homopolyphosphoric acid consisting of phosphoric acid having a single kind of constituent unit. In addition, polyphosphoric acid may be linear polyphosphoric acid or cyclic polymetaphosphoric acid, generally preferably linear polyphosphoric acid.

[0063]

Specific preferable examples of the salt of polyphosphoric acid with a nitrogen-containing heterocyclic compound include ammonium polyphosphate, melamine polyphosphate, piperazine polyphosphate, melame polyphosphate, meleme polyphosphate, ammonium polyphosphate, melamine melame meleme polyphosphate complex salt and the like. Of these, melamine polyphosphate is preferable.

[0064]

A polyphosphate flame retardant is thermally decomposed in the burning process of a moisture-proof material to form a comparatively thick phosphoric acid layer. This phosphoric acid layer shuts off oxygen, and suppresses a reaction of a substrate, an adhesive layer and oxygen, whereby the flame retardant property is considered to be achieved. Particularly, in a polyphosphoric acid-nitrogen-containing heterocyclic compound salt, since the nitrogen-containing compound is decomposed in addition to the aforementioned effect of the phosphoric acid layer to suppress the reaction of a substrate, an adhesive layer and oxygen, carbonization of charred coating produced by the nitrogen element upon burning is further promoted, thus expressing higher flame retardant property.

[0065]

One or more kinds of polyphosphate flame retardants can be used. The content is preferably 3.8 - 50 wt%, more preferably 3.8 - 30 wt%, relative to the whole moisture-proof material. When the content is not more than 50 wt%, sufficient adhesive force and transparency can be ensured. When it is not less than 3.8 wt%, a sufficient flame retardant effect can be obtained.

[0074]

One or more kinds of phosphate triester flame retardants can be used. In addition, the phosphate triester flame retardant is preferably an aromatic phosphate ester or an aromatic condensed phosphate ester. Using an aromatic phosphate ester and an aromatic condensed phosphate ester, the effect of conferring flame resistance to initial burning is increased.

[0075]

Using a phosphate triester flame retardant together with the aforementioned polyphosphate flame retardant, the flame resistance of the moisture-proof material is synergistically improved, as a result of which the total content of the flame retardant in the moisture-proof material can be reduced. Hence, for example, for a moisture-proof material to pass a burning test of a constructional material of a moisture-proof material for airplane floor panels, comparatively large amounts of a polyphosphate flame retardant, a phosphate triester flame retardant and other non-halogen flame retardants need to be contained in the moisture-proof material. Therefore, inconveniences such as decreased transparency, decreased adhesive property and the like occur. However, by adding a polyphosphate flame retardant and a phosphate triester flame retardant to the moisture-proof material, a moisture-proof material having sufficiently high flame resistance can be realized without causing such inconveniences.

[0076]

The content of the phosphate triester flame retardant is preferably 1.8 - 30 wt%, more preferably 1.8 - 10 wt%, relative to the whole moisture-proof material. When the content exceeds 30 wt%, transparency tends to decrease. When it is less than 1.8 wt%, a flame retardant effect tends to be difficult to obtain.

[0077]

In addition, when a phosphate triester flame retardant is to be contained in the adhesive layer, its content is

[0119]

Table 1

| | Example | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| TCP content | 5 wt% (1.9%) | 5 wt% (1.8%) | 5 wt% (1.8%) | 5 wt% (1.7%) | 10 wt% (3.5%) | 10 wt% (3.4%) | 20 wt% (6.7%) |
| Budit3141 content | 10 wt% (3.8%) | 20 wt% (7.3%) | 30 wt% (10.6%) | 40 wt% (13.7%) | 30 wt% (10.4%) | 40 wt% (13.4%) | 30 wt% (10.1%) |
| flame resistance | O (2 sec) | O (2 sec) | O (1 sec) | O (1 sec) | O (1 sec) | O (1 sec) | O (1 sec) |
| transparency | level 3 | level 2 | level 2 | level 1 | level 2 | level 1 | level 2 |
| moisture transmissivity (%) | 2.1 | 2.4 | 2.5 | 2.8 | 2.3 | 2.8 | 3 |
| moisture absorption rate (%) | 0.11 | 0.13 | 0.15 | 0.16 | 0.138 | 0.145 | 0.14 |
| adhesive force (lbs/inch) | 3 | 2.4 | 2.5 | 0.98 | 2.1 | 1.13 | 1.23 |
| rupture elongation (%) | 925 | 893 | 880 | 875 | 882 | 865 | 842 |
| tensile strength (PSI) | 10529 | 10234 | 10353 | 10245 | 10523 | 10252 | 10432 |
| linearity on adhesion | O | O | O | O | O | O | O |

CLAIMS

1. A moisture-proof material comprising a substrate and an adhesive layer formed on at least one surface of the substrate, wherein at least one of the substrate and the adhesive layer comprises a polyphosphate flame retardant and a phosphate triester flame retardant, simultaneously or alternatively, and wherein the thickness of the substrate is 12 - 16 mil (=304.8~406.4μm) .

2. The moisture-proof material according to claim 1, wherein the polyphosphate flame retardant is a salt of polyphosphoric acid and a nitrogen-containing heterocyclic compound.

3. The moisture-proof material according to claim 1, wherein the polyphosphate flame retardant is a salt of polyphosphoric acid and melamine.

4. The moisture-proof material according to claim 1, wherein the phosphate triester flame retardant is aromatic phosphate triester.

5. The moisture-proof material according to claim 1), wherein the content of the polyphosphate flame retardant is 3.8 - 50 wt% of the whole moisture-proof material and the content of the phosphate triester flame retardant is 1.8 - 30 wt% of the whole moisture-proof material.

6. The moisture-proof material according to claim 1, wherein the polyphosphate flame retardant and phosphate triester flame retardant are contained in at least an adhesive layer.

7. The moisture-proof material according to claim 6, wherein the content of the polyphosphate flame retardant in the adhesive layer is 5 - 40 wt% of the whole adhesive layer and

the content of the phosphate triester flame retardant in the adhesive layer is 5 - 20 wt% of the whole adhesive layer.

8. The moisture-proof material according to claim 7, comprising a substrate which does not contain a polyphosphate flame retardant and a phosphate triester flame retardant.

9. The moisture-proof material according to claim 1, wherein the moisture transmissivity is not more than 9.0%.

10. The moisture-proof material according to claim 1, which has a moisture absorption rate of not more than 1.0%.

11. The moisture-proof material according to claim 1, wherein the tensile strength is not more than 15000 psi.

12. The moisture-proof material according to claim 1, wherein the rupture elongation is not more than 1500%.