
(12) PATENT ABRIDGMENT (11) Document No. AU-B-75310/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 610506

(54) Title
CLUTCH ROTOR FOR ELECTROMAGNETIC CLUTCH AND METHOD OF PRODUCING

International Patent Classification(s)
(51)⁴ **F16D 013/58 B21D 039/03 B21H 001/00 F16D 027/14**
F16H 055/49

(21) Application No. : **75310/87** (22) Application Date : **07.07.87**

(30) Priority Data

(31) Number (32) Date (33) Country
61-158681 08.07.86 JP JAPAN

(43) Publication Date : **14.01.88**

(44) Publication Date of Accepted Application : **23.05.91**

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(56) Prior Art Documents
GB 2019960
US 4129026

(57) Claim

1. A clutch rotor for an electromagnetic clutch comprising a rotor member including an outer cylindrical portion, an inner cylindrical portion, a circular end plate connected between said cylindrical portions, and a cylindrical V-shaped pulley having an annular base portion, said outer cylindrical portion having a groove formed on an outer surface thereof, said groove being provided with knurling on a bottom surface thereof, said annular base portion of said V-shaped pulley being fixedly interfitted in said groove by the insertion of the inner annular surface of said V-shaped pulley into said groove, to fasten said V-shaped pulley on said rotor member.

2. A clutch rotor for an electromagnetic clutch comprising a rotor member including an outer cylindrical portion, an inner cylindrical portion, a circular end plate connected between said cylindrical portions, and a cylindrical V-shaped pulley having an annular base portion, said annular base portion of said pulley being provided with knurling on a bottom surface thereof, said outer cylindrical portion having a groove formed on an outer surface thereof, said annular base portion of said

V-shaped pulley being fixedly interfitted in said groove by the insertion of the inner annular surface of said V-shaped pulley into said groove, to fasten said V-shaped pulley on said rotor member.

3. A method of producing a clutch rotor comprising the steps of providing a member including an outer cylindrical portion, an inner cylindrical portion and a circular end plate connected between said cylindrical portions, and said outer cylindrical portion having a groove formed on an outer surface thereof, locating a cylindrical member about said groove, and simultaneously forming and fitting a V-shaped pulley within said groove by forcing said cylindrical member into said groove such that a radially inner portion of said V-shaped pulley is inserted into said groove, fixing of said V-shaped pulley into said groove being facilitated by the provision of knurling either on the surface of said groove or on the inner surface of said cylindrical member.

610506

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FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

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Complete Specification for the invention entitled:

Clutch rotor for electromagnetic clutch and method for
producing thereof

The following statement is a full description of this invention, including the
best method of performing it known to me/us

ABSTRACT

A clutch rotor for use in an electromagnetic clutch and the method for producing thereof is disclosed. The clutch rotor comprises a rotor member and a V-shaped pulley to receive a drive belt. The rotor member includes an outer cylindrical portion, an inner cylindrical portion and a circular end plate connecting therebetween. The outer cylindrical member is provided with a groove which formed on the outer surface thereof for disposing the pulley. The pulley is formed by applying a roller working operation to a cylindrical member. Simultaneously, an inner annular surface of the V-shaped pulley is interfitted in the groove of the rotor member. Therefore, the clutch rotor is easily made and in low cost.

TECHNICAL FIELD

The present invention relates to a clutch rotor suitable to be used for an electromagnetic clutch and the method for producing thereof.

BACKGROUND OF THIS INVENTION

5 A conventional electromagnetic clutch includes a ring-shaped rotor driven by a driving source through a belt, an armature disposed to face the end plate of the rotor with a gap and an electromagnetic coil generating an electromagnetic circuit covering the rotor and the armature to attract the armature against the rotor.

10 When the electromagnetic coil is energized, the armature is attracted to one end surface of the rotor, and rotated together with the rotor. The above rotor is previously pre-formed by forging, and then finished by a turning process (this process is as shown in Japanese Utility Model Publication No 57-39,639). However, if the rotor is finished by turning
15 process for forging form, a great volume of waste material is generated, and also steps for producing this method are complicated.

As the other method for producing the rotor, Japanese Patent Application Laid Open No 54-14,364 is shown that a ring-shaped pulley is disposed on the outer peripheral surface of a rotor. In the above method,
20 the pulley is previously formed as V-shape or W-shape before being disposed on the outer surface of the rotor. Thereafter, the fixing of the pulley to the rotor is made by welding or fitting. However, if rotor is separately consisted by the rotor, the step for assembling the pulley and rotor is
25 complicated, and the manufacturing performance becomes low. In addition to the above problems, the cost of equipment becomes higher, since particular equipment needs to be used for making welding or fitting.

SUMMARY OF THE INVENTION

It is a primary object of this invention to provide a clutch rotor for an electromagnetic clutch which is easily produced.

30 It is another object of this invention to provide a clutch rotor for an electromagnetic clutch which is made in low cost.

The clutch rotor for an electromagnetic clutch according to this invention includes a rotor member having an outer cylindrical portion, an inner cylindrical portion and a circular end plate connecting therebetween,
35 and a V-shaped pulley for receiving a V-belt to transmit the power of a driving source. The outer cylindrical portion is provided with an annular groove which is formed on the outer surface thereof. The V-shaped pulley is fixedly interfitted within the groove due to inserting an inner annular surface of the V-shaped pulley.

Furthermore, the method for producing a clutch rotor for use in an electromagnetic clutch according to this invention includes the following steps; forming a V-shaped pulley which is adapted to receive a drive belt by applying a roller working operation to a cylindrical member;
5 simultaneously interfitting an inner surface of the V-shaped pulley in the groove of the rotor member.

Further objects, features and other aspects of this invention will be understood from the following detailed description of the preferred embodiments of this invention when read in conjunction with the annexed
10 drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional view of a clutch rotor in accordance with one embodiment of this invention.

Figure 2 is a cross-sectional view of a clutch rotor modified by the
15 clutch rotor of Fig. 1.

Figure 3 is a half cross-sectional view of a clutch rotor of Fig. 1.

Figure 4 is a perspective view of a cylindrical member used for making a pulley.

Figure 5 is a cross-sectional view for explaining a first step for
20 producing the process of a clutch rotor.

Figure 6 is a cross-sectional view for explaining a second step for producing the process of a clutch rotor.

Figure 7 is a cross-sectional view for explaining a third step for producing the process of a clutch rotor.

Figure 8 is a half cross-sectional view of the rotor in accordance with another embodiment of this invention.

Figure 9 is a cross-sectional view taken along line IX-IX shown in Figure 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, there is shown a clutch rotor for an electromagnetic clutch in accordance with one embodiment of this invention. The clutch rotor 10 comprises outer cylindrical portion 11, inner cylindrical portion 12 which is connected to outer cylindrical portion 11 through circular end portion 13 and V-pulley 14. Outer
35 cylindrical portion 11 is provided with groove 111 at the outer peripheral surface thereof for disposing pulley 14. Groove 111 is formed by turning and the depth of groove 111 is equalized. V-pulley 14 is formed in cross-section of V-shape so as to form receiving portion 141 for a belt (not shown) and is fixedly disposed on groove 111. Since pulley 14 is

disposed in groove 111, the axial movement of pulley 14 is prevented and also, pulley 14 is prevented from rotating motion by frictional force produced between the inner end surface of pulley 14 and the bottom end surface of groove 111.

5 Referring to Fig. 2, double V-shaped pulley 15 which has two receiving portions 151, 152 to receive two belts (not shown) may be fixed on the rotor. Pulley 15 is formed in cross-section of W-shape and is fixedly disposed on groove 112, 113.

10 Referring to Figs. 3 to 7, the method for producing a clutch rotor for an electromagnetic clutch in accordance with one embodiment of this invention will be explained.

As previously described, rotor member 16 includes outer cylindrical portion 11 and inner cylindrical portion 12 which is connected to outer cylindrical portion 11 through circular end portion 13. Outer cylindrical portion 11 is provided with groove 111 to receive bottom portion of a pulley. Cylindrical member 17 for forming a pulley is disposed.

Referring to Fig. 5, rotor portion 16 is placed on back up jig 20, which includes an annular projection 201 axially extending from circular end plate 202 to support rotor member 16 so that the inner surface of outer cylindrical portion 11 of rotor member 16 contacts the outer surface of projection 201 of back up jig 20. Back up jig 20 is disposed on driving axis 21 which includes projection 211. Lower jig 22 is disposed on the outer end surface of circular end plate 202 so that the inner surface of lower jig 22 contacts the outer surface of outer cylindrical portion 11. Lower jig 22 is provided with inclined surface 221 at the upper end surface thereof. Circular groove 222 is formed on inclined surface 221. One end portion of cylindrical member 17 is inserted into circular groove 222.

Referring to Fig. 6, upper jig 30 is shown to be moved downwardly along with projection 211 of driving axis 21 by inserting projection 211 into guide hole 31 thereof, and is connected to driving axis 21. Upper jig 30 is provided with inclined surface 301 at the lower end surface facing inclined surface 221 of lower jig 22. Circular groove 302 is formed at the place corresponding to circular groove 221 on inclined surface 301. The other end portion of cylindrical member 17 is inserted into circular groove 302. Stopper 32 is slidably disposed in hollow portion 303 of upper jig 30 along with the inner surface of hollow portion 303 and is forced in the direction of driving axis 21 by recoil strength of spring 33 so as to prevent rotor member 11 from moving. As mentioned above, cylindrical member 17 and rotor member 11 are securely fixed. When driving axis 21

rotates, each part of an electromagnetic rotor and manufacturing devices is rotated together.

Referring to Fig. 7, a third step for a method of producing a clutch rotor is shown. When driving axis 21 is rotated together with the other parts including rotor member 11 and cylindrical member 17, and upper jig 30 is moved downwardly, simultaneously, roll 40 is urged to the outer surface of cylinder member 17. Since roll 40 is rotatably supported with pin 41 which is fixed on roll holder 42, through bearing 43, roll 40 rotates in accordance with rotation of cylindrical member 17. The cross-sectional shape of roll 40 is the same as the outer surface of groove 111.

Therefore, cylindrical member 17 is formed as a pulley including each inner surface which is defined by the outer surfaces of groove 111 and inclined surfaces 221, 301. Simultaneously, cylindrical member 17 is fixed on groove 111 by urging roll 40 to the outer surface thereof during rotation.

For more strongly fixing a pulley to groove 111, groove 111 is made knurling at the bottom surface thereof, as shown in Figs. 8 and 9. The inner bottom end surface of the pulley is interfitted on knurling surface 114 of groove 111. Alternatively, the inner bottom end surface of the pulley may be knurled, and the groove 111 initially smooth, so that the required interfitting might be effected. Therefore, the fixture strength between the pulley and rotor member 16 is improved. This invention has been described in detail in connection with the preferred embodiment, but these are examples only and the invention is not restricted thereto. It will be easily understood by those skilled in the art that other variations and modifications can be easily made within the scope of this invention, which is defined only by the following claims.



The claims defining the invention are as follows:

1. A clutch rotor for an electromagnetic clutch comprising a rotor member including an outer cylindrical portion, an inner cylindrical portion, a circular end plate connected between said cylindrical portions, and a cylindrical V-shaped pulley having an annular base portion, said outer cylindrical portion having a groove formed on an outer surface thereof, said groove being provided with knurling on a bottom surface thereof, said annular base portion of said V-shaped pulley being fixedly interfitted in said groove by the insertion of the inner annular surface of said V-shaped pulley into said groove, to fasten said V-shaped pulley on said rotor member.

2. A clutch rotor for an electromagnetic clutch comprising a rotor member including an outer cylindrical portion, an inner cylindrical portion, a circular end plate connected between said cylindrical portions, and a cylindrical V-shaped pulley having an annular base portion, said annular base portion of said pulley being provided with knurling on a bottom surface thereof, said outer cylindrical portion having a groove formed on an outer surface thereof, said annular base portion of said V-shaped pulley being fixedly interfitted in said groove by the insertion of the inner annular surface of said V-shaped pulley into said groove, to fasten said V-shaped pulley on said rotor member.

3. A method of producing a clutch rotor comprising the steps of providing a member including an outer cylindrical portion, an inner cylindrical portion and a circular end plate connected between said cylindrical portions, and said outer cylindrical portion having a groove formed on an outer surface thereof, locating a cylindrical member about said groove, and simultaneously forming and fitting a V-shaped pulley within said groove by forcing said cylindrical member into said groove such that a radially inner portion of said V-shaped pulley is inserted into said groove, fixing of said V-shaped pulley into said groove being facilitated by the provision of knurling either on the surface of said groove or on the inner surface of said cylindrical member.

4. A clutch rotor substantially as described herein with reference to the accompanying drawings.



RLF/1170h

5. A method of producing a clutch rotor substantially as described herein with reference to the accompanying drawings.

DATED this NINETEENTH day of FEBRUARY 1991

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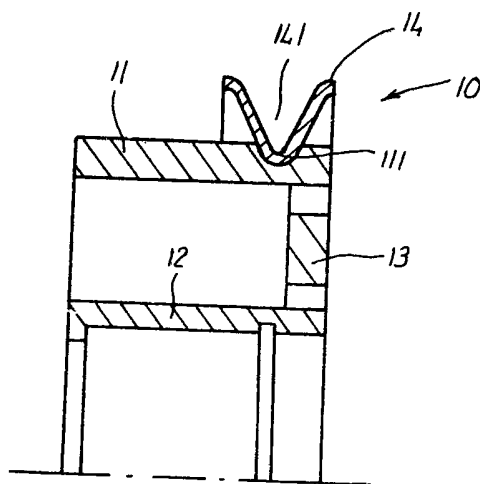


FIG. 1.

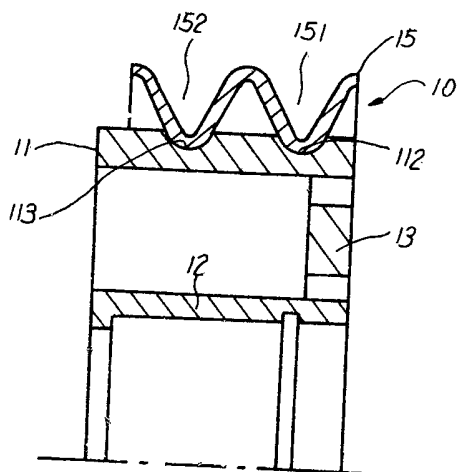


FIG. 2.

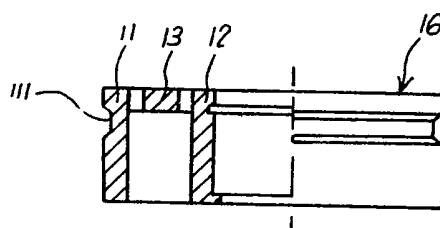


FIG. 3.



FIG. 4.

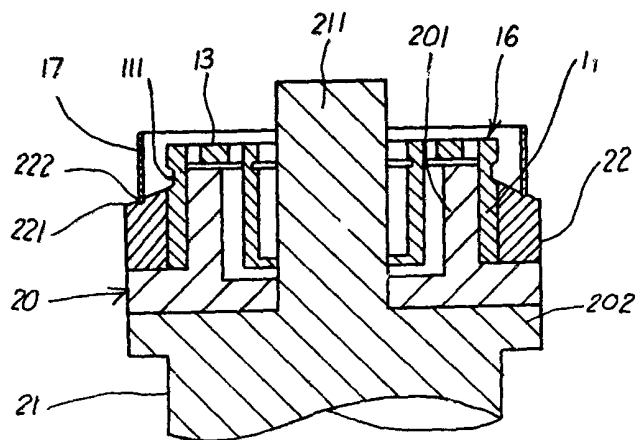


FIG. 5.

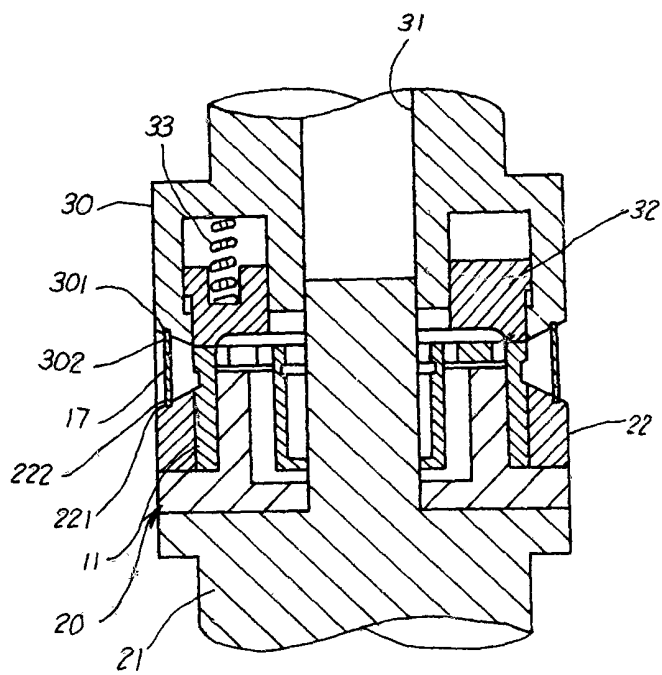


FIG. 6.

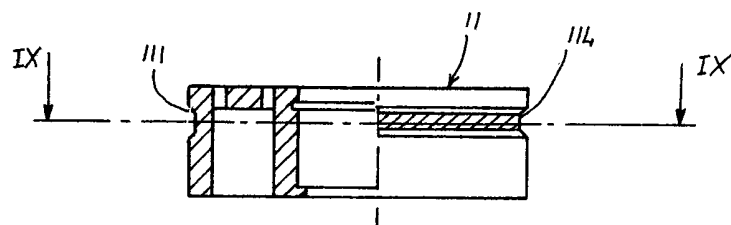


FIG. 8.

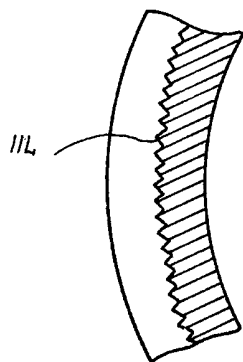


FIG. 9.