April 24, 1934. A. L. SALTZMAN 1,955,762

WINDING MACHINE

Original Filed Nov. 23, 1926 7 Sheets-Sheet 1

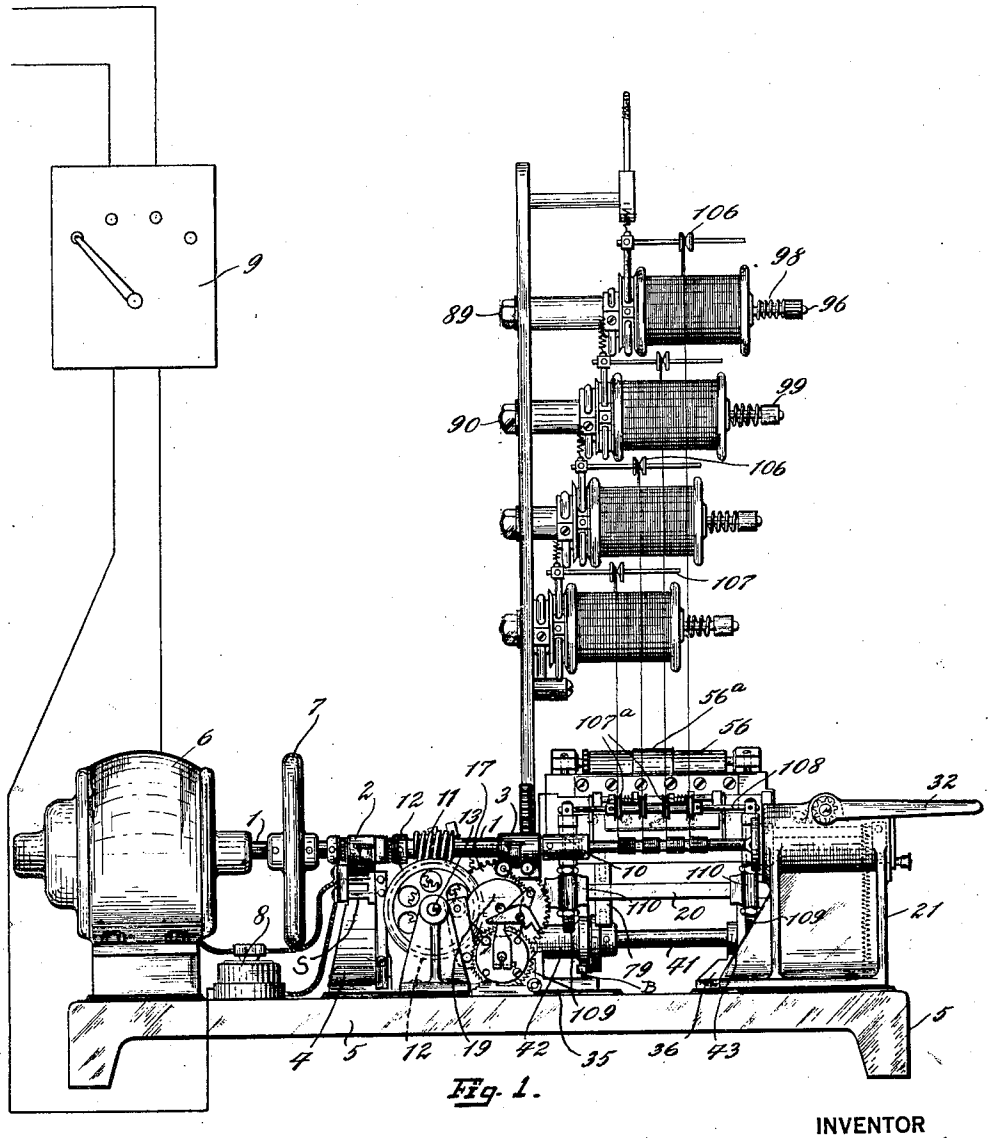



Fig. 1.

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WINDING MACHINE

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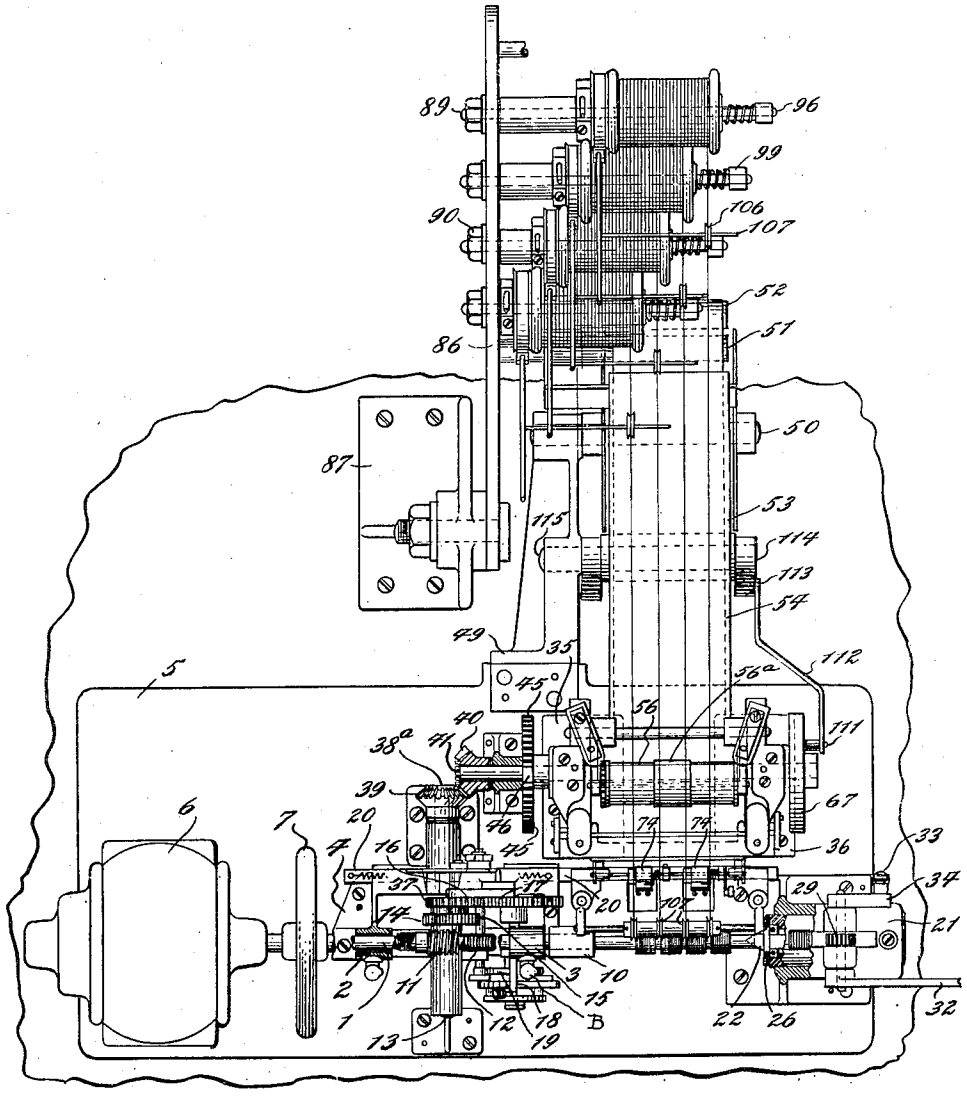



Fig. 2.

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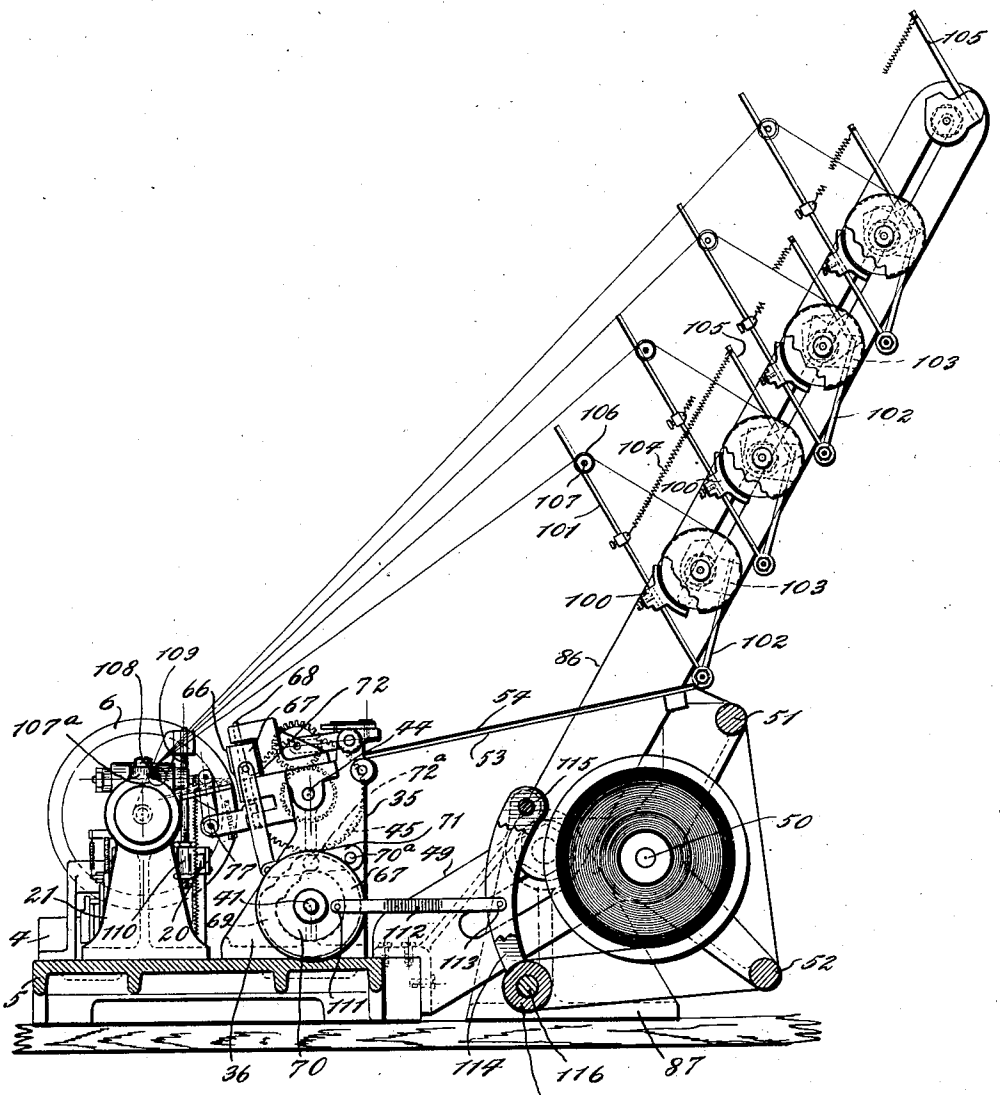



Fig. 3

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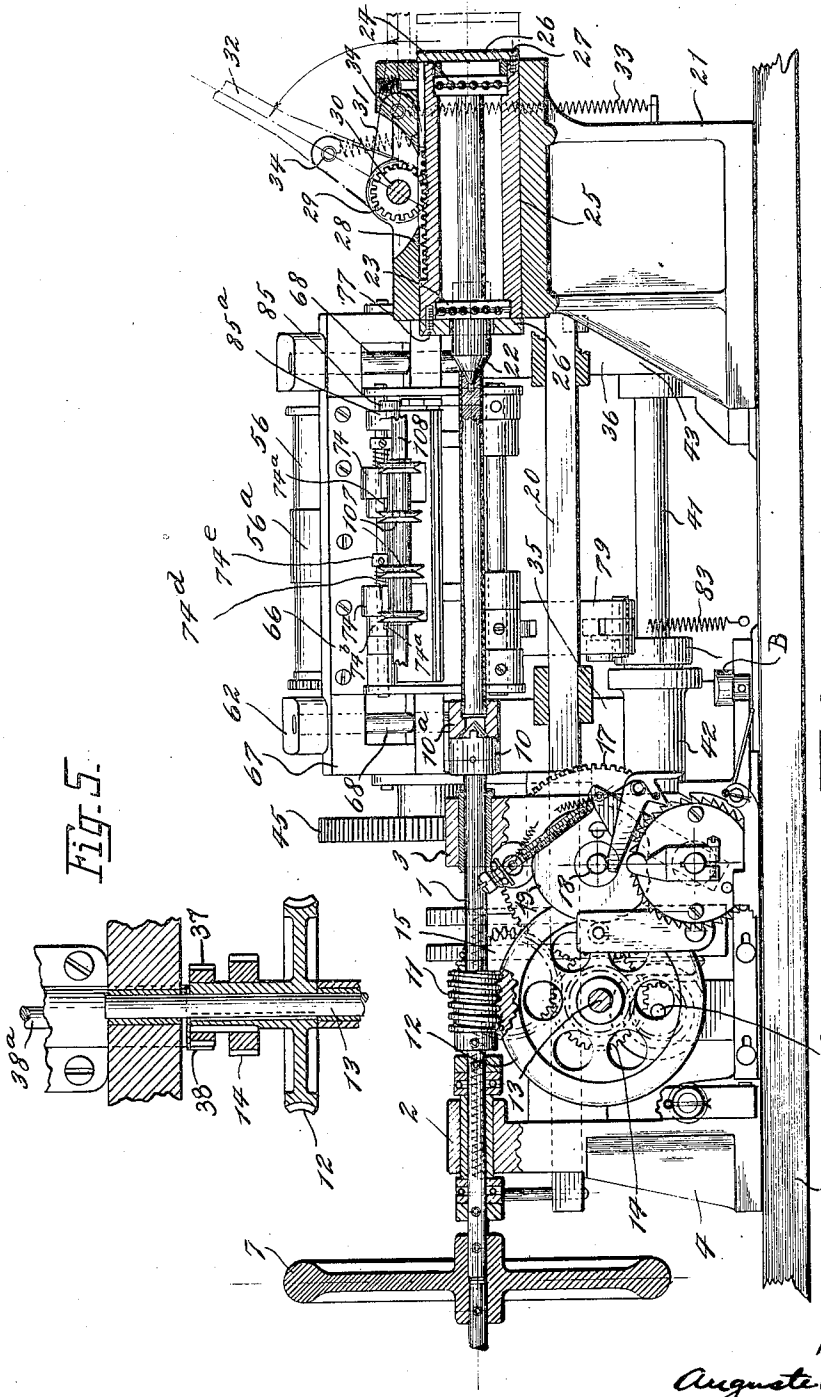


Fig. 4.



Fig. 5.

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WINDING MACHINE

Original Filed Nov. 23, 1926 7 Sheets-Sheet 5

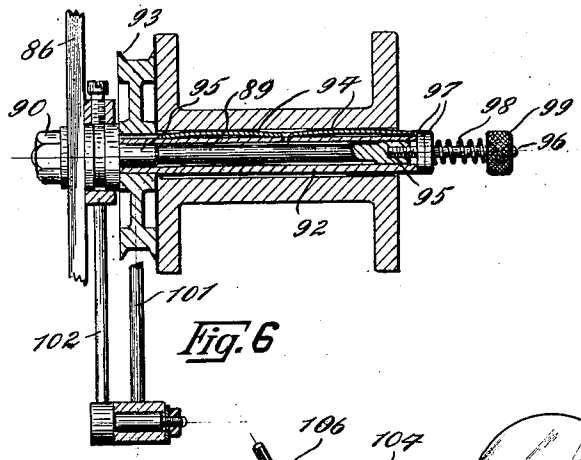



Fig. 6

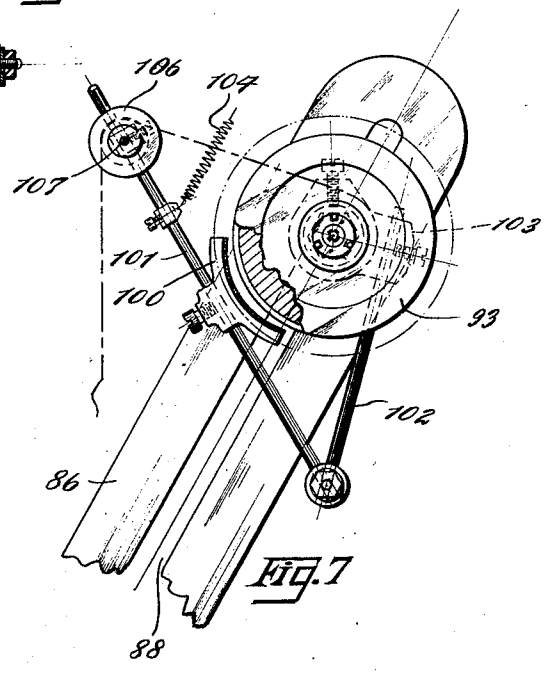



Fig. 7

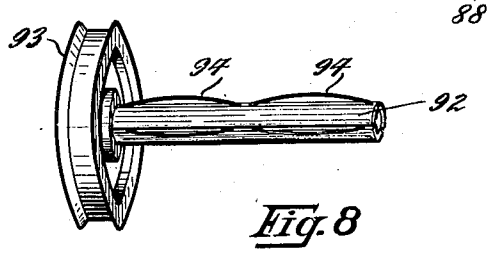



Fig. 8

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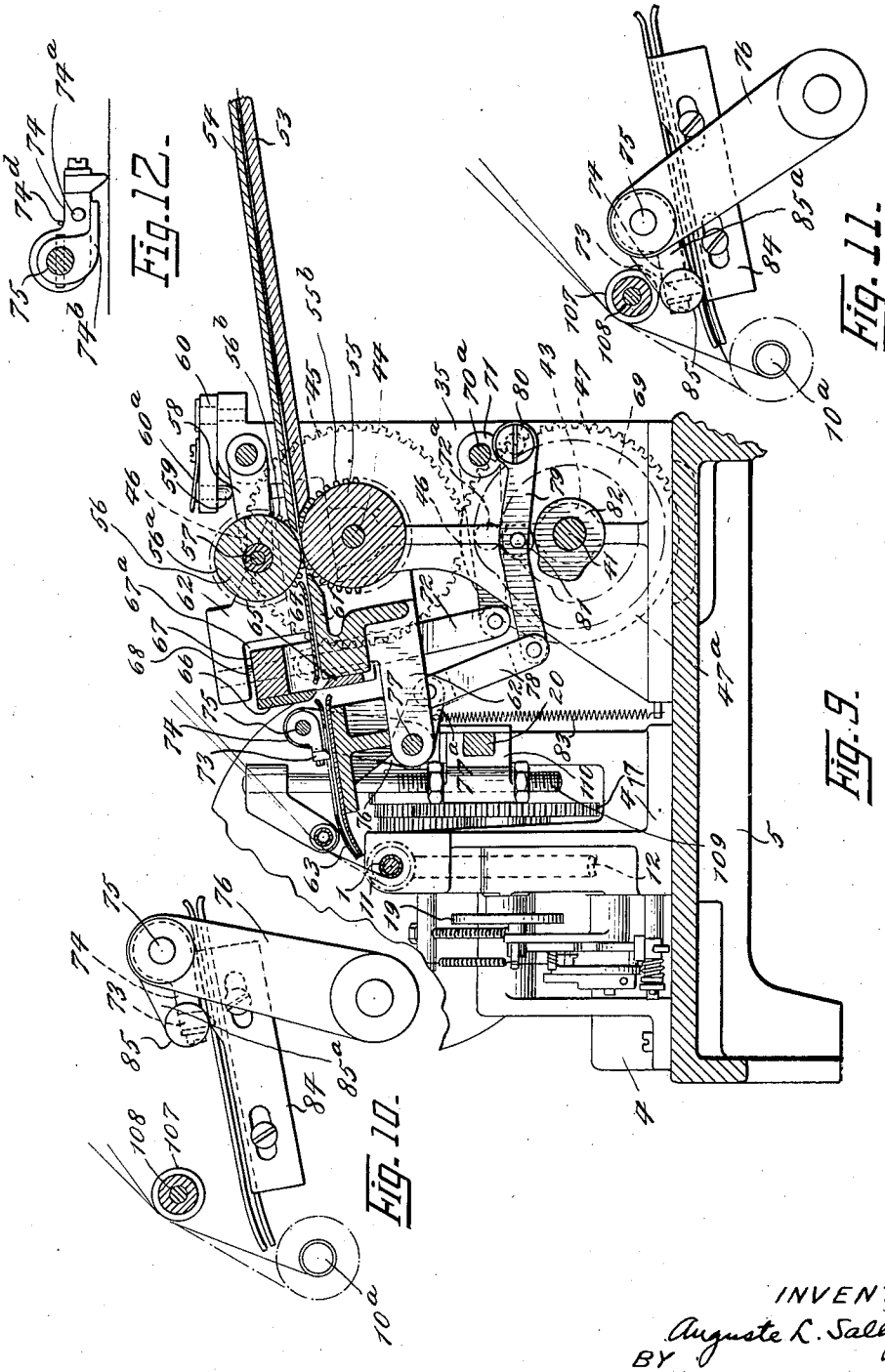


Fig. 9.



Fig. 10.



Fig. 11.



Fig. 12.

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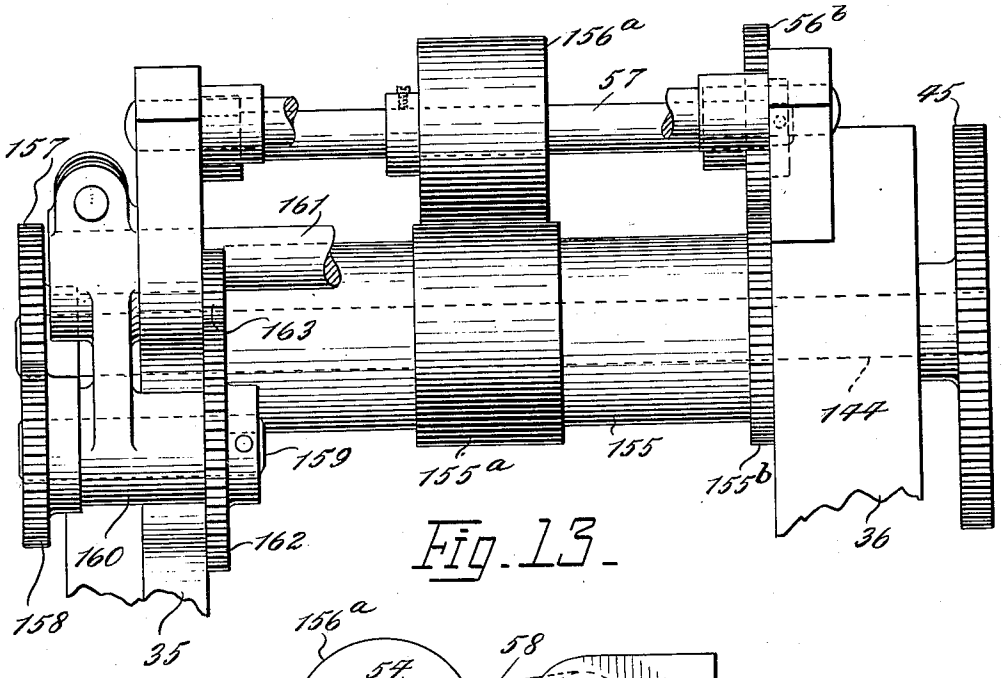



Fig. 13.

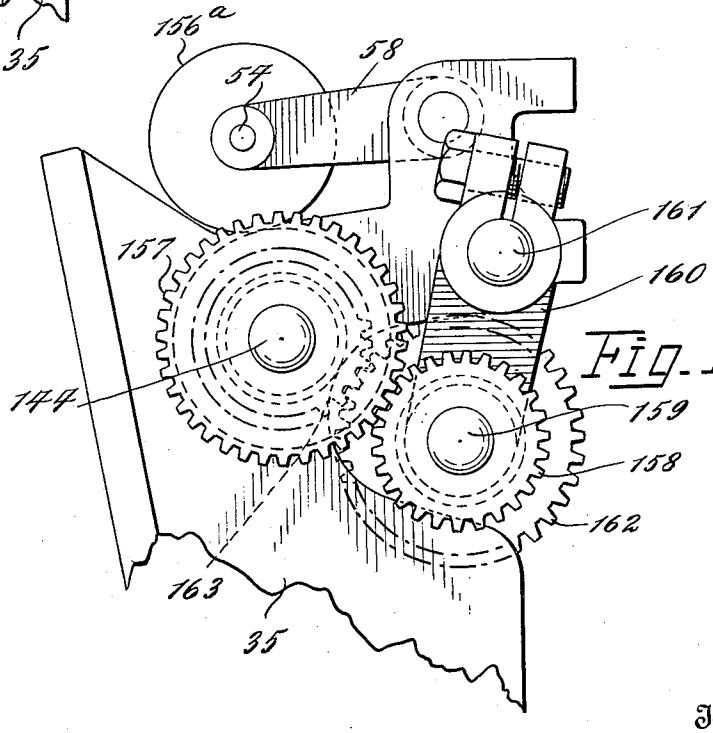



Fig. 14.

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Patented Apr. 24, 1934 1,955,762

# UNITED STATES PATENT OFFICE

1,955,762

## WINDING MACHINE

Auguste L. Saltzman, Orange, N. J., assignor, by mesne assignments, to General Cable Corporation, New York, N. Y., a corporation of New Jersey

Application November 23, 1926, Serial No. 150,341
Renewed August 12, 1929

8 Claims. (Cl. 242—10)

This invention relates to machines for winding strands of material such as wire into coils or helices, and has special reference to machines for winding copper wire into electric coils for use in various kinds of apparatus. Machines made in accordance with this invention may be adapted to wind a plurality of coils simultaneously in separated zones, upon a core supported by a spindle or mandrel. The convolutions of wire of each coil are wound in layers superimposed upon each other, and the machine is adapted to introduce or inject sheets of paper between the adjacent layers during the building up of the coils and while the spindle is in motion. A single sheet of paper may be utilized to surround each layer of a series of coils, whenever the coils are small enough and are wound closely together, and it is in reference to such a machine that this invention will be described.

The present machines for winding such coils have been found to be relatively slow and to wind coils whose outer dimensions are much larger than is necessary for the number of turns in the coil, therefore, it is within the contemplation of this invention to construct a machine which will wind coils much more rapidly than has been done heretofore, and which will produce a coil of a given number of turns that occupies much less space than coils heretofore manufactured.

To accomplish these desired results, radical changes are made in the structure of the coil winding machine, so that instead of the usual speeds or rotation of one to two thousand revolutions per minute, a machine embodying this invention may be rotated at a speed of five thousand revolutions and over per minute. In order to produce such a great increase in rotative speed, it is proposed to time the paper mechanism relatively to the winding mechanism so that the paper has been fully prepared for insertion while the coil is being wound, that is the paper is held in readiness to be inserted immediately upon the completion of each layer of a coil without halting the winding operation any appreciable amount. Furthermore, the manner of delivering the sheet of paper to the coil is such that the paper is positively fed and at the same time conveyed in such a way that it is ironed out thereby removing all wrinkles and is presented to the coil with its advancing edge parallel to the coil.

It was also necessary to provide takeoff means for feeding the wire to the core which would prevent the wire from being unreeled faster than it was being used. To this end a brake is applied to the wire spool and additional means are provided for stopping rotation of the spool of wire whenever a strand is not being drawn therefrom. In some instances the constant brake may be omitted. In addition thereto a gradual accelerating starting device is provided to prevent the wire from being subjected to any snap due to the sudden start of the spindle.

A detailed description will now be given in reference to the drawing, in which:

Fig. 1 is a front elevation of a machine constructed in accordance with this invention;

Fig. 2 is a plan view partly in section of the same;

Fig. 3 is a right side elevation partly in section of the same;

Fig. 4 is a front enlarged elevation partly in section of the driving and the paper mechanism;

Fig. 5 is a sectional detail of the driving gearing for the paper mechanism;

Fig. 6 is a sectional detail of the spool retarding and braking mechanism;

Fig. 7 is an end elevation of the same;

Fig. 8 is a detail of the spool spindle and brake drum;

Fig. 9 is a side section taken through the center of the machine;

Fig. 10 is a detail of the paper chute and paper controlling fingers in retracted position, and

Fig. 11 is another detail of the same, showing the paper controlling fingers in forward position.

Fig. 12 is a detail of the paper finger operating mechanism.

Fig. 13 is a rear elevation of a modified form of feed roll driving mechanism.

Fig. 14 is an end elevation of the same.

The embodiment of this invention as herein disclosed employs a spindle drive for rotating a core or mandrel similar to that disclosed in my co-pending application Serial No. 121,086, filed July 8, 1926, for Winding machines. In this application a motor driven device is disclosed for driving a mandrel or core and for controlling the number of windings per layer and the total number of layers in a coil. Means are provided whereby the gear ratio may be changed to vary the lead of the winding for different diameters of material, and means are also provided for automatically stopping the mechanism when a predetermined total number of turns has been reached. There are also shown means for setting the stroke of the traverse bar which controls the lateral width of each layer of the winding.

In the illustrated embodiment of this invention the driving mechanism Figs. 1, 2 and 4 com-

prises a shaft 1 rotatably mounted in bearings 2 and 3 on a bracket 4, attached to base 5. Suitably connected to one end of shaft 1 is a motor 6 for driving said shaft. Wheel 7 is attached to the shaft to serve as a fly wheel and as a convenient means for manually rotating and braking the shaft. A switch 8 is included in the electrical circuit, which also includes a standard automatic starting box 9, which will gradually accelerate the motor speed when the source of power is connected thereto. The end of shaft 1 not connected to the motor carries a chuck 10 adapted to support and center one end of a mandrel 10*a* upon which is wound a coil. A worm 11 is attached to shaft 1 and meshes with and drives worm wheel 12 rotatively mounted on stud 13 rigidly supported in bracket 4. A spur gear 14 is attached to and driven by worm wheel 12 and in turn meshes with and drives an intermediate spur gear 15 which is secured to gear 16 which in turn drives gear 17 attached to a cam shaft 18 rotatively mounted in bearings in bracket 4. This cam shaft carries a heart-shaped cam 19, (see also Fig. 9,) which imparts a transverse motion to the traverse bar 20. To this shaft is also operatively connected the automatic control mechanism for stopping the driving motor after a predetermined number of turns of the coil has been wound. The machine is started by turning switch 8 to the arm position and then by depressing button B which through interconnected levers, interlocking pins and ratchets will permit switch S of the automatic control mechanism to close and establish the motor circuit and thus energize the motor. All of this mechanism is described in detail in the co-pending application previously referred to and per se forms no part of this invention.

Secured to the base 5 in alignment with and spaced from the chuck is a tail stock 21, see particularly Fig. 4 within which is mounted a rotary center 22 in alignment with chuck 10. The chuck and tail stock are adapted to support a coil core or mandrel 10*a* between their centers. The center 22 is mounted in bearings 23 and 24 the inner races of which snugly fit the shank of the center pin, the outer races of the bearings being fixedly set in a sleeve 25 and retained therein by end plates 26 secured to the sleeve by any convenient means such as screws 27. The end plates 26 will also serve to retain the center within the sleeve due to the snug fit of the bearings 23 and 24 upon the shank of the pin. Sleeve 25 is mounted in a bore in the tail stock for sliding movement so that it may be moved axially and thereby carry the center toward or away from the coil core to permit the removal of a wound coil and to allow a new core or mandrel to be placed in the machine. In order to provide manual control of this movement the top portion of the sleeve is formed with a rack or teeth 28 thereon for engagement with a pinion 29 rigidly secured to a rock shaft 30 rotatably mounted in the tail-stock 21 and which carries an arm 31. A handle 32 is secured to the shaft so that movement of the handle will rotate the pinion and thereby move the sleeve and center toward or away from chuck 10 and permit the insertion of a new core. A spring 33 is attached to a pin 34 in the arm 31 and is also attached to some portion of the tail stock with the spring under tension so as to maintain the handle in either of its extreme positions and to permit the center 22 to be held in driving relation with the opposed portion of the mandrel 10*a*.

The paper mechanism which will now be described is driven from the same source of power as the spindle shaft and coil winding mechanism. The paper handling mechanism is supported on two spaced standards 35 and 36 secured to and extending upwardly from base 5 and is driven from shaft 1 and worm wheel 12. Attached to the spur gear 14 Fig. 5 so as to rotate therewith its another spur gear 37 which meshes with a gear 38 carried by transverse shaft 38*a* mounted in a pedestal bearing supported upon base 5. The outer end of this transverse drive shaft carries a bevel gear 39 which meshes with a coacting bevel gear 40 secured to the end of a cam shaft 41 mounted in bearings 42 and 43 in the standards 35 and 36. Also mounted for rotation in bearings in the standards 35 and 36, see also Fig. 9, and extending between said standards is a horizontal feed roll shaft 44 having an interrupted gear 45 upon one end. Gear 45 has two diametrically opposite idle segments 46 thereon, for purposes later to be described, and engages a segmental gear 47 upon the cam shaft 41 so as to be driven therefrom. Segmental gear 47 has teeth only upon such portions of its periphery as will rotate the feed roll shaft 180° for every rotation of the cam shaft 41, the two gears 45 and 47 being of equal diameter. The untoothed portion 47*a* of gear 47 makes sliding contact with each of the idle sections 46 of gear 45 so that movement is imparted intermittently to the feed roll shaft, that is twice to every rotation of the heart-shaped cam and consequently once for every stroke of the traverse bar. Thus through the modified "Geneva movement" the feed roll shaft is rotated 180° for each stroke of the traverse bar and while the traverse bar is in motion by properly positioning gear 47 relatively to shafts 18 and 41.

In the modified form of feed roll mechanism illustrated in Figs. 13 and 14 provision is made whereby the feed rolls are positively driven by gearing so mounted that the intermediate gears may be readily changed. In this way the length of the sheet of paper fed to the coils being wound may be varied at will by selecting the proper gears to rotate the feed roll a predetermined number of revolutions to feed a predetermined length of paper.

In this form the feed roll 155 having an enlarged center portion 155*a* is loosely mounted on shaft 144 journaled in standards 35 and 36. One end of this shaft carries a segmental gear 45 which is driven from a gear on the cam shaft similar to that heretofore described. Upon one end of the feed roll is a gear 155*b* secured thereto which meshes with gear 56*b* upon the upper roll shaft 54 and rotates roll 156*a* as previously described.

Upon the other end of shaft 144 is secured a gear 157 which meshes with gear 158 rigidly carried by one end of an intermediate shaft 159 rotatably carried by the lower end of a rock arm 160 the other end of which is adjustably secured to a rod 161 fast in brackets 35 and 36. To the inner end of shaft 159 is attached a gear 162 which engages with a gear 163 secured to the feed roll to rotate the same. It is obvious that the drive is from gear 45, shaft 144, gear 157, gear 158, shaft 160, gear 162, gear 163, roll 155. If it is desired to change the rate of drive of the feed rolls the arm 160 may be swung out and gears 157, 158, 163 and 162 and pairs of suitable sizes may be replaced.

In order to supply paper continuously to the machine means are provided for s[illegible]porting a roll

of suitable paper and for removing paper from the roll in a manner that it may be readily fed to the machine in the proper time relation. A bracket 49 Figs. 2 and 3 is secured to the edge of the base 5 by bolts or any convenient means and extends away from the base. Fastened to this bracket is a stub shaft 50 upon which a roll of paper is carried for rotation. Two guide studs 51, 52 secured to the bracket direct the paper as it leaves the roll to the outer end of a table 53 which is covered by a plate 54 to form a duct extending inwardly for conveying the paper to feed rolls. The paper is fed to a cutter (to be described later) by two feed rolls, an upper and a lower. The lower feed roll 55 Fig. 9 is mounted on shaft 44 and positively driven thereby and is of such diameter that its periphery is on a level with table 53 at the inner end thereof. The upper feed roll 56 which acts as a presser roll having an enlarged center portion 56*a* which projects through an opening in the cover 54 and contacts with the paper, is rotatably carried by a shaft 57 supported between two arms 58 which are pivoted to the upper ends of standards 35 and 36. The upper roll is resiliently held in contact with the paper upon the lower roll by means of a spring-pressed plunger 59 slidingly mounted in an arm 60 secured to standards 35 and 36. A spring 60*a* exerts a continuous pressure upon the top of the pin or plunger 59 to maintain the two rolls in contacting relationship. The upper roll may be an idle roll or it may be geared to the lower feed roll and positively driven. In the illustrated form of the invention gear 56*b* is fixed to the roll 56 in driving relation with a gear 55*b* fixed to the roll 55.

The feed rolls feed the paper onto a platform 61 formed integrally on a sub frame 62 carried by the standards 35, 36 and into a curved delivery chute 63. A cover plate 64 is provided over the platform to hold the paper thereon. A stationary knife blade 65 is secured to the edge of the platform adapted to cooperate with an upper reciprocating knife blade 66 attached to a knife block 67 mounted for vertical sliding movement in a channelway 67*a* in the sub frame 62. The knife block is guided upon a vertical pin 68 at each end thereof. The knife is driven from a cam groove 69 in a cam disc 70 Figs. 3 and 9 keyed or otherwise secured to one end of the cam shaft 41. A rock shaft 70*a* spans the two standards 35 and 36 and is journaled therein and is provided with an arm 71 secured to each end thereof, the other ends of arms 71 being pivotally connected to a link 72 which in turn is pivotally connected to the knife carrier 67. Intermediate the ends of the arm 71 and engaging the cam groove 69 is secured a cam roller 72*a* positioned so as to travel in the cam groove 69 whereby rotation of the cam will impart a reciprocating movement to the upper knife. The cam groove 69 is designed to impart a cutting movement to the knife for every stroke of the traverse bar and is positioned relatively to the cam shaft so that the knife is moved downwardly during movement of the traverse bar and when the feed rolls are at rest. After the paper has been prepared or treated during the interval while a layer of a coil is still being wound the paper is held in the curved chute 63 until the completion of a layer upon the coil. A pair or more of spring pressed fingers 73 Figs. 9, 10 and 11 are positioned above the delivery chute 63 so as to project through openings therein to position and deliver the paper to the coil. These fingers, which may be made of rubber so as to better contact grip the paper, are secured to short arms 74 Figs. 4 and 12 in any convenient manner, which arms are freely mounted on a shaft 75 which is freely mounted in the arms 76, 76 fixed to a rock shaft 77 which is rotatably mounted in the sub frame 62. Fixed on the shaft 75 adjacent to the arm 74 is another arm 74*b* whose upper surface is free of but adapted to contact with a pin 74*a* fixed in and projecting from the arm 74. A collar 74*e* adjustably secured to the shaft 75 carries one end of a spring 74*d* under tension, the other end of which engages the arm 74 in a manner to press the fingers 73 against the paper. Rotation of shaft 75 will thereby raise and lower the fingers through the coaction of the arm 74*b* and the pin 74*a*. It is obvious that any degree of pressure of the fingers upon the paper may be obtained by varying the tension of spring 74*d* through adjustment of collar 74*e*. A lever 77*a* fixed to the rock shaft 77 is pivotally secured to a link 78 connected to an arm 79 pivoted at 80 to standards 35, 36. The arm 79 carries a cam roller 61 intermediate its ends to engage a cam 82 upon the cam shaft. Thus rotation of cam 82 will cause a reciprocatory movement of the fingers 73, wherein said fingers are first moved forwardly so as to push a sheet of paper through the chute till it is within the bite of the rotating coil, and then moved rearwardly into the position shown in Fig. 10. The cam 82 is so positioned upon the cam shaft that its low point is in proper relation to the shaft so that the fingers are brought into operation during the interval between movement of the feed rolls, at each end of a stroke of the traverse bar. A spring 33 is secured under tension to the bell crank and to one of the standards to maintain the cam roller in contact with the cam.

In order to permit paper to enter the delivery chute when the fingers are inoperative and in retracted position, cam guide 84 (Figs. 10 and 11) is adjustably secured at the side of the chute to engage roller 85 on the arms 85*a* fast on the shaft 75*a* to raise the arms and fingers upon the return movement of the fingers so that paper may be fed into the chute beneath the fingers. The chute is curved at its outer end as it approaches the coil being wound so as to start the paper on a curved path and also to iron out the paper. The rubber finger tips act as retarding means after the paper has been seized by the bite of the rotating coil and wire and have a tendency to prevent the paper from being drawn through the chute on a bias.

With the spindle rotating at such high speeds it was found desirable to provide special means for feeding wire to the core instead of merely drawing from the ungoverned spools. In accordance with this invention a long arm is pivotally mounted upon a separate base 87, Figs. 2 and 3, the arm extending upwardly and rearwardly, and having a central slot 88 extending intermediate its ends. To this arm is secured the desired number of spindles 89, four being shown, upon which the spools of wire are held for rotation. The shanks of the spindles extend through the slot in the arm and are rigidly held by nuts 90 threaded upon the shanks in the conventional manner, each upper spindle being extended laterally beyond the lower one.

The spools of wire do not rotate directly upon the spindles but are first placed upon a shell or mandrel consisting of a sleeve portion 92 Figs. 6 and 8, having a brake drum 93 secured there-

to. The spool is frictionally held upon the mandrel by longitudinal curved springs 94 adapted to press against the spool and to fit within longitudinal grooves in the sleeve when the springs are depressed. The mandrel is adapted to rotate on two enlarged portions 95 of the spindle serving as bearings. In order to provide a constant friction to retard the rotation of the mandrel the spindle is bored at its outer end to receive a stud 96 which carries a pair of friction washers 97 which bear against the end of the mandrel. The washers are spring-pressed against each other and against the mandrel by means of a spring 98 held adjustably under compression by knurled nut 99 on the end of the stud 96.

It was found necessary to provide additional braking mechanism to bring the spools to a stop whenever wire was not being drawn from them or to prevent running away when the machine was slowing down. To this end an arcuate brake shoe 100 Fig. 7 lined with any suitable friction material is adjustably mounted upon a rod 101 pivoted to the extremity of a second and intersecting rod 102 which in turn is adjustably secured to a collar 103 fastened rigidly to each spool spindle adjacent the brake drum. A tension spring 104 Fig. 3, is attached to one end of a short rod 105 secured to each of collars 103*a*, the other end of the spring being attached to rod 101 to exert a resilient force whereby the brake shoe is brought into contact with the drum. This is of course applied to each spool.

A guide roller 106, Figs. 1 and 3, is mounted to freely rotate upon a rod 107 extending transversely from the upper ends of each of rods 101 over which the wire from the spool is led, after which the wire is led over a second guide roller 107*a* mounted for rotation on a bar 108 extending across and parallel to the coil spindle. Bar 108 is supported at each end by a vertical stud 109 adjustable in lugs 110 attached to the traverse bar.

When wire is being drawn from the spools, Fig. 7, the tension of the wire will exert a pull upon rods 101 and move them downwardly thereby releasing the brake shoe from the drum but immediately upon the stopping of the coil spindle this tension will be reduced and the springs 104 will apply the brakes to the spools and prevent further rotation of the spool.

In instances where large rolls of insulating paper are used provision is made whereby a length or supply of paper is unreeled from the roll previously to the action of the feed rollers. For this purpose a crank pin 111, Figs. 2 and 3, is inserted in the outer face of the cam 67 to which is pivotally secured connecting rod 112, the opposite end of which is pivotally connected at 113 to one of a pair of reciprocating arms 114 freely mounted on a stud 115 carried by the bracket 49. The two arms 114 are secured at their lower ends by a draw bar 116 in spaced relation substantially the width of the roll of paper and which carries a roller 116*a*. The paper is led directly from the roll over the draw bar and around the guide studs 51, 52 and into the duct. Rotation of the cam 67 will impart a reciprocatory motion to the draw bar and unreel a length of paper, the free end of the paper being held by the snubbing action of the guide studs and the feed rolls 55 and 56. The crank pin is inserted in the cam in such position relatively to the shaft that paper is drawn from the roll while the feed rolls are at rest.

The operation of the machine is as follows:— The operator inserts a core or mandrel between the chuck and tail piece and attaches the wires thereto, leading them downwardly from the spools over the upper guide rollers and over the lower guide rollers, secured to the traverse bar, the paper having been inserted in the machine. The motor is then started, being gradually brought to its maximum speed by the automatic starting box, and a layer is wound upon each of the coils being formed on the core. During the winding of a layer, the traverse drive shaft through bevel gears has rotated the cam shaft, which in turn drives the feed rolls 180° through the modified "Geneva movement", and has also operated the knife to cut a piece of paper from the sheet and deposit it in the delivery chute. At this point the projection on the finger operating cam will come into contact with its roller, and through its system of levers, will move the rubber fingers forwardly and downwardly to feed the sheet of paper in the delivery chute to the layer of wire just wound upon the coil, exactly as the traverse bar reaches the limit of its stroke. The winding wires on the coil act as tapes to carry the cut sheet between them and the previously wound layer. The delivery of the paper to the coil takes place while the untoothed section of the gear on the cam shaft passes over one of the idle segments of the gear on the feed roller shaft. The toothed portion of the cam shaft gear will come into contact when desired during the return movement of the traverse bar so that during this movement paper will be again passed to the delivery chute and cut to be fed to the coil exactly when the traverse bar reaches the limit of this return stroke. This cycle of operations is repeatedly continued until the total number of layers has been wound upon the core; when the operator secures the last turn upon the coil, cuts the wires and removes the completed coil.

It is obvious that various modifications may be made from the structure disclosed, without departing from the spirit and scope of the invention, as described in the following claims.

I claim:

1. In a coil winding machine including mechanism for winding successive layers of a coil, means for preparing a sheet of paper while a layer is being wound, and means including a closed and substantially horizontal chute having a curved end portion extending immediately adjacent the coil being wound for positively delivering a sheet of paper directly into the bite of the rotating coil and wire and along the line of travel of said wire whereby the paper is subjected to a straightening action as it leaves the chute.

2. A coil winding machine including mechanism for winding successive layers of a coil, means for feeding and cutting a sheet of paper while a layer is being wound, means for delivering the cut sheet of paper directly into the bite of the wire and coil being wound including a substantially horizontal closed chute having a curved end portion and fingers actuated between the winding of successive layers to position and positively deliver a sheet of paper through the chute and to the coil being wound, said curved chute serving to straighten and guide the paper directly into the coil being wound.

3. A coil winding machine including a drive shaft, a traverse bar actuated therefrom to control the length of a layer of the winding, a cam shaft driven from said drive shaft, feed rollers driven from said cam shaft for intermittent rota-

tion, a cutter actuated from said cam shaft, reciprocating fingers also driven from said cam shaft for positively delivering a sheet of cut paper into the bite of the wire and coil being wound, means for constantly urging said fingers into contact with said paper and a cam guide for raising said delivery fingers out of contact with the paper at one end of the reciprocating stroke of said fingers.

4. In a coil winding machine, a support for a core, means for rotating said support, a traverse bar for guiding a strand of wire to said core as it is rotated to lay a series of successive layers of wire on said core, paper mechanism for feeding and cutting predetermined lengths of paper, and means for guiding the cut paper into the bite of the wire being wound and along the line in the direction of travel of the wire, said latter means including a substantially horizontal chute having a downwardly curved end and a plurality of grippers for positively feeding the paper along the chute at predetermined intervals in accordance with movements of said traverse bar.

5. In a coil winding machine, a support for a core, means for rotating said support, a traverse bar for guiding a strand of wire to said core as it is rotated to lay a series of successive layers of wire on said core, paper mechanism for feeding and cutting lengths of paper, delivery means for positively feeding said cut paper to the coil being wound, said latter means including a substantially horizontal closed paper chute having a downwardly curved end and grippers for resiliently gripping the paper and positively feeding it along the chute at predetermined intervals in the winding operation in accordance with movement of said traverse bar.

6. In a coil winding machine, a support for a core, means for rotating said support, a traverse bar for guiding a strand of wire to said core as it is rotated to lay a series of successive layers of wire on said core, paper mechanism for feeding and cutting lengths of paper, delivery means for positively feeding said cut paper to the coil being wound, said latter means including a substantially horizontal closed paper chute having a curved end portion leading into the bite of the wire and coil being wound, said chute having openings in one wall thereof and grippers extending through said openings to positively feed the cut paper along the chute at predetermined intervals in the winding operation in accordance with movement of said traverse bar.

7. In a coil winding machine, a support for a core, means for rotating said support, a traverse bar for guiding a strand of wire to said core as it is rotated to lay a series of successive layers of wire on said core, paper mechanism for feeding and cutting lengths of paper, delivery means for positively feeding said cut paper to the coil being wound, said latter means including a substantially horizontal closed paper chute having a curved end portion leading into the bite of the wire and coil being wound, said chute having openings in one wall thereof and grippers extending through said openings to resiliently grip and positively feed the cut paper along the chute at predetermined intervals in the winding operation.

8. In a coil winding machine, a support for a core, a driving shaft for rotating said support, a traverse bar for guiding a strand of wire to said core as it is rotated to lay a series of successive layers of wire on said core, a cross shaft driven from said driving shaft, a knife, paper handling mechanism including feed rolls for feeding a sheet of paper to said knife mounted upon geared shafts, means including a swinging arm having removable gears thereon operatively connecting said geared shafts to said cross shaft whereby said feed rolls are positively driven from said cross shaft.

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