

SPECIFICATION

Outsert Moulded Members

This invention relates to an outsert moulded substrate device for use in for example tape recorders, radio receivers, time-keeping devices and toys, and particularly relates to a substrate device comprising a substrate made of hard material e.g. a metal, to which is moulded a synthetic resin member e.g. a substrate plate, support or spigot or the like, maintaining good precision.

Devices consisting of a substrate to which are bonded various functional components e.g. radio chassis, have hitherto been composed of a metallic substrate and separately produced functional components attached thereto by means of caulking or the like, or composed of a unit which was integrally made of a synthetic resin.

More recently devices in which synthetic resin-made functional members are integrally mounted on a hard substrate e.g. of metal, have been produced by pouring a synthetic resin into a metal mould in which is placed a metallic substrate having suitable fastening holes or apertures, such a method being known as outsert moulding, and is of increasing interest where it is desired to combine the characteristics of metals and of synthetic resins in such devices. A general description of outsert moulding is in the journal *Plastics Vol. 26*, pp 52 to 53.

Examples of functional members mounted on a substrate manufactured by the outsert method include movable units e.g. a gear, cam or knob, and stationary units e.g. substrate plate, support spigot, spring hooking terminal and bearing. The latter units particularly require secure fastening and accuracy of position on the substrate.

Prior art constructions of outsert moulded devices are hereinafter described and illustrated in Figures 1 and 2 of the accompanying drawings, of which

Figure 1 is a partial cross-section of an outsert moulded substrate device having a moulded-in spigot, and

Figure 2 is a partial cross-sectional view of a similar substrate device showing an alternative prior art construction.

Referring to Figure 1, a cylindrical pole functional member 1 is secured to a smooth substrate 2 by means of a small circular fastening aperture 3 formed in the substrate. Functional units which are embedded in the substrate such as plates and bearings, may also be secured in similar manner.

In the construction of Figure 1, the fastening mainly depends upon the frictional force between the surface of the substrate and the cylindrical functional member, which may thus be easily rotated even with a relatively small applied force. Furthermore the resin cross-section of the moulded-in functional unit 1 in the aperture 3 usually becomes smaller than the diameter of the aperture in the substrate due to moulding

shrinkage whereby the functional member 1 may be laterally movable causing rattling.

Thus in such constructions, a sufficiently firm fastening between the substrate and the moulded-in unit is not obtained.

In order to mitigate such effects, it has previously been proposed to provide a construction as shown in Figure 2, wherein a portion of the substrate is bent upwardly as shown. Such a construction however provides complications during manufacture and moulding.

Another prior art embodiment is to use a square aperture in the substrate. However subsequent rattling is not completely prevented, and the functional unit moulded-in assumes a complicated shape.

In an attempt to improve the fastening characteristics, it has also been proposed to provide the substrate with a recessed polygonal hole of radial form. Such a device however weakens the strength of the substrate and tends to become hooked to the moulding machine during the moulding operation.

The substrate device of the invention mitigates the defects inherent in the conventional devices hereinbefore described, and can be easily handled during the manufacturing outsert moulding process, to provide firm fastening and less deformation.

The invention provides an outsert moulded substrate device comprising a substrate member of hard material containing an aperture and a functional member of synthetic resin material outsert moulded through said aperture in the substrate member, characterized in that the said substrate member is provided with a plurality of protuberances and/or depressions in at least one surface thereof and distributed around the periphery of the said aperture so as to be embedded in the said functional member.

Preferably a said protuberance on one surface of the substrate member is associated with a depression correspondingly located on the opposite surface of the said substrate member.

In one embodiment of the invention the said substrate member is provided with a plurality of radially-disposed protuberances and/or depressions extending from the perimeter of the said aperture.

The recesses or protuberances need not be limited to radial features. Thus the protuberances or depressions may be in the form of an arc or arcs displaced from the periphery of the aperture and generally surrounding the said aperture. Alternatively they may be in the form of circular protuberances or depressions.

In a modification of the invention, a single protuberance or depression may be disposed on a surface of the substrate member enclosing the said aperture. Thus a single such depression may be provided on one surface of the substrate member and a corresponding single protuberance provided on the opposite surface.

The invention is hereinafter particularly described and illustrated in the accompanying

Figures 3 to 5 of the accompanying drawings, of which

Figure 3 is a plan view of a substrate device according to the invention,

5 Figure 4 is a partial section of the centre portion of Figure 3 along the line A—A',

Figure 5A(a) is a plan view of another embodiment of a substrate member for use according to the invention and Figure 5A(b) is a
10 sectional view of Figure 5A(a) along the line X—X',

Figure 5B(a) is a plan view of a further embodiment of a substrate member for use according to the invention and Figure 5B(b) is a
15 sectional view along the line Y—Y', and

Figure 5C(a) is a plan view of yet another embodiment of a substrate member for use according to the invention and Figure 5C(b) is a
20 sectional view along the line W—W'.

Referring to Figures 3 and 4, a substrate member made of hard material e.g. metal has a functional member 9, in this instance a spigot, made of synthetic plastics material, outsert moulded into the substrate member through an
25 aperture 7 therein. Round the periphery of the aperture there are provided a plurality of radially disposed protuberances on one surface of the substrate member and corresponding depressions on the opposite surface of the substrate member, each set of protuberances and depressions being
30 disposed diametrically opposite another such set, but whereby a depression of a surface of one set corresponds to a protuberance on the same surface of the diametrically opposed set. Such
35 diametrically opposed sets are shown in Figure 3 as 8a with 8d, 8b with 8f and 8c with 8e. The effect produced when such sets are incorporated in the outsert-moulded spigot is shown in Figure 4, which arrangement provides a further security
40 of the moulded member against movement during use.

Referring to Figure 5A, two arcuate depressions on one surface of the substrate member are shown together generally enclosing
45 aperture 7, and associated with corresponding protuberances on the other surface, so that an effect is produced as illustrated in Figure 5A(b).

Referring to Figure 5B, a single elliptical depression is provided on one surface of the
50 substrate member associated with a corresponding protuberance on the opposite surface, so that an effect is produced as shown in Figure 5B(b).

Referring to Figure 5C, a group of four
55 depressions in the form of spots are distributed round the aperture 7, and associated with corresponding protuberances on the opposite surface, so that an effect is produced as shown in

Figure 5C(b).

60 The recesses and/or protuberances provided in the substrate members for use according to the invention may readily be formed by a pressing operation of metal substrate members or during a moulding operation for thermosetting a
65 thermoplastics resin substrate member. Any type of functional member may be outsert-moulded thereon e.g. a cylindrical member for instance a circular or square spigot, a substrate plate, or spring member, fixed terminal or bearing. Thus
70 the substrate devices according to the invention may be used for all purposes for which such devices have hitherto been used e.g. for electrical appliances, communications equipment, precision machinery, furniture, watches or toys.

75 Claims

1. An outsert moulded substrate device comprising a substrate member of hard material containing an aperture and a functional member of synthetic resin material outsert moulded
80 through said aperture in the substrate member, characterized in that the said substrate member is provided with a plurality of protuberances and/or depressions in at least one surface thereof and distributed around the periphery of the said
85 aperture so as to be embedded in the said functional member.

2. A device according to Claim 1, wherein a said protuberance on one surface of the substrate member is associated with a depression
90 correspondingly located on the opposite surface of the said substrate member.

3. A device as claimed in Claim 1 or Claim 2, wherein the said substrate member is provided with a plurality of radially-disposed protuberances
95 and/or depressions extending from the perimeter of the said aperture.

4. A device according to Claim 1 or Claim 2, wherein the said substrate member is provided with two or more protuberances and/or
100 depressions and in the form of an arc displaced from the periphery of the said aperture and generally surrounding the said aperture.

5. A device according to Claim 1 or Claim 2, wherein the said substrate member is provided with a plurality of circular protuberances and
105 depressions.

6. A modification of the device according to Claim 1 or Claim 2, wherein the said substrate member is provided with a single protuberance or
110 depression on a surface thereof enclosing the said aperture.

7. An outsert moulded substrate device according to Claim 1, substantially as
115 hereinbefore described and illustrated in the accompanying drawings.

Figures 3 to 5 of the accompanying drawings, of which

Figure 3 is a plan view of a substrate device according to the invention,

5 Figure 4 is a partial section of the centre portion of Figure 3 along the line A—A',

Figure 5A(a) is a plan view of another embodiment of a substrate member for use according to the invention and Figure 5A(b) is a

10 sectional view of Figure 5A(a) along the line X—X',

Figure 5B(a) is a plan view of a further embodiment of a substrate member for use according to the invention and Figure 5B(b) is a

15 sectional view along the line Y—Y', and

Figure 5C(a) is a plan view of yet another embodiment of a substrate member for use according to the invention and Figure 5C(b) is a

20 Referring to Figures 3 and 4, a substrate member made of hard material e.g. metal has a functional member 9, in this instance a spigot, made of synthetic plastics material, outsert moulded into the substrate member through an

25 aperture 7 therein. Round the periphery of the aperture there are provided a plurality of radially disposed protuberances on one surface of the substrate member and corresponding depressions on the opposite surface of the substrate member,

30 each set of protuberances and depressions being disposed diametrically opposite another such set, but whereby a depression of a surface of one set corresponds to a protuberance on the same surface of the diametrically opposed set. Such

35 diametrically opposed sets are shown in Figure 3 as 8a with 8d, 8b with 8f and 8d with 8a. The effect produced when such sets are incorporated in the outsert-moulded spigot is shown in Figure 4, which arrangement provides a further security

40 of the moulded member against movement during use.

Referring to Figure 5A, two arcuate depressions on one surface of the substrate member are shown together generally enclosing

45 aperture 7, and associated with corresponding protuberances on the other surface, so that an effect is produced as illustrated in Figure 5A(b).

Referring to Figure 5B, a single elliptical depression is provided on one surface of the

50 substrate member associated with a corresponding protuberance on the opposite surface, so that an effect is produced as shown in Figure 5B(b).

Referring to Figure 5C, a group of four

55 depressions in the form of spots are distributed round the aperture 7, and associated with corresponding protuberances on the opposite surface, so that an effect is produced as shown in

Figure 5C(b).

60 The recesses and/or protuberances provided in the substrate members for use according to the invention may readily be formed by a pressing operation of metal substrate members or during a moulding operation for thermosetting a thermoplastics resin substrate member. Any type of functional member may be outsert-moulded thereon e.g. a cylindrical member for instance a circular or square spigot, a substrate plate, or spring member, fixed terminal or bearing. Thus

65 the substrate devices according to the invention may be used for all purposes for which such devices have hitherto been used e.g. for electrical appliances, communications equipment, precision machinery, furniture, watches or toys.

75 Claims

1. An outsert moulded substrate device comprising a substrate member of hard material containing an aperture and a functional member of synthetic resin material outsert moulded

80 through said aperture in the substrate member, characterized in that the said substrate member is provided with a plurality of protuberances and/or depressions in at least one surface thereof and distributed around the periphery of the said aperture so as to be embedded in the said

85 functional member.

2. A device according to Claim 1, wherein a said protuberance on one surface of the substrate member is associated with a depression

90 correspondingly located on the opposite surface of the said substrate member.

3. A device as claimed in Claim 1 or Claim 2, wherein the said substrate member is provided with a plurality of radially-disposed protuberances and/or depressions extending from the perimeter

95 of the said aperture.

4. A device according to Claim 1 or Claim 2, wherein the said substrate member is provided with two or more protuberances and/or

100 depressions and in the form of an arc displaced from the periphery of the said aperture and generally surrounding the said aperture.

5. A device according to Claim 1 or Claim 2, wherein the said substrate member is provided

105 with a plurality of circular protuberances and depressions.

6. A modification of the device according to Claim 1 or Claim 2, wherein the said substrate member is provided with a single protuberance or

110 depression on a surface thereof enclosing the said aperture.

7. An outsert moulded substrate device according to Claim 1, substantially as hereinbefore described and illustrated in the

115 accompanying drawings.