

CABLE GUIDES FOR USE WITH STRANDED
MULTI-CONDUCTOR FLAT RIBBON CABLES

This invention relates to cable guides for use with stranded multi-conductor flat ribbon cable. The invention is particularly useful for guiding conductors from flat ribbon cables to contact point perforations on printed circuit boards.

The continued miniaturisation of printed circuit boards has led to the advantageous use of stranded conductor flat ribbon cable. However, the continued reduction in size has accentuated the difficulty of threading the individual conductors from the cable to the appropriate holes in the board and of spreading conductors, which are closely spaced in the ribbon, in order that they enter in a practical way into the cable guide and from there into the printed circuit board.

According to the invention, a cable guide for use with stranded multi-conductor flat ribbon cable comprises a body having a row of similar through-holes with an approximately conical shape to be allocated alternately or as desired to the ends of conductors in the cable, each hole being tapered from a comparatively wider opening to a substantially narrower opening and all the wider openings being on a first face of the body and all the narrower openings being on a second face of the body with the wider openings in a row transversely overlapping one another along an imaginary straight line on said first face and the narrower openings being staggered on opposite sides of a second imaginary straight line on said second face whereby stripped ends of the conductors can be easily converted from an in-line pattern to a staggered pattern at the narrower openings.

According to another aspect of the invention a cable guide for use with a stranded multi-conductor flat ribbon cable comprises a body having a row of similar through-holes to be allocated respectively to adjacent

ends of conductors in the cable, each hole being tapered from a comparatively wider opening to a substantially narrower opening and all the wider openings being on a first face of the body and all the narrower openings 5 being on a second face of the body, and a clip integrally or detachably mounted on the body on top of the row of wider openings to extend over the conductors when they have entered the wider openings and to provide strain relief by exerting pressure on the conductor assembly.

10 In one form of the invention the body is with advantage formed with weakened surfaces enabling it to be broken transversely to the row of holes to provide two or more serviceable cable guides.

In order that the invention may be clearly 15 understood and readily carried into effect a cable guide in accordance therewith will now be described, by way of example, with reference to the accompanying drawings, in which:

Figs. 1, 2, 3 are respectively a side elevation, a 20 plan from above and a plan from beneath the cable guide;

Fig. 4 is a section on the line B-B in Fig. 2;

Fig. 5 is a cross-section on an enlarged scale on the line A-A in Fig. 2;

Figs. 6 and 7 are respectively a plan and side 25 elevation of detail A in Fig. 2; and

Fig. 8 is an elevation on a greatly enlarged scale of one form of clip that can be used with examples of the invention.

Figs. 1 to 7 show an eighteen pin cable guide 30 consisting of a substantially rectangular elongated body 1 of electrically insulating material formed with two rows of through-holes 2 staggered as shown and with six locating pegs 3 for inserting into a printed circuit board. Each hole 2 tapers (Fig. 5) from the outer face 35 of the body to the face that is to engage the board, the tapering being the result of an inclined surface a on one

side of the hole and an opposite surface perpendicular to the faces of the body.

When used, the end of a stranded multi-conductor flat ribbon cable is slit and stripped to provide 5 conductor ends that are inserted into the wide ends of an equivalent number of holes 2. The inclined surfaces a guide each conductor end to and through the narrow openings b (Fig. 5) of the holes. These conductor ends then protrude sufficiently to constitute pins that can 10 easily and reliably be inserted into drilled or punched holes in the circuit-board through which the conductors extend beyond the board far enough for the conductors to be wave soldered simultaneously with other components on the circuit board. Thus the cable guide receives the in- 15 line insulated, but adequately stripped, ends of the ribbon cable and converts the in-line pattern into a staggered hole pattern (Fig. 3).

The body 1 is formed with transverse notches 4 distributed lengthwise along it. These enable the body 20 to be broken into shorter pieces for accommodating ribbon cables with fewer conductors.

The locating pegs 3 are arranged so as easily and reliably to place the cable guide in a position where the outlet openings b of the holes 2 exactly face the 25 corresponding holes in the printed circuit board. These pegs 3 are formed with protrusions 5 (Fig. 6) at their free ends in order to prevent them from slipping out of the printed circuit board.

End notches 6 are provided at the ends of the cable 30 guide to receive a steel spring clip such as shown in Fig. 8 for holding the cable guide in place on the printed circuit board for assembly and wave soldering. This clip also provides strain relief for the ribbon cable by bearing on it at or near the points where the 35 cables enter the holes 2 (Fig. 2). In the case where the cable guide is broken to provide shorter lengths the

clips can be adapted to engage the half hole opening at b at one or each end of the broken piece. A further advantage of the clip is firmly to press the cable guide against the printed circuit board so as to prevent
 5 "wicking" of either the flux or the solder into the space between the cable guide and the printed circuit board, thus causing open or short circuits.

The angle c shown in Fig. 5 between the inclined surface of the hole 2 and the vertical line shown is so
 10 calculated as to provide a hold for the inserted conductor during the assembly of the cable guide and prior to stuffing the projecting conductor ends through the printed circuit board and then wave soldering.

From Fig. 2 it will be seen that the comparatively
 15 wide entry ends of the holes 2 overlap one another and are intersected by the centre line BB while the narrower outlet ends of the holes are staggered alternately on opposite sides of BB. In this example the spacing between the narrow ends is 2.54 mm. This enables 1.27 mm
 20 ribbon cable with much narrower spacing to be used when split, stripped and spread and yet enables easy insertion of the conductor ends into the printed circuit board and, at the underside of the board, the solder pads are not so crowded as to cause bridging and short circuits. With an
 25 in-line spacing of less than 2 mm between centres, for example 1.5 mm in-line conductor spacing, such difficulties would arise and the cable insertion would be difficult which is not the case with the wider spacing of the holes 2 on two staggered lines (Fig. 3). The cables
 30 may be single strand or double-tinned multi-strand conductors.

The invention is also applicable to the technology of surface mounting devices because the conductors can easily be bent 90 degrees beyond the holes 2 to coincide
 35 with conductive traces on the printed circuit board while the locating pegs 3 and the clip (Fig. 8) maintain the

cable guide in place for easy soldering and reflowing.

In one method of attaching the guide to a printed circuit board the guide is permanently moulded to the end or ends of a ribbon cable so that such end or ends can be
5 inserted into the printed circuit board, when prepared to accept such end or ends, by a simple manual or automated operation and wave or dip soldering such end or ends together with all other components inserted into the printed circuit board in one single joint operation.

10 In an alternative method the printed circuit board is furnished with at least one detachable female clip or terminal and the guide is permanently moulded to the end or ends of a ribbon cable so that the end or each end of the ribbon cable can be inserted into such a detachable
15 female clip or terminal by a simple manual or automated operation and wave or dip soldering is used to secure such female clip or terminal together with all other components inserted into the printed circuit board in one single joint operation.

**CLAIMS:**

1. A cable guide for use with stranded multi-conductor flat ribbon cable, the guide comprising a body having a row of similar through-holes with an approximately
5 conical shape to be allocated alternately or as desired to the ends of conductors in the cable, each hole being tapered from a comparatively wider opening to a substantially narrower opening and all the wider openings being on a first face of the body and all the narrower
10 openings being on a second face of the body with the wider openings in a row transversely overlapping one another along an imaginary straight line on said first face and the narrower openings being staggered on opposite sides of a second imaginary straight line on
15 said second face whereby stripped ends of the conductors can be easily converted from an in-line pattern to a staggered pattern at the narrower openings.
2. A cable guide according to Claim 1, comprising a clip integrally or detachably mounted on the body beyond
20 the ends of the row of wider openings to extend over the conductors when entering the wider openings and provide strain relief by exerting pressure on the conductor assembly.
3. A cable guide according to Claim 1 or Claim 2, in
25 which the tapered formation of each hole is defined by an inclined wall surface extending from an arc of the wider opening to a registering arc of the narrower opening and a wall surface extending perpendicularly to the body faces between arcs of the wider and narrower openings
30 opposite the first mentioned arcs.
4. A cable guide according to any one of the preceding claims, in which the body is formed with weakened surfaces enabling it to be broken transversely to the row of holes to provide two or more serviceable shorter cable
35 guides.
5. A cable guide according to any one of the preceding



claims, in which the body is provided with pegs for fitting into location holes in a printed circuit board to which the cable guide is to be secured with the narrower openings against the board.

5 6. A cable guide for use with a stranded multi-conductor flat ribbon cable, the guide comprising a body having a row of similar through-holes to be allocated respectively to adjacent or random ends of conductors in the cable, each hole being tapered from a comparatively
10 wider opening to a substantially narrower opening and all the wider openings being on a first face of the body and all the narrower openings being on a second face of the body, and a clip integrally or detachably mounted on the body on top of the row of wider openings to extend over
15 the conductors, when they have entered the wider openings and provide strain relief by exerting pressure on the conductor assembly.

7. A cable guide according to any one of the preceding claims, in which the separation between adjacent narrower
20 openings is not less than 2 mm between their centres.

8. A cable guide substantially as hereinbefore described with reference to the accompanying drawings.

9. A method of attaching a cable guide according to any one of the preceding claims to a printed circuit
25 board in which the guide is permanently moulded to the end or ends of a ribbon cable so that such end or ends can be inserted into the printed circuit board, when prepared to accept such end or ends, by a simple manual or automated operation and in which such end or ends
30 together with all other components inserted into the printed circuit board are wave or dip soldered in one single joint operation.

10. A method of attaching a cable guide according to any one of Claims 1 to 8, to a printed circuit board
35 furnished with at least one detachable female clip or terminal, the guide being permanently moulded to the



end or ends of a ribbon cable so that the end or each end of the ribbon cable can be inserted into such a detachable female clip or terminal by a simple manual or automated operation and wave or dip soldering is used to
5 secure such female clip or terminal together with all other components inserted into the printed circuit board in one single joint operation.

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