



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 1 351 548 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
08.10.2003 Bulletin 2003/41

(51) Int Cl.7: **H04R 9/04**

(21) Application number: **02022733.6**

(22) Date of filing: **11.10.2002**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventors:
• **Zhang, Jiansong**
Jiashan, Zhejiang 314112 (CN)
• **Zhao, Huijun**
Jiashan, Zhejiang 314112 (CN)

(30) Priority: **28.01.2002 CN 02215494**

(74) Representative: **Grosse, Rainer, Dipl.-Ing. et al**
Gleiss & Grosse
Leitzstrasse 45
70469 Stuttgart (DE)

(71) Applicant: **Speaker electronic (Jiashan) Co., Ltd.**
Zhejiang 314112 (CN)

(54) **A loudspeaker voice coil having a coil fixing mechanism**

(57) A loudspeaker voice coil having a coil fixing mechanism comprises a cylindrical voice coil bobbin and a coil. The coil fixing mechanism comprises a groove which is formed alone of a sleeve wrapping around and fixed to the outer wall of the voice coil bobbin, or formed of the sleeve together with the voice coil bobbin, and the coil being wound and fixed therein. This

groove can be formed of the collars formed respectively at the two ends of the sleeve, or alternatively of the collar formed at one end of the sleeve and the collar at the end of the voice coil bobbin attached to the other end of the sleeve. The two ends of the coil are stopped by the collars of the mechanism, which avoids the slackening, and dispersing apart or coming off from the bobbin of the coil despite of high power and high temperature.

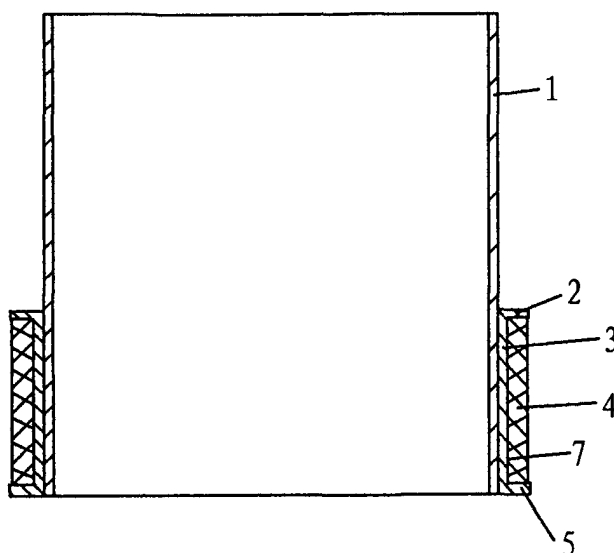


Fig. 1

EP 1 351 548 A2

Description

Technology field

[0001] The present invention relates to a component of a coil type loudspeakers, in particular to a coil fixing mechanism which can prevent the coil of high-power loudspeaker from being slackened and dispersed apart or coming off from the voice coil bobbin after being subjected to great heat due to the softening or charring of the adhesive cement.

Technology Background

[0002] The voice coil is a driving component of a loudspeaker, its bobbin is generally made of the non-magnet-conductive light alloy (such as aluminum-magnesium alloy), engineering plastics or paper, the coil is made by winding the heat resistant enamel-insulated wire and stuck to the bobbin with liquid cement. When the sound signal current passes through the coil, the voice coil will bring along the diaphragm under the action of the magnetic force in the magnetic gap to vibrate and produce a sound. When the voice coil of a high power loudspeaker is in operation, it is easy for the cement which is used to stick the coil to be softened or charred after being subjected to heat due to the high power, large mass of the coil, large vibration load, as well as the high warming up of the coil. Thus, when the high power loudspeaker is in operation, especially when the volume is very great, the softened or charred cement would make the coil to be easily slackened and dispersed apart or even to come off from the bobbin, resulting in the damage of the loudspeaker. Therefore, the assurance to keep the coil fixed and not to be slackened and dispersed apart has become a subject for study in this technical field.

[0003] U.S. Patent No. 4,118,605 disclosed a structure of voice coil. In one of its embodiments an annular groove is formed on the periphery of the voice coil bobbin and the coil is wound within the groove. The structure of the annular groove makes winding of the coil easy and the top and bottom end faces of the groove perform the function of stopping the coil. In another embodiment, a cylindrical coil-fixing device is provided with an outer diameter thereof being larger than the inner diameter but smaller than the outer diameter of the voice coil bobbin. On the inner wall of the bobbin there is a step for the cylindrical fixing device to be inserted in. The coil is wound on the peripheral wall of the fixing device, the top end of it being stopped by the bottom end of the voice coil bobbin. A common problem existing in these two structures is that the wall of the voice coil bobbin must be thick enough, as a groove for the coil is to be formed on the wall, it is evident that the wall can not be too thin. Such a structure of the voice coil will surely affect the tone quality and timbre of the loudspeaker. The inserting structure of the second embodiment has one more defect, that is the engaging area between the coil fixing

device and the body of the voice coil bobbin is too small, so that the degree of sticking and fixing between them is open to question, because it is hard to avoid separating from each other, especially in high power operating condition.

Summary of the present invention

[0004] The object of the present invention is to overcome the shortcomings of the prior art and to propose a loudspeaker voice coil having a coil fixing mechanism, in which the coil is firmly fixed on the voice coil bobbin, not easily slackened and dispersed apart or come off from the bobbin, while the tone quality and the timbre are still ensured. The process of making the voice coil as a whole is convenient with high production efficiency, being suitable for mass production.

[0005] The loudspeaker voice coil having a coil fixing mechanism comprises a cylindrical voice coil bobbin, a conical diaphragm, an damper, a coil and a coil fixing mechanism fixed on the bobbin, characterized in that the coil fixing mechanism comprises a groove which is formed alone of a sleeve wrapping around and fixed to the outer wall of the voice coil bobbin, or formed of the sleeve together with the voice coil bobbin, the coil being wound and fixed therein. This groove can be formed of the body of the sleeve and the collars extending radial outward formed respectively at the two ends of the sleeve, or alternatively formed of the body of the sleeve, a collar formed at an end of the sleeve and another collar extending radial outward formed at the end of the voice coil bobbin, which end attached to the other end of the sleeve.

In this kind of loudspeaker voice coil having a coil fixing mechanism, the coil fixing mechanism is wrapping around the voice coil bobbin. The thickness of the bobbin can be properly determined according to the requirement with respect to the tone quality and timbre. The coil is wound in the groove of the coil fixing mechanism, the two ends of the coil are stopped by the collars of the mechanism, which ensures that such trouble as the slackening and dispersing apart or coming off from the bobbin of the coil would not happen, so that the loudspeaker can still operate normally despite of high input power and big increase of temperature. Moreover, the sleeve of the coil fixing mechanism is stuck with the bobbin in a large area, that makes a strong joining of the two, and the processing of this kind of voice coil bobbin is simple and easy, so it can increase greatly the production efficiency and is suitable for mass production.

Brief explanation of accompanying drawings

[0006]

Fig. 1 is a structural diagram of the first embodiment of the present invention.

Fig.2 is a structural diagram of the second embod-

iment of the present invention.

Fig.3 is a partial structural diagram showing the bobbin, the sleeve and the coil of the first embodiment of the present invention.

Fig.4 is a partial structure diagram showing the bobbin, the sleeve and the coil of the second embodiment of the present invention.

Fig.5 and Fig.6 are axial view of the different embodiments of the present invention.

Fig 7 is a structure diagram of the sleeve provided with holes on its body.

The preferred embodiment mode of the present invention

[0007] As shown in Fig.1, the loudspeaker voice coil with a coil fixing mechanism comprises a cylindrical voice coil bobbin 1, a coil 4 and a conical diaphragm and an damper (not shown) fixed on the voice coil bobbin, a sleeve 3 wrapping around and adhering tightly to the bobbin 1 against its outer peripheral wall, the top and bottom ends of the sleeve are bent outward to form the collars 2, 5 (to bend the portion in dash line to form the collars as shown in Fig.3), a groove 7 is formed of the collars 2, 5 together with the body of the sleeve constituting a fixing mechanism for the coil 4 so that the coil 4 is easily wound to adhere in the groove and its two ends are stopped by the collars 2, 5. Thus the coil will not be slackened and dispersed apart or come off from the bobbin even if it is in the conditions that the voice coil bobbin under high power suffers heavier vibration and the cement used to stick the coil is heated to be softened.

As shown in Fig.2 and Fig.4, it is possible that only one end of the sleeve 3 is bent outward to form a collar 2, while the other collar 6 for forming the groove 7 of the coil fixing mechanism is formed by bending outward the end of the voice coil bobbin, which end is adjacent to the coil. When the coil 4 is wound in the groove 7 formed of the collar 2, 6 and the body of the sleeve 3, it can as well perform the same function of preventing the coil from being slackened and dispersed apart or coming off from the bobbin.

[0008] As shown in Fig.5, in order to facilitate the bending of the end of the sleeve and make the surface of the collar 2 of the coil fixing mechanism plane and smooth, the two ends of the sleeve before bending are cut to form some spaced notches on them first, then they are bent outward to form the collar surface with the notches 8 as shown in Fig.5.

[0009] As shown in Fig.6, the sleeve 3 of the voice coil may as well consist of several disconnected lining bars 9 distributed evenly or unevenly over the outer periphery of the voice coil bobbin. The ends of the lining bars are bent outward to form collars to attach to the end of the coil for stopping it, which can as well make the coil adhere firmly to the voice coil bobbin and prevent the coil from being slackened and dispersed apart or

coming off from the bobbin.

[0010] The collar of the sleeve can be formed either after the coil winding is completed, or before the coil is wound on the collared sleeve.

[0011] Due to the large mass of the high power loudspeaker, the inertia force of vibration is large, when the working temperature of the coil is higher under the high power, the relative sliding may occur between sleeve 3 and the voice bobbin 1, resulting in the separation of the sleeve and the bobbin. To avoid its happening, the sleeve 3 is stamped with several holes on the surface, as shown in Fig. 7. It will increase not only the friction between the sleeve and the voice coil bobbin, but also their sticking firmness because of some cement remaining in the small holes. In addition, the holes also make the air discharging easily, no bubble existing between the sleeve 3 and the voice coil bobbin 1 and no separation will occur when they are adhered to each other. Similarly, to get the same effect, the part of the peripheral wall of the voice coil bobbin that attach to the sleeve 3 also can be stamped with holes, while the sleeve 3 can be either provided with smooth surface or stamped with holes.

[0012] The material of the sleeve may be either non-magnet-conductive light alloy, or plastics or paper. If the light alloy is selected, a longitudinal groove shall be opened up for preventing eddy current from being generated in it and for serving as a compensation slot for thermal expansion and contraction. If plastics or paper is selected, more notches should be cut on the ends of the sleeve so as to facilitate the bending.

[0013] Moreover, the collars in the structure described above can also be acquired by externally connecting separate collars to the ends of the sleeve or the end of the voice coil bobbin in the way of sticking or scarf jointing. The present invention is not limited only to the embodiments described above. Any change or modification made for the invention in the scope of appended Claims shall be considered to be within the realm of the present invention.

Claims

1. A loudspeaker voice coil having a coil fixing mechanism comprises a cylindrical voice coil bobbin (1), a coil (4), and a conical diaphragm, an damper and a coil fixing mechanism which are fixed on the voice coil bobbin, **characterized in that** the coil fixing mechanism comprises a sleeve (3) which is firmly attached, nested and stuck to the outer wall of the voice coil bobbin (1), collars (2, 5) or (2,6) are formed respectively at the ends of the sleeve(3) or the voice coil bobbin, extending radial outward, the coil (4) is wound and stuck in the groove (7) formed of the collars (2, 5) or (2,6).
2. The loudspeaker voice coil according to claim 1,

wherein the body of the sleeve or/and the part of periphery of the voice coil bobbin which attach to the sleeve is/are stamped with holes.

3. The loudspeaker voice coil according to claim 1 or 2, wherein the sleeve (3) consists of several disconnected lining bars (9) distributed over the outer periphery of the voice coil bobbin. 5
4. The loudspeaker voice coil according to claim 1 or 2, wherein the collars (2, 5) or (2,6) are formed by bending outward the top and bottom ends of the sleeve (3) or/and the end of the voice coil bobbin or by sticking or scarf-jointing the separate collars to the sleeve. 10 15
5. The loudspeaker voice coil according to claim 3, wherein the collars (2, 5) or (2,6) are formed by bending outward the top and bottom ends of the sleeve (3) or/and the end of the voice coil bobbin or by sticking or scarf-jointing the separate collars to the sleeve. 20
6. The loudspeaker voice coil according to claim 4, wherein spaced notches (8) are cut on the surfaces of said collars (2,5) or (2,6). 25

30

35

40

45

50

55

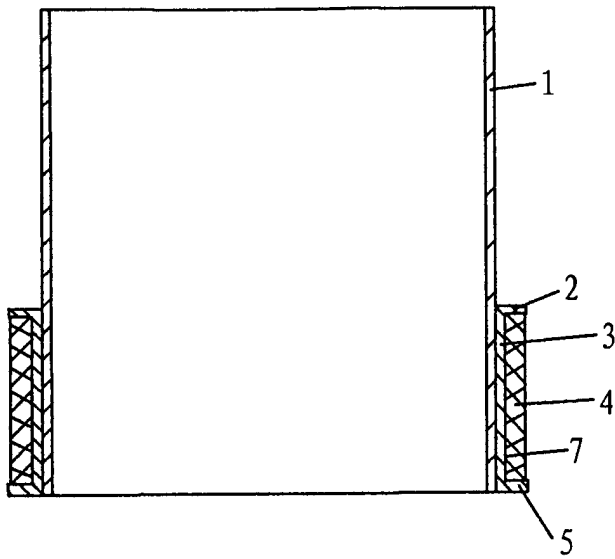


Fig. 1

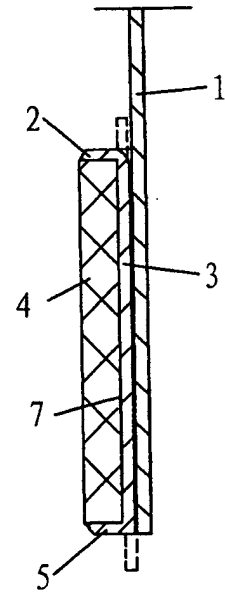


Fig. 3

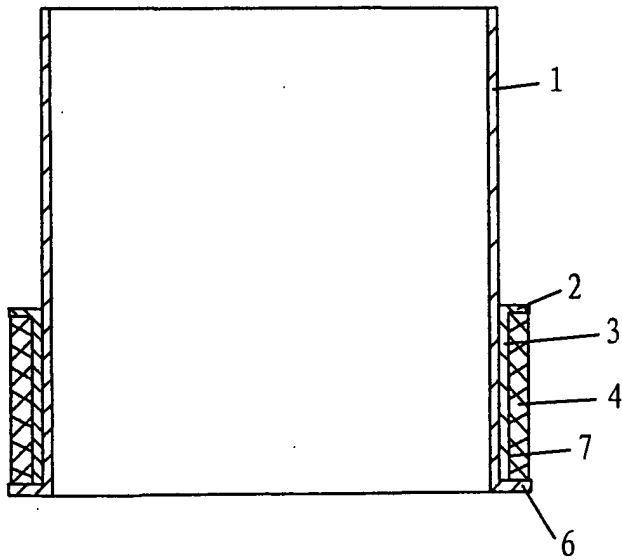


Fig. 2

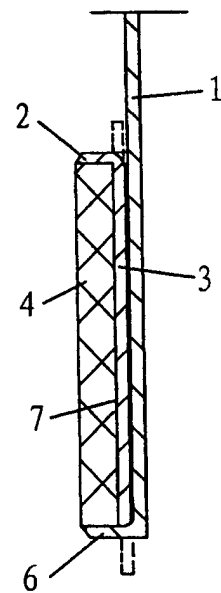


Fig. 4

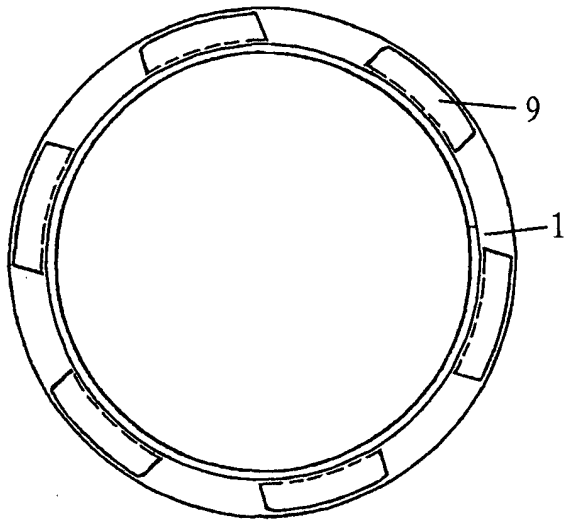


Fig. 6

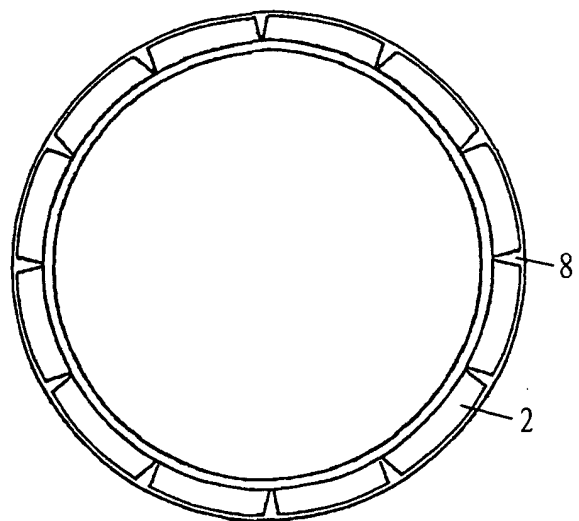


Fig. 5

