Jan. 19, 1932. J. A. WARREN 1,841,562

WINDING MACHINE

Filed Jan. 21, 1927 2 Sheets-Sheet 1

Fig. 1

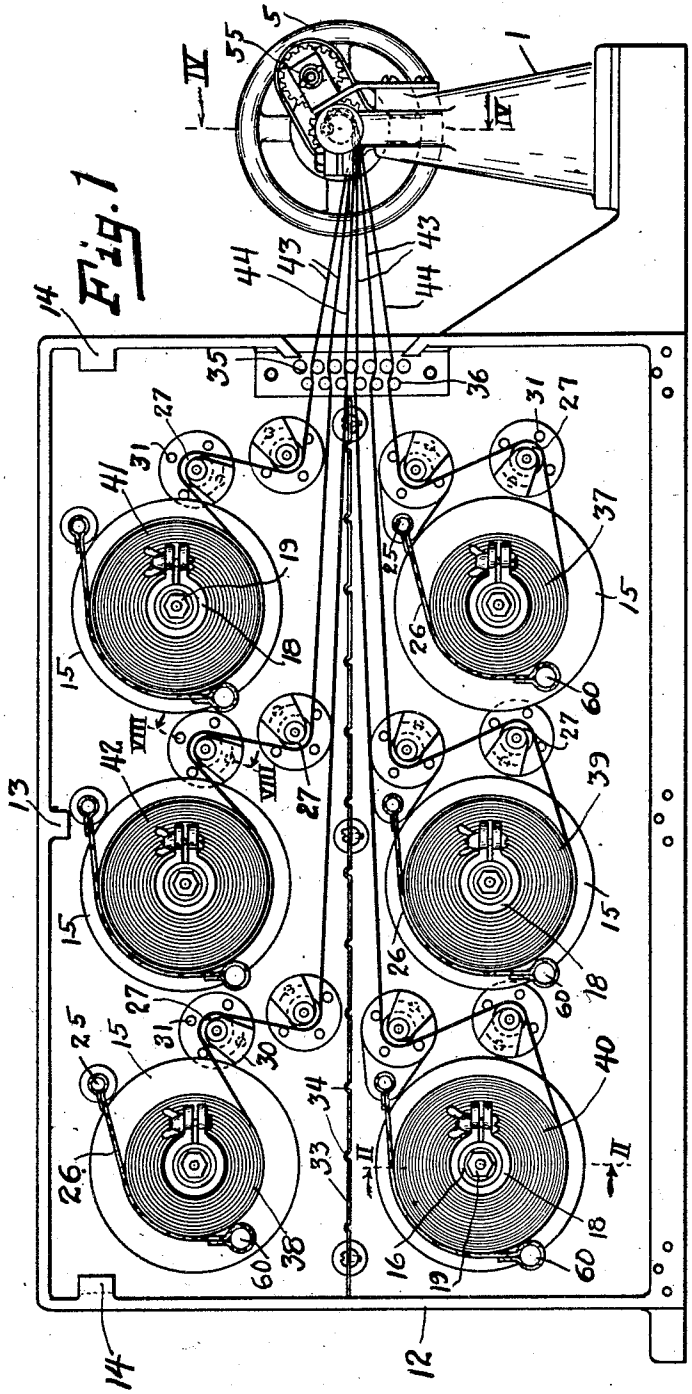


Fig. 3

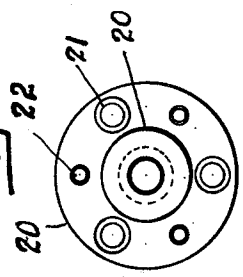
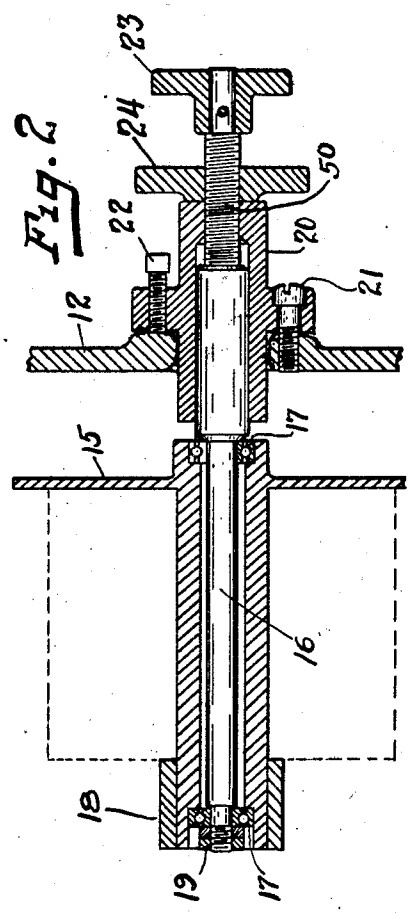


Fig. 2



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WINDING MACHINE

Filed Jan. 21, 1927 2 Sheets-Sheet 2

Fig. 9

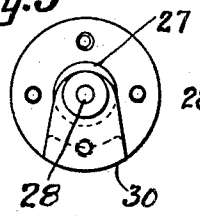
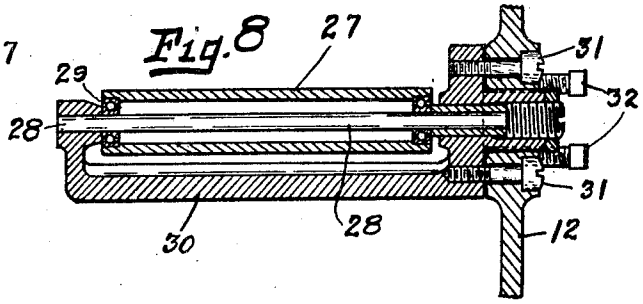


Fig. 8



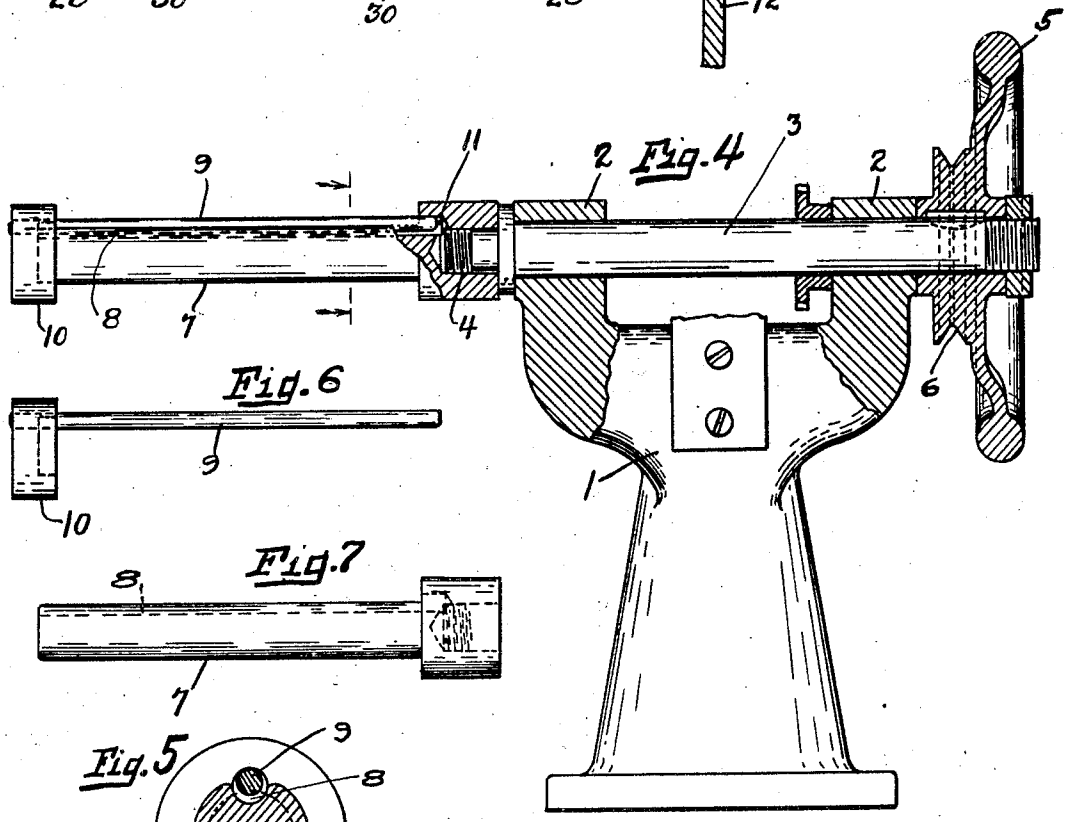


Fig. 4

Fig. 6

Fig. 7

Fig. 5

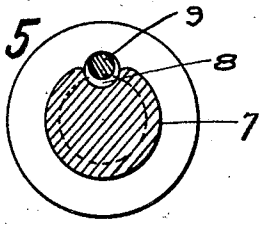


Fig. 11

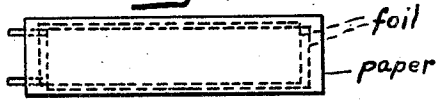


Fig. 10

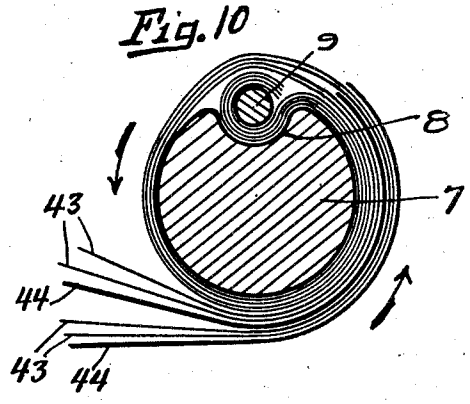
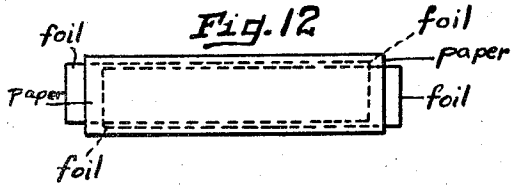


Fig. 12



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Patented Jan. 19, 1932 1,841,562

UNITED STATES PATENT OFFICE

JOSEPH A. WARREN, OF MOUNT VERNON, NEW YORK, ASSIGNOR TO H. R. VAN DEVENTER INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

WINDING MACHINE

Application filed January 21, 1927. Serial No. 162,591.

This invention relates to winding machines, and more particularly to machines for winding electrical condensers.

An object of this invention is to provide a machine which is adapted to continuously superimpose a plurality of layers of flexible material.

Another object is to devise a process for manufacturing electrical condensers to insure a compact article.

Another object is to provide a winding machine having a single mandrel means for winding a plurality of sheets of material.

A further object is to provide a winding machine having a single mandrel means for winding a plurality of sheets of material in conjunction with a plurality of guide and tension means.

Yet another object is to provide a winding machine in which the reels are automatically stopped when traction on the material is released.

Another object is to provide a winding machine having universally adjustable reels.

A further object is to provide a winding machine in which is incorporated means for smoothing out the material in its passage.

To accomplish these and other important objects I provide a machine for electrical condensers which comprise a plurality of strips of metal foil such as tin foil or other conducting material separated from each other by the interposition of one or more strips of dielectric material, such as cellulose acetate, paper or other material. The condensers after being wound are usually removed from the mandrel which is a part of the machine, but if desired, the condensers may be wound on a core which may be an integral part of the condenser.

To make my invention more easily understood I have shown in the accompanying drawings a preferred embodiment. In these the same numerals refer to similar parts throughout the several views of which,

Fig. 1 is a side elevation of the machine with rolls of material in position and a partially completed condenser on the mandrel;

Fig. 2 is a section on line II—II of Fig. 1 showing the details of a spindle and holder for a roll of material;

Fig. 3 is a plan view of the adjusting means for the spindle and holders shown in Fig. 2;

Fig. 4 is a section on line IV—IV of Fig. 1 showing the details of the winding head;

Fig. 5 shows a cross section of the mandrel on which the condensers are wound;

Fig. 6 shows the locking bar for the mandrel;

Fig. 7 shows the mandrel in horizontal view;

Fig. 8 is a transverse section on line VIII—VIII of Fig. 1 showing the details of a guide roller and bracket;

Fig. 9 is a front view of a guide roller and bracket;

Fig. 10 shows in diagrammatic form, somewhat distorted, a partially wound condenser; and,

Figs. 11 and 12 are diagrammatic showings of completed condensers.

Referring to the drawings, 1 designates the frame of the winding head. Carried by the standards of the frame are bearings 2 through which project a spindle 3. The spindle 3 has a threaded nose 4 on one end, and attached thereto at the other end a hand wheel 5 and pulley 6. The pulley 6 is connected by a belt, not shown, to an electric motor controlled by a foot operated rheostat. The motor and its controls are not shown, and it will be understood that in lieu of a motor, any suitable source of power and method of control may be used.

Removably mounted on threaded nose 4 of spindle 3 is a work mandrel 7. Mandrel 7 is provided with a longitudinal channel 8. A locking bar 9 is nested in the channel 8 in such a manner that its exposed surface projects slightly outside of a circular line coinciding with the circumference of the body of the mandrel 7. The locking bar 9 is removably held in position by an attached ring 10 at one end and at the other end by the hole 11 in the shoulder of mandrel 7. There is a clearance between the locking bar 9 and channel 8 whose function will be discussed hereinafter.

The magazine 12 has a door, not shown, held closed by latches, not shown, at 13 and 14.

The roll holders or reels for the material used in making the condensers, of which reels there may be as many as required, together with their associated friction strips and guide rolls, are all of substantially similar construction and one only will be described.

The reel 15 is rotatably mounted on spindle 16 through ball bearings 17, removable clamping ring 18 and lock nut 19. Spindle 16 has a threaded portion 50 extending through the threaded center hole in the universally adjustable bracket 20. Bracket 20 is removably fastened to the wall of the magazine 12, by screws 21. Screws 22 permit bracket 20 to be variably adjusted with respect to the wall of the magazine 12, so that spindle 16 and its associated reel 15 can be adjusted to any convenient angle. Secured to the end of the spindle 16 and outside of the magazine 12 is a hand wheel 23, by rotating which the spindle 16 is moved away from or towards the member 12 so that reels 15 and the strips of material coming therefrom will have the desired relation to mandrel 7 on the winding head. Lock nut 24 on being tightened locks spindle 16 in the desired position after adjustment. A post 25 is mounted on the wall of magazine 12 so that its attached friction strips 26, which may be of cloth or other suitale flexible material, will lie against the circumferential surface of a roll of material on reel 15. The friction strips 26 partly surround the roll of material and its free end is weighted by a suitable weight 60. A guide roller 27 is mounted on a spindle 28 on ball bearings 29 in a bracket 30. Bracket 30 is adjustably mounted on the wall of magazine 12 and secured thereto by screws 31. Screws 32 are used to adjust bracket 30 to its proper angular relation to the wall of magazine 12. The function of screws 22 and 32 is to adjust the bracket 20 and 30 against which the screws thrust, so that all the reels and their associated guide rollers rotate on substantially parallel axes.

A shelf 33 having a series of raised beads 34 divides the magazine into two compartments and supports the strips of material passing from the upper rolls during the threading of these strips through the machine. This shelf 33 also serves to receive any fragments which may fall from the strips, preventing such fragments from falling on the strips of material passing from the lower set of reels and so being carried along into the condenser being wound.

Two series of staggered rods 35 and 36 supported respectively at one thereof on the wall of the magazine 12 form apertures which serve to impart a final smoothness to the strips of material as they are drawn therethrough from the magazine onto the mandrel.

In describing the operation of the machine I will consider a condenser comprising two strips of metallic foil 44 and four strips 43 of any suitable flexible dielectric, such as paper. Both foil and paper are of nearly equal width and the construction is such that the layers of foil are separated from each other by two thicknesses of paper. In winding, the edges of all the paper strips are made to coincide as nearly as possible. The edges of the foil do not coincide with the edges of the paper, but, as shown in Figs. 11 and 12, one foil overlaps the paper at one edge and the other foil overlaps it at the other edge.

The disposition of the strips of paper 43 and the strips of foil 44 is clearly shown in Fig. 10, in which the condenser is shown in the act of being wound on a cylindrical mandrel. After winding they are removed from the mandrel and usually flattened.

Rolls of metal foil 37 and 38 and rolls of paper 39, 40, 41 and 42 are placed on reels 15 and severally secured thereto by clamping rings 18 and lock nuts 19. The position of reels 15 is adjusted by the members hereinbefore described so that the strips of foil and paper coming from the various reels will issue from the magazine in their proper relation. The friction strips 26 contacting with the peripheries of the several rolls, keep the strips of foil and of paper under the desired tension by their friction thereagainst as they are drawn off the rolls and stop the rotation thereof when such drawing off ceases. Strips of paper 43 and foil 44 after being drawn from their respective rolls on reels 15 contact with their several smoothing rollers 27 as shown in Figs. 1 and 8, and are drawn out of the magazine through the staggered apertures between the rods 35, 36.

As previously described the edges of the paper strips extend beyond the edges of the strips of foil as shown in Figs. 11 and 12. These are brought together against mandrel 7 as shown in Fig. 10 and secured thereto by inserting and locking the bar 9. The strips of paper thus lie in the slot 8 and underneath and partly around the locking bar 9. The free ends of the paper are then carried over the locking bar 9 so as to form a loop and are so held until spindle 3 carrying with it mandrel 7 is caused to revolve by applying power to pulley 6. A sufficient number of turns of both foil and paper as shown by counting mechanism 55, are wound onto mandrel 7 to make a condenser of the desired capacity. The machine is then stopped, the strips of foil severed by the operator, the arbor rotated a few turns again to give an overlay of paper, to prevent loosening of the compactly wound condenser, and then stopped. The strips of

paper are now severed. The mandrel is again rotated to wind on the free ends of the paper strips and the machine is stopped, while the outside strip of paper is secured by paste or other suitable means to prevent unwinding. By withdrawing the locking bar 9 the wound condenser will be loosened on mandrel 7 due to the particular relation of locking bar 9 to mandrel 7 as hereinbefore described, and the wound condenser is easily removed. To secure a flat condenser it is merely necessary to flatten out the wound element in a suitable manner. Practically all types of condensers, commonly known as paper condensers, including the Mansbridge type, may be wound on my machine, and I therefore do not restrict myself to the winding of condensers of the exact type described.

The machine can be modified or enlarged by having a greater or lesser number of reels and their associated members, thereby permitting the winding of condensers having any desired number of elements. Therefore I do not limit my invention to the particular size and arangement shown.

By the use of the above described machine I have succeeded in accomplishing new and desirable results in the process of manufacturing interleaved sheet materials, and more particularly in the preparation of compact electrical condensers, uniform in structure and capacity.

The use of interchangeable mandrels permits any desired size of condenser to be made. The use of the universally adjustable feeding and tensioning means of my invention enables the above described compact articles to be easily prepared and formed, and the automatic stopping means prevents any irregularities therein.

It should be understood that I do not limit the invention to the winding of condensers using paper as the insulating medium, or dielectric, as the machine is capable of handling any flexible insulating material which can be obtained in the form of rolls and which is suitable for the purpose.

A round mandrel on which the condensers are wound has been shown, but, obviously mandrels of flat shape or any desired suitable shape may be used.

While I have herein disclosed a machine which is a preferred embodiment of my invention, it should be understood that various modifications and changes in the arrangement of the elements will suggest themselves to one skilled in the art, and I therefore intend to cover all such modifications as come within the spirit and scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a machine adapted for manufacturing electrical condensers of the interleaved dielectric and conductor type, in combination, a dust-proof magazine, material holding means mounted therein, means for adjusting said material holding means in the direction of the axis of the rotation thereof, means for angularly adjusting said holding means with respect to a wall of said magazine and unreeling and tensioning means adjustably associated with said holding means.

2. In a machine for manufacturing electrical condensers of the interleaved and conductor type, in combination, adjustable material holding means mounted therein and means associated therewith for adjusting said holding means in the direction of the axis of rotation thereof, and also angularly with respect to the rest of said machine, and unreeling and tensioning means associated therewith.

3. In a machine adapted for manufacturing electrical condensers of the interleaved dielectric and conductor type, in combination, adjustable material holding means rotatably mounted therein, means for applying friction thereto, means associated therewith for varying the plane of rotation thereof, and also the plane of the axis of rotation, adjustable material tensioning and smoothing means, fixed tensioning and smoothing means, and rotatable, adjustable winding means for said materials.

4. In a machine for manufacturing electrical condensers of the interleaved dielectric and conductor type, in combination, a cabinet, material holding means mounted therein comprising a reel, a spindle, a supporting member therefor carried by a wall of the cabinet, and means to adjust the angular relation of the member to the wall, and unreeling and tensioning means associated therewith.

5. In a machine for manufacturing electrical condensers of the interleaved dielectric and conductor type, in combination, a cabinet, material holding means mounted therein, material guiding and tensioning means cooperating directly therewith, said guiding means comprising a support projecting through a wall of the cabinet, and means to adjust the angular relation of the support to the wall, and additional unreeling and tensioning means associated therewith.

In testimony whereof I affix my signature.

JOSEPH A. WARREN.