19 is rigidly secured the driving frame 20 adapted to drive the inner yarn carriers. A driving gear 21 is secured to the under face of the flange portion 18 of the outer revolving drum, and a similar driving gear 22 is rigidly secured to the rotating shaft 19. The outer revolving drum 16 and driving frame 20 are rotated in opposite directions by the pinion 23 which meshes with the upper and lower gears 21 and 22 and this pinion is secured to and is driven by the shaft 24 that is rotatably supported by the frame 10.

The outer revolving drum 16 is provided with the usual thread receiving slots 25 through which the strands of yarns from the outer carriers may pass to the braiding point, and at the upper end of the outer revolving drum is mounted the top ring 26 which serves to support the outer yarn carriers. In the construction shown these carriers consist of upstanding brackets 27 which are bolted to the top ring and each of these carriers has a shaft receiving socket adapted to receive a transversely extending shaft 28 upon which is mounted the yarn mass 29. The brackets 27 are also preferably provided with an upwardly extending arm 30 adapted to support the strand guiding ring 31 about which the strands are drawn as they are unwound from the yarn masses. At the inner face of the outer revolving drum 16 is preferably provided the grooved runway 32 adapted to receive a projection provided at the outer end of each inner yarn carrier.

The inner yarn carriers may have the general construction best shown in Fig. 8 wherein it will be seen that this carrier has the form of a hollow frame adapted to receive the inner yarn mass 33, and in the construction shown the inner yarn carrier is provided at its outer end with the spaced shoes 34 adapted to slide in the runway 32 and support the outer end of the inner yarn carrier. At the opposite end of each inner yarn carrier is provided a roller 35 which rests upon the annular track or ring 36, and this ring is supported by a fixed annular frame 37 that is rigidly secured to the upper end of the fixed post 14. The inner carriers are supported at their opposite ends by the means just described so that these carriers may travel freely in an annular path about the braiding point, and in the construction shown cooperating disks are employed to drive the inner carriers. To this end each inner carrier is provided with a pushed disk 38 which is rotatably mounted by a pin 39 within an opening formed near the outer end of the frame of the inner carrier, and each disk 38 is pushed forward by a pushing wheel 40 which wheel is rigidly secured to a shaft 41 journaled in a bearing provided upon the driving frame 20, the arrangement being such that the pushing wheel 40 engages the lower portion of the pushed roller 38 and serves to push the latter and its inner carrier forward.

It is desirable to positively rotate the cooperating wheels or rollers 38 and 40 to facilitate the passage of the outer strand of yarn between these two wheels, and to this end the shaft 41 is provided with a driving pinion 42 which pinion meshes with the teeth 43 formed at the under face of the fixed frame or disk 37, the arrangement being such that rotation of the driving frame 20 will advance the pushing wheels 40 about the central axis of the braiding machine and the engagement of the cooperating gears 42 and 43 will positively rotate the pushing wheel 40.

It is necessary to traverse the strands of yarn 44 which are led from the outer yarn masses 29 to the braiding points, and in the construction shown the traversing of these strands is effected through the use of the fixed deflectors 45 which are secured to the main frame 10. In the construction shown the strands 44 are led downwardly from the

guide ring 31 through slots 46 formed in the top ring 26 and each strand is then passed through the eye of a take-up spring 47 which serves to take up slack in the thread. From the spring 47 the strand is led to a thread guide 48 which is secured to the outer drum 16 and the thread receiving slot of each of the thread guides 48 is so positioned that when the thread is stretched taut and extends in a straight line from this guide to the braiding point, the taut thread will lie below the nose of the thread deflector 49 provided upon each inner yarn carrier. As a result of the arrangement just described, each deflector 49 tends to force the outer strand of yarn downwardly so that the inner carrier will pass over such strand. In order to cause these outer strands of yarn to pass under some of the inner yarn carriers and over others to produce the braid 50, the fixed deflectors 45 above mentioned are provided. The arrangement is such that as the outer strands of yarn are advanced around the braiding point by the outer revolving drum these strands will periodically engage the fixed deflectors 45, which deflectors are so shaped that they will force the thread upwardly within the drum slot 25 to elevate such thread above the nose of a deflector 49, so that the elevated threads will pass over the inner carriers while the threads that are not elevated by the deflectors will pass under the inner carriers.

The operating mechanism so far described may be driven by a belt 51 which engages a pulley 52 that is rotatably mounted upon the main shaft 24 and the starting and stopping of the braiding machine may be controlled by operating the hand lever 53 which is pivoted intermediate its ends and which serves to operate a clutch element 54 that is keyed to the shaft 24 for sliding movement towards and from the driving pulley 52. The arrangement is such that when the clutch element 54 is forced into engagement with the rotating pulley 52 the driving shaft 24 will be rotated. When it is desired to stop the braiding machine this may be effected promptly by shifting the lever 53 so that it will move the clutch element 54 out of engagement with the wheel 52 and at the same time will force the braking element 55 into frictional engagement with the fixed co-operating element 56. The lever 53 is normally held in its machine stopping position by a coiled spring 57 and when the lever is moved to the starting position it is held in such position by a latch 58 which is controlled by a solenoid 59 the arrangement being such that when the solenoid is actuated by a source of electrical energy it will retract the latch 58 to thereby release the lever 53 so that the same will be actuated by the spring 57 to stop the braiding machine.

The braiding machine illustrated in the drawing is shown as supplied with a conductor wire 60 about which the braid is to be placed, and this wire is led upwardly through the hollow fixed shaft 14 from a supply reel 61, which may be rotatably supported by the rollers 62 that are supported by the frame 63 in position to engage the spaced heads of the reel 61. The wire 60 with the braid formed thereupon is led upwardly from the braiding point about a take-up drum 64 which is rotated at the desired speed by the chain 65 and the series of gears 66, 67, 68, one of which may be changed to vary the rate of speed. The group of gears just mentioned is driven by the vertically extending shaft 69 (see Fig. 3) and this shaft is driven from the bevel gear 22 by a sprocket chain 70 which chain engages the sprocket 71 secured to the lower portion of the gear 22.

The braided cable or conductor wire upon leaving the take-up drum 64, in the construction shown, passes through a guide pipe 72, the discharge end of which pipe is bent downwardly to direct the cable towards the take-up reel 73. The spaced flanges of this reel rest upon and are driven by the rollers 74 rotatably supported by the frame 75. These rollers are driven by a belt 76 which passes around the pulleys 77 and 78. A traversing arm 79 is provided for the purpose of laying the cable properly upon the take-up reel 73, and this arm is supported by and projects downwardly from a sleeve 80 which is rotatably mounted upon the revolving shaft 81.

The general construction so far described while containing some new features is for the most part well known and is shown and described to make clear a type of braiding machine which is peculiarly well adapted to have associated therewith the wrapping means which will now be described. Should it be desirable to place upon a core or conductor wire a braided covering and also a protecting wrapper, this may be readily done in accordance with the present invention by employing the mechanism so far described to produce the braid 50 about the insulated wire 60. This is done by leading the outer strands of yarn 44 and the inner strands 82 inwardly to the braiding point formed at the lower end of the braiding guide or die 83 which guide, in accordance with the present invention, is supported so that it will rotate with the outer revolving drum 16, and in the construction shown the guide 83 is supported by a bar 84 which extends across the braiding machine and has its opposite ends secured by bolts 85 to the top ring 26. A short distance above the braiding guide 83 is supported a second guide or die 86 and this second guide or die may be rotated or held in a fixed position as desired. In the construction shown in Figs. 1 and 2 the upper die 86 is supported by the posts 87 which extend upwardly from the transversely extending bar 84 and the die 86 is secured within an opening formed in the

bar 88 that is bolted to the upper ends of the posts 87. As a result of the supporting means just described for the upper die the latter will necessarily rotate with the lower guide or die 83. In the modified construction shown in Fig. 3 the upper die 86 is non-rotatably supported by an arm 89 which projects downwardly from the frame or column 90 provided to support the take-up mechanism above described.

In order to wrap the protecting strands about the braided cable it is merely necessary to lead the strands from some of the yarn masses supported by the revolving drum 16 directly to the upper die 86 instead of leading these strands through the braiding machine to the braiding point. This may be done by leading the strands 91 from some of the yarn masses supported by the brackets 27 upwardly over the guide ring 31 and to the wrapping die 86, as will be apparent from Figs. 1 and 2. The wrapping strands 91 are shown as being larger in diameter than the strands employed to form the braid. It will be understood that the rotative movement imparted to the outer revolving drum 16 and the yarn masses carried thereby serves to wrap the strands 91 about the braid 50, and it will be seen from the foregoing that it is necessary to make very few changes in a braiding machine of the general type described in order to produce upon the same both the braiding and wrapping operations desired. The reason it is necessary to rotate the lower braiding guide or die 83 is because if a stationary support were provided to hold this die it would interfere with the strands being revolved about the cable 60 to form the protecting wrapper.

In some cases it may be desirable to employ the entire group of outer yarn masses shown in Figs. 1 and 2 to produce the desired braid, in which case the additional yarn masses required to supply the wrapping strands 91 may be supported in a second tier above the group of outer yarn masses shown in Figs. 1 and 2, as indicated by 92 in Fig. 3 wherein it will be seen that the outer yarn carriers 93 are constructed to support two groups of yarn masses one above the other. When the upper guide or die 86 is rotated as in Figs. 1 and 2 it may be desirable to form guiding notches 94 at the lower end of this die, as best shown in Fig. 4 as these notches will help to guide the strands 91 about the braided covering 50.

As previously pointed out the present invention relates not only to a combined braiding and wrapping machine but is directed also to important improvements in the braiding machine. One of these improved features resides in the construction whereby each inner yarn carrier is provided with guiding means for positively retaining the same in place so that the inner end of the carrier is prevented from lagging behind during the braiding operation. If a braiding machine is to operate properly it is essential that the various operating parts be at all times maintained in their proper position, and difficulty has been experienced heretofore in preventing the inner ends of the inner carriers from lagging behind. This lagging effect is entirely corrected in accordance with the present invention by providing each inner carrier with a shoe or block 95 having a curved bearing surface 95^a which is adapted to conform to the curvature of the outer face of an apron 96 which extends downwardly from the top ring 26, the arrangement being such that the bearing surface 95^a engages the outer surface of the apron 96 at the opposite sides of the longitudinal axis of the inner yarn carrier with the result that the carrier is positively held in place and its inner end is prevented from lagging.

Another desirable feature of the present invention resides in the construction whereby a housing is formed over the upper portion of the pushed roller 38. The block 95 may serve to form this protecting housing for the roller 38, as will be apparent from Figs. 8 and 9 wherein it will be seen that the block 95 is provided with a recess adapted to receive the upper portion of the roller 38.

This block may be formed of fibre or other non-metallic material, and serves to prevent lint and dirt from lodging upon the roller 38.

An extremely important feature of the present invention resides in the construction of the fixed outer deflectors 45. Deflectors of this general type have been employed heretofore but they have not been found satisfactory in high speed machines because when a braiding machine is operated at high speed the strands of yarn from the outer carriers are forced rapidly against the edge of the fixed deflectors 45 with the result that a severe strain is exerted upon these threads unless they slide very freely along the edge of the deflectors. The deflectors employed heretofore have been in most cases made of steel or brass, but there seems to be a slight affinity between these metals and the strands of yarn, with the result that no matter how high a polish may be given to the deflector edges the threads will not slide with sufficient freedom along the edges of the deflector. Furthermore, the materials used heretofore in forming these fixed deflectors tend to corrode or rust in the presence of moisture and gases which may be present in the atmosphere, and the action of either rust or corrosion on the deflector edges will cause the threads to drag and break.

The disadvantages experienced heretofore in the use of fixed deflectors upon a braiding machine are entirely overcome, in accordance with the present invention, by giving the

guiding edges of the deflectors a nickel finish such as indicated by N of Fig. 5. This may be done by nickel plating the edges of the deflectors or by forming these edges of a nickel alloy. Nickel appears to be entirely free from any affinity for the braiding strands; furthermore it will not rust or corrode, and takes a high polish. The use of nickel in the finishing of the edges of the fixed deflectors 45 has proved to be an extremely important feature of the present invention because this single change in the deflector type of braider has enabled the same to be operated at a much greater speed than was possible heretofore. This is due to the fact that the strands of yarn will slide along a nickel finished edge with much greater freedom than along edges otherwise finished. It is desirable that not only the guiding edges of the deflectors 45 have this novel finish, but that the thread guiding strip 25ª provided adjacent the slots 25 within the outer revolving drum be similarly finished by providing the guide slot of this strip with the nickel edge N, as shown in Fig. 6. It may be desirable to likewise finish the guiding edges of the deflector 49 of the inner yarn carrier.

Another feature of the present invention resides in the construction of the electrical stop devices which are associated with the strands of yarn extending to the braiding point from the outer and inner yarn carriers, and which may also be associated with the strands of yarn 91 that are wrapped about the completed braid. These electrical stop devices, as shown, are extremely simple in construction, and each stop device 97 associated with a strand of yarn 44 of the outer yarn carrier consists of a rocking lever pivotally secured to the outer face of the outer revolving drum 16 by a screw or the like 98. These rocking levers are so positioned that when a thread 44 which normally supports a particular lever in approximately a horizontal position, breaks, or becomes too slack, it will permit the thread-engaging end of the lever to rock downwardly under the influence of gravity and this will throw the opposite end of the lever upwardly into engagement with the top ring 26 to thereby complete an electrical circuit in a manner to be described. The same electrical stop devices 97 may be associated with the wrapping strands 91 by providing any desired lever 97 with a link 99 such as shown in Fig. 7, wherein it will be seen that one end of the link 99 is engaged with the hook formed at the heavy end of the lever, while the upper end of this link is provided with an eye adapted to receive the thread 91. An intermediate portion of said link is slidably mounted in a bushing 100 formed of porcelain or other insulating material, and which is mounted in the thread guide slot 46 formed in the top ring. The top ring 26 is insulated from the outer revolving drum 16, as will be apparent from Fig. 7, which shows the insulating material 101.

In order to stop the braiding machine when a thread breaks or becomes too slack, the solenoid 59 above mentioned is included in an electrical circuit with a battery or other source of electrical energy 102. One side of this battery is grounded to the main frame of the braiding machine by the conductor wire 103, while the opposite side of the battery is connected to a bracket 104 by the conductor wire 105. The bracket 104 is insulated from the machine frame and is provided with a contact 106 adapted to engage the outer edge of the top ring and it is supported by a sliding plunger for movement into and out of engagement with the ring. Since the ring 26 is insulated from the machine frame the electric circuit just mentioned will not be completed until one of the electrical stop devices 97 is permitted to rock into position to engage the top ring 26 and thus complete the electric circuit through the solenoid 59. This will release the starting lever 53 and permit the same to move to its machine stopping position under the influence of the spring 57. It is necessary to raise the top ring 26 when the inner carriers are being removed from or placed in engagement with their supporting runway, and the contact element 106 is therefore supported by the bracket 104 so that it may be moved out of engagement with the ring and held in its inoperative position while this ring is being moved to and from its operative position.

It is desirable that the supply of current to the braiding machine be cut off automatically when the starting lever is moved to its machine stopping position and this lever is therefore provided with a contact point 107 which serves to complete the circuit between the wire 105 and the braiding machine when the lever is moved to its operating position, and to break this circuit when the lever is released. The braiding machine may be provided with one or more push buttons 108 which may be actuated to excite the solenoid and thereby release the lever to stop the braiding machine. The stop mechanism provided on each inner carrier to stop the machine, when the braiding strand 82 breaks or becomes too slack, may consist of the drop lever 109, best shown in Fig. 8, and which is normally insulated from the supporting frame of the inner carrier, and is electrically connected to the contact brush 110 by the insulated wire 111. The contact brush 110 engages the outer face of the downwardly extending aprons 96, the arrangement being such that the current supplied to the upper ring 26 is not permitted to reach the frame of the inner yarn carrier as long as the contact lever 109 is held in its raised position, as shown in Fig. 8, but when this lever is permitted to engage the contact pin 112 the elec-

trical current will pass from the lever 109 to the frame of the inner carrier and from this frame to a grounded portion of the braiding machine. If the sliding shoes of the inner carrier 34 are formed of metal, the current will pass from these shoes to the outer revolving drum 16, but if these shoes are made of oil treated wood or other non-metallic substance, it will be necessary to provide a contact element such as 113 to complete the circuit between the inner carrier and the outer supporting structure.

It is desirable to maintain, as far as possible, a uniform tension upon the strands 82, as these strands are unwound from the inner yarn masses 33; and another feature of the present invention, therefore, resides in the construction whereby one of the sides of the frame of each inner yarn carrier is provided with a curved upper edge 114 which is disposed substantially concentric with the guide post 115 about which the strand 82 passes. The effect of this curved edge 114 is to hold this strand approximately a constant distance from the guide pin 115 as the same is unwound from the ends and intermediate portions of the yarn mass 33.

What is claimed is:—

1. In a combined braiding and wrapping machine, an outer revolving drum, outer yarn carriers mounted upon said drum to be rotated thereby about the central axis of the machine, inner yarn carriers, means for traversing the inner yarn carriers and outer drum in opposite directions about the central axis of the machine, a braid guide supported at the braiding point to rotate with the outer revolving drum, and additional yarn carriers mounted upon said drum and adapted to have the strands extending therefrom wrapped about the braid as they are carried by the drum about the braiding point.

2. In a combined braiding and wrapping machine, two sets of yarn carriers, means for revolving the carriers in opposite directions about a braiding point to form the braid, and additional yarn carriers mounted to travel with one of said sets of yarn carriers and arranged to wrap strands about the completed braid.

3. In a combined braiding and wrapping machine, two sets of yarn carriers, means for revolving the carriers in opposite directions about a braiding point to form the braid, a braid guide supported at the braiding point to rotate with one set of carriers, and additional yarn carriers mounted to travel with one of said sets of carriers and arranged to wrap strands around the completed braid.

4. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions to form the braid, means for drawing the completed braid upwardly from the braiding point, and additional yarn carriers mounted to travel with one of said sets of yarn carriers and arranged to wrap strands about the completed braid above said braiding point.

5. In a combined braiding and wrapping machine, outer and inner yarn carriers, an outer revolving drum for supporting the outer yarn carriers, means for revolving the inner carriers and said drum in opposite directions to form the braid, and additional yarn carriers mounted upon said drum to rotate therewith and arranged to wrap strands about the completed braid.

6. In a combined braiding and wrapping machine, outer and inner yarn carriers, an outer revolving drum for supporting the outer yarn carriers, means for revolving the inner carriers and said drum to form the braid, a braid guide supported at the braiding point by said drum to rotate therewith, and additional yarn carriers mounted upon said drum to rotate therewith and arranged to wrap strands about the completed braid above said guide.

7. In a combined braiding and wrapping machine, outer and inner yarn carriers, an outer revolving drum for supporting the outer yarn carriers, means for revolving the inner carriers and said drum to form the braid, a braid guide supported at the braiding point, means for guiding the strands from some of said outer carriers to the braiding point to form the braid, and means for guiding the strands from the remaining outer carriers to the braid above said guide to wrap the strands about the completed braid.

8. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions to form the braid, a braid guide supported at the braiding point, a second guide supported in spaced relation to the first, means for drawing the completed braid through the two guides, and means for wrapping strands about the braid as the latter passes from one guide to the other.

9. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions to form the braid, a braid guide supported at the braiding point, a second guide supported in spaced relation to the first, means for rotating one of said guides, means for drawing the completed braid through the two guides, and means for wrapping strands about the braid as the latter passes from one guide to the other.

10. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers to form the braid, a braid guide supported at the braiding point, additional yarn carriers arranged to wrap strands about the completed braid, means for rotating said additional carriers, and means for rotating said guide with the additional carriers.

11. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers to form the braid, a braid guide supported at the braiding point, a second guide supported in spaced relation to the first, means for drawing the completed braid through the two guides, means for wrapping strands about the braid as the latter passes from one guide to the other, and means for rotating both guides.

12. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions to form the braid, a braid guide supported at the braiding point, a second braid guide supported in spaced relation to the first, means for drawing the completed braid through the two guides, means for wrapping strands about the braid as the latter passes from one guide to the other, and means for rotating said second braid guide.

13. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions to form the braid, a braid guide supported at the braiding point, a second braid guide supported in spaced relation to the first, means for drawing the completed braid through the two guides, and means for wrapping strands about the braid as the latter passes from one guide to the other.

14. In a combined braiding and wrapping machine, two sets of yarn carriers, means for advancing the carriers in opposite directions, additional yarn carriers, means for traversing said additional carriers to wrap strands about the completed braid, and stop means associated with the last mentioned yarn carriers to stop the machine if a strand breaks or becomes too slack.

15. In a combined braiding and wrapping machine, inner and outer carriers, means for advancing the carriers to form the braid, means for guiding the strands from some of the outer carriers to the braiding point to form the braid, means for guiding the strands from the remaining outer carrier to wind the strands over the braid, and stop mechanism associated with both sets of outer carriers to stop the machine if a strand breaks or becomes too slack.

16. In a combined braiding and wrapping machine, inner and outer carriers, an outer revolving drum for supporting the outer carrier, means for rotating the outer drum and inner carriers in opposite directions, a guide ring mounted upon said drum to rotate therewith, means for guiding strands from some of the outer carriers downwardly from the ring to the braiding point to form the braid, and means for guiding strands from other outer carriers about the ring and to wrap the strands about the complete braid.

17. In combination with a braiding machine provided with inner and outer yarn carriers and a revolving drum upon which the outer yarn carriers are mounted, a wrapping attachment for wrapping strands around the completed braid to form a protecting covering thereupon, including a bridge bar adapted to be secured to said drum to rotate therewith, and a braiding die supported by the bridge bar to rotate therewith and positioned to direct the braiding strands to the braiding point.

18. In combination with a braiding machine provided with inner and outer yarn carriers and a revolving drum upon which the outer yarn carriers are mounted, a wrapping attachment for wrapping strands around the completed braid to form a protecting covering thereupon, including a bridge bar adapted to be secured to said drum to rotate therewith, a die mounted upon the bridge bar and supported thereby in position to guide the braiding strands to the braiding point, and a second die mounted upon the bridge bar and supported thereby in position to guide wrapping strands about the completed braid.

In testimony whereof, I have signed my name to this specification.

OTTO A. FREDERICKSON.