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(54) Releasable electrical connector

(57) A releasable electrical connector comprises carriers (2, 4, 6, 8, 10, 12) on which are formed parallel conducting strips (29), and insulating separators (14, 16, 18, 20, 22, 24) which support and separate the carriers so that they interdigitate on the connectors mating. The carriers are mounted within a casing (figs 4, 5, not shown) which causes the interdigitating parts of the carriers to be clamped together on mating.

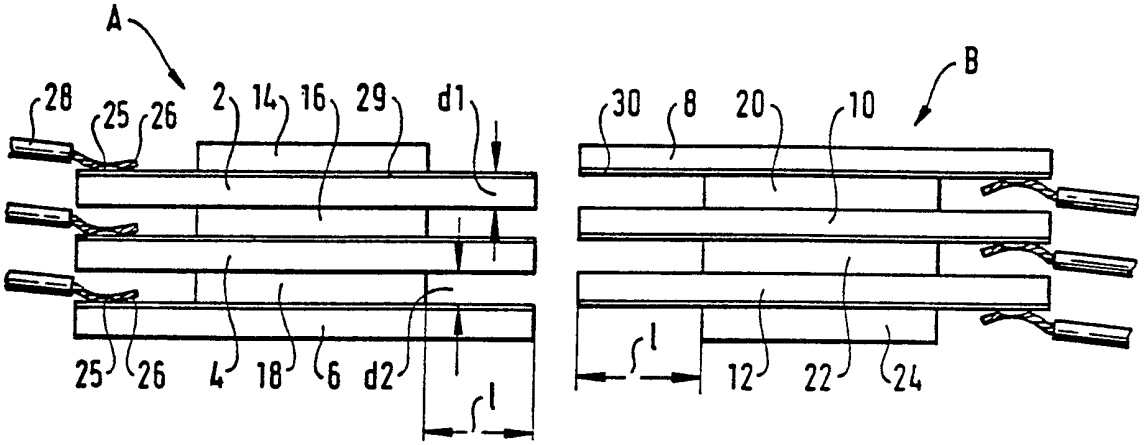

FIG. 1

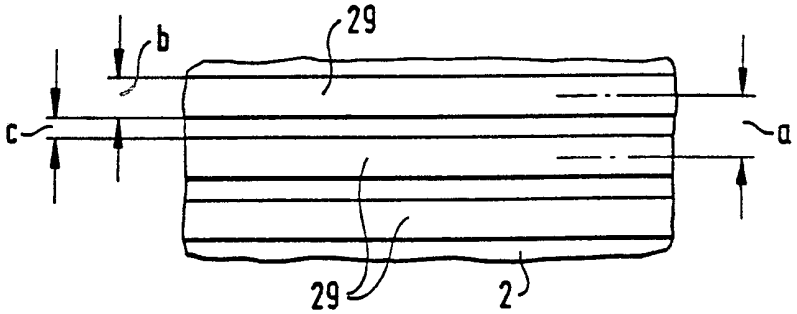

FIG. 3

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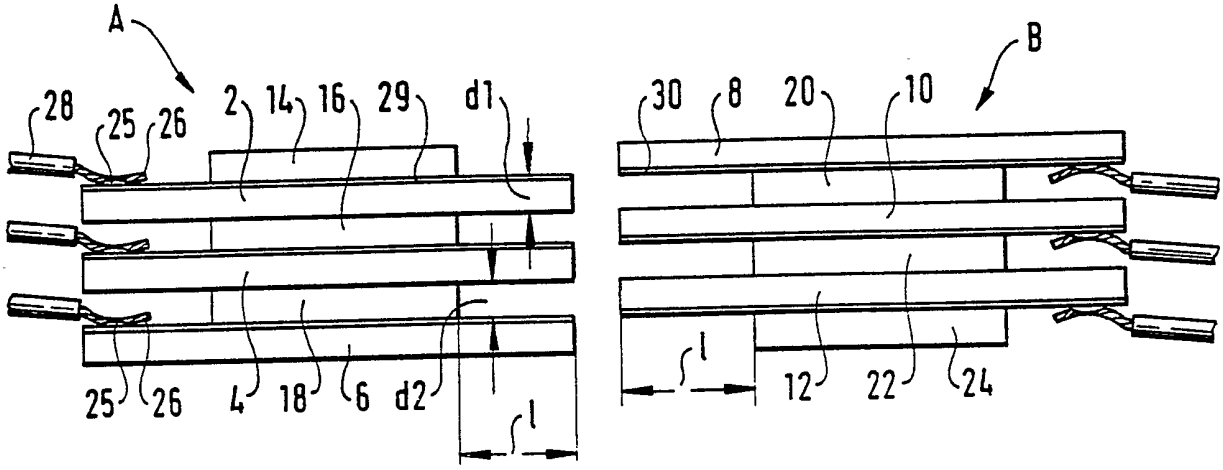

FIG. 1

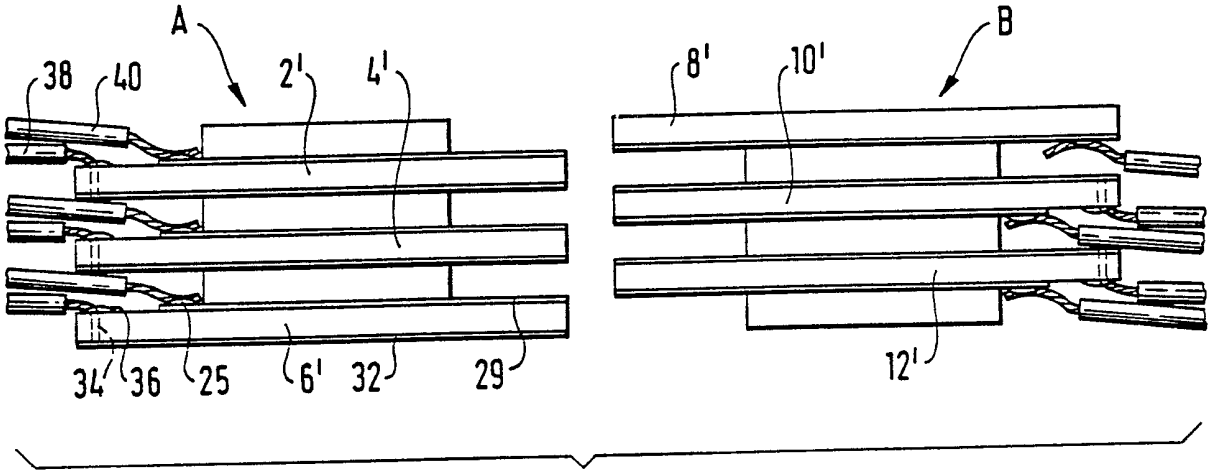

FIG. 2

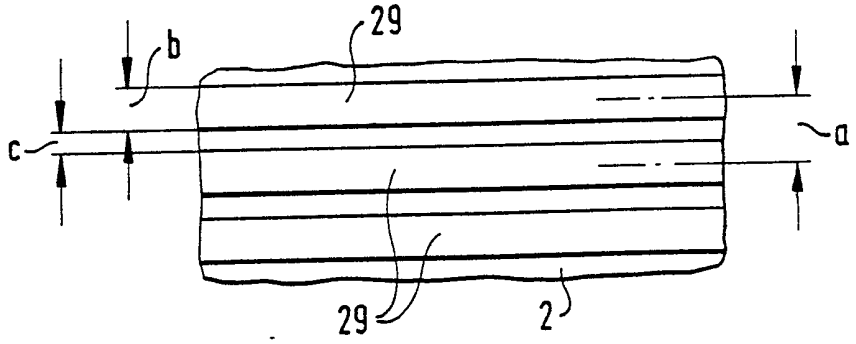

FIG. 3

FIG. 4

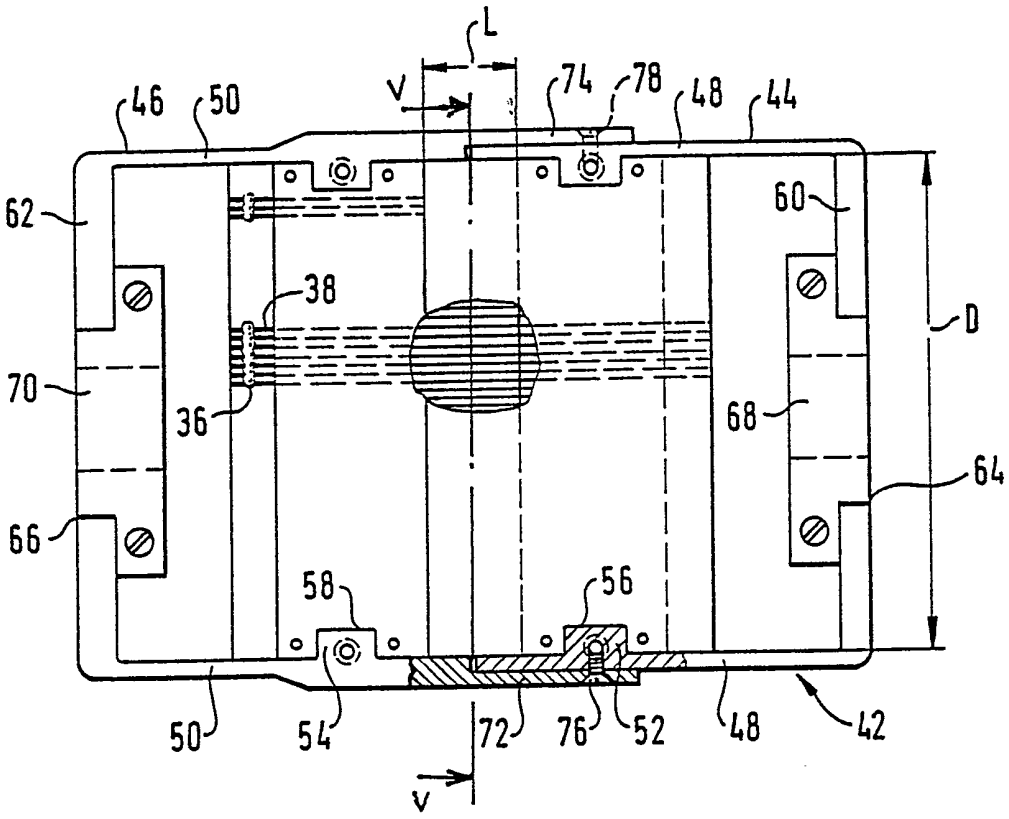
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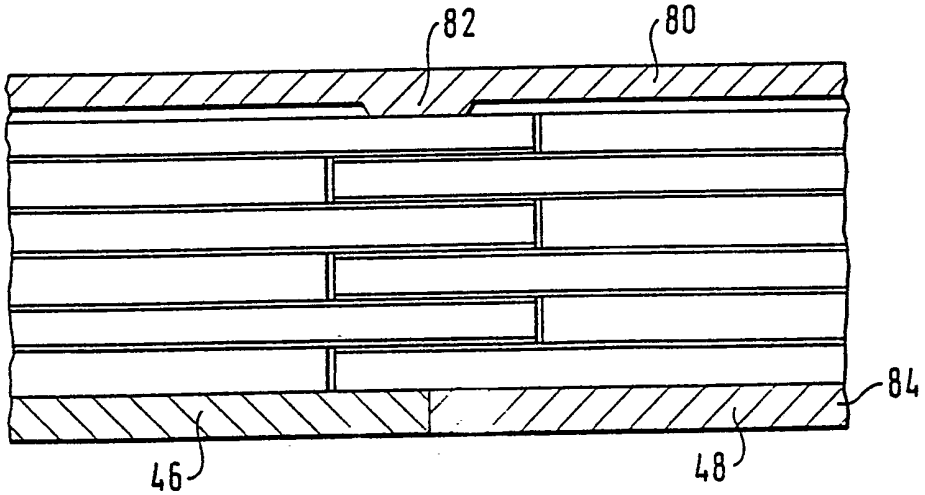
FIG. 5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Releasable electrical connector

The present invention relates to a releasable electrical connector with parallel contacts for a plurality of insulated conductors.

Electrical connectors of the kind described are known especially as plug connectors in the computer industry (German Industrial Standard 41612, German GM 76 31 033), which may for instance be made in a three-rowed structure with 96 poles. The connection elements in this case are round plug pins in a plug part and corresponding sockets in a socket part.

Also known is a connector arrangement for connecting together a plurality of connecting wires according to a predetermined wiring scheme by means of printed circuit boards which are stacked spaced one above the other in a frame and are held parallel to one another, in which arrangement each circuit board has current paths at least on one side and the connecting wires are connectable to the edge contacts of the circuit board by means of plug connectors having a plurality of contacts, and edge contacts of selected current paths of different circuit boards are connected together by insertable comb-like contact strips extending transversely to the circuit board plane (German Published Specification 19 27 050).

In measurement technology it is often necessary to provide several hundred signal paths. In cable strands of this kind which contain 300 to 600 conductors it is necessary for technical reasons to incorporate disconnection or junction points. When plug connectors in accordance with German Industrial Standard 41612 are

used, 3 to 7 plug connectors would have to be provided in this case. Disconnection or junction points of this kind therefore require considerable space.

The present invention seeks to provide a releasable electrical connector which is light and as small as possible in volume and is also easy to handle.

According to the present invention, there is provided an electrical connector for a plurality of insulated conductors with contact carriers, which are arranged in a casing with two casing parts capable of being separated and of being locked together, and which carriers are capable of being secured against lateral and longitudinal movement in the casing, wherein a plurality of contact strips are located parallel to one another on each contact carrier, each contact strip having at one end a soldering point for a respective conductor, the contact carriers are arranged one above the other and are held, by insulating spacer elements, at intervals (d_2) corresponding to the thickness (d_1) of the contact carriers, and end sections of the contact carriers project beyond the spacer elements, and the casing is provided with means by which contact pressure can be applied to the projecting and mutually engaging ends of the contact carriers.

Plugs according to the invention have a high packing density as regards their contacts. Moreover their use is simple, more particularly the making of the soldered connections for the conductors to be connected.

In one preferred arrangement, the width (b) of co-operating contact strips on the mutually engaging contact carriers is different.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 shows a connector with the two connector parts, in accordance with a first embodiment;

Figure 2 shows a connector according to a second embodiment of the invention;

Figure 3 shows a plan view of a section of a contact carrier of a connector according to Figures 1 or 2;

Figure 4 shows in plan view and partly in section a casing for a plug connector according to Figures 1 to 3; and

Figure 5 shows a section on line V-V in Figure 4.

The basic structure of a connector according to the present invention is illustrated in Figures 1 and 3. The connector consists of two connector elements A and B. Each of these elements consists of a stack of contact carriers 2,4,6 in the connector part A and 8,10,12 in the connector part B. In each case these contact carriers are located at a spacing one above the other, which is predetermined by spacer elements 14,16,18 in connector part A and 20,22,24 in the connector part B.

The contact carriers consist of hard plastics sheets, which preferably have a thickness d_1 of 0.5mm. The spacer elements have a thickness d_2 which corresponds to thickness d_1 and thus may also amount to 0.5 mm. The spacer elements also consist of a hard plastics

sheet.

In the embodiment according to Figure 1 a plurality of contact strips 29 located parallel to one another are arranged on the surface of the contact carriers. As shown in Figure 3 these strips have a centre-to-centre distance a which amounts to between 1 mm and 1.75 mm. The width b of the strips is then about 70% of the centre-to-centre spacing a. With a centre-to-centre spacing a of 1 mm the strip width b is thus 0.7mm and the strips have a spacing of 0.3mm from one another. At the left hand end, in Figure 1, of the contact carrier 2, a respective soldering point 25 is provided for each of the contact strips, and the stripped end 26 of the cable 28 to be connected is soldered on to this point.

The length of the spacer elements 12,14 and 15 in the direction of the length of the contact strips is made such that the soldering point 25 is free at one end of the contact carrier 2. At the opposite end a predetermined length l of the contact carrier projects beyond the spacer element.

The contact strips may be made in the form of a printed circuit and gold plated to obtain high reliability in contacting.

Contact strips 30 on contact carrier 8 of the connector part B co-operate with the contact strips 29 on the contact carrier 2. These strips are arranged at the same centre-to-centre spacing a as the contact strips on the contact carrier 2. Here, however the width b of the contact strips is preferably narrower than the width of the contact strips 29 on the contact carrier

2, so that having regard to the installation tolerances of the contact carriers in a casing, which will be described later, a reliable overlap of contact strips that belong together is ensured. To make contacting possible, the stack of contact carriers and spacer elements in the connector part B is arranged as the mirror image of the arrangement in the connector part A. Therefore, with a connector having 8 contact carriers in a stack one above the other, 8 x 80 = 640 conductors can be connected together.

When flat or ribbon cables with an element spacing of 1.75 mm are used, with a corresponding centre-to-centre spacing of 1.75 mm of the contact strips and with the same width, 45 conductors can be connected to a contact carrier, and with 8 contact carriers, therefore, 360 conductors can be connected. The whole connector then has a width of 85 to 90 mm and a thickness of 8 mm not including he casing wall thicknesses, and can be made with a total length of 12 to 15 cm including the casing.

Still smaller dimensions can be achieved with the embodiment according to Figure 2. In this embodiment the construction of the contact carriers and of the spacing elements is basically the same as in the embodiment according to Figure 1. This embodiment differs from that of Figure 1 in that the contact carriers 2′ to 12′, of which only the contact carrier 6′ will be described here, are provided on both sides with contact strips 29 and 32 arranged parallel to one another. The contact strips 32 located at the bottom in Figure 2 are contacted at the left hand outside end of the contact carrier 6′, through this carrier and are connected, via this connection 34, with a soldering

point 36 on the top side of the contact carrier 6'.

The contact strips 29 on the top side of the contact carrier 6' end at a spacing from the soldering point 36. The soldering point 25 of the contact strip 29 located on top of the contact carrier is then located at a spacing from the soldering point 36. This spacing must be made such that reliable soldering of the connection wires 38 and 40 is possible.

When contact strips are arranged on both sides of the contact carriers 2' to 12' the number of contacts on one carrier is doubled,so that for the example given above, for the total number of connections given in each case the number of contact carrier plates is reduced to n/2 + 1(n = number of boards with strips on one side as in Figure 1). The thickness of the stacks of the connector parts A and B is correspondingly reduced.

Figure 4 illustrates an embodiment of a separable casing 42 for the connector parts A and B, which have been described above. The casing 42 has two casing parts 44 and 46. These casing parts are provided with side walls 48 and 50 which are arranged at a spacing D. This spacing D is made with a tolerance which ensures that the contact carriers of the two connector parts A and B, which are made with a corresponding tolerance, are so held over their width in the casing as to ensure the necessary contact overlap of the contact strips.

On the walls 48 and 50 projections 52 and 54 are formed which engage in corresponding depressions 56 and 58 in the contact carriers and spacer elements and prevent these from moving in the direction of the length of the

contact strips. Instead of a tolerance D, the distances between the mutually opposed surfaces of the projections 52 and 54 and bottoms of the depressions 56 and 58 may alternatively be made with a corresponding tolerance. For the depressions 56 and 58, the contact carriers are provided with edges of suitable width. In the embodiment illustrated, contact carriers according to Figure 2 are provided which are indicated by their soldering points 36 and 38.

In the end walls 60 and 62 of the casing parts 44 and 46,openings 64 and 66 are formed, through which the cables extend outwards. In the region of these openings cable holders 68 and 70 are provided, by which the cable sections located on the inside are relieved of tension.

The casing part 46 is provided with arms 72 and 74 which engage laterally over the casing part 44 and which may also be formed as guides. In the region of the projection 52 of the casing part 44 these arms 72 are connected to the casing part 44 by means of screws 76 and 78.

The contact carriers of the two connector parts A and B engage over one another over the length L which is greater, by a tolerance addition, than the distance $\underline{1}$ by which the contact carriers project beyond the spacer elements.

On its top side with reference to Figure 4 the casing is provided with a cover plate which is shown in Figure 5. By means of this cover plate 80, in the central region a contact pressure means (in this case a rib 82) acts on the region of overlap of the contact carriers

and thereby applies the necessary contact pressure against the bottom 84 of the casing 42, which may be provided with a corresponding rib or ridge.

The individual contact plates or boards, wafers, decks etc may each be connected separately to the cables to which they belong. Since all soldering points are arranged side by side on one side of the contact plates, soldering can take place in one plane. After the soldered connections have been made the individual conductors or alternatively flat cables are put together and jacketed and then with the contact plates put into the respective casing parts, in which the cable bundle is fixed by means of the cable holders 68 and 70. After the connector parts A and B respectively have been introduced into the two casing parts 44 and 46 in this may, the two casing parts can be pushed together, whereupon the contact carriers of one connector part are respectively introduced between the contact carriers of the other casing part. In some cases the contact plates may be made with a bevel on their outer ends, which facilitates the introduction more particularly of high stacks. After the casing parts have been secured together, for instance by introduction of the screws 76 and 78 described above, the cover plate 80 is put on and contact pressure is applied by way of the rib 82 as pressure means.

Claims

1. An electrical connector for a plurality of insulated conductors with contact carriers, which are arranged in a casing with two casing parts capable of being separated and of being locked together, and which carriers are capable of being secured against lateral and longitudinal movement in the casing, wherein a plurality of contact strips are located parallel to one another on each contact carrier, each contact strip having at one end a soldering point for a respective conductor, the contact carriers are arranged one above the other and are held, by insulating spacer elements, at intervals (d_2) corresponding to the thickness (d_1) of the contact carriers, and end sections of the contact carriers project beyond the spacer elements, and the casing is provided with means by which contact pressure can be applied to the projecting and mutually engaging ends of the contact carriers.

2. An electrical connector according to Claim 1, wherein the contact carriers comprise hard plastics sheets.

3. An electrical connector according to Claim 1 or 2, wherein the contact carriers are provided with contact strips on both sides.

4. An electrical connector according to Claim 3, wherein the contact strips on one side of the contact carriers are each connected, by a connection extending through the carrier, with a respective soldering point on the other side of the contact carrier and this soldering point is in each case arranged at a spacing from the soldering point for the contact strip on said

other side of the contact carrier.

5. An electrical connector according to any preceding claim, wherein the width (b) of co-operating contact strips on the mutually engaging contact carriers is different.

6. An electrical connector according to any preceding claim, wherein, on the inner sides of the casing, projections are provided as stops and engage in depressions in the longitudinal sides of the contact carriers.

7. An electrical connector according to any preceding claim, wherein a cover plate engaging over both casing parts is provided for the casing and has a rib for applying the contact pressure.

8. An electrical connector substantially as herein described with reference to each of the accompanying drawings.

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