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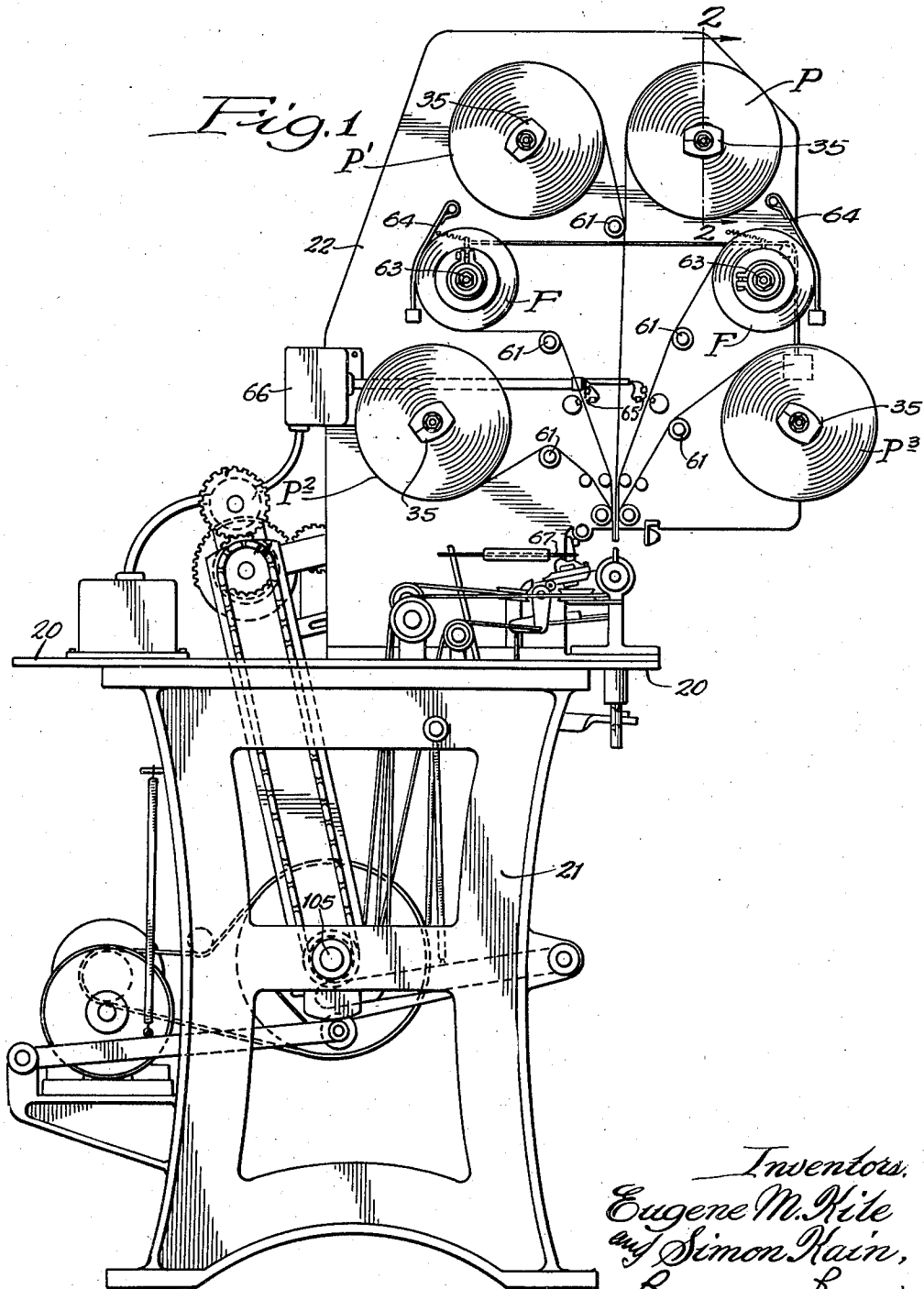
E. M. KILE ET AL

2,365,707

CONDENSER WINDING MACHINE

Filed Feb. 3, 1942

2 Sheets-Sheet 1



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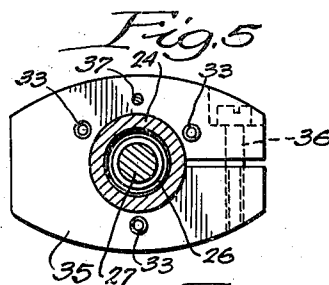
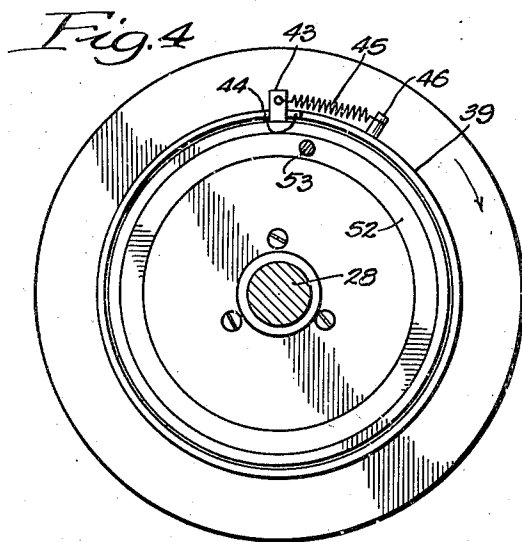
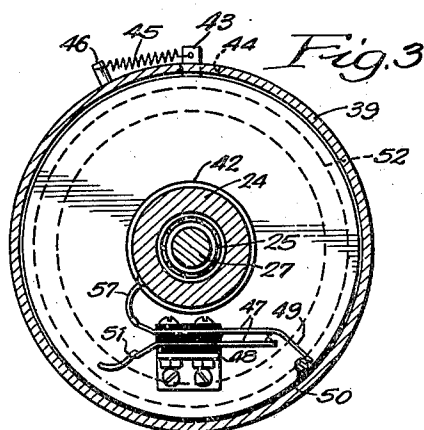
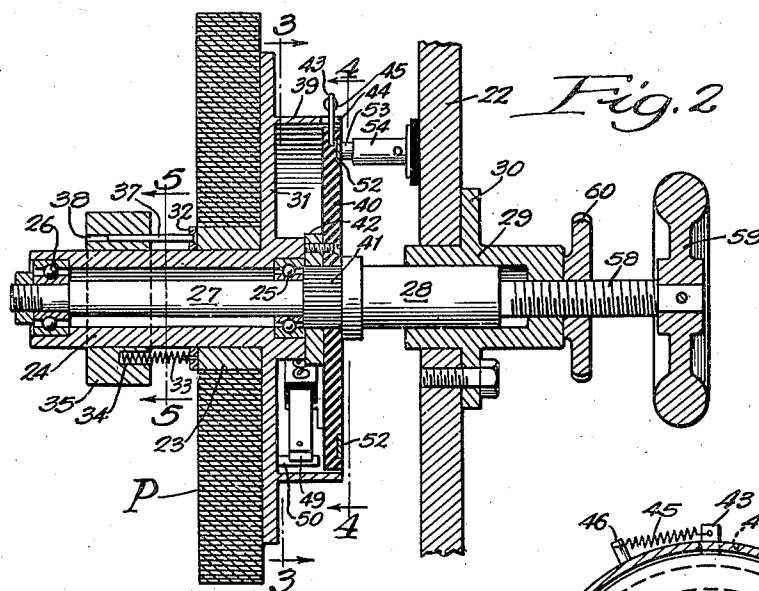
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CONDENSER WINDING MACHINE

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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CONDENSER WINDING MACHINE

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5 Claims. (Cl. 242—57)

The machine of the present invention constitutes an improvement in certain particulars of the machine set forth and described in Letters Patent No. 2,205,171, issued June 18, 1940, and in its general character the present machine closely follows that of the patent referred to.

The machine is one which makes provision for the winding of condensers from webs of metal foil and paper which are fed in superposed relation from spools so arranged as to feed to a common line of advance, so that a laminated composite strand of foil and paper will be delivered to a mandrel upon which the condenser will be wound until it is built up to the desired dimensions, at which time the strips of foil and paper will be automatically and successively severed so that the terminus of the foil will lie within the final paper windings and be thoroughly protected thereby. The strips of foil may be slightly staggered with respect to the paper strips, so that the edges of the respective foil strips will be oppositely protruded or exposed at the ends of the condenser and in position to have the leads of wire soldered thereto.

The machine of the present invention differs from that of the patent in respect to the means provided for frictionally mounting the paper rolls and making provision for the breaking of the motor circuit in the event one or more of the paper strips become accidentally disrupted during the feeding operation. In other respects the machine follows quite closely the construction set forth in said patent so that it is not deemed necessary to describe in detail such features as the construction and mounting for the divided mandrel or the means for stripping the wound condensers therefrom, which features are identical with those set forth in said patent.

Further objects and details will appear from the description of the invention in conjunction with the accompanying drawings, wherein—

Figure 1 is a side elevation of the winding machine of the present invention;

Fig. 2 is an enlarged sectional detail taken on line 2—2 of Fig. 1, looking in the direction of the arrows and showing the mounting for one of the paper rolls, with the means provided for breaking the motor circuit in the event the roll is relieved from feeding tension due to accidental breaking of the strip;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is a view taken on line 4—4 of Fig. 2, looking in the direction of the arrows; and

Fig. 5 is a view taken on line 5—5 of Fig. 2, looking in the direction of the arrows.

The frame and mountings for the operating parts are substantially identical with those shown in the patent referred to, and comprise a table 20 supported on suitable end standards 21 and carrying a vertically extending upper frame or superstructure 22 which affords a mounting for a series of drums or rolls of suitable insulating paper P, P', P², and P³, four being shown in the present embodiment, although a greater or lesser number might be employed. The upper frame also serves as a mounting for a pair of rolls of a suitable foil F, two of said rolls being shown in the present embodiment.

As shown, the rolls of metal foil on each side occupy an intermediate position with respect to the paper rolls, so that, in the feeding of the composite strand from which the condenser is built up, there will be six layers or laminations, two paper layers occupying the center position with single layers of foil on each side thereof, and with single layers of paper occupying the outermost positions. However, as the composite strand is wound upon itself, the single outer layers of successive convolutions will overlies one another, so that in the completed condenser each strip of foil will be separated by two strips of paper. The edges of the respective strips of foil may be offset slightly oppositely with respect to the adjacent edges of the paper strips so that the foil in the completed condenser will be exposed at each end, although the respective foil strips throughout all portions of the condenser are separated from one another.

As shown in Fig. 2, each of the paper rolls is wound up and carried upon a ring-shaped core 23 which is snugly mounted upon a sleeve-like hub 24 carried by inner and outer ball bearings 25 and 26 mounted upon the reduced end 27 of a fixed pintle 28 which is mounted within a cup-shaped socket 29 provided with a flange 30, which is bolted or otherwise secured to the upper frame 22.

The hub 24 terminates in a disk 31, forming a spool against which the side of the paper roll frictionally contacts, so that, as the paper strip is drawn from the spool, it will exert sufficient friction against the disk and the hub thereof to cause a slight limited rotation. The inner edge of the core 23 will be held in frictional contact against the face of the spool disk 31, through the provision of a facing ring 32, which surrounds the hub and is urged inwardly by a plurality of springs 33 which are socketed within recesses

34 in the inner face of a split clamping block 35, which may be tightened and clamped upon the hub by the turning of a clamping screw 36 (see Fig. 5). In order to prevent rotation of the facing ring 32 which bears against the core 23, the ring is provided with an outwardly extending pin 37 which is entered within an aperture 38 in the clamping block 35.

The disk 31 is provided with an annular flange 39, the margin of which surrounds an insulating plate 40 of Bakelite or the like, which is closely engaged with a knurled portion 41 of the pintle 28 so that it rigidly engages the same, and the insulating plate carries a facing ring 42 which bears against the inner end of the hub 24.

The insulating plate 40 is provided with a pin 43 which projects outwardly through a short slot 44 in the flange 39 and is connected by a coil spring 45 with a lug 46 outwardly projecting from the flange. This allows a limited degree of movement between the insulating plate 40 and the disk 31 which bears frictionally against the paper roll. When the paper strip is under tension, as in Fig. 3, the spool disk 31 will be moved forward against the light tension of the spring 45 until the pin 43 engages the end of the slot, and, so long as the paper strip is feeding forward normally under tension, this relationship of the parts will be maintained. If, however, the paper strip should break and the feeding tension be relieved, the spring 45 will draw back the pin 43 to the opposite end of the slot (Fig. 4). This slight degree of relative movement is relied upon to open the motor circuit in an emergency and stop the feeding of the paper.

The above result is accomplished by means of a spring contact switch 47, which stands normally in closed relation as in Fig. 3, and the members of which are secured to a bracket 48 mounted upon the inner face of the insulating plate 40. One of the prongs of the switch 47 is provided with an extension 49 which is adapted to be contacted by a pin 50 inwardly projecting from the face of the spool disk 31. When the paper is feeding normally, the disk 31 with its flange 39 will be rotated clockwise, in Fig. 4, against the tension of the spring 45 until the pin 43 bears against the back of the slot 44, which slight movement causes the pin 50 to open the contact switch 47. In the event a break in the paper strip occurs, the feeding tension will be relieved and the parts will assume the relationship shown in Fig. 3, which closes the contact 47 and energizes a relay to control the motor circuit and open the motor circuit as the control circuit is closed and permit closing of the motor circuit when the control circuit is open. However, it is obvious that the opening rather than the closing of the switch might be availed of to deenergize the motor circuit.

The outermost switch member is provided with a control circuit connection 51 leading through the insulating plate 40 and making connection with a metallic conducting ring 52, which contacts a brush 53 carried by a binding post 54 in the relay circuit. The companion switch member is connected by a circuit wire 57 to the hub 24, and thence through the bearings and connections to the frame of the machine and to ground. Each of the paper spools is provided with switches and connections of the character described, so that a break in any one of the paper strips will immediately cause a closing of the relay circuit, since the switch elements are arranged in parallel, and all must be open in order

to prevent the relay from de-energizing the motor.

In order to provide for the axial adjustment of the pintle which carries the hub 24 and spool disk 31 which comprise the spool for the paper roll, the pintle 2 is provided with a screw extension 58, threaded through the end of the socket 29 and carrying a hand wheel 59, which permits very delicate and accurate adjustments to be made in order to properly align the several paper strips which are to be united into the strand in such a way as to allow the edges of the respective foil strips to protrude beyond the ends of the completed condenser. A lock nut 60 is provided to securely lock the adjusting screw in position after the adjustment has been made. The conducting ring 52, which will be rotated with the adjustment of the pintle, provides continuous contact with the brush 53, irrespective of axial adjustments of the pintle.

The paper and foil strips are fed downwardly over guide rolls 61 united into a strand which is wound upon a divided mandrel of the character described in the patent aforesaid, and it is not here deemed necessary to describe in detail the construction of the mandrel. The foil strips are fed from rolls F which are carried by spools 63 of the character shown in the patent, and are restrained from overrunning by friction bands 64, which likewise need not be described in detail.

Provision is made for puncturing the foil strips by the passage of electric sparks discharged from needle points 65 and associated mechanism of the character shown in the patent referred to, the current being charged into condensers 66 in the manner shown in said patent. Provision is also made for the discharge of the sparks which perforate the foil in advance of the severing of the paper strips by a knife blade 67, so that the paper strips will overlies and enclose the foil, but these features are fully set forth in the patent referred to and need not be here described in detail.

Operation

The rolls of paper and foil are mounted upon the respective spools, and the paper spools are adjusted, by the mechanism shown in Fig. 2, to stagger the paper strips with respect to the foil strips, so that one edge of one of the foil strips will protrude from one side of the paper while the opposite edge lies within the opposite margins of the paper, the companion foil strip being similarly arranged to protrude beyond the opposite edges of the paper strips.

After accurate adjustment has been made to feed the paper and foil strips in proper relation, the mandrel will be lifted to engage the leading end of the composite strand which will be drawn down in position to be engaged by the divided mandrel, and the tension thus imparted will result in slightly rotating the paper roll-carrying hubs against spring tension, to open the switch mechanisms shown in Fig. 3. This permits the final closing of the motor circuit as soon as the strand is properly engaged with the mandrel, in the manner described in the patent referred to.

The engagement of the depending leading end of the composite strand will occur while the mandrel stands in elevated relation, as described in the patent, and thereafter the rotation of the mandrel will draw down the respective strips by rotation of the cores 23 around the hubs 24, which after their initial slight rotation under tension stand stationary during the normal unwinding of

the strips from the rolls. The unwinding of the strips will continue until the condenser has been built up on the mandrel.

At a timed period in the feeding operation, the sparks emitted from the needle points 65 will puncture through the foil strips to provide a weakened line of severance, and thereafter the application of a braking pressure on the foil spools will prevent additional feeding and cause the rupturing of the foil strips prior to the advance of the knife 67, which severs the paper and completes the cutting free of the composite strand thereby relieving the paper rolls from tension and allowing the hubs to be reversely rotated to effect a deenergizing of the motor circuit.

We claim:

1. In a condenser winding machine the combination of a plurality of rotatably mounted hub members adapted respectively to hold rolls of wound up strips of insulating material, the rolls being each rotatably mounted upon its hub member and positioned to deliver said strips to a common center for union into a composite strand, each hub member being rigid with a disc adapted to frictionally engage the side of a roll to impart limited rotation to the hub member as the roll is unwound under tension, means for winding the strips delivered under tension from the rolls into a composite strand in the form of a condenser, a fixed member adjacent each rotatably mounted hub member and having stop means for limiting forward rotation of the hub member under unwinding tension, means for reversely rotating the hub member when tension is released and switch members adapted to control a motor circuit supplying power for actuating the winding means, one of said switch members being positioned to maintain power applying relation to the other by the forward rotation of the hub member with its disc occasioned by friction imparted by the tension of the unwinding strip and positioned to be oppositely moved to deenergize the motor circuit as the hub member is reversely rotated when the tension is released.

2. In a condenser winding machine the combination of a plurality of rotatably mounted hub members adapted respectively to hold rolls of wound up strips of insulating material, the rolls being each rotatably mounted upon its hub member and positioned to deliver said strips to a common center for union into a composite strand, each hub member being rigid with a disc adapted to frictionally engage the side of a roll to impart limited rotation to the hub member as the roll is unwound under tension, means for winding the strips delivered under tension from the rolls into a composite strand in the form of a condenser, a fixed plate adjacent the disc of each hub member, coacting stop means on the disc and plate respectively for limiting the forward rotation of the hub and disc under unwinding tension, a spring for reversely rotating the hub disc when tension is released and switch members carried between the disc and plate and adapted to control a motor circuit supplying power for actuating the winding means, one of said switch members being positioned to be moved relatively to the other by forward rotation of the hub member with its disc occasioned by friction imparted by the tension of the unwinding strip to energize the motor circuit, and positioned to be restored to deenergize the motor circuit by reverse rotation of the hub member and disc when the tension is released.

3. In a condenser winding machine the com-

5 bination of a plurality of rotatably mounted hub members adapted respectively to hold rolls of wound strips of insulating material, the rolls being each rotatably mounted upon its hub member and positioned to deliver said strips to a common center for union into a composite strand, each hub member being rigid with a disc adapted to frictionally engage the side of a roll to impart limited rotation to the hub member as the roll is unwound under tension, means for winding the strips delivered under tension from the rolls into a composite strand in the form of a condenser, a fixed plate adjacent the disc of each hub member, coacting stop means on the disc and plate respectively for limiting the forward rotation of the hub and disc under unwinding tension, a spring for reversely rotating the hub disc when tension is released and switch members carried by the fixed plate and operable by movement of the hub disc, and adapted to control a motor circuit supplying power for actuating the winding means, said switch members being operable to energize the motor circuit when the hub member with its disc is forwardly rotated by friction imparted by the tension of the unwinding strip and operable to deenergize the motor circuit as the hub is reversely rotated when the tension is released.

4. In a condenser winding machine the combination of a plurality of rotatably mounted hub members adapted respectively to hold rolls of wound up strips of insulating material, the rolls being each rotatably mounted upon its hub member and positioned to deliver said strips to a common center for union into a composite strand, each hub member being rigid with a disc adapted to frictionally engage the side of a roll to impart limited rotation to the hub member as the roll is unwound under tension, means for winding the strips delivered under tension from the rolls into a composite strand in the form of a condenser, a fixed member adjacent each rotatably mounted hub member and having stop means for limiting forward rotation of the hub member under unwinding tension, means for reversely rotating the hub member when tension is released and switch members adapted to control a motor circuit supplying power for actuating the winding means, one of said switch members being positioned to maintain power supplying relation to the other by the forward rotation of the hub member with its disc occasioned by friction imparted by the tension of the unwinding strip and positioned to be oppositely moved to deenergize the motor circuit by reverse rotation of the hub member and disc when the tension is released, each of the mountings for the respective hub members and fixed members being in the form of a pintle upon which the fixed member is rigidly secured and carrying bearings interposed between the pintle and the hub, and screw adjusting means for moving the pintle axially to laterally adjust the delivering position of the roll carried by the hub member.

5. In a condenser winding machine the combination of a plurality of rotatably mounted hub members adapted respectively to hold rolls of wound up strips of insulating material, the rolls being each rotatably mounted upon its hub member and positioned to deliver said strips to a common center for union into a composite strand, each hub member being rigid with a disc adapted to frictionally engage the side of a roll to impart limited rotation to the hub member as the roll is unwound under tension, means for winding the

strips delivered under tension from the rolls into a composite strand in the form of a condenser, a fixed plate adjacent the disc of each hub member, coacting stop means on the disc and plate respectively for limiting the forward rotation of the hub and disc under unwinding tension, a spring for reversely rotating the hub disc when tension is released and switch members carried between the disc and plate and adapted to control a motor circuit supplying power for actuating the winding means, one of said switch members being positioned to maintain power supplying relation to the other by the forward rotation of the hub member with its disc occasioned by

friction imparted by the tension of the unwinding strip and positioned to be oppositely moved to deenergize the motor circuit by reverse rotation of the hub member and disc when the tension is released, each of the mountings for the respective hub members and fixed plates being in the form of a pintle upon which the hub is rotatably mounted and the plate is fixedly carried and including screw adjusting means for moving the pintle axially to laterally adjust the delivering position of the roll carried by the hub member.

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