

PATENT SPECIFICATION

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(19)



(54) OUTSERT MOULDED PLATE ASSEMBLIES

(71) We, POLYPLASTICS COMPANY LIMITED, a Japanese Company of 2-30 Azuchimachi, Higashi-Ku, Osaka, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

This invention relates to a flat metal base plate assembly for watches, measuring meters, communication equipment, recorders, optical equipment, toys, etc., which base plate is provided with a plurality of functional parts composed of a synthetic plastics material integrally bonded thereto. Such functional parts may for example be studs or bearings, and in general form areas of differing thickness bonded and fixed onto the base plate. Such base plates have heretofore been prepared by attaching such functional parts composed of a metal to holes formed on a metal base plate by caulking or the like, or by integrally forming an entire base plate device from a synthetic plastics material. However the former technique is complicated and a high precision cannot be attained, and base plates formed by the latter technique suffer from an insufficient rigidity and again a high precision cannot be attained because of the strain and shrinkage effects in the material used.

Recently base plate assemblies have been developed comprising a metal base plate and functional parts composed of a synthetic plastics material. In these base plate assemblies, the metal base plate component avoids the disadvantages of insufficient rigidity and shrinkage occurring at the moulding step. Further such base plate assemblies can be prepared in one moulding operation by the so-called outsert moulding process, with attendant advantages of reduced manufacturing costs and consistency of the final product.

Outsert moulding is a known method of

moulding plastics material onto base plates, and differs from insert moulding in which the base plate is introduced into the resin. In outsert moulding the base plate is anchored to the plastics material by injecting the plastics resin into anchoring means in the base plate, e.g. anchoring slots, grooves, holes or apertures in the base plate.

In outsert moulding for forming base plate assemblies, runners are normally used consisting of bands or strips of synthetic plastics material extending between functional parts to connect or fix such parts. Also the functional part or parts may themselves consist of an extended mass of plastics material extending along the base plate assembly.

However in a base plate assembly including a large or band-like synthetic plastics member fixed to a base plate at two or more bonding holes, distortion can arise so that such base plate device cannot be used as a part of equipment in which high precision is required. Such an effect is shown in Figures 1 and 2 of the accompanying drawings, of which Figure 1 is a top view showing a base plate assembly in which synthetic plastics members 2 and 2' are affixed to a metal base plate 1 and are connected to each other through a plastics runner 3. During moulding tension is generated in the runner 3 by moulding shrinkage of the moulded synthetic plastics material, and as shown in the side view of Figure 2, the base plate 1 is consequently deformed as indicated by the broken lines 1'. Such a defect similarly occurs where a large and lengthy functional part is affixed to a base plate through two or more bonding holes formed on the base plate.

Such effects are mitigated by the present invention, which provides a base plate assembly, comprising a flat metal base plate having a synthetic plastics material bonded thereon through a plurality of bonding holes

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in the same metal base plate and forming one or more areas of differing thickness moulded on the base plate, characterised in that said base plate is provided with one or more straight or curved reinforcing elements being ribs formed by sending out of the plane of the base plate or by slots one or more sides of which are bended out of the plane of the base plate, each said element extending towards each of a pair of said holes or being disposed substantially parallel to a line forming a pair of said holes.

The said reinforcing element(s) may be in the form of one or more straight or curved lines extending towards or reaching two bonding holes, or disposed parallel or substantially parallel to a line joining the bonding holes. Curved lines may be arcuate lines.

The said reinforcing elements may extend away from or towards plastics material bonded to the base plate. Preferably the reinforcing elements coincide with that of runners in the plastic material bonded to the base plate, and particularly the runners may be moulded so as to be bonded with the lines of reinforcing elements.

In section they may be of part circular e.g. semi-circular, section, or of angular section, e.g. in the form of a three-sided section. Another form of angular section line may be formed by cutting a line on the base plate and bending at least one side of the cut along its length.

The invention is hereinafter particularly described and illustrated in Figures 3 to 11 of the accompanying drawings, of which

Figure 3 is a representational part plan view of a base plate for use in an assembly according to the invention showing two bonding holes 4, 4' with a linear reinforcing element A extending to each of the bonding holes;

Figure 4 is a part sectional view of the base plate of the assembly of Figure 3 showing the part circular section of the reinforcing element of Figure 3, which may be produced for instance by a simple drawing operation;

Figure 5 is a representational plan view of a base plate assembly according to the invention wherein plastics material is bonded to the base plate of Figure 3 through the bonding holes 4, 4' and a plastics runner 3 extends between the bonding holes along the reinforcing element. Functional parts 2, 2' made of bonded plastics material are disposed above the bonding holes 4, 4'.

Figure 6 is a part sectional view of the section across the runner of Figure 5, showing the moulded runner extending into and filling the part-circular section of the reinforcing element;

Figure 7 is a representational view of means for producing the assembly of Figure

6 showing two mould plates 5, 6 in a position just before reaching a clamping position before moulding. The mould plate 5 has a mould cavity 5' for moulding the runner, and the mould plate 6 has a cavity 6' for receiving the underside of the reinforcing element. A plastics resin is introduced into 5' and A through a gate or other runner.

Figures 8(a) to (e) show possible relationships of a reinforcing element A to a plastics runner 3 extending to two bonding holes 4, 4' associated with moulded functional parts 2, 2'.

In Figure 8(a) A extends linearly towards the bonding holes 4, 4' and is co-incident with the runner 3.

In Figure 8(b) two lines of reinforcing element A are provided each extending inwardly from a bonding hole 4 or 4' and corresponding to the linear runner 3.

In Figure 8(c) the runner 3 joins the bonding holes 4, 4' in the form of an arc, A extending linearly towards the bonding holes as in 8(a).

In Figure 8(d), two reinforcing elements A are provided, being parallel to and on opposite sides of linear runner 3.

In Figure 8(e) the reinforcing element A extends towards the bonding holes 4, 4' in the form of an arc alongside the linear runner 3.

Figures 9(a) to (d) are schematic part plan views of base plate assemblies according to the invention wherein (apart from Figure 9(a), which is similar to the arrangement shown in Figure 8(d)) arrangements of reinforcing elements to more than two bonding holes are shown.

Referring to Figure 9(b), two bonding hole parts are joined by linear runners 3, 3' to form generally converging runners. A reinforcing element A is disposed between the runners along a line bisecting the angle the runners make with each other.

In Figure 9(c), two reinforcing elements A, A' intersect with each other at their ends, each line being parallel to a linear runner of a pair of runners 3, 3' joining a set of three bonding holes, one bonding hole being common to two runners;

In Figure 9(d), two reinforcing elements A, A' intersect with each other at their mid-fronts, each runner extending towards two bonding holes being disposed diagonally opposite to each other in a quadrilateral arrangement of four bonding holes, each bonding hole being joined successively to another bonding hole by runners 3, 3', 3" and 3'''.

Figures 10(a) to (d) illustrate in partial cross-section various forms of reinforcing elements which may be used in the base plate of base plate assemblies according to the present invention;

In Figure 10(a), the reinforcing element

has a part-circular section, similar to that shown in Figure 4, but curved in the opposite direction;

Figures 10(b) to (d) show sections produced by cutting along a line in the base plate and bending one or both sides of the line to different extents. Thus Figure 10(b) shows one side of the cut line only, having been bent through 90°; Figure 10(c) similarly shows one side of the cut line bent to a lesser extent, and Figure 10(d) shows two sides of a cut line bent to a similar lesser extent.

When the reinforcing element corresponds to a runner, then it is preferred that the said runner is moulded so as to be integral with the said reinforcing element. Examples of such embodiments are shown in the part sections of Figures 11(a) to (g). Figures 11 (a) to (d) show various arrangements of moulded runner in a reinforcing element of angular shape, and Figures 11(e) to (g) show various arrangements of moulded runner in a reinforcing element obtained by cutting a line in the base plate and bending along one of the cut sides.

Instead of the runners represented in Figures 5 to 11 the embodiments of the invention may include any lengthy and large plastics mass extending between anchoring holes, and which for instance may itself form a functional portion of the base plate assembly.

WHAT WE CLAIM IS:-

1. A base plate assembly, comprising a flat metal base plate having a synthetic plastic material outsert moulded thereon through a plurality of bonding holes in the said metal base plate and forming one or more areas of differing thickness moulded on the base plate, characterised in that said base plate is provided with one or more straight or curved reinforcing elements being ribs formed by bending out of the plane of the base plate or by slots one of more sides of which are bended out of the plane of the base plate, each said element extending towards each of a pair of said holes or being disposed substantially parallel to a line forming a pair of said holes.

2. An assembly as claimed in Claim 1, wherein a said reinforcing element joins at least two bonding holes.

3. An assembly as claimed in Claim 1, wherein a reinforcing element extends towards but does not reach, two bonding holes.

4. An assembly as claimed in Claim 1, wherein the said reinforcing element(s) comprise two or more elements disposed along a line joining two bonding holes.

5. An assembly as claimed in Claim 3, wherein at least one of the said reinforcing element(s) between two bonding holes extends to a said bonding hole.

6. An assembly as claimed in Claim 1, wherein two or more of said reinforcing elements are disposed parallel to a line joining the two bonding holes.

7. An assembly as claimed in any of Claims 1 to 3, wherein the reinforcing element(s) is/are of an arcuate configuration extending towards two adjacent holes.

8. An assembly as claimed in any of Claims 1 to 7, wherein at least two of the said reinforcing elements intersect each other.

9. An assembly as claimed in Claim 8, wherein the said elements intersect at their ends.

10. An assembly as claimed in Claim 8, wherein the said elements intersect at their mid-point.

11. An assembly as claimed in any of Claims 1 to 10, wherein the said reinforcing element(s) is/are of part-circular section.

12. An assembly as claimed in any of Claims 1 to 10, wherein the reinforcing element(s) is/are of angular section.

13. An assembly as claimed in Claim 12, wherein the said reinforcing element(s) are formed by cutting a line on the base plate and bending at least one side of the cut along its length.

14. An assembly as claimed in any of Claims 1 to 13, wherein the reinforcing element(s) coincide with that of a moulded runner in the plastics material bonded to the base plate.

15. An assembly as claimed in Claim 14, wherein the said runner is moulded so as to be bonded with the reinforcing elements.

16. A base plate assembly as claimed in Claim 1, substantially as hereinbefore described.

17. A base plate assembly substantially as hereinbefore described in any of Figures 3 to 10 of the accompanying drawings.

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has a part-circular section, similar to that shown in Figure 4, but curved in the opposite direction;

5 Figures 10(b) to (d) show sections produced by cutting along a line in the base plate and bending one or both sides of the line to different extents. Thus Figure 10(b) shows one side of the cut line only, having been bent through 90°; Figure 10(c) similarly shows one side of the cut line bent to a lesser extent, and Figure 10(d) shows two sides of a cut line bent to a similar lesser extent.

15 When the reinforcing element corresponds to a runner, then it is preferred that the said runner is moulded so as to be integral with the said reinforcing element. Examples of such embodiments are shown in the part sections of Figures 11(a) to (g).
20 Figures 11 (a) to (d) show various arrangements of moulded runner in a reinforcing element of angular shape, and Figures 11(e) to (g) show various arrangements of moulded runner in a reinforcing element obtained by cutting a line in the base plate and bending along one of the cut sides.

25 Instead of the runners represented in Figures 5 to 11 the embodiments of the invention may include any lengthy and large plastics mass extending between anchoring holes, and which for instance may itself form a functional portion of the base plate assembly.

WHAT WE CLAIM IS:-

35 1. A base plate assembly, comprising a flat metal base plate having a synthetic plastic material outsert moulded thereon through a plurality of bonding holes in the said metal base plate and forming one or more areas of differing thickness moulded on the base plate, characterised in that said base plate is provided with one or more straight or curved reinforcing elements being ribs formed by bending out of the plane of the base plate or by slots one of more sides of which are bended out of the plane of the base plate, each said element extending towards each of a pair of said holes or being disposed substantially parallel to a line forming a pair of said holes.

50 2. An assembly as claimed in Claim 1, wherein a said reinforcing element joins at least two bonding holes.

55 3. An assembly as claimed in Claim 1, wherein a reinforcing element extends towards but does not reach, two bonding holes.

60 4. An assembly as claimed in Claim 1, wherein the said reinforcing element(s) comprise two or more elements disposed along a line joining two bonding holes.

65 5. An assembly as claimed in Claim 3, wherein at least one of the said reinforcing element(s) between two bonding holes extends to a said bonding hole.

6. An assembly as claimed in Claim 1, wherein two or more of said reinforcing elements are disposed parallel to a line joining the two bonding holes.

7. An assembly as claimed in any of Claims 1 to 3, wherein the reinforcing element(s) is/are of an arcuate configuration extending towards two adjacent holes.

8. An assembly as claimed in any of Claims 1 to 7, wherein at least two of the said reinforcing elements intersect each other.

9. An assembly as claimed in Claim 8, wherein the said elements intersect at their ends.

10. An assembly as claimed in Claim 8, wherein the said elements intersect at their mid-point.

11. An assembly as claimed in any of Claims 1 to 10, wherein the said reinforcing element(s) is/are of part-circular section.

12. An assembly as claimed in any of Claims 1 to 10, wherein the reinforcing element(s) is/are of angular section.

13. An assembly as claimed in Claim 12, wherein the said reinforcing element(s) are formed by cutting a line on the base plate and bending at least one side of the cut along its length.

14. An assembly as claimed in any of Claims 1 to 13, wherein the reinforcing element(s) coincide with that of a moulded runner in the plastics material bonded to the base plate.

15. An assembly as claimed in Claim 14, wherein the said runner is moulded so as to be bonded with the reinforcing elements.

16. A base plate assembly as claimed in Claim 1, substantially as hereinbefore described.

17. A base plate assembly substantially as hereinbefore described in any of Figures 3 to 10 of the accompanying drawings.

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