Jan. 20, 1959 J. E. ANTONIDIS ET AL 2,870,354

DYNAMO ELECTRIC MACHINE

Filed April 2, 1956

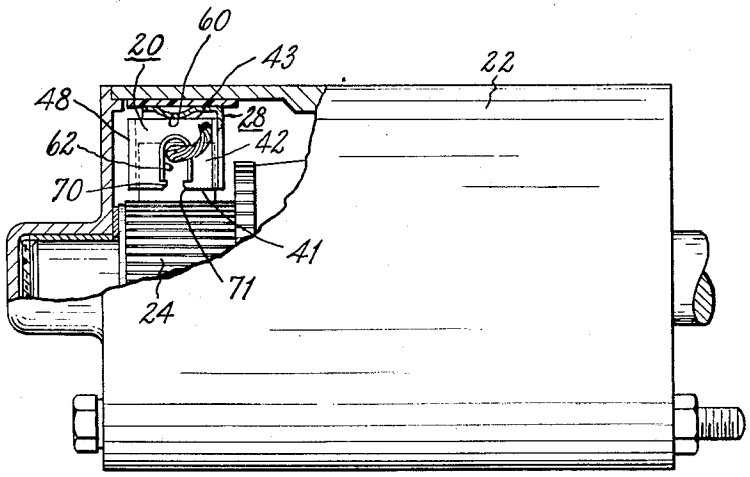


Fig. 1.

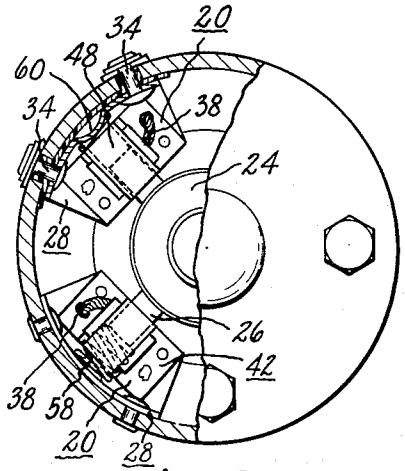


Fig. 2.

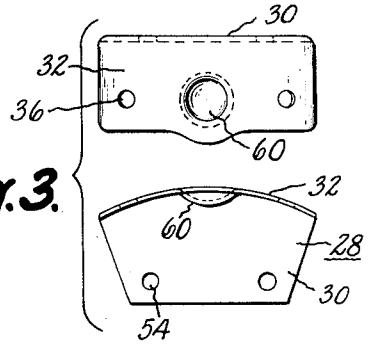


Fig. 3.

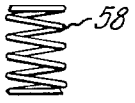


Fig. 5.

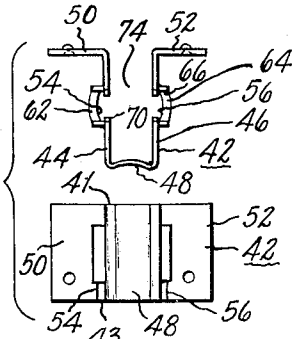


Fig. 4.

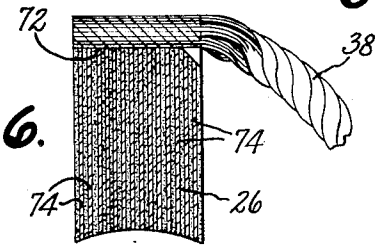


Fig. 6.

INVENTORS
JOHN E. ANTONIDIS
BY MERRILL E. DRAY
ROBERT A. ULM
John N. Marvin
ATTORNEY

United States Patent Office 2,870,354 Patented Jan. 20, 1959

2,870,354

DYNAMO ELECTRIC MACHINE

John E. Antonidis, Anderson, Merrill E. Dray, Marion, and Robert A. Ulm, Anderson, Ind., assignors to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application April 2, 1956, Serial No. 575,631
6 Claims. (Cl. 310—247)

This invention relates to brushes and brush holders for dynamoelectric machines and more particularly to an improved brush holder and the connection between the terminal lead and the brush which is held in position by the brush holder.

It is an object of the present invention to provide an economical brush holder for a dynamoelectric machine, with a minimum of inexpensive parts; and to form these parts to receive the end of the brush that has the end of the terminal lead wire weld directly thereto.

A further object of the present invention is to form a connection between the end of a stranded wire pigtail and a brush that is formed of a plurality of wire strands. This object is achieved by welding the end of the stranded wire pigtail to the ends and not the sides of the wire strands which form a major portion of the brush structure.

Another object of the present invention is to form a brush holder of a pair of bent metal strips one of which pair is provided with a curved surface so it can be secured to the inner surface of a tubular dynamoelectric unit and the other of which is formed and secured to the first of the pair to define an open ended chamber wherein a coiled spring is positioned and held by means on both of said strips.

A still further object of the present invention is to connect all of the parts of a brush holder and the pigtail and brush by welding so as to considerably reduce the cost of manufacture of a brush holder assembly. This object is accomplished by forming and welding two metal parts together to form a chamber and by welding one end of the pigtail directly to the end of the brush which is formed of metal strands which are disbursed in the body of the brush and by welding the other end of the pigtail to one of the metal parts of the holder.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

Figure 1 is a side view of a dynamoelectric unit having a portion of the exterior broken away to show the brush and brush holder according to the present invention.

Figure 2 is a sectional view through the unit in Figure 1 showing how the brush and brush holders are mounted.

Figure 3 is a plan and side view of one of the formed metal strip parts which form a part of the brush holder.

Figure 4 is a plan and side view of another of the formed metal strip parts which forms another part of the brush holder.

Figure 5 is a view of a spring as used in the brush holder.

Figure 6 is a sectional view of a brush showing the welded connection between the wire strands which form the lead wire and the ends of the wire strands in the brush.

In the drawings and in Figures 1 and 2 particularly, the brush holder **20** is shown as mounted in a dynamoelectric unit **22**. The unit **22** shown is of the conventional type and includes a shaft which carries and rotates a commutator **24**. The commutator **24** is formed of a plurality of segments which may be replaced by slip rings,

if desired, as the brush holder **20** and the brush **26**, shown in Figure 6, may be used with either alternating or direct current dynamoelectric units.

The brush holder **20** is formed from metal parts shown in Figures 3 to 5. The brush holder part **28** in Figure 3 is formed of a single strip of metal. This part **28** has a flat wall portion **30** and an arcuately curved wall portion **32** which is disposed at right angles to the flat wall portion **30**. The curve of the arcuate wall **32** may be of the same radius as the radius of the inner surface of the unit **22** so the brush holder may be suitably secured within the unit **22**, by rivets **34**. These rivets **34** pass through holes **36** in the arcuate wall. If desired, the brush holder may be electrically insulated from or be in electrical contact with the tubular frame of the unit **22** as shown, respectively, in the upper and lower brush holders in Figure 2. When the latter arrangement is used, the pigtail **38** from brush **26**, which will be hereinafter described, is generally welded directly to the brush holder **20**.

The brush holder part **42** is also formed of a bent strip of metal as shown in Figure 4. The part **42** has a pair of spaced walls **44** and **46** which are interconnected by a curved web portion **48**. Extending in opposite directions from the spaced walls **44** and **46** are a pair of flanges **50** and **52**, respectively. These flanges **50** and **52** each may have locating pimples which are received in locating holes **54** in the flat wall **30** of part **28** to aid in the positioning of parts **28** and **42** when the parts **28** and **42** are welded together with the bottom edge of the part **42** juxtaposed but spaced from the arcuately curved portion **32** of member **28** (see Figure 2).

In Figure 4, it will be seen that the spaced walls **44** and **46** are formed with outwardly curved portions **54** and **56**, respectively. The portions **54** and **56** extend over the entire width of the strip member and aid in defining a space or chamber wherein the brush spring **58** is received. In Figure 3, the curved portion **32** of member **28** is shown as having a projection **60**. This projection **60** is formed by stretching the metal of the arcuate portion **32** to form a raised portion or projection **60** which will extend into the inner space of the coil spring **58** which also helps position the spring **58** properly in the chamber defined by portions **54** and **56**. The curved portions **54** and **56** are partially cut out to form slots or notches **62** and **64**. These slots **62** and **64** preferably extend from the edge **41** of member **42** and terminate in a rounded base spaced from the edge **43** of the member **42**. The edges of the slots **62** and **64** are preferably outwardly rounded as shown by the numeral **66** to provide a smooth edge for the walls of the slots **62** and **64**. This rounded edge **66** will prevent chafing of the terminal lead or pigtail **38** which will be hereinafter more fully described. Located along the top edges of member **42** and extending into slots **62** and **64** from the opposite edges thereof are four spaced lugs **70**. These lugs will help maintain the spring **58** under a suitable initial compression on the arcuately curved portion **32** of member **28** and within the space defined by curved portions **54** and **56**. The lugs **70** are preferably formed to have downwardly inclined edges **71** along the top of member **42**. This will permit the spring to be readily inserted into position.

In Figure 6 of the drawings, a metallic type brush **26** is shown. This brush may be formed according to the teachings set forth in U. S. Patent 1,198,873, which has been assigned by the inventor to the assignee of the present invention. This brush is preferably formed of a plurality of conducting metal strands, i. e., copper, which are promiscuously dispersed throughout the brush body and which strands are held in position by a mixture of carbon and a binder so the strands are oriented sub-

stantially parallel to the major axis of the brush, or, in other words, so the strands are perpendicularly disposed to the edge 72. The end of the stranded wire terminal lead or pigtail 38 is welded in this position, a firm and highly satisfactory welded connection is established as the individual strands of the pigtail are welded to the exposed ends of the strands 74 of the brush. This is a rather unusual result in that when the pigtail is welded to the sides of the brush, an unsatisfactory connection is established. It is believed this result can be best explained as follows. When the pigtail is welded to end 72, then the welded connection is formed with the end surfaces of the strands which form a portion of the brush. These strands, because they are perpendicular to the end 72, are securely embedded in the brush body and will not be pulled loose when stress is applied on the welded connection. On the other hand, when the pigtail is welded to the side of the brush, then the individual strands will be pulled loose and the connection is easily broken.

After the welded connection between the pigtail 38 and brush 26 is established as indicated, the brush is inserted into the space 74, defined by the spaced walls 44 and 46, the curved connecting web 48, and the portion of member 28 between the spaced walls 44 and 46. When the brush is inserted into this space 74, the spring 58 will urge the brush into engagement with the commutator of the dynamoelectric unit 20 (see Figure 2). Further, the pigtail will extend through one of the slots 62 and 64 and, thus, permit free movement of the brush in space 74. The strands of the pigtail will not be damaged or chafed when the pigtail moves in these slots as the turned out edges 66 present a smooth surface on which the pigtails may ride.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A brush holder for holding a brush in contact with a commutator in a dynamoelectric machine having a tubular frame, comprising; an L-shaped member having a flat wall and an arcuately curved wall portion at right angles to the flat wall, a strip member having a pair of spaced walls, a curved web interconnecting the spaced walls and a pair of flanges oppositely extending from said spaced walls secured to said flat wall so one edge of said strip member is juxtaposed to the curved portion of said L-shaped member, a raised portion in said curved wall extending centrally between the spaced walls, a pair of slots in each of said spaced walls, extending in said spaced walls from an open end to a closed end adjacent the curved portion of said L-shaped member, a spring disposed between said spaced walls and positioned by said raised portion, a lug adjacent the open ends of said slots for maintaining said spring between said spaced walls, and a brush sized to be received between said spaced walls and having an end engageable with said spring, said brush having a portion thereof comprising a quantity of fine metallic strands promiscuously disposed throughout said brush with the strands being oriented substantially parallel with the brush's major axis, and a pigtail welded to the end of said brush that is in engagement with said spring.

2. The combination of a commutator brush consisting essentially of a plurality of fine metallic strands wherein said strands are promiscuously disposed throughout a mixture of carbon and a binder and wherein the strands are oriented substantially perpendicular to an end of said brush, and a braided metal wire terminal lead for said brush wherein the lead has one of its ends welded to said end of said brush.

3. A brush holder for use in a dynamoelectric machine having a tubular frame comprising; a pair of bent metal strips connected to define a chamber with a curved flange on one of said strips arranged to be secured to an inner surface of said frame and the other strip has a pair of open ended slots therein, a coiled spring within said chamber having one end thereof engageable with the inner side of said curved flange, and shoulder means on both of said strips engageable with said spring for maintaining said spring in position within said chamber.

4. In a method for attaching an end of a stranded metal wire terminal lead to a brush that includes a plurality of fine metal wire strands held together by a mixture of carbon and a binder and which are oriented substantially perpendicular to an end of said brush, the step of welding the end of the lead directly to the ends only of the metal strands.

5. A brush holder for holding a brush in contact with a commutator in a dynamoelectric machine having a tubular frame comprising; an L-shaped member having a flat wall portion and an arcuately curved wall portion disposed at right angles to the flat wall portion securable to an inner wall portion of said tubular frame, a strip member having a pair of spaced walls interconnected with a curved web portion and having a pair of flange portions oppositely extending from the spaced walls, said flange portions being secured to said flat portion with one edge of said strip member juxtaposed to the curved portion of said L-shaped member, said curved web portion, said spaced walls, a portion of the flat wall portion and a portion of said curved wall portion cooperating with each other to define a chamber with an open end, a raised portion in said curved wall extending into said chamber, a curved portion in each of said spaced walls forming an enlargement in said chamber, a spring within said chamber positioned by said raised portion and the curved portions in said spaced walls, a pair of slots in the curved portions of said spaced walls extending from the open end of said chamber toward said arcuately curved wall and lugs adjacent the open end of said slots for maintaining said spring in said chamber.

6. A brush holding arrangement for a dynamoelectric machine of the type having a tubular frame comprising, a metal member having an arcuately extending portion attached to an arcuately extending inner wall portion of said tubular frame, first, second and third sheet metal walls extending radially from said arcuately extending portion with said first and second walls being joined together at the end thereof opposite the arcuately extending portion by a curved web, said first, second and third walls and said web defining a substantially rectangular brush holder chamber having one end closed by said arcuately extending portion, a radially extending slot formed in each of said first and second walls, a brush in said chamber having a lead wire attached thereto that passes through one of said slots and whose configuration conforms to the configuration of said chamber, a coiled compression spring located within said chamber and positioned between said brush and said arcuately extending portion for urging said brush outwardly of said brush holding chamber, and means extending radially from said arcuately extending portion for positioning one end of said spring in said chamber.

References Cited in the file of this patent

UNITED STATES PATENTS

677,348	Fish	July 2, 1901
1,396,948	Cooley	Nov. 15, 1921
1,509,666	Campbell	Sept. 23, 1924
1,707,317	Pipes	Apr. 2, 1929
1,835,011	Burr	Dec. 8, 1931
2,361,378	Brennan	Oct. 31, 1944
2,584,214	Luther	Feb. 5, 1952
2,629,061	Swarthout	Feb. 17, 1953
2,710,360	Dennis	June 7, 1955
2,760,094	Edmundson	Aug. 21, 1956

FOREIGN PATENTS

243,204	Switzerland	Dec. 2, 1946