June 25, 1940. L. E. POOLE 2,205,822

COIL RETAINER

Filed Nov. 10, 1937

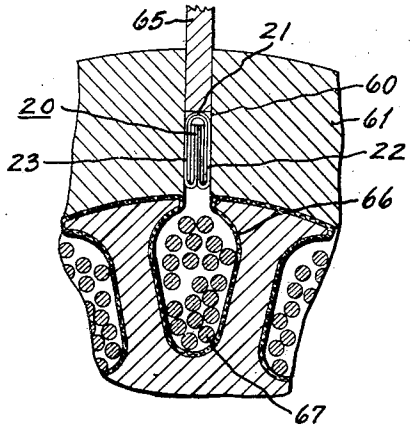



Fig. 1

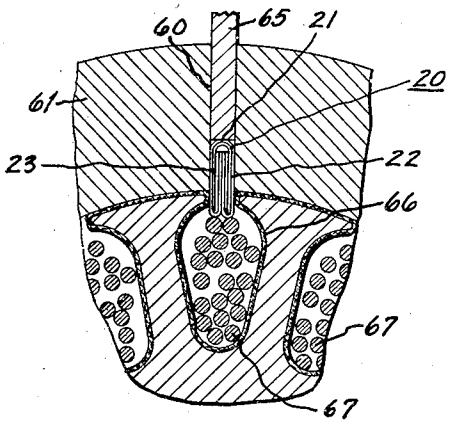



Fig. 2

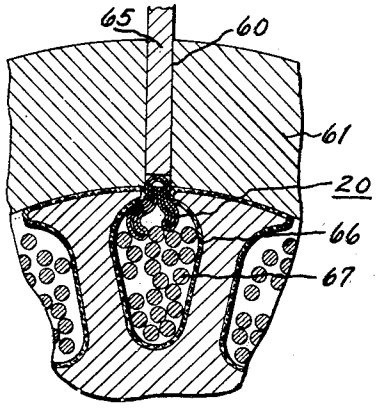



Fig. 3

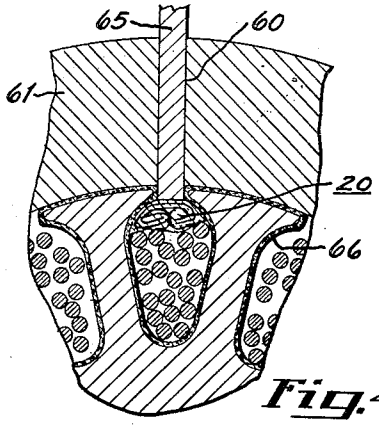



Fig. 4

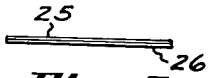



Fig. 5

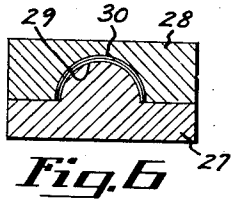



Fig. 6

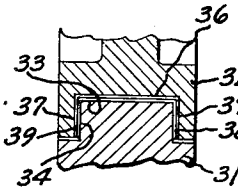



Fig. 7

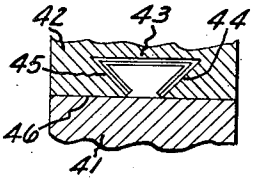



Fig. 8

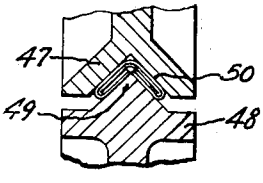



Fig. 9

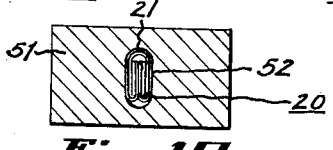



Fig. 10

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# UNITED STATES PATENT OFFICE

2,205,822

## COIL RETAINER

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Application November 10, 1937, Serial No. 173,812

10 Claims. (Cl. 171—206)

This invention relates to a method of and means for constructing dynamo-electric machines having cores with coils wound in the slots, and more particularly this invention relates to a method for folding strips and mounting the folded strips of insulating material in the slots of an armature core in which armature windings are received and held.

In the manufacture of cores or armatures for use in motors and dynamo-electric machines, and particularly of the smaller sizes, the armatures are provided with a plurality of circumferentially spaced recesses having narrow throats which are adapted to receive a plurality of turns of wires forming the armature coils. Heretofore it has been the practice for securing the coils, in the armature recesses, by wedges made of fiber, rope and the like, but these methods have been unsatisfactory in that the retaining means and coils would be forced out through the throats, due to centrifugal force, when the R. P. M. of the armature was above a certain amount.

An object of the invention is the provision of means for holding coils in the armature recesses which would otherwise be forced out of the recesses by centrifugal force.

Another object of the invention is the provision of means for retaining armature coils which consists in positioning a length of the folded insulating material in the throat of an armature slot.

Further objects and advantages of the present invention will be apparent from the following description reference being had to the accompanying drawing wherein a preferred embodiment of the present invention is clearly shown.

In the drawing:

Fig. 1 is a fragmentary view of an armature recess, on an enlarged scale, in position to receive a folded retainer strip.

Fig. 2 is a view similar to Fig. 1 showing the retainer strip entering the throat of the recess.

Fig. 3 is a view similar to Fig. 1 showing substantially the formation of the strip as it is forced through the throat of the recess and against the coils within the recess.

Fig. 4 is a view similar to Fig. 1 showing the form assumed by the strip after it has been forced into the recess.

Figs. 5 to 10 inclusive are views showing different steps in the process of folding a strip or strips of flat insulating paper so as to form a coil retaining member of the desired shape.

Referring to the drawing one type or form of a coil retaining member or plug which may be produced by the present invention before it is positioned in an armature core recess is shown in Figs. 1, 2 and 10. The retaining member as formed is designated in its entirety by numeral 20 and comprises a web or yoke portion 21 which joins integral diverging leg portions 22 and 23 which are of U-shape in cross sections.

The method for folding the retaining member 20 will be first described. Preferably a pair of superimposed flat strips of insulating material 25 and 26 are intermittently and progressively guided over any suitable platform, not shown, through guide members 27 and 28. The guide member 27 is provided with a convex forming surface 29 while the guide member 28 is provided with a concave portion 30 adapted to extend above the surface 29 but spaced therefrom so that the strips 25 and 26 may be fed between the members 27 and 28 and bend the strips into a convex formation as clearly shown in Fig. 6.

The strips 25 and 26 are advanced intermittently and as the strips pass from the guide members 27 and 28 they enter between two rolls 31 and 32. The roll 31 is provided with a peripheral rib or projection having a straight surface 33 and straight side walls 34. The projection is adapted to extend into a recess provided in the roll 32. The recess comprises a straight bottom 36 and straight converging side walls 37. As the strips 25 and 26 pass in between the rolls 31 and 32 the side edges of the strips are forced downwardly to form parallel spaced legs 38 and 39. The legs are bent substantially at right angles to the medial portion of the strips. On further longitudinal advancement of the strips, the strips pass through a second set of guide members 41 and 42 which urge the previously formed legs 33 and 39 toward each other, as indicated in Fig. 8. This is accomplished by providing the guide 42 with a recess having a flat bottom 43 and inclined side walls 44 and 45 extending toward each other. The guide 41 is provided with a flat surface 46 which operates to hold the partly formed strips within the recess of the guide 42. As the deformed strips 25 and 26 are moved further, the leg portions, which have been moved partially toward each other by the guides are urged against a section of the medial portion by a second set of rolls 47 and 48. The rolls 47 and 48 also form a longitudinal crease in the medial portion to provide a V-shaped formation of the strips, see Fig. 9. The V-shaped formation of the strips is accomplished by providing the roll 47 with a peripheral cone-shaped projection 49 and the roll 48 with a V-shaped groove 50. As the strips are further moved longitudinally the U-shaped leg portions

are forced against each other in a parallel relation by a stationary guide 51. The guide 51 is provided with an oblong opening 52 through which the folded strips pass to form a compact section of the strips. Then the strips are advanced into an opening 60 of an armature support member 61 to a predetermined position over and adjacent one of the narrow throats of a recess provided by the armature. A predetermined length of the compact folded strips is then severed from the supply to provide the coil retaining member 20 having resilient characteristics.

After the length of folded strips or retaining member 20 is severed from the supply a tool 65 is automatically operated to force the length of folded material from the opening 60 into the recess of the armature. The coil retaining member or folded length 20 is preferably of a cross dimension slightly smaller than the throat so that the insulation 66 which lines the recess will not be marred or damaged as the retaining member is being placed in the recess and over the coils 67 by the tool 65 as shown in Fig. 2.

When the retaining plug 20 is being forced through the throat of the armature recess by the inserting tool 65 the U-shaped leg portions 22 and 23 will first engage the coils, see Fig. 2. A continued downward movement of the plug 20 over the coil by the tool 65 the coil will be compressed thereby causing the legs 22 and 23 to be urged in opposite direction in a manner as substantially shown in Fig. 3, the leg 22 being urged to the right and the leg 23 to the left as viewed in Fig. 3. As the plug is further moved into the recess by the tool 65 against the coils the plug is compressed so that it will, figuratively, appear like a solid mass as indicated in Fig. 4. Upon withdrawal of the tool 65 the reaction of the coils will cause the distorted plug to engage the side walls of the recess and prevent displacement of the coils. Thus by the present invention the danger of the plug being forced out through the throat, due to centrifugal force, is substantially eliminated.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. The combination with an armature having longitudinally extending recesses having throats smaller than the recesses, of coils in the recesses, and retaining plugs, each plug comprising a strip of folded insulating material including a medial portion between two diverging multi-ply folded sections extending the full length of its respective throat and arranged so that the folded sections lie between the coils and the walls of the recess and the medial portion closing the throat whereby the coils are maintained in the recess.

2. The combination with an armature having longitudinally extending recesses having throats narrower than the recesses, of coils in the recesses, and retaining plugs for maintaining the coils within the recesses, each plug comprising superimposed strips of insulating material folded to provide a medial portion between two diverging multi-ply folded sections, the folded sections lying between the coils and the walls of the recess and the medial portion sealing the throat.

3. The method of securing armature coils in recesses having peripheral throats comprising the steps of, superimposing flat strips of insulating material from a supply, folding the strips on each side of their medial line into a pair or diverging legs, severing an appropriate length of the folded sections from the supply, and then forcing the edges of the legs into the recess against the tension of the coils by a punch which act causes the legs to spread in opposite directions over the coils, and then withdrawing the punch permitting the coil to expand which causes the legs to be held between the coil and the outer wall of the recess thereby covering the throat.

4. The method of securing armature coils in recesses having peripheral throats comprising the steps of, superimposing flat strips of insulating material from a supply, folding the strips on each side of a medial portion into a pair of diverging legs, compressing the leg portions together to a dimension slightly less than the dimension of the throat, severing a length of the compressed folded section from the supply, forcing the edges of the legs through the throat against the tension of the coils by a punch which causes the leg portions to spread in opposite directions over the coils and then withdrawing the punch and permitting the legs to engage the side walls of the recess thereby closing the throat.

5. The method of securing armature coils in recesses having peripheral throats comprising the steps of, superimposing flat strips of insulating material, bending the strips on each side of a medial line into a pair of substantially parallel leg portions, bending the leg portions toward each other and against the medial portion providing a pair of U-shaped sections, forcing the U-shaped sections together in substantial parallelism forcing the yokes of the U-shaped member into the recess against the tension of the coils by a tool which act causes the U-shaped sections to spread in opposite directions over the coils and the medial portion to close the throat and then withdrawing the tool and allowing the coil to expand to hold the U-shaped sections between the coil and walls of the recess.

6. The method of securing armature coils in recesses having peripheral throats comprising the steps which include, folding a flat strip of insulation lengthwise into a U-shaped member, forcing the edges of the U-shaped member into a throat and spreading edges of the U-shaped member over packed wires within the recess.

7. The method of securing armature coils in recesses having peripheral throats comprising the steps which include, folding strips of laminated insulation lengthwise into a U-shaped member, forcing the edges of the U-shaped member into the throat, and then spreading the edges of the U-shaped member over the coils within the recess.

8. The method of securing armature coils in recesses having peripheral throats comprising the steps which include, folding an insulator lengthwise to form U-shaped members, one on each side of a medial line, folding said pair of U-shaped members toward each other to form a third U; forcing the yokes of the first formed U-shaped members into the throat, and then spreading said first formed U-shaped members over the coils within the recesses.

9. The method of making a retainer member for sealing a throat of an armature recess having coils therein comprising the steps which include, superimposing strips of insulating material, bending portions of the strips to form plural-ply U-shaped members, one on each side

of a medial line, folding said pair of U-shaped portions toward each other to form a third U.

10. The method of making a retainer member for use in holding armature coils within a recess, comprising the steps which include; bending portions of a strip of insulating material on each side of a medial line into a pair of U-shaped members, and then forcing the said formed U-shaped members toward each other to form another U, the first formed U-shaped members providing the arms of the last mentioned U-shaped member.

LORA E. POOLE.