July 21, 1953 R. A. KRAAY 2,645,797

BRUSHING APPARATUS

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FIG. 1

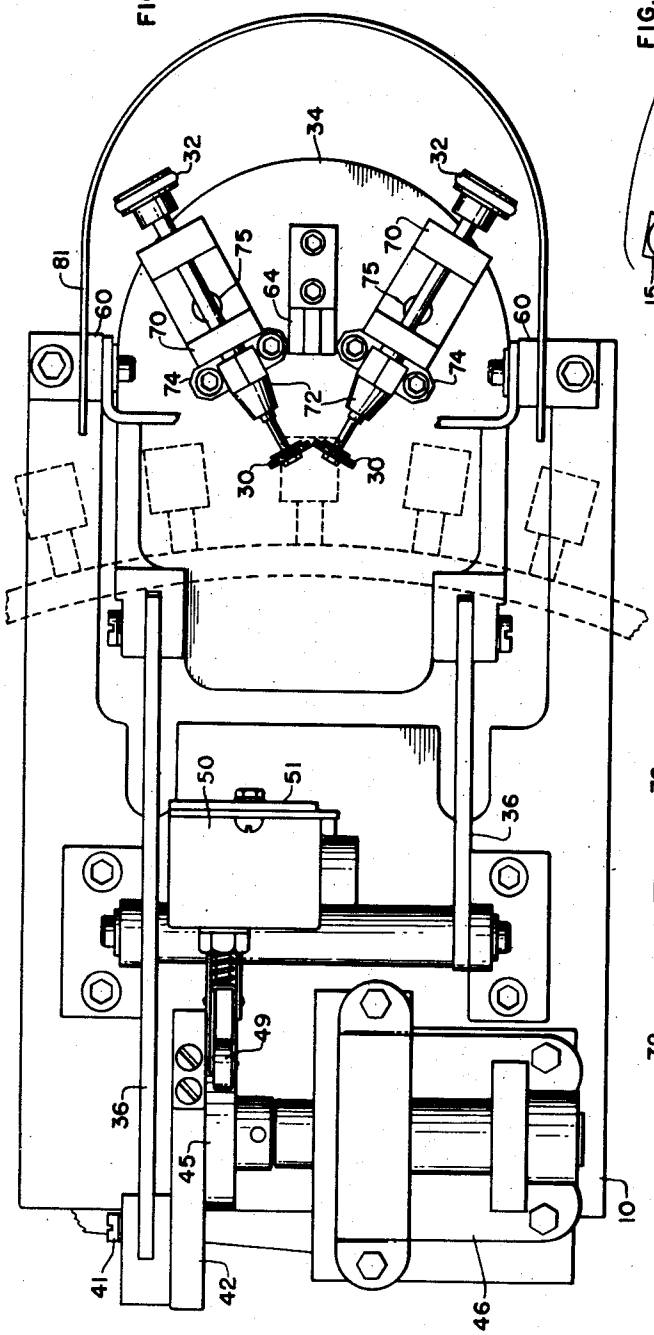


FIG. 4

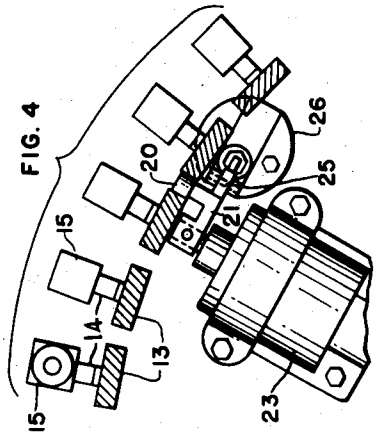
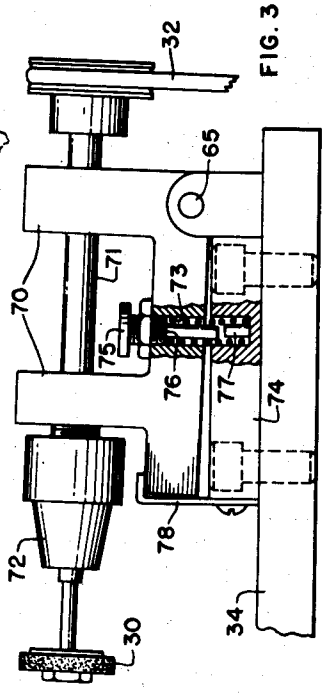


FIG. 3



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FIG. 2

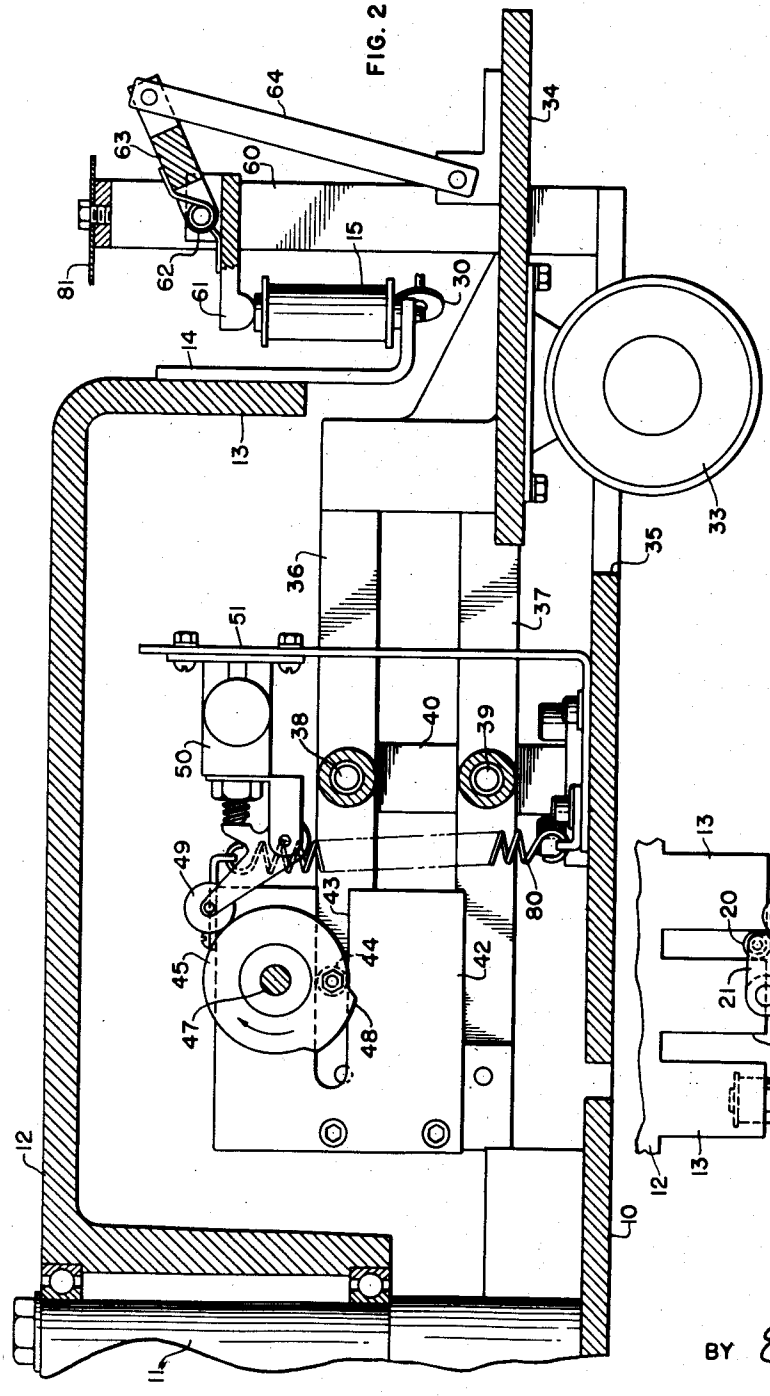


FIG. 6

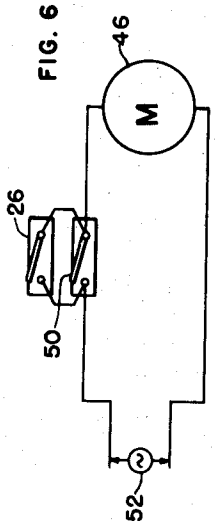
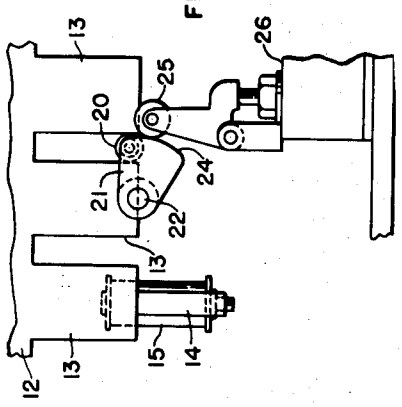


FIG. 5



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BRUSHING APPARATUS

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Application June 3, 1950, Serial No. 165,998

2 Claims. (Cl. 15—21)

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This invention relates to brushing apparatus and more particularly to apparatus for simultaneously clamping and brushing a selected area of each of a plurality of articles in an orderly manner.

In the manufacture of relay coils, the coils are wound either by hand or an automatic winding machine using enamel covered wires. After the coils have been wound they are provided with core pieces and spool heads, after which it is necessary to solder the ends of the coil to terminals on one of the spool heads. Since the wire which is ordinarily used for winding such coils is provided with an enamel coating, it is necessary, in order to provide a good solder joint, to remove the enamel from at least a portion of the wire which is to be soldered to the terminals on the spool head.

It is an object of the invention to provide improved brushing and clamping apparatus for simultaneously clamping and brushing articles as they are moved into brushing position.

One embodiment of this invention is directed to apparatus for removing the enamel from a portion of the ends of the coils by the provision of one or more small brushes adapted to be moved into contact with the wires, and adapted to be continuously rotated and thereby brush the enamel off the wires. In practice, this operation is one of many operations which must be performed on an assembled coil, and for this reason the assembled coils are placed on article carriers which are circumferentially spaced around the periphery of an indexable turntable. All of the other operations which may be carried out on such a turntable during the manufacture of a coil need not be enumerated. However, an example of another operation which may be carried out prior to the brushing operation is the coalescing of the lower edges of the insulating material ordinarily provided between the coil layers by causing the lower side of the coil to be immersed in a suitable liquid medium at some point during its travel on the turntable.

Since many other operations are ordinarily performed on the coils during their travel around the turntable, it is undesirable to continuously clamp or otherwise rigidly hold the coils on the article carriers. At the brushing station, however, it is necessary to provide clamping means to move into engagement with the top of each coil as it moves into brushing position, since the actual brushing operation encompasses an area on the lower side of the mounted coil. If a clamp were not provided at the brushing position, movement of the brush into engagement with the otherwise loosely held coil would cause the coil to be lifted from its engagement with the carrier and no brushing action would take place.

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Therefore in the preferred embodiment of the invention, an indexable turntable carrying the articles to be brushed is provided and the path of the articles on the turntable is such that they are moved into a brushing station provided with brushing and clamping mechanisms. The brushing, clamping and indexing mechanisms are so interconnected that an article is clamped and the brushes are moved into brushing engagement in timed relation with the indexing operation.

A more complete understanding of the invention may be had by referring to the following description when read in conjunction with the accompanying drawings wherein;

Fig. 1 is a top plan view of the brushing apparatus with only a small portion of the turntable being shown in dotted lines;

Fig. 2 is a side elevational view of the brushing apparatus and turntable. In order to more clearly show the mechanism for carrying the brushes, the brush assemblies have been omitted from Fig. 2;

Fig. 3 is a side elevation of one of the brushes;

Fig. 4 is a top plan view of the mechanism for indexing the turntable;

Fig. 5 is a side elevation of the indexing mechanism shown in Fig. 4 with the drive motor omitted and,

Fig. 6 is a schematic circuit diagram of the circuit for energizing the brush and clamp actuating motor.

Referring first to Figs. 1 and 2, the apparatus comprises a base 10 which has secured thereto a shaft 11 around which a turntable 12 may be rotated. The turntable 12 has a plurality of downwardly extending arms 13 circumferentially spaced about its outer periphery, and each of the arms 13 is provided with an L-shaped article support member 14 adapted to support a coil 15 during the travel of the turntable. The turntable 12 is adapted to be indexed through single increments and stopped for a predetermined period of time between each indexing operation by means of a small roller 20 coacting with the edges of the slots formed between the downwardly extending arms 13. The small roller 20 is carried by a rotatable arm 21, which arm is in turn actuated by a shaft 22 connected to a motor 23. It will be observed that the

indexing operation provided by the roller 20 is somewhat similar to the ordinary Geneva movement. The arm 21 is provided with a cam surface 24 which is adapted to contact the actuating lever 25 of a normally opened microswitch 26, and thereby move the microswitch to its closed position. The description of the action of microswitch 26 and its relationship to the apparatus will not be made at this time, but will be deferred until such time as the actual cycle of operation is described.

Referring to Figs. 1, 2 and 3, the brushing apparatus consists of a pair of high speed brushes 30 which are driven by a suitable belt drive 32 from a motor 33. Both of the brushes, as well as the motor 33, are mounted on a vertically movable table 34 which moves within an aperture 35 formed in the base 10. The vertical movement of the brushing assembly is controlled by two pairs of parallel arms 36 and 37 which form a conventional pantograph linkage. The arms 36 and 37 are pivoted at points 38 and 39, respectively, on an upwardly extending bracket 40 secured to the base 10 and one of the arms 36 is connected by a bolt 41 to a plate 42 which has an elongated slot 43 formed therein.

The brushing wheels and associated mechanism are caused to rise, so that the brushes 30 come in contact with wires extending downwardly from the coil 15 by means of a small cam roller 44 which rides in the slot 43. The small roller 44 is in turn mounted on a rotatable disc 45 which is driven by a motor 46 through a shaft 47. The disc 45 has a raised cam surface 48 formed thereon, which surface serves to contact a cam follower 49 once each revolution of the disc 45, thus to break a pair of contacts on a microswitch 50 mounted on a bracket 51 extending from the base 10 and controlled by the cam follower 49. The microswitches 26 and 50 are connected in parallel to control the energization of the motor 46 which is adapted to be energized from an alternating current source 52. It will thus be observed that at the moment the brushes reach their downward or nonbrushing position, the raised surface 48 contacts the cam follower 49 thereby to open the microswitch 50 and deenergize the motor 46. The motor 46 is subsequently energized by closure of the contacts on microswitch 26 at the end of the next indexing operation when the next coil 15 has been moved into brushing position. At this time when the motor 46 is again energized, the raised surface 48 is driven out of engagement with the cam follower 49, thus allowing the microswitch 50 to again close its contacts. Therefore, subsequent opening of the contacts on microswitch 26 due to the continuous movement of the arm 21 has no effect on energization of the motor 46 until the brushing operation has been completed and the brushes moved again to their lower position.

The base 10 is provided with a pair of upwardly extending arms 60, between which there is pivoted a clamping member 61 adapted to be urged to clamping engagement with a coil 15 by means of a spring 62 coacting with a pair of pivotally connected arms 63 and 64, the latter of which is also pivotally connected to the vertically movable table 34. Thus upward movement of the table 34 causes the arm 63 to be rotated counterclockwise against the torsion of the spring 62, thereby causing the clamping member to be moved counterclockwise into clamping engagement with a coil 15.

Referring in particular to Fig. 3, a preferred construction of one of the brushing mechanisms carried by the table 34 may comprise a yoke 70 provided with suitable bearing surfaces to accommodate a shaft 71 on which is threaded a chuck 72. The shaft 71 and chuck 72 are adapted to be driven by the belt drive 32 from the motor 33, and thereby drive the brush 30 which is secured in the chuck 72.

Since the coil structures are somewhat fragile in construction, and since the brushes 30 wear down with continued use, it is desirable to provide for these contingencies by making the position of the yoke 70 and brush 30 slightly variable in a vertical direction. For these reasons, the yoke 70 is secured to the table 34 by means of a hinged connection 65, and the yoke 70 is provided with a small cylindrical aperture in which there is placed a compression spring 73. The spring 73 extends also into a cylindrical recess formed in a plate 74 which is permanently secured to the table 34. The yoke 70 is also provided with a locating screw 75, threaded within the aperture in the yoke, and the screw 75 has a shoulder 76 formed thereon which contacts the top of the spring 73. Thus rotation of the locating screw 75 determines the amount of compression exerted on the spring 73, thereby controlling the pressure exerted by the brush 30 on the article to be brushed. The locating screw 75 is limited in its downward travel by a pin 77 fixedly secured in the recess in the plate 74, and the clockwise rotation of the yoke 70 around the hinge 65 is limited by means of an inverted L-shaped keeper 78 secured to the plate 74. Under ordinary conditions of compression by the spring 73, the yoke 70 will ride to its extreme upward position against the keeper 78 each time the brushing mechanism is lowered from brushing engagement.

It is to be noted that the brushing mechanism carried by the table 34, which includes the motor 33, is fairly heavy, and it is therefore desirable, in order to reduce the wear on the roller 44, slot 43 and motor 46, to provide means for aiding the upward travel of the table 34. As shown in Fig. 2, this may be accomplished by providing a heavy coil spring 80 which tends to urge the plate 42 downward, thereby tending to urge the table 34 upward. In place of the spring 80, suitable weights and pulleys may also be provided to perform the same purposes.

In one complete cycle of operation of the apparatus, assuming that the motor 23 is being driven continuously, and likewise assuming that the brushes 30 are being driven continuously, reference will first be made to Fig. 5. Since the roller 20 is being continuously carried in a circular path by the arm 21 in a clockwise direction as viewed in Fig. 5, travel of the roller 20 in such a circular path in cooperation with the slots formed between the arms 13 causes the turntable to be indexed through one increment, thereby causing a coil 15 to be moved into position over the brushes 30. At approximately the instant when the indexing operation is completed, the cam surface 24 on the arm 21 contacts the actuating lever 25 thereby closing the contacts on microswitch 26. Closure of microswitch 26 contacts at this time causes the motor 46 to be energized thereby causing the disc 45 (Fig. 2) to be rotated in a clockwise direction. At the instant when the microswitch 26 contacts are closed, the brushes 30 are in their downward position and the clamp 61 is consequently disen-

gaged. Likewise at this instant, the cam surface 48 is in engagement with the cam follower 49 thereby maintaining the contacts of microswitch 50 in their open position. When the motor 46 is energized, thereby starting rotation of the disc 45, the surface 48 moves out of engagement with the follower 49 thereby allowing the microswitch 50 contacts to close. At approximately the same time, the cam surface 24 moves out of engagement with the actuating lever 25 thereby allowing the microswitch 26 contacts to open. Thus it will be seen that the motor 46 is now being energized through the contacts on the microswitch 50 thus continuing the rotation of the disc 45 and carrying the roller 44 downward. Downward movement of the roller 44 within the slot 43 causes the plate 42 to be moved downward with the aid of the spring 39. This operation moves the table 34, through the medium of the pantograph linkage, upwardly thereby carrying the brushes 30 into brushing engagement with the lower side of a coil 15 and simultaneously causing the clamp 61 to be moved downward into clamping engagement with the coil 15. Since the brushes are being continuously rotated by the motor 33, a brushing operation now will be carried out, and the operation will be discontinued as the roller 44 starts back to its upward position in its clockwise travel, thereby moving the table 34 back to its downward position. As the roller 44 reaches approximately the topmost point of its travel, the surface 48 again contacts the follower 49 thereby breaking the circuit through microswitch 50 and deenergizing the motor 46. The motor 46 then remains deenergized until the next indexing operation of the turntable is completed, whereupon a new cycle of operations similar to the one just described will be carried out.

Although the invention has been described in conjunction with the brushing of wires extending downwardly from a coil, it is obvious that the apparatus may be adapted for use in many other similar types of operations, and it is to be understood that the examples given herein are merely illustrative. It is further to be understood that the specific position of the brushes as shown in Fig. 1 is dictated solely by virtue of the design of the coil with a contact strip appended thereto, and with other types of coils a different orientation of the brushes may be desirable.

For purposes of safety, a hood 81 may be provided to enclose the brushing and clamping apparatus during actual operations.

It is to be understood that the above-described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

1. Apparatus for brushing articles comprising an indexable turntable, a plurality of article carriers on said turntable, a brushing station adjacent said turntable in the path of said article carriers, means to index said turntable thereby to move articles carried by said carriers into said brushing station, a plurality of reciprocably movable brushes resiliently mounted for simultaneous movement into and out of brushing engagement with an article indexed to said brushing station, a cam-actuated linkage for imparting reciprocable movement to said brushes, means movable reciprocably with said brushes for continuously imparting rotative brushing motion to the brushes, a cam wheel for imparting movement to said linkage, a motor for driving said cam wheel, a normally open first switch means momentarily closable by said indexing means at the end of each indexing operation to energize said motor, and a second normally closed cam-actuated switch means in parallel with said first switch means and positioned to be opened at the end of each brushing operation.

2. Apparatus for brushing articles comprising an indexable turntable, a plurality of article carriers on said turntable, a brushing station adjacent said turntable in the path of said article carriers, means to index said turntable thereby to move articles carried by said carriers into said brushing station, a reciprocably movable brush mounted for movement into and out of brushing engagement with an article indexed to said brushing station, a cam-actuated linkage for imparting reciprocable movement to said brush, means movable reciprocably with said brush for continuously imparting rotative brushing motion to the brush, a cam wheel for imparting movement to said linkage, a motor for driving said cam wheel, a normally open first switch means momentarily closable by said indexing means at the end of each indexing operation to energize said motor, a second normally closed cam-operated switch means in parallel with said first switch means and positioned to be opened at the end of each brushing operation, and a clamping member movable under control of said linkage into clamping relation with an article being brushed.

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