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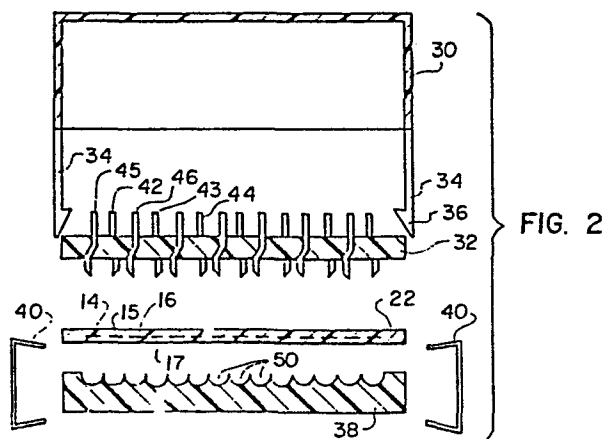
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Electrical connector blocks.

An electrical connector block (10) for a flat ribbon cable having a plurality of conductors (14 to 17) lying side-by-side in an insulating ribbon (22) comprises a base (32) having a plurality of terminals (42 to 46) extending therethrough and lying in a plurality of rows. Each terminal (42 to 46) has an upper connection end and a lower insulation-piercing end. At least one terminal (42 to 46) is aligned with each conductor (14 to 17) in the ribbon (22) so that, when the base (32) is pressed against the ribbon, the terminals contact the conductors of the ribbon. Components can be connected between terminals (42 to 46) of each row and held on the base (32) for interconnecting conductors (14 to 17) in the ribbon (22) or connecting the conductors to ground. A top cover (30) includes a recess for covering the components and is engaged over the base (32) while a button cover (38) is engaged under the base and includes a plurality of slots (50) for accommodating any displacement of the ribbon (22) after it has been pierced by the insulation-piercing ends of the terminals (42 to 46).



ELECTRICAL CONNECTOR BLOCKS

This invention relates to electrical connector blocks for a flat ribbon cable having a plurality of conductors lying side by side in an insulating ribbon.

5 The proper grounding of electrical equipment is important, since transients may be generated internally or externally of the equipment which must find a pathway to ground or else damage may occur to the equipment or injury may occur to persons handling the equipment.

10 Transient protectors absorb this energy and minimise damage or prevent excessive voltage from leaving the equipment. Typically, the transient protectors are soldered onto a circuit board or to a connector. High density boards, however, have little room for such transient protectors. Moreover, standard insulation displacement connectors do not have exposed metal where the transient protectors can be added.

15 A particular danger may exist in cathode ray tubes (CRTs) in that high voltage in CRTs could propagate outside the enclosure of the devices via signal lines connected to the devices. Such propagation can cause fire, shock and/or equipment damage. Another concern is that the high voltage in the signal wires can arc over to other circuits or bare metal. If these wires are connected to equipment in a hazardous location, such as in the proximity
20 of flammable or explosive material, this arc can cause ignition of this material.

25 It is desirable that any voltage on any signal leading out of a CRT be less than 250 volts a c with respect to ground (earth). The anode voltage in a CRT could be 14,000 to 35,000 volts. The capacitance of the anode could be 500 to 2,500 pF.

Transient protectors for lines leaving a CRT would thus be desirable, particularly in view of the small amount of space which is generally available on circuit boards of such devices.

30 Electrical connector blocks having insulation-piercing bifurcated contacts or tines for the formation of electrical connections have been described in US Patent Nos. US-A-3 012 219 and US-A-3 820 058. These

connector blocks include one or more rows of insulation-piercing contacts for piercing the insulation of a multi-conductor ribbon cable or other insulated conductors. Also, a number of connector blocks are known in the prior art for common or ground termination of alternate drain conductors or a ground plane in a multi-conductor flat ribbon cable. Such connector blocks are disclosed in US Patents Nos. US-A-3 634 806, US-A-3 731 251, US-A-3 864 011 and US-A-3 912 354.

The prior art does not teach the placement of components such as signal conducting resistors or surge suppression devices in shunt or parallel with two or more conductors in a ribbon cable.

According to one aspect of the invention there is provided an electrical connector block for a flat ribbon cable having a plurality of conductors lying side-by-side in an insulating ribbon, the block comprising:

a base member capable of lying over a portion of the ribbon cable;

a plurality of terminal contacts extending through the base member and each having an upper connection end and a lower insulation-piercing end, the plurality of terminal contacts being disposed in the base member in a pattern such that at least some of the terminal contacts are engageable via the insulation-piercing ends thereof with at least some of the conductors of the ribbon cable;

a bottom cover engageable on an opposite side of a ribbon cable from the base member;

mounting means connected between the base member and the bottom cover for urging the base member and bottom cover together with a ribbon cable therebetween; and

at least one component connected between at least two of the plurality of terminal contacts for connection to at least one conductor of the ribbon cable.

According to a second aspect of the present invention there is provided an electrical connector block for flat, ribbon cables which includes a base for carrying a plurality of terminals having at least one insulation piercing end, a top cover portion and a bottom cover portion, the ribbon being fixed between the base and bottom cover portion with the top cover portion having a recess for containing components connected between terminals on the base, and the bottom cover portion including a plurality of cavities which provide room for the insulation piercing end of the terminals

which can project through the insulation of a ribbon and into contact with a conductor of the ribbon.

Preferred embodiments of the present invention described in detail hereinbelow provide a connector block which is particularly suited for a ribbon cable and provides contact to conductors in the cable as well as locations for mounting components on the block, which components are connected between conductors in the cable or between a conductor and a ground connection. The preferred connector blocks are provided on the ribbon itself so that there is no need for access to or space on a circuit board to which the ribbon may be connected. This also facilitates retrofitting of pre-existing assemblies.

The preferred electrical connector blocks are simple in design, rugged in construction and economical to manufacture.

The invention will now be further described, by way of illustrative and non-limiting example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective, exploded view of an electrical connector block embodying the invention;

Figure 2 is an exploded sectional view of the connector block of Figure 1;

Figure 3 is a side elevational view of the connector block in an engaged position on a ribbon;

Figure 4 is a top plan view of a base of the connector block of Figure 1;

Figure 5 is a top plan view of a base of another electrical connector block embodying the invention;

Figure 6 is a side elevational view of the base of Figure 5, shown without components; and

Figure 7 is a side elevational view of a circuit board with ribbon connector outfitted with an electrical connector block embodying the invention.

Figures 1, 2 and 3 show an electrical connector block 10 for a flat ribbon cable 12 having a plurality of side-by-side conductors 14 to 17 which are enclosed within an insulating ribbon 22.

The block 10 comprises a top cover 30 which covers components connected to a base member or base 32. The top cover 30 includes arms 34

with hooks or shoulders 36 which engage under a bottom cover 38. The arms 34 have the dual purpose of holding the cover 30 on the base 32 as well as holding the bottom cover 38 up into engagement with the ribbon 12. Spring metal clips 40 are provided on both ends of the block 10 and on either side of the arms 34 for holding the base 32 to the bottom cover 38.

The base 32, as shown best in Figure 2, includes a plurality of terminals or contacts 42 to 46. Each contact 42 to 46 extends through the base 32 and includes a lower insulation piercing end. The lower insulation piercing end can be bifurcated (not shown) or tine-shaped. It is important the insulation piercing end of each of the terminals or contacts 42 to 46 be sufficiently long to pierce the insulation of the ribbon 22 and come into contact with one of the conductors 14 to 17 in the ribbon.

To further facilitate this contact, the bottom cover 38 is provided with a plurality of cavities or recess slots 50 which are disposed under each conductor to accommodate any displacement of the ribbon 22 after it has been pierced by the insulation-piercing ends of the terminals or contacts 42 to 46.

The terminals or contacts 42 to 46 automatically pierce the insulation and come into contact with the conductors 14 to 17 when the block 10 is assembled.

As shown in Figure 4, a plurality of components 52, 53 and 54 can be connected, for example by soldering, between terminals in a first row of terminals containing the contacts 42, 43 and 44 and a second row of terminals containing the contacts 45 and 46. These components may, for example, be resistors or diodes. In Figure 4, the component 52 is shown connected between adjacent conductors 14 and 15 by virtue of its being connected to the terminals 42 and 45. In a similar fashion, the component 53 is shown connected between terminals 43 and 46 and thus interconnects adjacent conductors 16 and 17. Components can be arranged in other manners, however, to connect any one conductor with any other conductor and also to provide this connection with a selected component, such as a resistor or diode.

Figures 5 and 6 illustrate an embodiment of the invention used as a transient protector. In this case, the base 72 includes a first row of terminals or contacts at 74 and a second row at 76. A bus line 78 having slots 80 is fixed near the centre of the base 72. Transient protection for

each conductor including conductors 19, 20 and 21 is provided by a ground wire 82 which has one end fixed, for example by clamping or soldering, to the bus line 78.

Figure 7 shows a ribbon cable 12 connected between a circuit board 90 and a standard displacement connector 92. At some point along the ribbon cable 12, the connector block or box 10 is engaged and is shown with the ground wire 82 connected by a nut and bolt combination to a chassis 94 which supports the circuit board 90.

CLAIMS

1. An electrical connector block (10) for a flat ribbon cable (12) having a plurality of conductors (14 to 17) lying side-by-side in an insulating ribbon (22), the block (10) comprising:

5 a base member (32; 72) capable of lying over a portion of the ribbon cable (12);

a plurality of terminal contacts (42 to 46) extending through the base member (32; 72) and each having an upper connection end and a lower insulation-piercing end, the plurality of terminal contacts being disposed in the base member (32; 72) in a pattern such that at least some of the
10 terminal contacts are engageable via the insulation-piercing ends thereof with at least some of the conductors (14 to 17) of the ribbon cable (12);

a bottom cover (38) engageable on an opposite side of a ribbon cable (12) from the base member (32; 72);

15 mounting means connected between the base member (32; 72) and the bottom cover (38) for urging the base member and bottom cover together with a ribbon cable (12) therebetween; and

at least one component (e.g. 52) connected between at least two of the plurality of terminal contacts (42 to 46) for connection to at least one conductor (14 to 17) of the ribbon cable (12).

20 2. An electrical connector block according to claim 1, wherein the plurality of terminal contacts (42 to 46) lie in a pair of spaced-apart rows, the at least one component (e.g. 52) is connected between a terminal contact of one row and a terminal contact of the other row, and a spacing between each terminal contact in each row is at least equal to a spacing
25 between side-by-side conductors (14 to 17) in the ribbon cable (12).

3. An electrical connector block according to claim 2, wherein each terminal contact in one row is spaced by an amount to engage each other conductor in the ribbon cable (12) and each conductor in the other row is spaced to engage a conductor not contacted by a terminal contact of the
30 first-mentioned row.

4. An electrical connector block according to claim 1, claim 2 or claim 3, including a top cover (30) having a recess and engaged over the base member (32; 72) for covering the at least one component (e.g. 52) and the terminal contacts (42 to 46).

5 5. An electrical connector block according to claim 4, wherein the top cover (30) includes a pair of arms (34) extending towards and engaged or engageable with the bottom cover (38) on opposite sides of the bottom cover.

10 6. An electrical connector block according to claim 5, wherein the mounting means includes a plurality of clips (40) engaged or engageable between the base member (32; 72) and the bottom cover (38) for holding the base member and the bottom cover together.

15 7. An electrical connector block according to claim 4, wherein the mounting means includes a plurality of clips (40) engaged or engageable on opposite sides of the base member (32; 72) and bottom cover (38), and between the base member and bottom cover, the mounting means also including the top cover (30) having a pair of arms (34) extending towards and into engagement with the bottom cover (38) for holding the top cover (30) to the bottom cover and the base member (32; 72) and the ribbon cable (12)
20 between the top cover and bottom cover.

FIG. 1

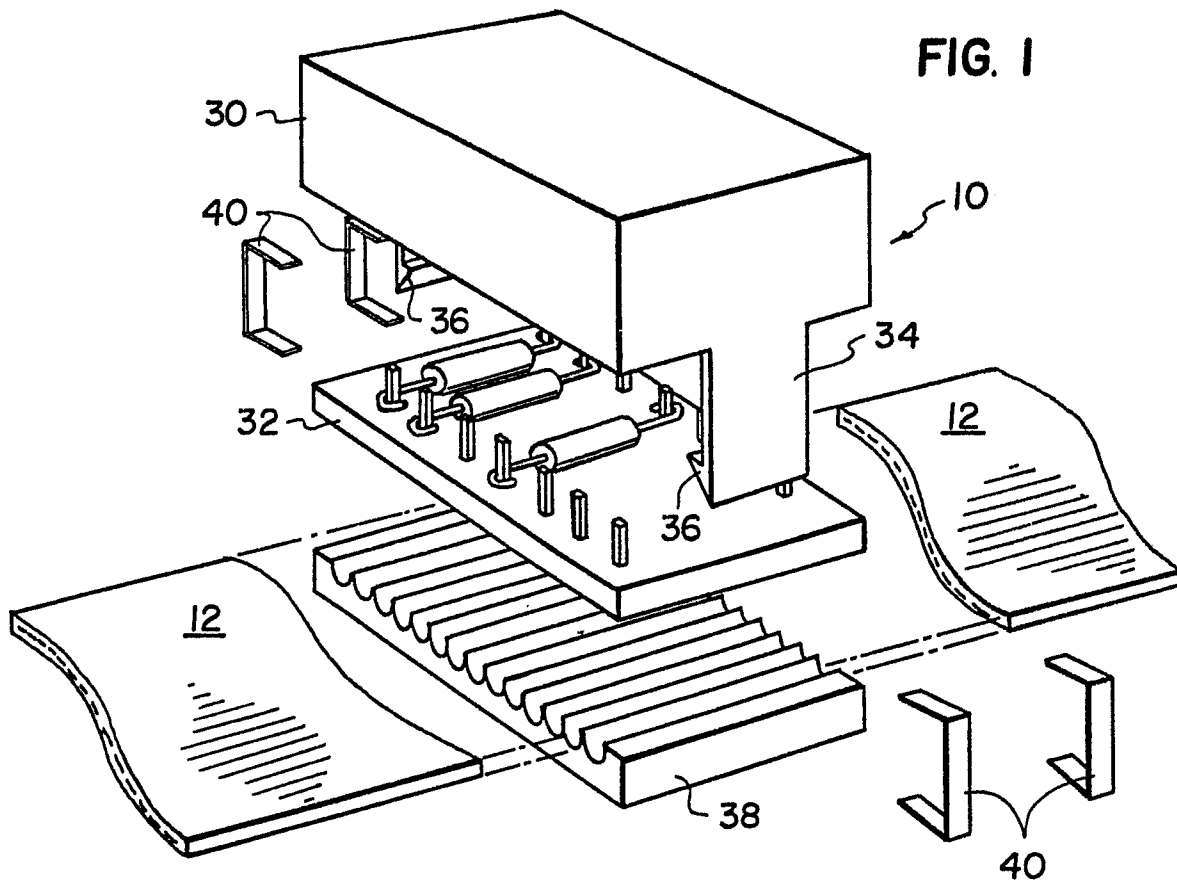
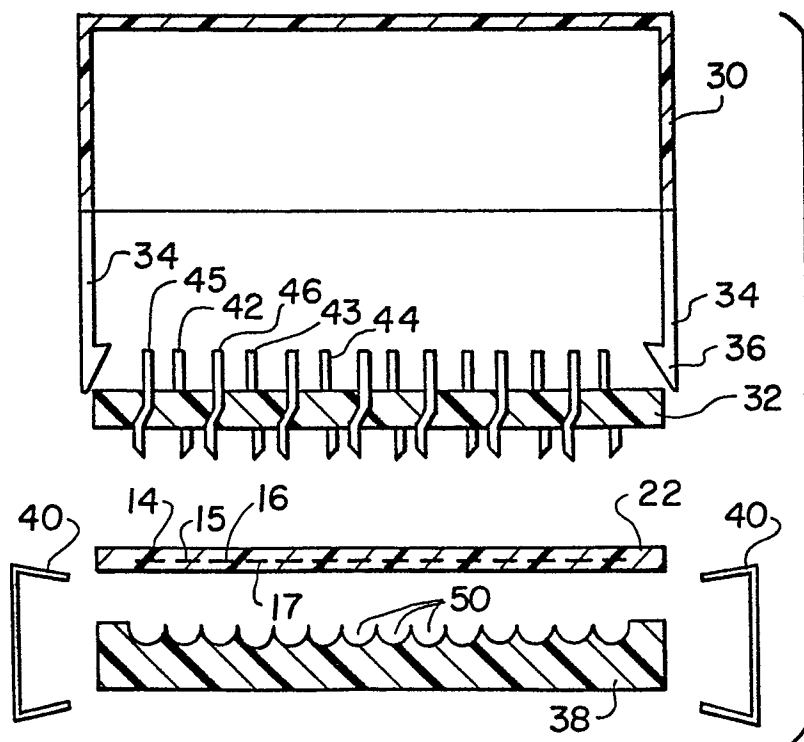
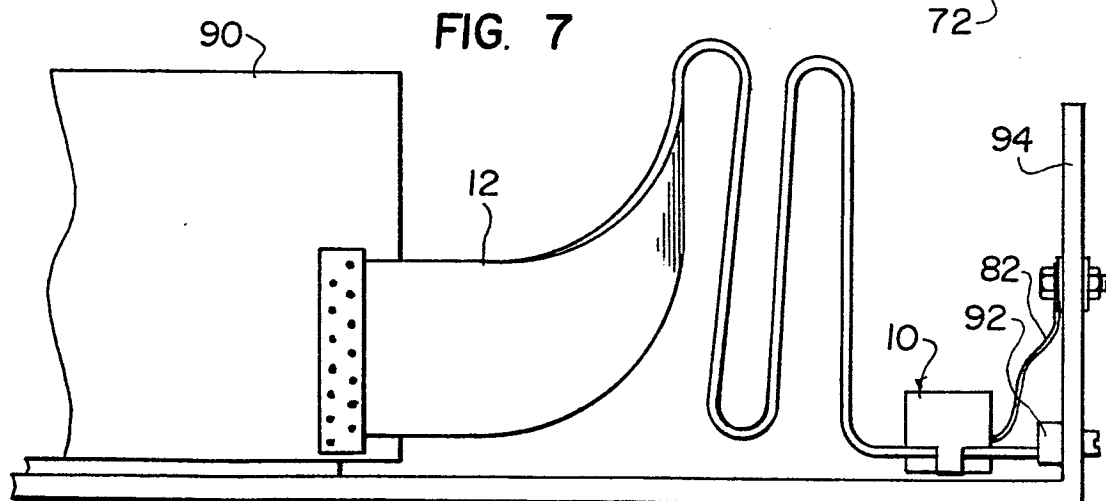
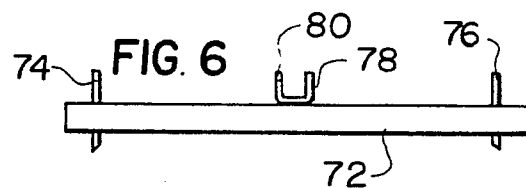
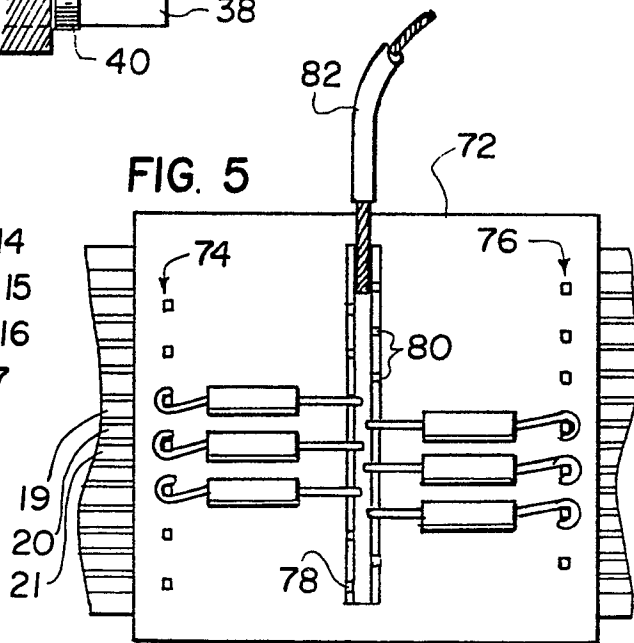
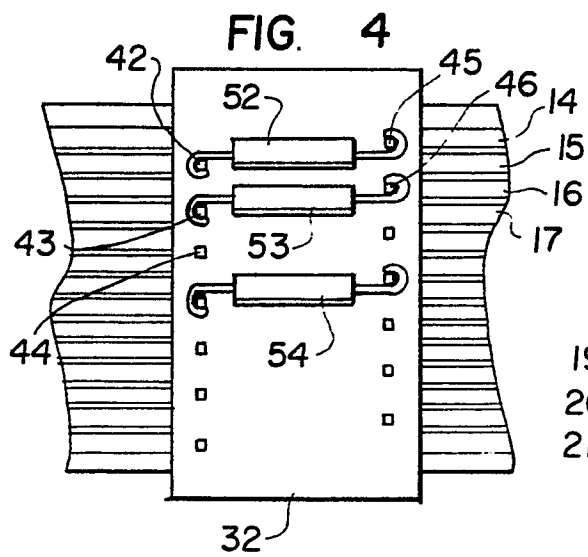
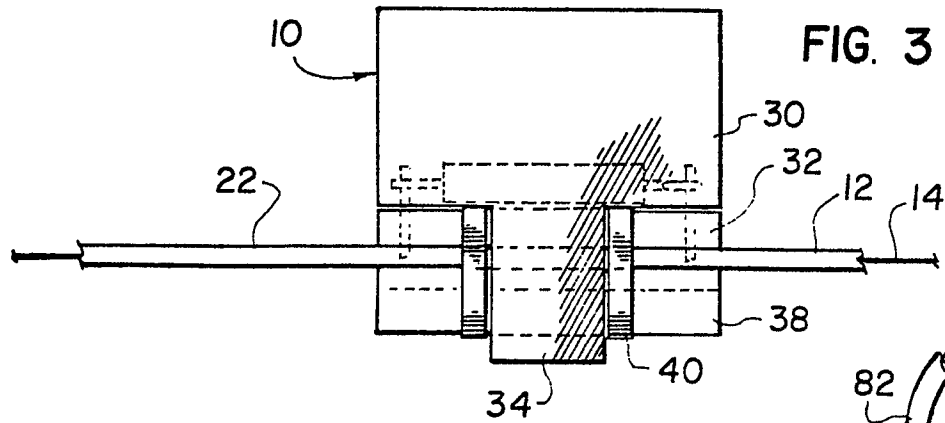


FIG. 2







DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	EP-A-0 043 627 (DU PONT) * Figure 1; page 3, line 9 - page 5, line 3 *	1-5,7	H 01 R 23/66
Y	DE-A-3 309 837 (SONY) * Figures 2-7; claim 1; page 6, line 33 - page 9, line 15	1-5,7	
A	US-A-4 027 941 (NAROZNY) * Figures 1-11; column 3, line 39 - column 6, line 11 *	1-5	
A,D	US-A-3 912 354 (CAMPBELL et al.) * Figures 1-19; column 1, line 56 - column 3, line 14 *		
A,D	US-A-3 820 058 (FRIEND) * Figures 1-3; column 2, lines 16-46 *		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			H 01 R 23/66 H 01 R 9/07 H 01 R 13/66 H 05 K 3/00 H 05 K 7/02
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 14-06-1985	HAHN G Examiner
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	