Feb. 24, 1931. G. A. JOHNSON 1,793,487

APPARATUS FOR MAKING ELECTRIC CABLES

Filed March 22, 1929 3 Sheets-Sheet 1

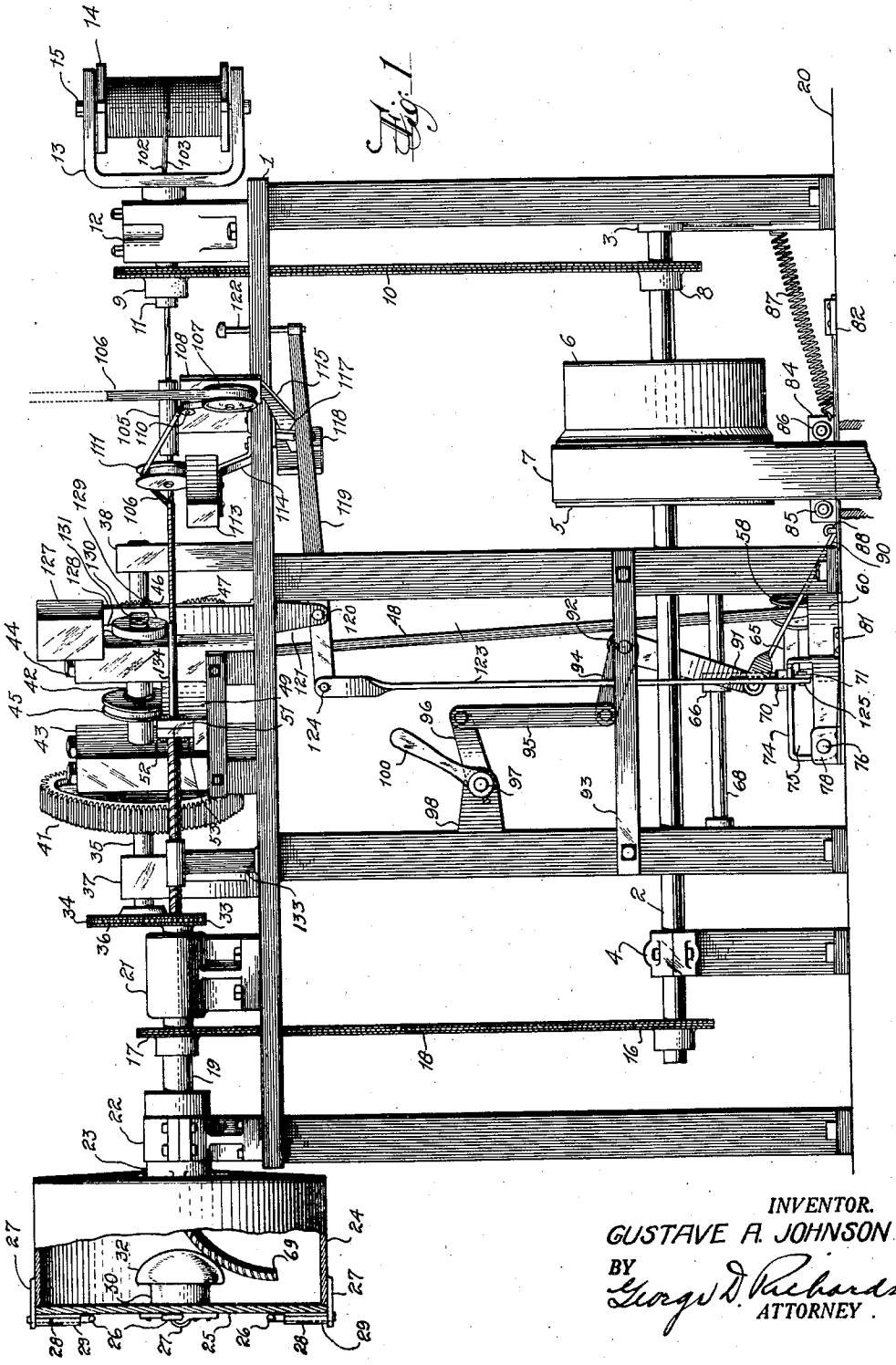


Fig. 1

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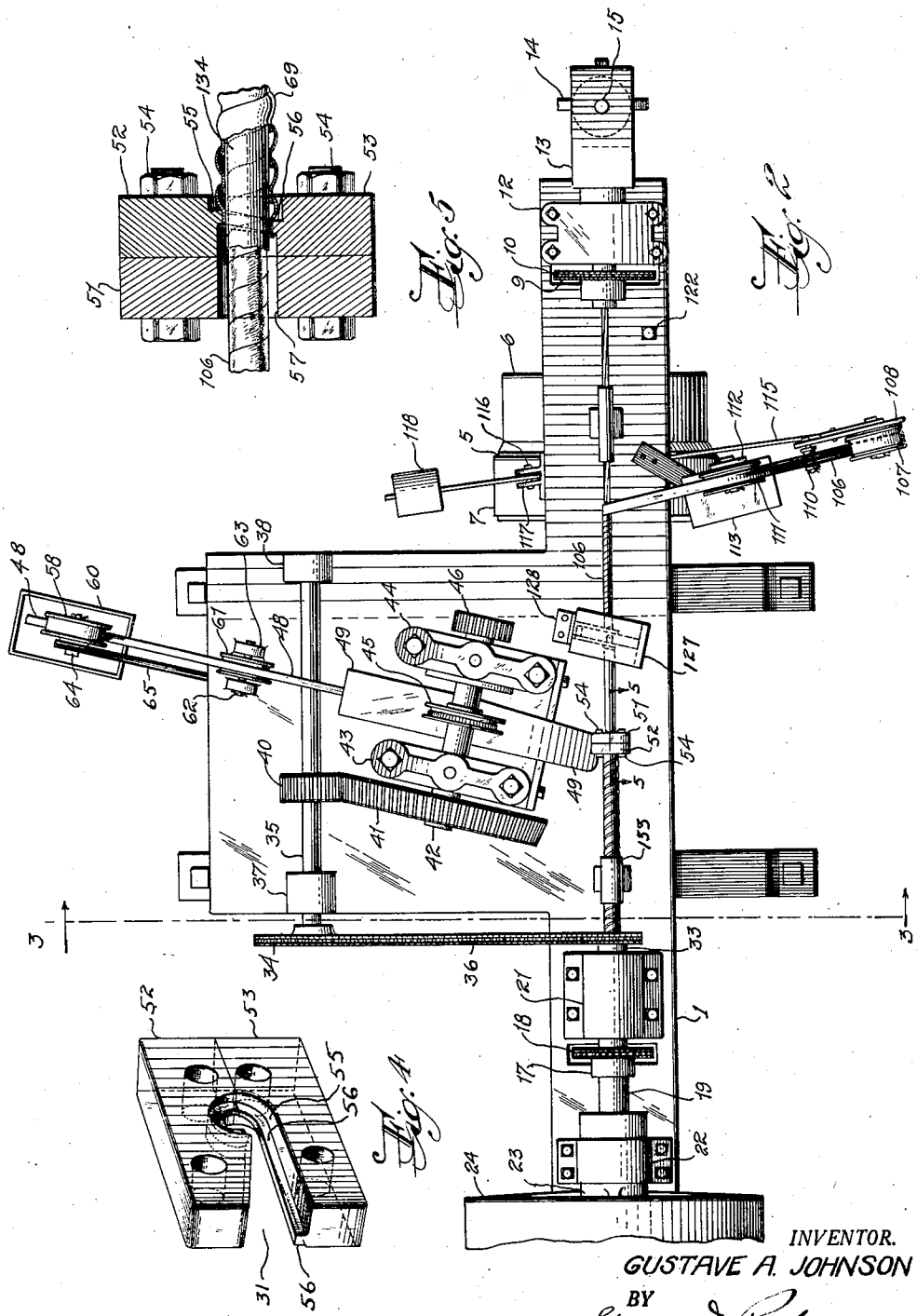


Fig. 3

Fig. 4

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Filed March 22, 1929 3 Sheets-Sheet 3

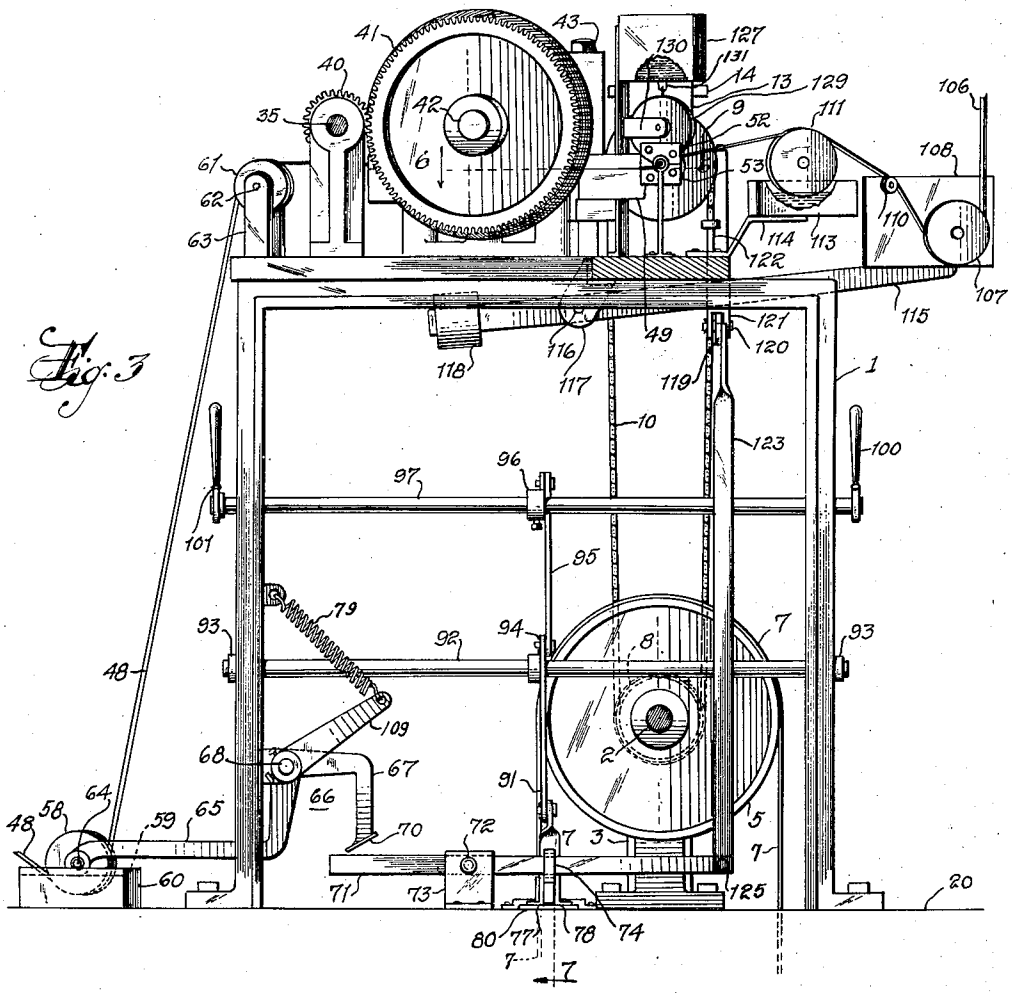


Fig. 3

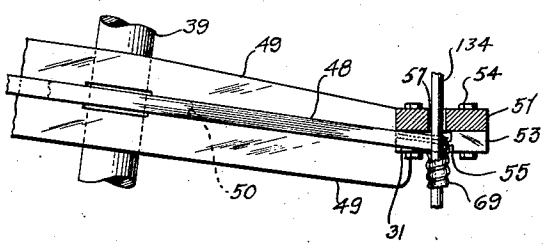


Fig. 6

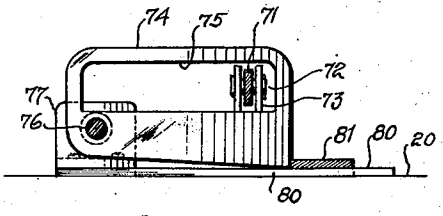


Fig. 7

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UNITED STATES PATENT OFFICE

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APPARATUS FOR MAKING ELECTRIC CABLES

Application filed March 22, 1929. Serial No. 349,078.

This invention relates, generally, to a method and apparatus for making electric cables; and the invention has reference, more particularly, to an improved method and apparatus for making an armored electric cable having a plurality of electrical conductors.

Heretofore, it has been common practice to employ a plurality of apparatuses or machines for producing an armored electric cable. One apparatus has been used to put a desired twist on the insulated conducting strands or wires. Another independent apparatus has been employed to braid the twisted wires with an insulating tape or tapes and still another apparatus has been used to apply a suitable water-proofing agent to the twisted and wrapped wires. A fourth apparatus is then employed to put the armored or flexible metallic casing over the twisted, wrapped, and water proofed wires. The use of such a plurality of apparatuses not only requires a relatively high initial equipment investment but also results in high operating costs owing to the necessity for transferring the material worked upon from one apparatus to another during the manufacturing process.

It is the principal object of the present invention to provide a novel method and apparatus for producing armored electric cables, which consists in employing but a single apparatus or machine for twisting, wrapping, water-proofing and armoring a plurality of insulated electrical conductors.

Another object of the present invention lies in the provision of means for automatically stopping the functioning of the novel apparatus or machine of this invention in the event that the tapes of material supplied to the same should accidentally break or otherwise fail to feed as desired.

Still another object of this invention is to provide a novel apparatus of the above character which is of simple construction and which is positive and reliable in operation.

Other objects of this invention, not at this time more particularly enumerated, will be clearly understood from the following detailed description of the same.

The invention is clearly illustrated in the accompanying drawings, in which:—

Fig. 1 is a view in front elevation of the novel armored cable making machine of this invention and illustrates the method of producing the armored cable.

Fig. 2 is a plan view of the structure shown in Fig. 1;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is a perspective view of the cable-die employed in producing the cable armor;

Fig. 5 is an enlarged sectional view taken along line 5—5 of Fig. 2;

Fig. 6 is a fragmentary sectional view taken along line 6—6 of Fig. 3; and

Fig. 7 is an enlarged fragmentary sectional view taken along line 7—7 of Fig. 3.

Similar characters of reference are employed in all of the hereinabove described views, to indicate corresponding parts.

Referring now to the several figures of the drawings, the reference numeral 1 designates a machine frame or table which serves as a support for the novel armored cable making apparatus or machine of this invention. According to the preferred arrangement, a power shaft 2 extends under the top of table 1 and is rotatably supported in pedestals 3 and 4 mounted on the supporting floor 20. The power shaft 2 carries a fixed pulley 5 and a loose pulley 6. The pulley 5, and consequently shaft 2, are adapted to be rotated by a power belt 7. A driving sprocket 8 is keyed to the shaft 2 and is adapted to drive a driven sprocket 9 through a sprocket chain 10. The driven sprocket 9 is fixed upon a rotatable hollow shaft 11 that extends through a bearing pedestal 12 and has a reel carrier 13 fixed to its outer end. The reel carrier 13 carries a wire reel 14 that is rotatably supported on a bolt 15.

A second driving sprocket 16 is also keyed to the shaft 2 and is adapted to drive a driven sprocket 17 through a sprocket chain 18. Sprocket wheel 17 is keyed upon a hollow shaft 19 that has its inner end rotatably supported in a bearing pedestal 21 and its outer end likewise supported in a bearing pedestal 22. Driven sprocket 17 is somewhat smaller

than driven sprocket 9, so that with driving sprockets 8 and 16 of the same size, shaft 19 rotates at a higher speed than shaft 11. For example, these sprockets may be designed so that during a period while shaft 19 makes 48 revolutions, shaft 11 will make only 45½ revolutions. This difference in speed of shafts 19 and 11 produces the desired twist in the cable conductors as will later appear. The shaft 19 extends outwardly of pedestal 22 and has the hub 23 of a winding drum 24 keyed on the outer end portion of the shaft 19. Winding drum 24 is of substantially cylindrical shape and has an open outer end which is adapted to be closed by a cover plate 25. Cover plate 25 is removable from the drum 24 and is attached to this drum when desired by means of slide bolts 26. These slide bolts are adapted to be inserted into socket plates 27 that are fixed to the outer periphery of the drum 24. The slide bolts 26 have a bayonet connection 28 with their bolt casings 29 so that when these bolts are inserted into the socket plates 27, the bayonet connections serve to lock these bolts in such position and thereby prevent accidental removal or displacement of the cover plate 25 from the drum 24. Centrally positioned upon the cover plate 25 and adapted to project into the drum 24, is a boss or projection 30 having a round shield plate 32 carried on its free end. With the cover plate 25 mounted upon the drum 24, the shield plate 32 extends centrally within the drum 24 for the purpose of deflecting the armored cable outwardly toward the inner periphery of the drum in a manner to be further described.

A sprocket 33 is fixed upon the inner end of the shaft 19 and is positioned adjacent the bearing pedestal 21. Sprocket 33 is adapted to drive a sprocket 34 by means of a transmission chain 36. The sprocket 34 is keyed upon a stub shaft 35 that is rotatably supported by bearing pedestals 37 and 38. The stub shaft 35 has keyed thereupon a pinion 40 which meshes with and is adapted to drive a beveled gear 41. The beveled gear 41 is keyed upon the end of a shaft 42 that is rotatably mounted in bearing supports 43 and 44. The shaft 42 carries a flanged forming roller 45 that is positioned between the bearing supports 43 and 44. A gear 46 is keyed to that end of shaft 42 that is adjacent the bearing support 44. Gear 46 meshes with a similar gear 47 that is mounted on a shaft 39 (see Fig. 6), extending parallel to and positioned below the shaft 42. This latter shaft carries a forming roller 50 that is adapted to cooperate with the forming roller 45 to form suitable longitudinally extending concavo-convex grooves in a metallic tape or cover strip 48 in a manner well known in the art. The periphery of forming roller 50 is adapted to engage the under surface of tape 48 while the forming roller 45 engages the upper surface thereof, so that the tape is gripped between these rollers.

The metallic cover strip or tape 48 is suitably supported and guided by a guide block 49 during its passage between the forming rollers 45 and 50. The guide block 49 carries a bracket plate 51 at its outer end. The bracket plate 51 has removably secured thereto, as by bolts 54, the two halves 52 and 53 of an armor-die (see especially Figs. 4, 5 and 6). This armor-die has a lead in clearance opening 31 and a central aperture 55 provided with an internal helical thread 56 of suitable shape for conforming to the metallic cover strip 48 as deformed by the forming rollers 45 and 50. The armor-die is adapted, through the medium of its helical thread 56, to form the metallic cover strip 48 as it is fed from the forming rollers into a flexible metallic cover 69 for the cable produced by the machine. The bracket plate 51 has an aperture 57 in alignment with the aperture 55 of the armor-die.

The metallic tape or cover strip 48 is supplied to the armored cable making machine from a suitable spool or reel (not shown). The metallic cover strip thus fed from this reel is adapted to pass under a guide roller 58 that is partially immersed in a suitable lubricant 59 contained within a vessel 60. From the roller 58, the metallic cover strip 48 passes upwardly and over a guide roller 61 that is rotatably mounted upon a shaft 62 carried by a pedestal 63. From the guide roller 61, the cover strip 48 extends into the guide block 49, passing between the forming rollers 45 and 50 and is gripped by these rollers, and thence moves to the armor-die. The forming roller 45 has a portion of its periphery serrated, knurled or otherwise roughened as shown in Fig. 2 for the purpose of increasing its frictional grip on the cover strip 48 so that this roller may readily drive the cover strip through the armor-die.

The cover strip guide roller 58 is rotatably mounted upon a pin 64 that is carried by an arm 65 of a bell crank lever 66. Bell crank lever 66 is fixed upon a supporting shaft 68 that is rotatably carried by the frame 1, the other arm 67 of bell crank lever 66 having an offset portion 70 overlying the forward end of a trip lever 71. A desired tension is maintained in the cover strip 48 by the action of a tension spring 79 that has one end connected to a lever 109 which is fixed upon shaft 68 and its other end attached to machine frame 1. Spring 79 acting through lever 109, shaft 68, arm 65 and roller 58 causes this roller to tension cover strip 48.

The trip lever 71 is pivoted upon a pin 72 carried by a pedestal 73. Trip lever 71 extends through a rectangular aperture 75 in a trip-cam 74 (see Fig. 7). Trip-cam 74 is of substantially rectangular shape and has a bearing aperture provided near one of its

ends. A pivotal pin 76 extends through this bearing aperture and this pin has its ends supported in brackets 77 and 78. The brackets 77 and 78 are mounted upon and secured to a belt shifter plate 80. The belt shifter plate 80 extends through longitudinal guides 81 and 82 fastened to the supporting floor 20. Belt shifter plate 80 has an upstanding flange 84 carrying shifter rollers 85 and 86 that are positioned adjacent opposite edges of one run of the transmission belt 7. A tension spring 87 has one end secured to the upstanding flange 84 and its other end secured to the machine frame 1. The tension spring 87 tends to shift the belt shifter plate longitudinally through the guides 81 and 82, and by urging roller 85 against the edge of belt 7, move this belt onto the loose pulley 6, thereby cutting off the supply of power to the cable making machine and effecting the stopping of the same. This action of the spring 87 is normally prevented, however, by the action of the trip-cam 74. During the normal running of the machine (as illustrated in Figs. 1 and 2), trip-cam 74 abuts the longitudinal guide 81 and prevents spring 87 from moving the belt shifter plate 80 so as to stop the machine.

An eye-member 88 is secured to the belt shifter plate adjacent the upstanding flange 84 and an operating link 90 has its lower end bent into a hook which extends through the aperture in the eye-member 88. The upper end of operating link 90 is pivotally connected to a depending arm 91 of a bell crank lever that is pivoted upon a transversely extending shaft 92 supported at its ends in brackets 93 carried by the machine frame 1. The other arm 94 of this bell crank lever is pivotally connected to the lower end of a vertically extending link 95. The upper end of this vertically extending link is in turn pivotally connected to a lever 96 that is fixed upon a shaft 97 rotatably supported in brackets 98 carried by the frame 1. Shaft 97 extends from the rear to the front of the machine frame and has operating handles 100 and 101 secured to its rear and front ends, respectively.

The wire reel 14 is wound with a pair of suitably insulated wires 102 and 103. From the reel 14 these wires extend through the hollow shaft 11 and thence through a supporting guide-member 105 mounted upon the top of the machine frame 1. From the supporting guide-member 105 these wires extend to and through the central apertures 57 and 55 within the bracket plate 51 and armor-die respectively.

A fibrous tape 106 made of suitable insulating material such as paper, is adapted to be spirally wrapped upon the wires 102 and 103. This tape is unwound from a suitable drum (not shown) and passes down and under a guide roller 107 rotatably carried by a plate 108. From the guide roller 107, the tape 106 extends up and over a smaller guide roller 110 also rotatably carried by the plate 108. From the roller 110 this tape extends over an adhesive or mucilage applying guide roller 111. The roller 111 is rotatably carried by a plate 112 that is attached to a mucilage or other adhesive container 113 which in turn is supported upon a bracket 114 that is affixed to the top of the table 1. The mucilage applying guide roller 111 has its lower portion projecting into liquid mucilage or adhesive substance contained within the container 113 and the feeding of tape 106 causes roller 111 to revolve, thereby applying mucilage to the inner surface of tape 106. From the roller 111, the tape 106 extends to and is wrapped spirally around the two wires 102 and 103, each successive turn of the tape preferably lying in partially overlapping relation with the next turn thereof.

The plate 108 is mounted upon the outer end of a lever 115. Lever 115 is fulrumed intermediate its ends upon a pin 116 carried by a hanger 117 that is secured to the top of the frame or table 1. The inner end of lever 115 carries a weight 118 which acts to counter-balance a part of the weight of the outer portion of lever 115 together with that of the plate 108 and its guide rollers. The portion of the weight of these members which is not so counterbalanced serves to produce the desired feeding tension in the tape 106. A lever 119 extends below and transversely of the lever 115. Lever 119 is fulcrumed intermediate its ends upon a pin 120 carried by a hanger 121 which is attached to the underside of the table. One end of the lever 119 carries a vertically extending bolt 122 which projects through an aperture in the top of the table 1. Downward swinging movement of the lever 119 is limited by the head of bolt 122 striking the upper surface of the top of the table 1. The other end of lever 119 has a depending link 123 pivoted thereto by a pin 124. The lower end of link 123 is pivotally connected by a pin 125 to the rear end of trip-lever 71.

A container 127 filled with water proofing material, such as paraffin, is supported in overlying relation to the wires 102 and 103 by a bracket 128 that is mounted upon the top of table 1. A friction roller 129 is rotatably carried by a pedestal 130 that is attached to the bracket 128. Friction roller 129 has rubbing contact with the outer surface of the paper tape 106 that is spirally wrapped upon the two insulated wires 102 and 103. The container 127 is provided with a depending teat 131 that is adapted to supply water-proofing material to the peripheral surface of roller 129. The friction roller 129 is adapted to convey such water-proofing material or liquid supplied by the teat 131 to the outer surface of the spirally wound tape 106 covering the wires 102 and 103.

In operation, the two wires fed from the spool 14 are adapted to pass through the hollow shaft 11, through the supporting guide member 105, through the bracket plate 51 and the armor-die, through a supporting guide member 133 and through the hollow shaft 19 into the drum 24. Inasmuch as the hollow shaft 19 revolves at a higher speed than the hollow shaft 11, drum 24 will revolve at a higher speed than reel 13 which is attached to shaft 11. Such being the case, that portion of the wires 102 and 103 that extends into the drum 24 will revolve at a higher speed than that portion of these wires which is just leaving the spool 14. This variation in speed of the wires at opposite ends of the machine results in a desired twisting of the wires, as will be apparent from an inspection of Figs. 1 and 2. The feeding of the wires from the spool 14 to the drum 24 is caused by the action of the armor-die. The helical thread 56 of this armor-die in forming the metallic cover 69 advances the cover 69 together with the enclosed wires 102 and 103 toward the drum 24 or toward the left as viewed in Fig. 1. The pitch of the spiral thread 56 determines the rate at which the cable is advanced toward the winding drum 24.

The wires 102 and 103 upon leaving the spool 14 and while revolving, pass through the hollow shaft 11. Upon arriving opposite the mucilage applying guide roller 111, these wires are wrapped with the insulating tape 106 and as the width of this insulating tape is normally greater than the pitch of the thread 56 of the armor-die, this tape will be wrapped upon these wires so that adjacent turns thereof are in overlapped relation. Since the roller 111 applies mucilage to the inner surface of tape 106 and as the lever 115 together with roller 107 exerts a desired tension upon the tape 106, this tape is pressed firmly against the twisted wires 102 and 103 so that the mucilage is impregnated therein, causing the tape 106 to be securely bound to these wires. With the wires thus wrapped with the tape 106, they are advanced toward the friction roller 129. This friction roller contacts with and is revolved by the rotating tape covered wires so that the water-proofing material from the teat 131 passes onto the tape covered wires, thereby forming a coating 134 of water-proofing material, such as paraffin. The taped and water-proofed wires then advances from the friction roller 129 to and through the central apertures in the bracket plate 51 and the armor die wherein the water-proofed wires are surrounded with the metallic cover 69. From the armor die, the completed armored cable moves on through guide member 133, through hollow shaft 19 and into winding drum 24. Within this drum the shield plate 32, acting in conjunction with centrifugal force, serves to deflect the cable outwardly and against the interior surface of the drum 24 so that the completed cable as it advances into the drum 24 is wound spirally into a coil therein.

The armored cable making apparatus or machine is adapted to automatically stop running in the event that either the tape 106 or 48 should fail to feed properly. Thus, for example, should tape 106 accidentally break, the excess weight of the rear portion of the lever 115 over that of the front portion of this lever, which rear portion carries the plate 108 and guide rollers 107 and 110, will cause the lever to swing downwardly about its pivotal pin 117, thereby causing the weight 118 to move upwardly. As lever 115 swings downwardly it will strike lever 119 and cause this lever to turn about its pivotal pin 120. The direction of turning of the lever 119 as viewed in Fig. 1 causes the link 123 to move upwardly. As link 123 moves upwardly it causes the rear portion of trip lever 71 to also swing upwardly about its pivotal pin 72, and in so swinging upwardly this trip lever strikes trip-cam 74 and moves this cam upwardly and out of engagement with the longitudinal guide 81, whereupon the spring 87 acts by shifting belt shifter plate 80 to move the belt 7 onto the loose pulley 6, thereby stopping the running of the machine. This same action would take place in the event that the tape 106 should become slack for any reason. Such slackness is undesirable as it would tend to cause the tape to be loosely wrapped upon the wires 102 and 103. The metallic cover strip or tape 48 ordinarily does not break but this tape at times tends to become caught upon its reel and does not feed properly, in which event the increased tension therein will cause bell crank lever 66 to turn in a clockwise direction, as viewed in Fig. 3, against the tension of spring 79. As this lever moves in this clockwise direction, the offset portion 70 thereof will strike the forward end of trip lever 71, and by turning this lever about its pivotal pin 72, will also raise the trip-cam 74, thereby effecting the stoppage of the machine.

To again start the machine when the same is not running, it is merely necessary to move either of the handles 100 or 101 upwardly, thereby actuating lever 96, link 95, bell crank levers 91—94, and operating link 90 to move the belt shifter plate 80 toward the left as viewed in Fig. 1 against the tension of spring 87. This motion of the belt shifter plate causes shifter roller 86 to move belt 7 back onto the fixed pulley 5, thereby again starting the machine. During this motion of the belt shifter plate, the trip-cam 74 is gradually sliding off of the longitudinal guide 81, until with the belt 7 completely upon the fixed pulley 5, this trip-cam drops into locked engagement with guide 81, thereby preventing the

spring 87 from moving the belt 7 to off position.

When the winding drum 24 becomes filled with a coil of the finished armored cable, the machine may be stopped as by manually pulling down lever 115 so as to effect the release of the trip-cam 74. The metallic cover 69 may then be cut at some point between the armor-die and the guide 133. Upon releasing slide bolts 26 and the removal of cover plate 25, the coil of armored cable formed in the winding drum 24 may be removed therefrom, whereupon this cover plate may again be replaced and the machine started as before.

It is desired to point out that owing to the simplicity and peculiar construction of the armor-die and the positioning of this die on the side of the bracket plate 51 as viewed in Figs. 1 and 2, this armor-die readily forms the metallic cover strip 48 into a flexible cover for the cable without, in any way, injuring the cover strip or its coating of galvanizing material, should it possess such a coating. The lubricant picked up by the cover strip during its passage through the vessel 60 not only serves to lubricate the cover-strip during its passage through the armor-die, but also aids in retaining this cover strip in cool condition during its passage therethrough. Also, as the armor-die becomes worn in use, causing an enlargement of its central aperture, the abutting edges of the two halves thereof may be ground down somewhat to again bring the central aperture 55 to desired dimension.

The use of the shield plate 32 causes the ready outward deflecting of the cable toward the inner periphery of the winding drum, resulting in the winding of this cable into a coil therein. Were the shield plate not used, the armored cable would often become clogged in the winding drum 24 and would not be wound up properly, thereby resulting in a possible injury to the armored cable or to the cable making machine. It will be noted that by properly proportioning the speed of rotation of the winding drum 24 with respect to that of the reel 14, a desired number of twists per foot may be formed in the wires 102 and 103. It has been found in actual practice, that by revolving the drum 24 at five hundred revolutions per minute and the reel 14 at four hundred and seventy-four revolutions per minute, the wires 102 and 103 receive two and one-half twists per lineal foot, which is a desirable number of twists.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:—

1. An armored cable making machine comprising in combination, supporting means along which a plurality of wires are adapted to be moved longitudinally, means for rotating different portions of said wires at different speeds so as to twist said wires together, means for supplying an insulating tape to said rotating wires, said tape being wrapped thereupon in spiral form as said wires rotate, a die member, and means for feeding a metallic tape through said die member into surrounding relation with said taped wires.

2. An armored cable making machine comprising in combination, supporting means along which a plurality of wires are adapted to be moved longitudinally, means for rotating different portions of said wires at different speeds so as to twist said wires together, means for supplying an insulating tape to said rotating wires, said tape being wrapped thereupon in spiral form as said wires rotate, a die member, means for feeding a metallic tape through said die member into surrounding relation with said taped wires, and means for stopping the operation of said machine should said insulating tape supplying means fail to function.

3. An armored cable making machine comprising in combination, supporting means along which a plurality of wires are adapted to be moved longitudinally, means for rotating different portions of said wires at different speeds so as to twist said wires together, means for supplying an insulating tape to said rotating wires, said tape being wrapped thereupon in spiral form as said wires rotate, a die member, means for feeding a metallic tape through said die member into surrounding relation with said taped wires, and means for stopping the operation of said machine should said metallic tape feeding means fail to function.

4. In an armored cable making machine, in combination, a supporting table, a rotatable wire reel carried by one portion of said table, a container member rotatably carried by another portion of said table, the wires from said reel being adapted to pass along said table and into said container, means to rotate said container at a greater speed than said wire reel, thereby effecting the twisting of said wires together during their passage to said container, and means for supplying an insulating tape with an adhesive inner surface to said wires during their passage to said container, the rotation of said wires serving to spirally wrap said insulating tape in binding relation upon said wires.

5. In an armored cable making machine in combination, a supporting table, a rotatable wire reel carried by one portion of said table, a container member rotatably carried by another portion of said table, the wires from

said reel being adapted to pass along said table and into said container, means to rotate said container at a greater speed than said wire reel, thereby effecting the twisting of said wires together during their passage to said container, means for supplying an insulating tape with an adhesive inner surface to said wires during their passage to said container, the rotation of said wires serving to spirally wrap said insulating tape in binding relation upon said wires, and means carried by said table for applying water-proofing material to said taped wires.

6. An armored cable making machine comprising, a supporting table, a rotatable wire reel carried by one portion of said table, a container member rotatably carried by another portion of said table, the wires from said reel being adapted to pass along said table and into said container, means to rotate said container at a greater speed than said wire reel, thereby effecting the twisting of said wires together during their passage to said container, means for supplying an insulating tape with an adhesive inner surface to said wires during their passage to said container, the rotation of said wires serving to spirally wrap said insulating tape in binding relation upon said wires, means carried by said table for applying water-proofing material to said taped wires, a metallic tape feeding mechanism, and an armor-die associated with said mechanism and arranged in the path of movement of said taped and water-proofed wires, said armor-die acting to spirally wrap metallic tape supplied by said feeding mechanism upon said wires, the successive turns of said metallic tape being in interlocked relation.

7. In an armored cable making machine, in combination, a table, a wire reel rotatably mounted at one end of said table, a winding drum rotatably mounted at the other end of said table, the wires from said reel being adapted to be fed along said table and into said winding drum, means to drive said winding drum at a higher rate of rotation than said wire reel, thereby effecting a twisting together of said wires as they leave said wire reel, a lever pivoted on said table and carrying a guide roller, an adhesive applying roller, an insulating tape extending around said guide roller and over said adhesive applying roller and adapted to be spirally wrapped on said wires as they advance while rotating, and mechanism operated by said lever in the event of breakage or relaxed tension of said insulating tape for stopping the operation of said machine.

8. In an armored cable making machine, in combination, a table, a wire reel rotatably mounted at one end of said table, a winding drum rotatably mounted at the other end of said table, the wires from said reel being adapted to be fed along said table and into said winding drum, means to drive said winding drum at a higher rate of rotation than said wire reel, thereby effecting a twisting together of said wires as they leave said wire reel, a lever pivoted on said table and carrying a guide roller, an adhesive applying roller, an insulating tape extending around said guide roller and over said adhesive applying roller and adapted to be spirally wrapped on said wires so they advance while rotating, mechanism operated by said lever in the event of breakage or relaxed tension of said insulating tape for stopping the operation of said machine, and a friction roller carried by said table to contact said taped wires and adapted to apply water-proofing compound thereto, and means to supply water-proofing material to said roller.

9. An armored cable making machine comprising a table, a wire reel rotatably mounted at one end of said table, a winding drum rotatably mounted at the other end of said table, the wires from said reel being adapted to be fed along said table and into said winding drum, means to drive said winding drum at a higher rate of rotation than said wire reel, thereby effecting a twisting together of said wires as they leave said wire reel, a lever pivoted on said table and carrying a guide roller, an adhesive applying roller for applying adhesive to an insulating tape extending around said guide roller and over said adhesive applying roller, said insulating tape being adapted to be spirally wrapped on said wires so they advance while rotating, mechanism operated by said lever in the event of breakage or relaxed tension of said insulating tape for stopping the operation of said machine, a friction roller carried by said table to contact said taped wires and adapted to apply water-proofing compound thereto, and means to supply water-proofing material to said roller, an armor-die, and feeding mechanism operating to feed metallic covering tape through said armor-die into enclosing relation with said twisted, taped and water-proofed wires.

10. An armored cable making machine comprising a table, a wire reel rotatably mounted at one end of said table, a winding drum rotatably mounted at the other end of said table, the wires from said reel being adapted to be fed along said table and into said winding drum, means to drive said winding drum at a higher rate of rotation than said wire reel, thereby effecting a twisting together of said wires as they leave said wire reel, a lever pivoted on said table and carrying a guide roller, an adhesive applying roller for applying adhesive to an insulating tape extending around said guide roller and over said adhesive applying roller, said tape being adapted to be spirally wrapped on said wires so they advance while rotating, mechanism operated by said lever in the event of

breakage or relaxed tension of said insulating tape for stopping the operation of said machine, a friction roller carried by said table to contact said taped wires and adapted to apply water-proofing compound thereto, and means to supply water-proofing material to said roller, an armor-die, feeding mechanism to feed metallic covering tape through said armor-die into enclosing relation with said twisted, taped and water-proofed wires, and mechanism adapted to be operated by said metallic covering tape upon obstruction of feeding movement thereof for effecting the stopping of said machine.

11. An armored cable making machine comprising a table, a wire reel rotatably mounted at one end of said table, a winding drum rotatably mounted at the other end of said table, the wires from said reel being adapted to be fed along said table and into said winding drum, means for applying a taped coating to said wires during their passage to said winding drum, and additional means for applying a spirally wrapped metallic flexible casing to said taped wires, thereby forming a complete armored cable that passes into said winding drum, said winding drum having an inwardly directed shield-plate positioned in the path of movement of said cable, said shield-plate acting to deflect said cable outwardly against the inner periphery of said drum.

12. In a machine for making electric cable having a conductor, supporting means along which the cable conductor is adapted to be moved longitudinally, means for rotating said conductor, means for supplying an insulating tape to said rotating conductor, said conductor by rotating causing said tape to be wrapped thereupon in spiral form, transmission means for actuating said conductor rotating means, a driving pulley for operating said transmission means, a drive belt for said pulley, means for shifting said belt on and off said drive pulley, a detent means cooperative with said shifting means for holding said belt in driving relation to said pulley, means for biasing said shifting means to belt releasing position, and means operative to release said detent on failure of normal feeding movement of said tape.

13. In a machine for making electric cable having a conductor, supporting means along which the cable conductor is adapted to be moved longitudinally, means for rotating said conductor, means for supplying an insulating tape to said rotating conductor, said conductor by rotating causing said tape to be wrapped thereupon in spiral form, means for supplying a metallic cover strip to said rotating conductor, said metallic cover strip being wrapped in spiral form and enclosing relation to said conductor, transmission means for actuating said conductor rotating means, a driving pulley for operating said transmission means, a drive belt for said pulley, means for shifting said belt on and off said drive pulley, a detent means cooperative with said shifting means for holding said belt in driving relation to said pulley, means for biasing said shifting means to belt releasing position, and means operative to release said detent on failure of normal feeding movement of said tape, and additional means also operative to release said detent on failure of normal feeding movement of said metallic cover strip.

In testimony, that I claim the invention set forth above I have hereunto set my hand this 19th day of March, 1929.

GUSTAVE A. JOHNSON.