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PROCESS FOR MANUFACTURING THE SPEAKER
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ABSTRACT OF THE DISCLOSURE

A method of manufacturing a speaker comprising melting powdery, granular or annular hot-melt adhesives by high frequency induction, allowing the adhesive to flow between parts to be joined, solidifying the adhesive to adhere a cone, damper, and voice coil of a speaker to their adjoining parts and melting similar adhesive and allowing it to flow about the periphery of the cone to solidify and adhere the periphery of the cone to the speaker housing.

The present invention relates to a process for manufacturing a speaker, especially to a process for manufacturing a speaker by using a hot melt resin and adhering by induction heating.

In the past, in manufacturing a speaker, the cone, damper, voice coil, and housing of the speaker were adhered to each other by liquid adhesives. In this case, the adhesives were used as resin solved by an organic solvent such as methyl, ethyl and ketone etc.; and a heating process used a hot air furnace or infrared ray for promoting drying or thermo-setting, and the process of leaving the speaker at the ordinary temperature for long hours (over 24 hours) without heating was adapted for drying after application of the adhesive. But according to such former processes, uniformity of density, amount of use and thickness by application manner etc. of the adhesives cannot be obtained. As a result there are many defects such as non-uniform quality, foaming appearing in evaporation of the solvent and the necessity of strict thermal control of the drying furnace. Further, as the speaker is heated entirely, deformation of the cone is produced, and especially in a speaker having large caliber a very long drying time is needed.

The main object of the present invention is to provide a process for manufacturing a speaker using a novel and useful adhesion process.

Other object of this invention is to provide a process for manufacturing a speaker in which hot melt resin is used and only the part to be adhered is heated and adhered by induction heating, thus the cone etc. are not deformed.

Another object of this invention is to provide a process for manufacturing a speaker in which adhesion can be carried out in a short time.

Other object and characteristics will become apparent from the following description referring to the drawings.

FIG. 1 is a longitudinal sectional side view of the speaker showing the required parts being adhered and illustrating one example of the present invention; FIG. 2 is a longitudinal sectional side view of the speaker of FIG. 1 showing other example of the present invention; and FIG. 3 is a longitudinal sectional side view of the completed speaker formed by the present invention.

The steps of the new process for manufacturing a speaker will be explained by the following description.

In FIG. 1, voice coil 1 is set to the surface of a center gauge 2 inserted in a determined slot between a yoke 3 and a pole piece 4.

In the step shown in FIG. 1, it is assumed that a magnet system which consists of a yoke 3, pole piece 4 and magnet 5, housing 6, and a damper 7 were assembled already. In a jointing part between a voice coil 1 and damper 7 a powdered or granular hot melt resin adhesive is scattered, or a molded annular adhesive, as described later, is inserted.

One example of such adhesive is a mixed resin obtained by blending 50% each of natural resin (rosin) and ethyl vinyl acetate. This resin is a yellowish brown solid at normal temperatures, has 0.9 of specific gravity at 20° C., 90° C. softening temperature, and 115° C. melting temperature. When the mixed solid resin having a certain size is crushed by a powdering machine, the temperature is raised by frictional heat generated therebetween, so that it cannot be powdered unless the resin is kept under the softening temperature of the resin, i.e. 70° C. This temperature of the resin is kept under 70° C. by cooling the outside or putting the powdering machine in a cooling medium (for example Dry Ice etc.), and thus the powder can be obtained easily. The previously mentioned molded annular adhesive can be attained as follows: the mixed resin is heated to about 80° C. and softened, then it is formed in a sheet by a roller before it cures, next said sheet is formed into an annular form by a press and thus the desired annular adhesive can be obtained.

In the present invention, the center gauge 2 is used in order to insert the voice coil 1 exactly at a predetermined position in a slot formed between the yoke 3 and pole piece 4. First, the voice coil 1 is fitted with the center gauge 2 and is inserted into the slot. Then, either a powdered or granular hot melt resin adhesive may be scattered on the joint or a hot melt resin adhesive formed in a ring shape of which inner diameter is approximately coincident with the diameter of the voice coil 1, may be inserted with a portion in the joint which is formed by the damper 7 in contact with the voice coil 1. Next, a cone 9 is inserted into the center gauge 2 and powdered or granular hot melt resin adhesive may be scattered on or an annular adhesive may be inserted at the contacting portion of the cone 9 with the voice coil 1, similar to the above-mentioned joint. Next, the extended part of the center gauge 2 is covered by the high frequency induction heating coil 10 and a high frequency current is passed through said coil 10. Thus the center gauge 2 is heated by eddy current loss and adhesive 8 becomes molten and flows uniformly into the places to be adhered. In this case, the center gauge 2 is heated to 150° C. in five seconds after current is passed through the coil 10. Since the center gauge is formed to have a low heat capacity, it is cooled in 4-5 minutes at ordinary temperatures after the current through the coil 10 is shut off, and the adhesive 8 is solidified.

FIG. 2 shows a second example of this invention. In this example, said powder or granular hot melt adhesive 8 is scattered on the peripheral edge 6' of the housing 6, or an annular adhesive 8 is inserted between the cone 9 and housing 6. After the cone 9 is fitted on the peripheral edge 6' of the housing 6, high frequency current is passed through a high frequency induction heating coil 11. Thus the peripheral edge 6' of the housing 6 is heated and, as in the first example, adhesive 8 becomes molten and uniformly flows into the places to be adhered. Next, the current through the coil 11 is shut off allowing the solidification of the adhesive 8. Further adhesion steps for the voice coil 1 is the same as for the first example.

In both of said first and second examples, after the adhesive is solidified, the center gauge 2 and high frequency induction heating coil 10 and 11 are removed.

After the adhesion operation is completed, the cap 12 is mounted on the voice coil part and thus the speaker is...
completed. According to the adhesion process of this invention, as only the part to be adhered is heated, the cone itself is never deformed and the time necessary for adhesion can be much reduced, for example, in a speaker having a 20 cm. caliber it needs 40 minutes when the usual solvent type adhesives are used. On the contrary, according to the process of this invention, the necessary time is only five minutes, thus the time necessary for adhesion can be reduced to a great extent.

Further, especially when said molded annular adhesive is used, the amount of adhesive to be used becomes constant and the quality of the products becomes uniform since the adhesive is distributed uniformly, the quality of the speaker is improved and also the assembly operation becomes very simple.

The adhesives are not limited to the composition of the example and any hot-melt adhesives can be used for this invention, and the adhesion process can be varied in various forms.

What we claim is:

1. A process for manufacturing a speaker comprising the steps of fitting a voice coil on a center gauge, inserting said voice coil fitted on said center gauge into a slot between a yoke and a pole piece of a magnet system provided with a damper, disposing powdery hot-melt adhesives on parts for joining said damper and said voice coil, fitting a cone on said center gauge, disposing powdery hot-melt adhesives on parts for joining said cone and said voice coil, heating said center gauge only by high frequency induction heating to thereby melt said adhesives and allow them to flow between said parts, and cooling said center gauge to thereby solidify said adhesives.

2. A process for manufacturing a speaker according to claim 1 in which granular hot-melt adhesives are used in place of said powdery hot-melt adhesives.

3. A process for manufacturing a speaker according to claim 1 in which molded annular hot-melt adhesives are used in place of said powdery hot-melt adhesives.

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