

Description

The present invention relates to a rotating electrical machine with assembled rotor.

Certain rotating electrical machines such as skeleton-type screen coil motors, have often a stator constituted by two elements made up of a pile of punched metal sheets, assembled together, the first said element being in the general form of a U provided in its base with a recess intended to receive a rotor, and the second being in the form of a small bar and mounted between the ends of the two arms of the U of the first element for supporting an electromagnetic coil.

In one constructional form of rotating electrical machines of this type, the production of their stator often entails a considerable loss from punching, namely of the sheet metal parts situated between the two arms of the U of the first element of this stator. Several solutions have been proposed for recovering these punching losses. Some propose punching rotor sheets from these losses, and others envisage punching the bars constituting the second element of the stator from the losses. Given the special configurations adopted hitherto for stator bar elements and rotor sheets of known electrical machines, the waste resulting from this recovery of losses remains considerable. Consequently, the proposed solutions for recovery mentioned hereinbefore have not been found satisfactory.

Document FR-A-2289062 shows more particularly a method of punching stator laminations or sheets of the kind proposed by the invention. But in the U portion, or window, of the sheet, a space is lost whose sheet is then throw away as waste. Admittedly, successively, a projection

of the following sheet is punched in the window, and then, moving upwards, there is a punching which will serve as a core for an excitation winding. But the invention put forward in that document solves a different problem. It proposed turning over the core such as to vary the free dimension between the core and the bottom of the window. Thus, this portion is always lost.

The present invention, having as its object to obviate the disadvantages of the known rotating electrical machines mentioned hereinbefore, makes it possible to provide an improved rotating electrical machine with assembled stator which is economical and the manufacture of which involves only negligible waste of sheet metal used, magnetic or non-magnetic.

A rotating electrical machine with assembled stator according to the invention is of the kind wherein the stator is constituted by a pile of metal sheets obtained by punching from a strip of magnetic sheet the width of which is that of the stator, each sheet comprising successively along the axis of the strip:

- a rectangular projection,
- a rotor bore,
- a window such that the base of the sheet is in the form of an inverted "U", adapted to contain an excitation winding constituted by a core and a coil,

the rectangular projection originating from punching within a low portion of the window of the preceding sheet in the strip. The essential feature of the invention is that the core is constituted by a pile of metal sheets in the form of a small bar, each sheet of the bar originating from a second, high punching of the sheet window, the bar being disposed in the low portion of the window, and that the sum of the height of the projection and the height of

the bar is equal to the depth of the hollow of the "U" of the sheet base, such that no loss of material occurs in the longitudinal direction of the sheet strip.

For the better understanding of the invention, a description will now be given of several constructional examples illustrated in the accompanying drawings, wherein

Fig. 1 is a partial view in perspective of a rotating electrical machine according to a first constructional example of the invention;

Fig. 2a is a diagrammatic view of a sheet strip wherein the two types of elements of the stator of the electrical machine according to Fig. 1 are punched, namely a U element and a bar element;

Fig. 2b is a diagrammatic view of a stator sheet of the Fig. 1 machine, showing the two elements of this sheet assembled, these elements having emanated from the punching of the sheet strip of Fig. 2a;

Fig. 3a is a diagrammatic view of a sheet strip wherein the two elements constituting the stator sheets of a rotating electrical machine are punched according to a second constructional example of the invention;

Fig. 3b is a diagrammatic view of a stator sheet showing the positioning, in the U element, of the bar element resulting from the punching of the strip of sheet of Fig. 3a, in the U element;

Fig. 4a shows a diagrammatic view of a sheet strip in which there are punched the two types of elements constituting the stator of a rotating electrical machine according to a third constructional example of the invention;

Fig. 4b is a diagrammatic view of a stator sheet resulting from the assembling of the two types of elements resulting from the punching of the sheet strip of Fig. 4a, a U element and a bar element;

Fig. 5a is a diagrammatic view of a sheet strip wherein are punched the two types of elements constituting the stator of a rotating electrical machine according to a fourth constructional example of the invention, and

Fig. 5b is a diagrammatic view of a stator sheet resulting from the assembling of the two types of elements resulting from the punching of the sheet strip of Fig. 5a, a U element and a bar element.

A rotating electrical machine 1 of skeleton type according to the invention comprises (Fig. 1) a rotor 2 and a stator 3 which is constituted by two elements, a U-shaped element 4 and a bar-shaped element 5 which is adapted to be assembled with a tight fit between the ends of the two arms of the U element 4. The stator 3 is provided with an electromagnetic coil 6 carried by this bar element 5.

According to an important feature of the invention the stator 3 of the machine is obtained by forming a pile of U elements 4, comprising in the first instance in the hollow of the U a bottom 12 having a shape and dimensions identical to those of a longitudinal zone at least of the bar element 5, in the second instance in the inner faces of the opposite end portions of the arms of the U, hollows having forms and dimensions identical to those of the ends of the bar-shaped element 5, and adapted to receive this bar element by a force fit and intimate contact of surfaces, and thirdly in the end of the base of the U, a rectangular projection (7) which is symmetrical

with respect to the axis of the U, and whereof the height plus the height of the bar-shaped element 5 is equal to the depth of the hollow of the U, and whereof the length is equal to the distance of the inner ends of the two arms of the U (Fig. 2).

In the first example illustrated in Figs. 1 and 2, the stator 3 comprises an element block 5 constituted by a pile of elements 5 in the form of a straight bar with rounded ends, which is symmetrical respectively relatively to its longitudinal axis and to its transverse axis, and an element block 4 constituted by a pile of U-shaped elements 4 and comprising in the hollow bounded by its two arms on the one hand a hollow bottom 12 having a form and dimensions identical to those of the bar-shaped element 5 and, on the other hand, in the inner faces of the opposite end portions of the arms of the U, hollows 13 having a shape and dimensions identical to those of the rounded ends of the element 5.

In the end zone of the U element 4 there is fitted a rectangular projection 7 which is symmetrical with respect to the axis 8 of the U and having a height 9 predetermined in such a manner that its own value plus the value of the height 10 of the bar-shaped element 5 is equal to the total height of the hollow of the U (Fig. 2a). This rectangular projection 7 has a length 11 equal to the distance of the inner ends of the two arms of the U (Fig. 2a). According to a method of manufacturing a rotating electrical machine according to the invention, such as Fig. 2 illustrates, the U-shaped elements 4 and the bar elements 5 are produced by punching from a sheet metal strip which has the width of the elements 4. As is shown in Fig. 2a, the elements 4 are mated in one another. In other words the projection 7 of one U element is situated within the U of the preceding element 4. Above

this projection 7, in the hollow of the U, the bar-shaped element 5 is situated. Since the sum of the value of the height 9 of this projection 7 and that of the height 10 of this bar is equal to the depth of the hollow of the U of this first sheet, no loss of material will be caused in the longitudinal direction of the sheet strip 14. However, the projection 7 of the element 4 being rectangular and the inner surfaces of the opposite end portions of the arms of the U being provided with hollows 13 which have a shape and dimensions identical to those of the rounded ends of the bar element 5, the only punching losses are constituted by the waste pieces in the form of a segment of a circle 22 whose arc is constituted by the contour of the hollow 13 and the chord which subtends this arc is constituted by the lateral straight edge of the projection 7. Consequently, these punching losses constitute only a negligible loss of sheet metal used.

According to a second constructional example of the invention (Fig. 3), in the stator 3 of the rotating electrical machine 1, the bar-shaped element 5 has, like the one in the first example, a shape which is symmetrical in the longitudinal sense and in the transverse sense, and dimensions identical to those of the hollow bottom 12 of the U of the element 4. However, in this example the bar element 5 does not have rounded ends but straight ends provided at their centre with a projection 15 of half-moon shape (Fig. 3b).

In the punching carried out for producing the sheets constituting these elements 4 and 5 of the stator 3 in one and the same sheet strip 14, the losses are constituted solely by sheet surfaces 16 equivalent to those of the half-moon projections 15 of the ends of the element 5. Thus, these losses are negligible.

According to a third constructional example of the invention (Fig. 4), in the stator 3 of the machine the bar element 5 has a shape which is symmetrical with respect to its transverse axis and non-symmetrical with respect to its longitudinal axis. Indeed the bar element 5 has ends which have a straight portion 17 and a half-moon portion 18. The U element 4 of the stator 3 has a bottom 12 having a shape and dimensions identical to those of a longitudinal zone of the element 5 which is bounded by the half-moon portions 18 of its ends.

In the punching of these elements 4 and 5 of the stator 3 from a sheet strip 14, the losses are constituted only by areas 19 of sheet which are equivalent to those of the half-moon portions 18 of the ends of the element 5. Thus these losses are negligible.

According to a fourth constructional example of the invention (Fig. 5) the bar element 5 of the stator 3 of the machine has a trapezoidal form wherein the corners of the major base are rounded. The U element 4 of the stator 3 has a bottom 12 having a shape and dimensions identical to those of a longitudinal zone of the element 5, which covers the major base of the latter.

After punching in a sheet strip 14 these elements 4 and 5 of the stator 3, shown in Fig. 5, the losses are constituted solely by areas 20 bounded (Fig. 5a) firstly by the contours of the hollows 21 formed in the inner surfaces of the opposite end portions of the arms of the U of an element 4, secondly by the lateral edges of the rectangular projection 7 of the end of the U of a second element 4 mating with it, and thirdly by the non-parallel edges of the element 5 of trapezoidal form. Thus these losses are negligible.

In the production of the rotating electrical machine 1 according to the invention, these losses due to waste pieces resulting from the punching, from magnetic sheets, of the elements 4 and 5 of the stator 3 of the rotating electrical machine 1 are thus advantageously reduced to a value distinctly lower than the losses involved in the manufacture of known electrical machines.

C l a i m s

1. Rotating electrical machine with assembled stator, wherein the stator is constituted by a pile of metal sheets obtained by punching from a strip of magnetic sheet the width of which is that of the stator, each sheet comprising successively along the axis (8) of the strip:

- a rectangular projection (7),
- a rotor bore,
- a window (10, 11, 12) such that the base of the sheet is in the form of an inverted "U", adapted to contain an excitation winding (6) constituted by a core (5) and a coil,

the rectangular projection (7) originating from punching within a low portion of the window (10, 11, 12) of the preceding sheet in the strip, characterised in that the core is constituted by a pile of metal sheets in the form of a small bar (5), each sheet of the bar (5) originating from a second, high punching (10) of the sheet window, the bar (5) being disposed in the low portion of the window, and in that the sum of the height (9) of the projection (7) and the height (10) of the bar (5) is equal to the depth of the hollow of the "U" of the sheet base, in such a manner that no loss of material occurs in the longitudinal direction of the sheet strip (14).

2. Machine according to claim 1, characterised in

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2. Machine according to claim 1, characterised in



that the bar element (5) of the stator is symmetrical with respect to its longitudinal axis and with respect to its transverse axis, and in that its ends are rounded.

3. Machine according to claim 1, characterised in that the bar element (5) of the stator is symmetrical relatively to its longitudinal axis and relatively to its transverse axis, and in that its rectilinear ends are provided respectively centrally with a half-moon projection (15).

4. Machine according to claim 1, comprising a stator provided with a bar element (5) symmetrical relatively to its longitudinal axis and non-symmetrical relatively to its transverse axis, its ends each having a rectilinear portion (17) prolonged by a half-moon portion (18), characterised in that this stator comprises a U element (4) having a bottom (12) of the U with a shape and dimensions identical to those of a longitudinal zone of the bar element (5), and having at its ends half-moon portions (18).

5. Machine according to claim 1, characterised in that its stator (3) comprises on the one hand a bar element (5) having a trapezoidal form the corners of the major base of which are rounded and, on the other hand, a U element (4) having a bottom (12) of the U the shape and dimensions of which are identical to those of a longitudinal zone of the bar element (5) which covers the major base of the bar element (5).

