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2,529,176

BINDING WIRE CLIP

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Fig. 1a.

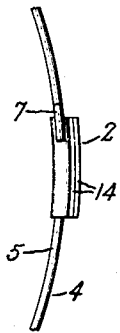


Fig. 1.

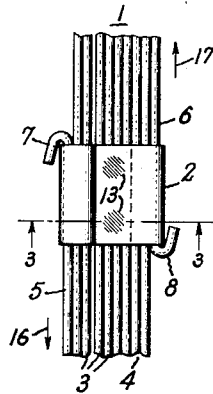


Fig. 4.

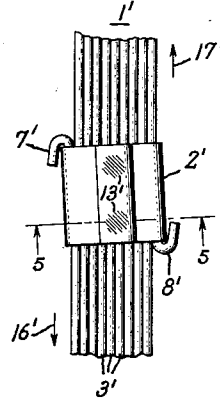


Fig. 2.

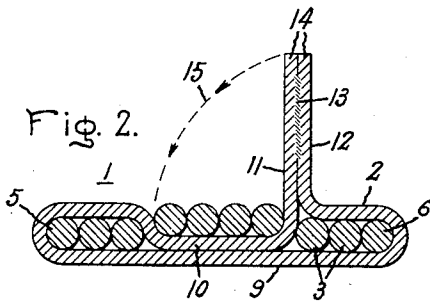


Fig. 5.

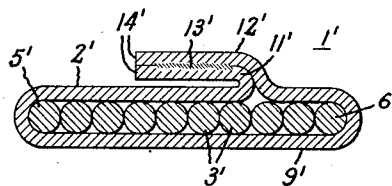
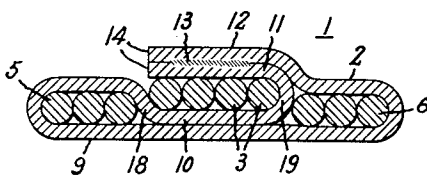


Fig. 3.



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BINDING WIRE CLIP

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2 Claims. (Cl. 171-252)

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My invention relates to binding devices and more particularly to a binding wire clip for use in securing binding bands on the rotors of dynamoelectric machines.

In the manufacture of the rotor members of dynamoelectric machines of the direct current type it is common practice in order to secure the windings of such rotors in place to provide binding bands at the ends thereof. To form such bands binding wire which resembles piano wire in appearance is tightly wrapped in a plurality of turns about the rotor and the ends of the wire and then secured tightly with respect to the band to prevent unwinding of the wire during operation of the machine.

Various methods and devices have been employed to fasten the ends of the wire used in binding bands. Such methods and devices include soldering and brazing and various forms of holding devices such as clips and the like. In general however, existing methods tend to have certain disadvantages such as excessive cost or tendency to loosen at the relatively high temperatures encountered in certain applications. Furthermore in the use of certain holding devices skewing of the turns of wire forming a binding band may result due to the existence of a force couple caused by the tendency of the ends of the binding wire to pull and unwind in opposite directions. It is, of course, obvious that the failure of a binding band may cause serious damage by entanglement of the loosened wire in other portions of the machine and by permitting throw-out of the rotor windings.

It is an object of my invention to provide a new and improved binding wire clip for use in securing the ends of binding wire in the forming of binding bands on the rotors of dynamoelectric machines.

It is another object of my invention to provide a clip of the type mentioned which is inexpensive to manufacture and which has a high degree of reliability in securing the ends of binding wire in the forming of binding bands.

It is a further object of my invention to provide a clip which is prevented from skewing due to the force couple imposed on such a clip by pulling of the ends of binding wire.

According to one embodiment, my invention provides a clip formed of a thin strip of a bendable material, such as metal, arranged to be interwoven with the turns of wire of a binding band and to link the end turns thereof, and to have the ends of the strip welded or otherwise fastened together to form a closed member. By

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interweaving the clip with the turns of wire an interlocking construction is formed which is highly resistant to action of a force couple, thereby permitting the ends of the binding wire to be secured tightly to the clip and at the same time preventing skewing of the turns and clip.

My invention will be better understood from a consideration of the following description taken in connection with the figures of the accompanying drawing and the appended claims, in which the features of my invention believed to be novel are more particularly set forth.

In the drawing Fig. 1 is a plan view and Fig. 1a is an elevational view of a clip constructed in accordance with my invention and assembled with a binding band; Figs. 2 and 3 are sectional views showing certain features of the arrangement of Fig. 1; Fig. 4 is a plan view of another type of clip showing the effect of skewing action; and Fig. 5 is a sectional view of the arrangement of Fig. 4.

Referring to Fig. 1 there is shown in assembled relation a portion of a binding band 1 for a rotor (not shown) of a dynamoelectric machine and binding wire clip 2 including certain features of my invention. Binding band 1 comprises a plurality of turns 3 of binding wire 4, preferably of a type having a relatively high degree of tensile strength yet being bendable. Wire 4 is wound tightly about a rotor to form clamping engagement with the windings thereof, thereby tending to secure the windings in place on the rotor. Fig. 1a is an elevational view of the portion of a band shown in Fig. 1 indicating the curvature thereof. Binding wire 4, as employed to form turns 3, is preferably a continuous piece of wire. The end turns 5 and 6 of band 1 which form the extremities thereof, include therefore the opposite ends 7 and 8 of binding wire 4. It is the principal function of binding wire clip 2 to secure ends 7 and 8 of binding wire 4 tightly with respect to band 1 to prevent loosening of band 1 by unwinding of binding wire 4.

Attention is next directed to Figs. 2 and 3. Fig. 3 is a sectional view of binding band 1 and binding clip 2 taken along line 3-3 of Fig. 1. Fig. 2 is generally similar to Fig. 3 with the exception that clip 2 is shown prior to a final bending operation thereon. Referring first to Fig. 2, the details of construction and assembly of clip 2 with respect to binding band 1 are shown therein. Clip 2 is formed of a strip 9 of a bendable material, preferably metal. The center portion of strip 9 is positioned underneath band 1 so as to lie between band 1 and the rotor windings being

clamped thereby. The end portions of strip 9 are bent up around end turns 5 and 6 of band 1.

In accordance with my invention I interweave a portion of strip 9 between turns 3 by passing strip 9 under a portion thereof to achieve an interlocking engagement between turns 3 and strip 9. The portion of strip 9 interwoven with turns 3 is indicated in Fig. 2 by numeral 10. The end portions or extremities of strip 9 designated by numerals 11 and 12, are brought to a common point at which they are suitably joined. In order to bring end 11 of strip 9 to a common point with end 12, strip 9 is again brought to the outer surface of band 1 leaving underlying portion 10 of strip 9 in its interlocked position relative to turns 3. Ends 11 and 12 of strip 9 may then be joined to form strip 9 into a continuous or closed member. While a number of methods of joining ends 11 and 12 may be employed, I have found that spot-welding is an economical and convenient means of joining ends 11 and 12. Such a weld is shown in Fig. 2 and is designated by numeral 13.

The final operation in the installation of clip 2 consists of bending the portion of clip 2, designated by numeral 14, which is formed by joining ends 11 and 12 of strip 9, against the outer surface of band 1 to make portion 14 generally parallel therewith. The direction of such bending is indicated by a broken line 15 in Fig. 2. The final position of portion 14 after bending is shown in Fig. 3 and also in Figs. 1 and 1a. It will be noted that a pair of welds 13 is shown in Fig. 1. It will be understood that the number of welds employed is dependent on the length of clip 2 along the periphery of band 1. In general I have found that a pair of such welds is sufficient to join the ends of a normal clip, although in the case of a relatively narrow clip a single weld may be sufficient.

The structure and assembly operations of clip 2 as thus far shown and described are for the purpose of securing clip 2 in an interlocking engagement with respect to band 1. The final operation for the purpose of securing ends 7 and 8 of wire 4 to clip 2 consists of bending ends 7 and 8 sharply against the edges of clip 2 prior to cutting ends 7 and 8 to a convenient length. Such sharp bends are highly effective in securing ends 7 and 8 to clip 2, since a relatively high degree of bending effort is required to unform such sharp bends. It is of course essential that the material chosen for wire 4 be able to withstand relatively sharp bending without danger of failure.

One of the principal advantages of my invention as embodied in the construction shown and described, is the prevention of skewing of binding clip 2 due to the force couple resulting from pulls in opposite directions by ends 7 and 8 indicated by arrows 16 and 17 respectively in Fig. 1. Such a skewing action is illustrated in Figs. 4 and 5, wherein a clip 2' similar in certain respects to clip 2 of Fig. 1 is assembled on a binding band 1' similar to binding band 1 of Fig. 1. The elements shown in Figs. 4 and 5 are designated by prime numerals similar to the numerals employed for similar elements in Figs. 1 and 3. In Fig. 5 there is shown a sectional view of clip 2' and band 1' taken along line 5—5 of Fig. 4. It will be seen that clip 2' is generally similar to clip 2 as shown in Figs. 2 and 3 except that strip 9' from which clip 2' is formed is arranged to link all the turns 3' of band 1' and that strip 9' accordingly is not interwoven with turns 3' to form an interlocking

engagement between band 1' and clip 2'. In Fig. 4 the effect is shown of a couple produced by the forces of ends 7' and 8' pulling in opposite directions as represented by arrows 16' and 17' respectively, tending to produce a twisting or skewing effect in clip 2' with an accompanying tendency to displace turns 3' from their normal positions.

In accordance with my invention I reduce such skewing effects to a minimum by providing restraining forces by interlocking clip 2 with binding band 1. More particularly, in the arrangement shown in Fig. 3 a restraining force is established at the point where strip 9 is transferred from the outer surface of band 1 to the undersurface thereof. The general point of the application of such force is indicated by numeral 18. Again, when strip 9 is returned from the undersurface of band 1 to the outer surface thereof a second restraining force is applied at a point indicated generally by numeral 19. The force applied at point 19 is particularly effective because of the sharp bend placed in strip 9 when joint portion 14 is bent against band 1, causing tight contact between strip 9 and the particular turn 3 around which strip 9 is bent.

The width of strip 9, which determines the length of clip 2 along the circumference of band 1, is preferably made relatively great with respect to the width of band 1 to provide a maximum amount of force from the interlocking of clip 2 and band 1 to oppose the force couple tending to produce a skewing effect. While mention has been made of restraining force produced by the interlocking action described, and the presence of such forces has been indicated particularly at points 18 and 19 in Fig. 3, it will be obvious that inherent restraining forces are obtained by relatively tight contact between strip 9 and end turns 5 and 6 of band 1. However, I have found that for a high degree of reliability in securing ends 7 and 8 and in preventing a skewing action, it is highly desirable to supplement such inherent forces by providing additional restraining forces through an interlocking engagement between clip 2 and band 1 as illustrated by the forces at points 18 and 19 in Fig. 3.

While I have shown a particular interweaving arrangement between strip 9 and turns 3 it will be obvious that my invention is not limited to the particular arrangement shown but includes other interweaving arrangements. The number of end turns of a binding band to be included in the linked portions at the extremities thereof and the number of times the strip forming a binding clip is interwoven from the outer surface to the undersurface of the band is dependent on the requirements of particular applications encountered. I have found that the arrangement herein employed is particularly suitable for a large number of applications from the standpoint of effectiveness, reliability and ease of construction.

While I have shown spot-welding as a preferred means of joining ends 11 and 12 of strip 9 other means may readily be employed. In addition to spot-welding other fusible joining means such as brazing or soldering may be employed in various applications, depending on operating temperatures to be encountered, or the clip ends may be joined by mechanical means such as folding or riveting.

It has been found in the construction of rotors for dynamoelectric machines that if both ends of a binding wire employed to form a binding

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band may be securely held relative to the band, it is unnecessary to solder or otherwise fasten together the entire group of wires forming the band. By the use of a binding clip embodying the features of my invention to secure the ends of a binding wire in the manner described, I have found that the troubles encountered due to failures of binding bands may be reduced to a minimum by elimination of skewing and subsequent loosening of the turns of binding wire forming the band. Furthermore the use of such a binding band and clip provides a binding arrangement which is simple in construction and inexpensive to manufacture since only simple tools and common materials are required.

While I have shown and described a preferred embodiment of my invention, it will be understood that my invention may well take other forms and I, therefore, aim in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a dynamoelectric machine the combination of a binding band for the rotor of said machine, said band comprising a plurality of closely-spaced tightly-wound turns of binding wire arranged to be maintained in clamping engagement with the windings of said rotor, and a binding clip to secure the ends of said wire relative to said band, said clip being formed of a strip of a bendable material, said strip being interwoven with said turns in a direction normal thereto to form interlocking engagement therewith and arranged to link the end turns forming the extremities of

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said band and including the ends of said wire, the extremities of said strip being fastened together to form a closed member, and the ends of said wire being bent against said clip to form interlocking engagement therewith.

2. In a dynamoelectric machine the combination of a binding band for the rotor of said machine, said band comprising a plurality of closely-spaced tightly-wound turns of binding wire arranged to be maintained in clamping engagement with the windings of said rotor, and a binding clip to secure the ends of said wire relative to said band, said clip being formed of a strip of a bendable material, said strip being interwoven with said turns in a direction normal thereto to form interlocking engagement therewith and arranged to link the end turns forming the extremities of said band and including the ends of said wire, the extremities of said strip being fusibly joined together to form a closed member, the portion of said member including said joined extremities being folded against the periphery of said band so as to be generally parallel with said periphery, and the ends of said wire being bent against said clip to form interlocking engagement therewith.

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