as a result of extensive studies, the inventors of the present invention found that when an adhesive layer includes a low-viscosity adhesive portion and a high-viscosity adhesive portion, the high-viscosity adhesive portion is disposed between the low-viscosity adhesive portion and an opening of the base material layer, and viscosities of the adhesive portions and a viscosity ratio of the adhesive portions are appropriately controlled, during heat shrinkage, water blocking between strands can be achieved, and an outflow of an adhesive from an opening can be prevented. This finding led to the realization of the present invention. That is, the heat-recoverable component includes an adhesive layer including a low-viscosity adhesive portion and a high-viscosity adhesive portion disposed between the low-viscosity adhesive portion and an opening of the base material layer, in which the low-viscosity adhesive portion has a shear viscosity of the upper limit or less at a shear rate of 1 s^{-1}, the high-viscosity adhesive portion has a shear viscosity of the lower limit or more at a shear rate of 1 s^{-1}, and a ratio of the shear viscosity of the high-viscosity adhesive portion to the shear viscosity of the low-viscosity adhesive portion is the upper limit or less. Therefore, water blocking between the strands can be achieved during heat shrinkage. Specifically, in the heat-recoverable component, since the shear viscosity of the low-viscosity adhesive portion is the upper limit or less, a low-viscosity adhesive can penetrate between the strands at the heat shrinkage temperature, and water blocking between the strands can be achieved during heat shrinkage. In the heat-recoverable component, since the high-viscosity adhesive portion is disposed between the low-viscosity adhesive portion and an opening of the base material layer and the shear viscosity of the high-viscosity adhesive portion is the lower limit or more, the opening of the base material layer is clogged with the high-viscosity adhesive portion, and an outflow of the low-viscosity adhesive from the opening of the base material layer can be prevented. Furthermore, in the heat-recoverable component, since the ratio of the shear viscosities is the upper limit or less, it is possible to prevent the low-viscosity adhesive from flowing out from the opening of the base material layer before the opening of the base material layer is clogged with the high-viscosity adhesive portion during heat shrinkage.

[0014]

The low-viscosity adhesive portion preferably contains a polyamide as a main component. Viscosities of polyamides significantly change in a relatively narrow temperature range. Accordingly, when the low-viscosity adhesive portion contains a

like may be used alone or in combination.

[0034]

The lower limit of the content of the oxidation inhibitor in the base material layer 2 is preferably 1 part by mass and more preferably 1.5 parts by mass relative to 100 parts by mass of the resin component. The upper limit of the content of the oxidation inhibitor is preferably 30 parts by mass and more preferably 20 parts by mass relative to 100 parts by mass of the resin component. When the content of the oxidation inhibitor is less than the lower limit, the base material layer 2 becomes easily oxidized, and the heat-recoverable component 1 may be degraded. When the content of the oxidation inhibitor exceeds the upper limit, blooming and bleeding may occur.

[0035]

Examples of the phenol-based compound used as the oxidation inhibitor include pentaerythritol tetrakis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate], tetrakis-[methylene-3-(3'5'-di-tert-butyl-4'-hydroxyphenyl)propionate]methane, triethylene glycol-bis[3-(3-tert-butyl-5-methyl-4-hydroxyphenyl)propionate], and 6-(4-hydroxy-3,5-di-tert-butyl·anilino)-2,4-bis·octyl-thio-1,3,5-triazine.

[0036]

Examples of the amine-based compound used as the oxidation inhibitor include 4,4'(α, α-dimethylbenzyl)diphenylamine, polymerized products of 2,2,4-trimethyl-1,2-dihydroquinoline, 6-ethoxy-2,2,4-trimethyl-1,2- dihydroquinoline, N-(1,3-dimethylbutyl)-N'-phenyl-1,4-phenylenediamine, and N-isopropyl-N'-phenyl-1,4-phenylenediamine.

[0037]

<Adhesive layer>

The adhesive layer 3 is formed on the inner circumferential surface of the base material layer 2. The adhesive layer 3 includes a low-viscosity adhesive portion 3a and a pair of high-viscosity adhesive portions 3b which are disposed between the low-viscosity adhesive portion 3a and one opening of the base material layer 2 and between the low-viscosity adhesive portion 3a and the other opening of the base material layer 2. The low-viscosity adhesive portion 3a and the high-viscosity adhesive portions 3b each have a ring shape. The low-viscosity adhesive portion 3a is disposed between the pair of high-viscosity adhesive portions 3b.

[0038]

material layer 2 and between the low-viscosity adhesive portion 3a and the other opening of the base material layer 2, and the shear viscosity of the high-viscosity adhesive portions 3b is the lower limit or more. Therefore, the openings of the base material layer 2 are clogged with the high-viscosity adhesive portions 3b, thus preventing the low-viscosity adhesive from flowing out from the openings of the base material layer 2. Furthermore, in the heat-recoverable component 1, since the shear viscosity of the low-viscosity adhesive portion 3a is the upper limit or less, the low-viscosity adhesive penetrates between the strands and fills the gaps S between the strands at the heat shrinkage temperature, to thereby achieve water blocking of the gaps S between the strands of the insulated electrical wires 4 during heat shrinkage. Furthermore, in the heat-recoverable component 1, since the above ratio of the shear viscosities is the upper limit or less, it is possible to prevent the low-viscosity adhesive from flowing out from the openings of the base material layer 2 before the openings of the base material layer 2 are clogged with the high-viscosity adhesive portions 3b during heat shrinkage.

[0071]

In the insulated electrical wire-covering method, the heat-recoverable component 1 is used. Accordingly, when the heat-recoverable component 1 is thermally shrunk in the step of heating the heat-recoverable component 1, the conductor-exposed portions can be covered with an insulating coating and made waterproof, and water blocking in the gaps S between the strands of the insulated electrical wires 4 can be achieved. Therefore, the insulated electrical wire-covering method has good productivity.

[0072]

[Other embodiments]

It is to be understood that the embodiments disclosed herein are only illustrative and are not restrictive in all respects. The scope of the present invention is not limited to the configurations of the embodiments and is defined by the claims described below. The scope of the present invention is intended to cover all the modifications within the meaning and the scope of equivalents of the claims.

[0073]

In the embodiments described above, a heat-recoverable component including a tube-shaped base material layer has been described. However, the heat-recoverable component according to the present invention is not limited to such a heat-recoverable

component including a tube-shaped base material layer. Alternatively, the heat-recoverable component may be, for example, a heat-recoverable component 7 including a cap-shaped base material layer 8, as illustrated in Fig. 5. In the heat-recoverable component 7, one end of the base material layer 8 is clogged with a high-viscosity adhesive portion 3b, and the base material layer 8 has an opening only at the other end thereof. The heat-recoverable component 7 has a ring-shaped low-viscosity adhesive portion 3a on the inner circumferential surface of the base material layer 8 and further has a ring-shaped high-viscosity adhesive portion 3b between the low-viscosity adhesive portion 3a and the opening of the base material layer 8.

The heat-recoverable component 7 can be formed by thermally shrinking a portion of an end of a heat-recoverable component including a tube-shaped base material layer, the portion having a high-viscosity adhesive portion 3b, to clog one opening of the base material layer with a high-viscosity adhesive. This heat-recoverable component 7 can be suitably used for, for example, wire terminal treatment.

[0074]

The heat-recoverable component may include another layer other than the base material layer and the adhesive layer. An example of the other layer is a heat-dissipating layer disposed on the outer circumference of the base material layer.

[0075]

In the above embodiments, cases where a plurality of insulated electrical wires are covered have been described as the insulated electrical wire-covering method and the electrical wire bundle. Alternatively, a single insulated electrical wire may be covered.

EXAMPLES

[0076]

Hereinafter, the present invention will be described more specifically by way of Examples. However, the present invention is not limited to the Examples described below.

[0077]

[Adhesive layer tube]

As adhesive layer tubes, five types of tubes each containing a polyamide as a main component and one type of tube containing a polyethylene as a main component were prepared as shown in Table 1. The softening points of the prepared polyamides and the