

Drilling Printed Circuit Boards and Entry Boards therefor

This invention relates to a method of drilling holes in printed circuit boards and to an entry board adapted for use in such a method.

5 It is well known that in drilling printed circuit boards it is usual to use dummy boards on either side or both sides of the board or boards to be drilled. These dummy boards are sometimes referred to as backing and entry boards. A backing, or back-up, board is disclosed in
10 US-A-3700341, comprising a laminate of aluminium foil firmly bonded to Masonite, a fibrous board. A laminated entry board is disclosed in US-A-4311419. When many boards are being drilled they are usually made up in stacks consisting of an entry board on top of the printed circuit board
15 material. There are a number of reasons for this - one of these is to reduce burring, another to prevent damage to the top laminate in the stack and another to improve drilling accuracy. At the bottom of the stack there is usually another board called the back-up board which is there for a
20 number of reasons, one of which being to prevent the drills drilling into the base tooling plate of the drilling machine, and another being to prevent burring of the printed circuit board material. Various materials are used for the dummy boards, but the most common dummy boards are composite
25 boards consisting of a metal cladding on one or both sides of a softer, often organic, sheet of material. The metal is rigidly and permanently bonded to the substrate or substrate by means of a permanent adhesive such as an epoxy resin.

A problem associated with the drilling of printed circuit boards has been the effect of the board material on the drill bit. Circuit boards commonly contain much epoxy resin. During the drilling operation the resin becomes
5 firmly bonded to the margins and flutes of the drills. This increases the power requirement, the heat input and causes smearing inside the drilled holes. In some cases the resin build up limits the useful life the drills. The resin can be difficult and expensive to remove when drills are being
10 refurbished.

According to the invention, an entry board for use adjacent a printed circuit board during drilling therethrough comprises a pcb-engaging sheet adapted to resist burr-formation during the drilling therethrough,
15 laminated with a further sheet over whose surface is distributed a drill lubricant. The further sheet may be non-metallic. Where the further sheet is a paper board, the lubricant can be interspersed in the paper board such that the lubricant is distributed not only over its surface but
20 also beneath its surface. The lubricant may be any dry film lubricant such as graphite, molybdenum disulphide or polytetrafluoroethane (ptfe) and it may be interspersed in the material during manufacture or it may be applied subsequently by brushing, rollcoating or spraying. The
25 preferred lubricant is ptfe.

Preferably, the entry board comprises two laminar components whose faces are joined such that there is no relative slip during transportation, cutting and

positioning, and such that they are separable by peeling them apart; one of the laminar components, constituting a substrate of e.g. a fibrous board, being provided with the drill lubricant.

5 The drill lubricant reduces or eliminates resin build-up on the drill bit.

10 In another aspect, the invention provides a method of drilling a printed circuit board, comprising placing an entry board in accordance with the invention defined above next to the printed circuit board and drilling through both boards.

Examples of the use of the invention will now be given with reference to the accompanying diagrammatic drawings, in which:

15 Figure 1 is a section through an entry board comprising a fibre board substrate and a cladding on one side only; and

Figure 2 is a section corresponding to Figure 1 but with cladding on both sides of the substrate.

20 In this embodiment of the present invention, a metal layer may be removed from a substrate after use, thus allowing the substrate to be disposed of and the metal reclaimed. Alternatively the substrate may be reused in some applications. Referring to Figure 1, a weak bond between the metal A and the substrate B may be achieved by means of a
25 low strength adhesive applied to one or both of the contacting surfaces or by an interposed double-sided adhesive tape or by treatment of the surfaces in a way which gives some degree of mechanical keying between them. It is

not necessary that the bonding extends completely across the surfaces.

Example

5 The preferred process uses aluminium 40 microns (0.04mm) thick bonded on to a paper board of approximately 500 microns (0.5mm) thick. The adhesive layer is intended to be the minimum which will hold the layers together during storage, handling, cutting, transportation and positioning. The thickness of the adhesive layer is approximately 3
10 microns and an ideal peeling force between the aluminium and paper of about 50N/m (Newtons/metre) is achieved. This corresponds to a tensile strength of the bond of about 40kN/m² (kilo Newtons/square metre). Tests have shown that the peeling force must be below 500N/m corresponding to a
15 tensile strength of about 400N/m².

It will be appreciated that the substrate thickness could be greater than 0.5mm and that the foil or sheet could be of a slightly different thickness.

20 In a trial of the drill lubricant, the composite board was sprayed on the paper side with fine solid ptfe particles dispersed in a carrier fluid. The carrier evaporated leaving a thin ptfe layer on the paper. After drilling 1000 holes through a typical stack of 3 circuit boards with the treated entry board in position no resin build-up was
25 observed on the drill. Another drill used under identical conditions but with no ptfe on the entry board showed considerable resin build-up.

It will be appreciated that the entry board of the

present invention could equally well be used as a backing board.

Application No. GB 9405516.7; divided from this Application, claims an entry board with two laminated sheets
5 which do not separate during normal use but are separable, for recycling, by peeling them apart.

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CLAIMS

1. An entry board for use adjacent a printed circuit board (pcb) during drilling therethrough comprising a pcb-engaging sheet adapted to resist burr-formation during the drilling therethrough, laminated with a further sheet over whose surface is distributed a drill lubricant.
2. An entry board according to Claim 1, in which the further sheet is non-metallic.
3. An entry board according to Claim 2, in which the non-metallic further sheet is a paper board in which the lubricant is interspersed such that the lubricant is distributed not only over its surface but also beneath its surface.
4. An entry board according to Claim 2, in which the non-metallic further sheet is a paper board on which the lubricant is applied as a dry film.
5. An entry board according to any preceding Claim, in which the lubricant is graphite, molybdenum disulphide or polytetrafluoroethane.
6. An entry board according to any preceding claim, comprising two laminar components whose faces are joined such that there is no relative slip during transportation, cutting and positioning, and such that they are separable by peeling them apart; one of the laminar components being provided with the drill lubricant.
7. A method of manufacturing an entry board according to Claim 3, comprising interspersing the lubricant in the paper fibre during manufacture of the paper board.



8. A method of manufacturing an entry board according to Claim 4, comprising brushing, rollcoating or spraying the lubricant as a dispersion in a carrier fluid on to the paper board and allowing the carrier fluid to evaporate.

5 9. A method of drilling a printed circuit board, comprising placing an entry board in accordance with Claim 1 next to the printed circuit board and drilling through both boards.

10 10. An entry board, substantially as described herein with reference to the accompanying drawings.

11. A method of producing a dummy board, substantially as described herein with reference to the Example and the accompanying drawings.

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