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2,913,603

POLE PIECES

Filed Aug. 20, 1957

2 Sheets-Sheet 1

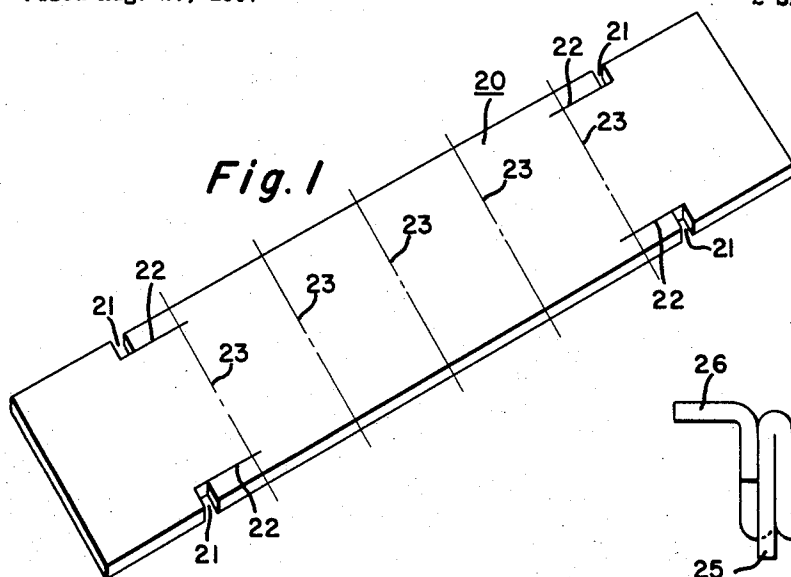


Fig. 1

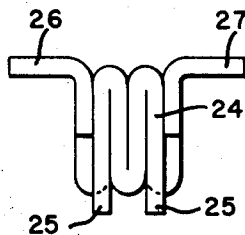


Fig. 2

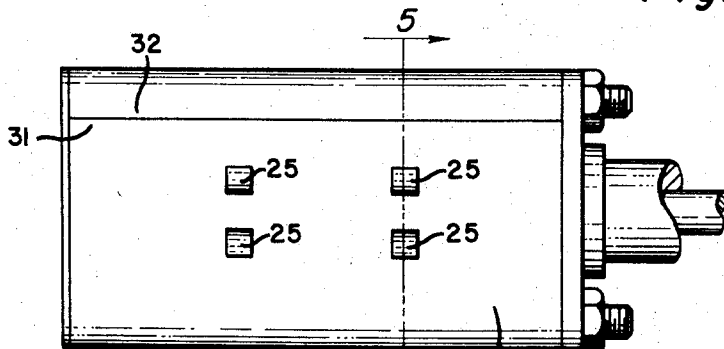


Fig. 4

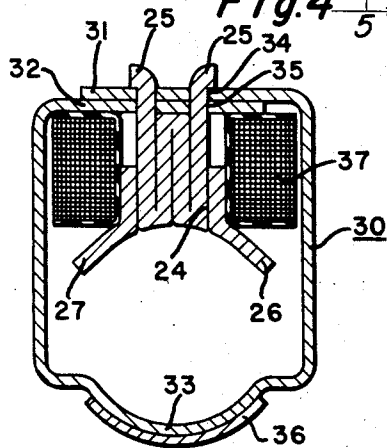


Fig. 5

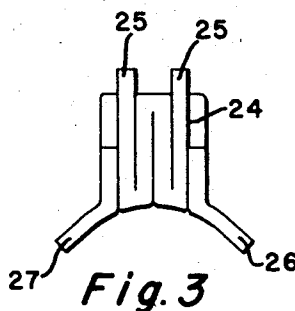


Fig. 3

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2 Sheets-Sheet 2

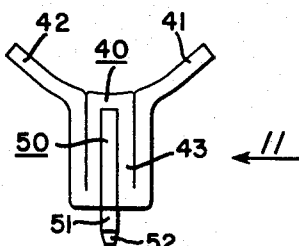
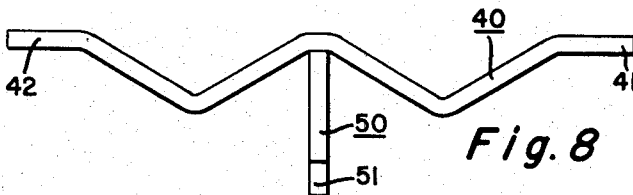
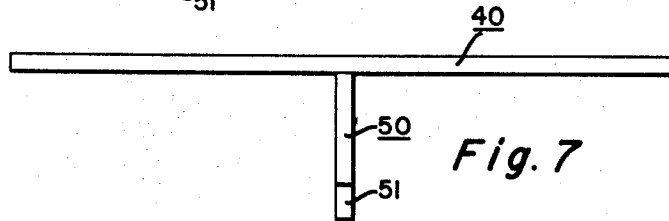
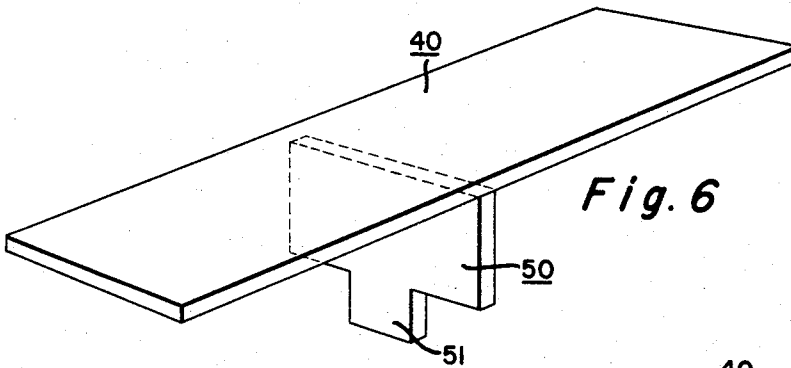


Fig. 10

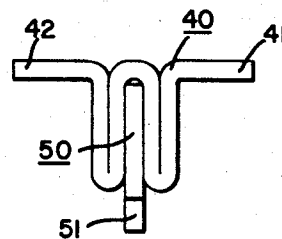


Fig. 9

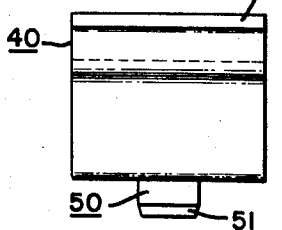


Fig. 11

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2,913,603

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10 Claims. (Cl. 310—42)

This invention pertains to dynamo electric machines, and particularly to pole pieces for electric motors.

Heretofore, it has been common practice to utilize suitably shaped stacked laminations in the manufacture of small direct current motors. In order to reduce the cost of manufacture of such small motors, it has been proposed to substitute separate poles, or a single pole, and a frame for the stacked laminations, the pole pieces being composed of either sintered iron or steel. The present invention relates to a sheet metal pole piece and method of making same which is much cheaper than pole pieces composed of either sintered iron or solid steel. Accordingly, among my objects are the provision of a sheet metal pole piece having integral mounting means; the further provision of a method of making sheet metal pole pieces having integral mounting means; the further provision of a sheet metal pole piece having separate mounting means; and the still further provision of a method of making a sheet metal pole piece having separate mounting means.

The aforementioned and other objects are accomplished in the present invention by forming a pole body and a pair of pole shoes from an integral strip of sheet metal, such as steel. Specifically, two embodiments of the present invention are disclosed herein. In the preferred embodiment, the pole piece is composed of two pieces of sheet steel, one of which is formed with a mounting tang and is also utilized during the forming operation. The other piece of sheet metal is bent around three sides of the mounting tang element and forms the pole body and the pole shoes.

The steps involved in making the preferred pole piece comprise locating the tang element in a plane perpendicular to the sheet metal strip; placing the elements in forming dies; applying pressure to the sheet metal strip so as to bend the same in a zig zag fashion about the tang element; and thereafter placing the partially formed pole piece in a coining machine to deform the pole shoes into an arcuate configuration while simultaneously forming the pole body to the desired configuration.

In the second embodiment, the pole piece is composed of an integral strip of sheet metal having pairs of notches in its marginal edges together with slits extending towards the center of the strip. The notched and slit portions form tangs for mounting the pole piece in a motor frame when the pole piece is formed to the final configuration.

The steps involved in making the pole pieces of the second embodiment comprise notching and slitting the steel strip; placing the steel strip in the forming dies, and actuating the dies so as to bend the strip in a zig zag fashion; and thereafter placing the pole piece in a coining machine to form the pole shoes into an arcuate configuration and to deform the pole body in the desired configuration.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, where-

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in preferred embodiments of the present invention are clearly shown.

In the drawings:

Figure 1 is a perspective view of a sheet metal strip for forming a pole piece constructed according to one embodiment of this invention.

Figure 2 is an end view in elevation of a partially formed pole piece constructed according to the first embodiment of this invention.

Figure 3 is an end view in elevation of the final configuration of a pole piece constructed according to one embodiment of this invention.

Figure 4 is a fragmentary view in elevation of a motor incorporating a pole piece constructed according to one embodiment of this invention.

Figure 5 is a sectional view taken along line 5—5 of Figure 4 with certain parts removed.

Figure 6 is a perspective view of the metal pieces utilized to make a pole piece according to the preferred embodiment of this invention.

Figure 7 is a side view in elevation of the pieces shown in Figure 6.

Figure 8 is a view in elevation depicting an intermediate step in the forming operation.

Figure 9 is an end view in elevation of the partially completed pole piece constructed according to the preferred embodiment.

Figure 10 is an end view in elevation of the final configuration of the pole piece constructed according to the preferred embodiment.

Figure 11 is a side view in elevation taken in the direction of arrow 11 of Figure 10.

With particular reference to Figures 1 through 3, in one embodiment of the present invention, the pole piece comprises a single strip 20 of sheet metal, such as steel. The strip 20 has a greater width than thickness as shown in Figure 1, and the opposed marginal edges thereof are formed with notches 21 which connect with slots 22 extending inwardly therefrom. The strip of metal 20 is bent in zig zag fashion about phantom lines 23 as indicated in Figure 1 by forming dies, not shown, to the configuration shown in Figure 2. The metal piece shown in Figure 1 is not the final configuration of the pole piece, but rather the configuration after the strip of sheet metal leaves the forming dies which bend the metal back and forth upon itself so that the intermediate portion thereof forms a pole body designated by the numeral 24 with four tangs 25 extending therefrom. The tangs 25 are formed by reason of the marginal edges of the strip 20 being notched and slotted as aforescribed prior to insertion in the forming dies. In addition, the ends 26 and 27 of the strip are disposed at right angles to the body portion 24 in the intermediate configuration.

Thereafter, the article as shown in Figure 2, is placed in a coining machine, and during the coining operation the pole body 24 assumes the final configuration as shown in Figure 3, and the ends 26 and 27 are deformed to an arcuate configuration constituting pole shoes. The tangs 25 extend upwardly from the pole portion 24 and are utilized for attaching the pole piece to a motor frame.

Referring to Figures 4 and 5, an electric motor of the general type disclosed in copending application Serial No. 664,009, filed June 6, 1957, in the name of Simmons et al., and assigned to the assignee of this invention, is disclosed. This motor comprises a unitary sheet metal frame 30 having overlapping end portions 31 and 32, the side 33 of the frame opposite the overlapping ends being of arcuate configuration and constituting one pole of the motor. The overlapping end portions 31 and 32 of the frame have aligned apertures 34 and 35 respectively, through which the tangs 25 of the pole piece extend. In addition, a pole plate 36 of magnetic material

is welded to the outer periphery of the arcuate portion 33 to improve the flux distribution. The tangs 25 of the pole piece extend through the aligned apertures 34 and 35 of the overlapping end portions 31 and 32, respectively, and are thereafter swaged, or otherwise deformed, so as to rigidly interconnect the ends of the frame while simultaneously securing the pole piece in position. The pole body is encircled by a field coil 37, and an armature of conventional construction is rotatably journaled in the end plates of the motor frame between the pole shoes 26 and 27 and the arcuate pole portion 33 of the frame.

With particular reference to Figures 6 through 11, the preferred embodiment of a pole piece constructed according to this invention will be described. In the preferred embodiment, the pole piece is composed of two pieces of metal, namely a steel strip 40 having a greater width than thickness, and a steel piece 50 having a tang portion 51. The steel strip 40 and the steel piece 50 are placed in the forming dies at right angles to each other as viewed in Figures 6 and 7, and during the first operation of the forming dies, the strip 40 is bent as indicated in Figure 8 so that the ends 41 and 42 thereof remain in a plane at right angles to that of the piece 50 while the intermediate portion is of zig zag shape. Thereafter, the strip 40 is bent around three sides of the piece 50 by having its intermediate portion bent upon itself and on both sides of the piece 50. As a final operation, the article shown in Figure 9 is placed in a coining machine so as to deform the final configuration of the pole body designated by the numeral 43. In addition, during the coining operation the tang 51 is formed with tapered ends as indicated by numeral 52. The completed pole piece constructed according to the preferred embodiment is shown in Figures 10 and 11, it being understood that the pole piece shown in Figures 10 and 11 can be used in the motor as shown in Figures 4 and 5 if the overlapping end portions 31 and 32 have only a single pair of aligned apertures therein.

From the foregoing it is readily apparent that the pole pieces constructed according to the present invention can be readily produced at substantial savings over solid steel pole pieces of the type shown in the aforementioned copending application. Moreover, by making pole pieces according to the preferred embodiment of this invention, the separate mounting piece in effect constitutes part of the forming dies during the intermediate forming operation and eliminates the expensive notching and slitting operations of the pole piece constructed according to the modified embodiment of this invention.

While the embodiments of the 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 pole piece comprising, a single strip of sheet

metal having its intermediate portion bent to form a pole body and its ends formed to constitute pole shoes which extend in opposite directions from the pole body.

2. A pole piece comprising, a single strip of sheet metal having its intermediate portion formed to constitute at least the major part of a pole body and the ends formed to constitute pole shoes, and mounting means extending from said pole body.

3. The pole piece set forth in claim 2 wherein said mounting means is integral with said strip and comprises a plurality of tangs extending from said pole body.

4. A pole piece comprising, a strip of sheet metal having its intermediate portion folded back and forth upon itself to form a pole body having a thickness equal to at least four times the thickness of said strip, opposite ends of said strip being formed to constitute pole shoes.

5. The pole piece set forth in claim 4 wherein said intermediate portion of said strip is folded about a second metal piece constituting mounting means.

6. The pole piece set forth in claim 4 wherein said strip has marginal notches and inwardly extending slots connecting with said notches so as to form integral mounting tangs, and wherein said pole body has a thickness equal to six times the thickness of said strip.

7. A pole piece comprising, a strip of sheet metal having its intermediate portion formed to constitute at least the major portion of a pole body and the ends formed to constitute pole shoes, and mounting means extending from said pole body comprising a separate piece of metal about which the intermediate portion of said strip is folded.

8. A pole piece comprising, a strip of sheet metal having its intermediate portion folded upon itself to form a pole body having a thickness equal to at least twice the thickness of said strip, opposite ends of said strip being formed to constitute pole shoes.

9. A pole piece comprising, a single strip of sheet metal having its intermediate portion folded back and forth upon itself to form a pole body having a thickness equal to at least four times the thickness of said strip, opposite ends of said strip being formed to constitute arcuate pole shoes.

10. A pole piece comprising, a single strip of sheet metal having its intermediate portion bent to form a pole body and its ends formed to constitute arcuate pole shoes which extend in opposite directions from the pole body.

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