

"CONNECTOR"

The present invention relates to a connector for flat electric cable which is used for wiring electronic equipment such as a computer.

Flat electric cable, which is frequently employed for wiring electronic equipment, is manufactured by juxtaposing plural conductors and molding the assembled conductors with insulation material into a tape-shaped cable.

To connect flat electric cable to a printed circuit board in electronic equipment, a connector and a terminal block shown in Figs. 1A-1C can be employed. Fig. 1A is a perspective view of the connector. The connector includes a housing 2 having a cable insertion hole 3 and a plurality of resilient contacts 4 arranged in the cable insertion hole 3. As shown in Fig. 1C which is a sectional view taken along line X-X' in Fig. 1A, each of the contacts 4 has a portion extending through the housing 2 to serve as a leg 5 of the connector terminal. In Figs. 1A and 1C, reference numeral 10 designates partition walls which are formed on the inner surface of one side of the housing.

The terminal member 6 of the flat electric cable which is inserted into the cable insertion hole 3 of the connector is formed as follows. End portions of the conductors 8 of the flat cord 7 are exposed by removing portions of the insulation

material from the cable after which a plastic plate 9 is bonded to one side of the flat cable 7. The plastic plate 9 is longer than the exposed parts of the conductors 8. Flat electric cables with such terminal members 6 are commercially available.

In the connector 1, the legs 5' of the terminals are arranged at equal intervals at a pitch A in a single line. The pitch A of the legs is equal to the pitch P of the conductors 4 in the connector, that is, the pitch B of the conductors in the flat electric cable.

The legs 5 of the connector terminals are soldered to a printed circuit board or the like. In view of the accuracy of a pattern formed on a printed circuit board and the accuracy and reliability of the legs which are soldered to the printed circuit board, the pattern pitch corresponding to the pitch A of the legs 5 of the connector terminals is limited. Accordingly, it is not practical to reduce the pitch A to less than a certain limiting value. In the case of manufacturing the connectors on a large scale, the limiting pitch of the legs along the same line is 1/10 inch. That is, it is impossible to decrease the pitch of the legs 5 to less than that value so that the density of the connector terminals is correspondingly limited.

Accordingly, the primary object of the present invention is to eliminate the above-described difficulties accompanying a conventional connector.

Furthermore, with the connector constructed as described above, the terminal member is maintained inserted in the connector only by the depression force of the elastic contacts 3. Accordingly, the terminal member of the cable is readily removable from the connector. That is, this connector arrangement is disadvantageous in that it has a low reliability. This drawback may cause an especially serious problem when the number of conductors in the cable is small and the depression force is accordingly small.

In order to overcome this drawback and to increase the force required for removing the terminal member from the connector, terminal members as shown in Figs. 5A and 5B have been employed.

In the example shown in Fig. 5A, cuts 14 are formed in the edge portions of the terminal member 6' of the flat electric cable 7 including the plastic plate 9'. In order to lock the terminal member 6' in the connector, it is necessary for the connector to be provided with protrusions or keys which can freely go in and out of the cuts 14 located at the positions inside the connector housing which correspond to the cuts 14. With such a construction the terminal member 6' and the connector are necessarily bulky and intricate in construction.

In the example shown in Fig. 5B, holes 16 are formed in one side of the terminal member 6" and between conductors 8 of the flat cable 7. In order to lock the terminal member 6",

it is also necessary for the connector to be provided with protrusions or keys which can freely go in and out of the holes 16 at positions inside the connector which correspond to the holes 16. In addition, it is
5 necessary to increase the distance between adjacent conductors in order to accommodate the holes making the space required for the terminal member significantly larger. Therefore the connector and the terminal member are necessarily bulky and intricate in construction.

10 According to a first aspect of the invention, a cable connector for detachable connection to a flat electric cable comprises a housing having a cable insertion hole formed therein to receive an end portion of said cable in electrical connection with contacts within the
15 housing, and terminal members having legs of equal length extending outwardly from the housing initially in a single line, a first group of said legs being bent substantially at 90° to a first side of the housing and then at 90° to extend in the axial direction of the
20 connector, a second group of said legs alternating with legs of the first group being bent substantially at 90° towards the opposite side of said housing from said first side and then substantially at 90° to extend parallel to said legs of the first group, the
25 arrangement being such that end portions of the legs extending, after said bending, axially of the connector are staggered alternately in a zig-zag manner and are in two lines with the ends of the legs substantially in a plane, the pitch between adjacent legs in either of
30 said groups of legs being equal to the pitch between said lines.

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According to another aspect of the invention, a cable connector for detachable connection to a flat electric cable comprises a housing having a cable insertion hole formed therein to receive an end portion of said cable in electrical connection with contacts within the housing, and terminal members having legs of equal length extending outwardly from the housing initially in a single line, a first group of said legs being bent substantially at 90° to extend in a direction perpendicular to the axial direction of the connector, and a second group of said legs alternating with the legs of the first group being bent at a position closer to the centre of the housing than the legs of the first group at an angle of greater than 90° and being then bent at a position near an outer surface of the housing to extend in a direction substantially parallel to said legs of the first group, the arrangement being such that end portions of the legs extending, after bending, in a direction perpendicular to the axial direction of the connector are staggered alternatively in a zig-zag manner and are in two lines with the ends of the legs substantially in a plane, the pitch between adjacent legs in either of said groups of legs being equal to the pitch between said lines.

In the foregoing arrangements according to the invention, the pitch of the end portion of the legs which are to be soldered to a printed circuit board is within a conventional pitch range while the pitch of the contacts coupled to the conductors of a mating flat electric cable, with the contacts and the conductors having the same pitch, is reduced to about half of that of the contacts of a connector in which the end portions of the lgs of the connector terminals are arranged in a straight line thereby significantly increasing the packing density.

Yet further, in accordance with the invention the connector includes a locking structure in which a rectangular protrusion and groove are provided on the inner surface of one side wall of the housing of the connector and on a terminal member of the flat electric cable, respectively, and protruding partitions are formed on a second, opposite side wall. With this simple construction, the terminal member can be positively locked in the connector, the terminal member and the connector can be miniaturized, and the reliability of the device is high.

The objects of the invention are further met by a connector having a housing which is made of hard plastic material for accommodating contacts therein. A first rectangular protrusion or groove is formed on the inner surface of one side wall of the housing in such a manner that the first rectangular protrusion or groove extends perpendicularly to the axis of the connector. Protruding partitions for isolating the contacts from one another are formed on the inner surface of another, opposite side wall and a second rectangular groove or protrusion is provided on a terminal member of the flat electric cable in such a manner that, when the terminal member of the flat electric cable is inserted between the inner surface of the first side wall and the protruding partitions, the second rectangular groove or protrusion engages with the first rectangular protrusion or groove to lock the terminal member with the connector.

Figs. 1A-1C are diagrams showing examples of a prior art connector and the terminal part of a flat cable of which Fig. 1A is a perspective view of the connector, Fig. 1B is a perspective view of the terminal part of the flat cable, and Fig. 1C is a sectional view taken along line X-X' in Fig. 1A;

Figs. 2A-2C are diagrams showing a preferred embodiment of a vertical type connector according to the invention of which Fig. 2A is a perspective view of the connector and Figs. 2B and 2C are sectional views taken along lines Y-Y' and Z-Z', respectively, in Fig. 2A, respectively;

Figs. 3A-3C are diagrams showing preferred embodiments of a horizontal type connector according to the invention of which Fig. 3A is a perspective view of the connector and Figs. 3B and 3C are sectional views taken along lines C-C' and D-D', respectively, in Fig. 3A;

Fig. 4 is a plan view showing the arrangement of holes in a printed circuit board into which the end portions of the legs of connector terminals shown in Figs. 2A-2C or 3A-3C are inserted;

Figs. 5A and 5B are perspective views showing examples of the terminal member of a flat electric cable;

Figs. 6A-6F show another preferred embodiment of the invention of which Fig. 6A is a sectional view showing a connector into which the terminal member of a flat electric cable is inserted, Fig. 6B is a perspective view showing the connector, Fig. 6C is a perspective view of the terminal member

of the cable, Fig. 6D is a bottom view of an inner surface of the connector, Fig. 6E is sectional view showing a locking part, and Fig. 6F is a sectional view showing another example of the rectangular protrusion which is shown in Fig. 6A; and

Figs. 7A and 7B show yet another embodiment of the invention of which Fig. 7A is a sectional view showing a connector and the terminal member of a flat electric cable which is inserted into the connector and Fig. 7B is a perspective view of the terminal member of the flat electric cable shown in Fig. 7A.

Preferred embodiments of the invention will be described with reference to Figs. 2 through 4.

Figs. 2A-2C show a preferred embodiment of a vertical type connector constructed according to the invention. More specifically, Fig. 2A is a perspective view of the vertical type connector, Fig. 2B is a sectional view taken along line Y-Y' in Fig. 2A, and Fig. 2C is also a sectional view taken along line Z-Z' in Fig. 2A. In Figs. 2A-2C, those components which have been described with reference to Figs. 1A-1C are similarly numbered.

The structure of the wire insertion hole 3 of the connector 11 is the same as that of the connector in Figs. 1A and 1C. As shown in Figs. 2A-2C, the leg 15 of each of the connector terminals is bent through 90° in the widthwise direction of the connector at the outlet of the housing 2 and is then again bent through 90° but in the opposite direction so that the end portion 12 of the leg 15 extends along the axis of the leg 15. In this case, adjacent legs 15 are bent in opposite directions. Accordingly, the end portions 12 of the legs 15 are arranged in two lines which are spaced with a pitch P, P being the pitch of the contacts 4, from the axes of the legs 15 in the opposite directions.

Fig. 4 is a top view showing the arrangement of holes in a printed circuit board into which the end portions of the

legs of the connector described above are inserted. As shown in Fig. 4, six holes 13 are alternately arranged in two lines. The holes have a pitch of $2P$ not only in the horizontal direction but also in the vertical direction.

Since the end portions of the legs are staggered or arranged in a zigzag manner as described above, the pitch of the end portions of the legs is twice the pitch P of the contacts so that the pitch P of the contacts, which is the same as the pitch of the conductors of the flat cable, can accordingly be decreased. That is, the packing density can be increased.

In this connection, if the bending margins (corresponding to P in this case) of the legs 15 of the terminals are made equal, then the legs 15 can be made equal in length before bending. That is, it is unnecessary to change the lengths of the legs separately depending on their positions. This facilitates the manufacture of the connector of the invention.

Figs. 3A-3C show a preferred embodiment of a horizontal type connector according to the invention. More specifically, Fig. 3A is a perspective view of the connector and Figs. 3B and 3C are sectional views taken, respectively, along lines C-C' and D-D' in Fig. 3A. In Figs. 3A-3C, those components which have been previously described with reference to Figs. 1A-1C and 2A-2C are similarly numbered.

The structure of the cable insertion hole 3 of the connector 21 is similar to that of the connector 11 shown in

Figs. 2A-2C. However, it should be noted that while the connector in Fig. 2 is of the vertical type, the connector in Fig. 3 is of the horizontal type. Alternate legs 25 of the connector terminals are bent as shown in Fig. 3B. That is, a first group of alternate ones of the legs 25 are bent through 90° in the direction of width of the connector so that the end portions 22 of the legs 25 extend perpendicularly to the axis of the connector. The remaining legs 25 of a second group are bent as shown in Fig. 3C. That is, the legs 25 of the second group are bent through 90° in the widthwise direction of the connector at a point closer to the contact than the legs of the first group so that the end portions 22 of the legs 25 extend perpendicularly to the axis of the connector. In this case, the end portions 22 of the legs 25 are arranged in two lines which are spaced a distance $2P$ from each other, P being the pitch of the contacts 4.

In this case also, the arrangement of holes formed in a printed circuit board into which the end portions of the legs are inserted is the same as that shown in Fig. 4. The pitch of the end portions of the legs is twice the pitch P of the contacts 4 and accordingly the pitch of conductors in the flat electric cable with which the connector is used can be reduced as much so that the packing density can be significantly increased.

In this case, the legs 25 of the first group which are bent through 90° at points closer to the contacts 4 than those

of the second group are bent with a bending margin which is longer than that of the second group as shown in Figs. 3B and 3C. Accordingly, the connector can be manufactured with terminals having legs of equal length before bending. That is, it is necessary to provide terminals whose legs are the same in length.

In accordance with the invention, it is not always necessary that both the pitch between the two lines in which the holes are arranged for receiving the legs of the connector terminals and the pitch of the end portions of the legs be precisely equal to twice the pitch of the contacts. That is, the former may be somewhat different from twice the latter. In any event, the packing density is significantly increased.

As is clear from the above description, according to the invention, the legs of the terminals of a connector which is adapted to be connected to a flat cable are bent in such a manner that the end portions of the legs are staggered alternately or in a zigzag manner forming two lines. Accordingly, the pitch of the end portions of the legs is about twice the pitch P of the contacts and therefore the pitch P of the contacts, which is the same as the pitch of the conductors in the flat cable, can be decreased as much as a result of which the packing density is increased. This is a significant merit of the invention.

Furthermore, according to the invention, in bending the legs of the connector terminals, the lengths of the legs can

be made equal by adjusting the bending margins of the legs before the legs are bent. Therefore, it is unnecessary to make the lengths of the legs different from one another according to their positions. This facilitates the manufacture of the connector.

Figs. 6A-6F show another embodiment of the invention. More specifically, Fig. 6A is a sectional view showing a connector into which the terminal member of a flat electric cable is inserted and Figs. 6B and 6F are diagrams showing parts of the connector and the terminal. In Figs. 6A-6F, those components which are common to those in the previously discussed embodiments similarly numbered.

In Fig. 6A, reference numeral 11 designates the connector holding the contacts 4. A rectangular protrusion 33 is formed on the inner surface 30 of one side wall of the housing 32 extending along one edge of the cable insertion hole. More specifically, as shown in Fig. 6D which is a diagram showing the inner surface 30 of the housing, the rectangular protrusion 33 extends perpendicularly to the axis 42 of the connector 11. As shown in Fig. 6E, the rectangular protrusion 33 has a top portion 38 which is trapezoidal in section.

Protruding partitions 21 are formed on an inner surface 40 opposite to the inner surface 30 which are adapted to isolate the juxtaposed contacts 4 from one another as shown in Fig. 6B, which is a perspective view of the connector, and in Figs. 6A and 6F. Each of the partitions 41 has a predetermined height as will be described later.

Reference numeral 35 designates the terminal member of a flat electric cable 7 which is inserted into the cable insertion hole 3' of the housing 32. In the terminal member of the flat electric cable 7, the conductors 8 are exposed and a relatively hard plastic plate 37 is bonded to one side of the flat electric cable 7 with adhesive or the like as shown in Fig. 6C. The plastic plate is made of polyester or the like and its length is greater than that of the conductors 8. A rectangular groove 34 is cut in the outer surface of the plastic plate 37 at a position where it can engage with the rectangular protrusion 33 of the connector 11.

In order to facilitate the removal of the terminal member 35 of the cable from the connector, it is desirable that, for the trapezoidal section of the rectangular protrusion 33 formed on the inner surface 30 of the connector 11, an angle α between the inner surface 30 and an extension of one sloped side 39 of the rectangular protrusion 33 and which is further from the cable inserting hole, be 45° or less as shown in Fig. 6E. If the angle exceeds 45° , the following difficulty tends to occur. That is, since the molded housing 32 is, in general, drawn in only one direction during its manufacture, it is difficult to draw the molded housing from the mold as a result of which it is difficult to form the trapezoidal top portion of the rectangular protrusion.

Nonetheless, in accordance with the invention, the angle α may be larger than 45° . That is, even if the angle

exceeds 45° , the terminal member 35 of the cable can be removed from the housing because the housing 32 is made of an elastic hard plastic material and, accordingly, the cable insertion opening 3' is elastically deformed or flexed outwardly when the terminal member 35 is disengaged from the housing 32.

The rectangular protrusion may so as to cover the entire width W, perpendicular to the axis of the connector, of the inner surface 30 as shown in the Fig. 6D or to cover a part of the width W as shown in Fig. 6F. Alternatively, a plurality of rectangular protrusions may be formed to cover parts of the width W. To correspond to this construction, the rectangular groove 34 provided in the terminal member 35 of the flat electric cable may be formed so as to cover the entire width, perpendicular to the axis, of the plastic plate 37 or to cover a part of the width. Alternatively, a plurality of rectangular grooves 34 may be formed to cover parts of the width.

As is clear from the above description, the locking strength can be set as desired by varying the lengths of the rectangular protrusion and the mating rectangular groove.

It is necessary that, as shown in Fig. 6A, the distance between the top surface 38 of the rectangular protrusion 33 and the top surfaces of the protruding partitions 41 in the housing 32 of the connector be smaller than the thickness of the portion, except for the groove 34 of the terminal

member 35 of the cable where the conductors 8 are exposed, and is equal to or larger than the thickness of the portion where the groove 34 is formed.

With the locking structure constructed as described above, when the terminal member 35 of the cable is inserted between the protrusion partitions 41 and the inner surface 30 of the housing 32 so as to cause the rectangular protrusion 33 to engage with the rectangular groove 34, the surfaces of the terminal member 35 are strongly held by the protruding partitions 41, the rectangular protrusion 33 and, the contacts 4. Thus, the terminal member 35 is positively locked to the connector.

In inserting the terminal member 35 of the cable into the connector or in removing it from the connector, the terminal member 35 must pass through a gap which is smaller than its thickness. However, the insertion or removal of the terminal member 35 can be readily achieved because the housing 32 of hard plastic material can readily elastically deform or expand outwardly.

Thus, the holding force of the protruding partitions 41 is exerted on the part of the terminal member where the rectangular protrusion 33 on the inner surface of the housing is engaged with the rectangular groove 14 as a result of which the cable is locked with the connector at a predetermined, controlled, locking strength.

In this connection, the width of the gap, and

accordingly the height of the protruding partitions 21, are determined suitably from a desired locking strength and the elasticity of the housing material.

The locking structure may be so modified that, while the rectangular groove is formed in the inner surface 30 of the housing, the rectangular protrusion is formed on the plastic plate 37. In this case, it is essential that the distance between the inner surface 30 and the top surface of the protruding partitions 41 be smaller than the thickness of the portion of the terminal member of the cable where the rectangular protrusion is formed and that the distance be larger than the part, except for the protrusion, where the conductors are exposed.

Figs. 7A and 7B show yet another embodiment of the invention. More specifically, Fig. 7A is a sectional view showing a connector into which the terminal member of a flat electric cable is inserted and Fig. 7B is a perspective view showing the terminal member of the flat electric cord shown in Fig. 7A. In Figs 7A-7B, those components which have been discussed with reference to the previously described embodiments are accordingly similarly numbered.

As is clear from a comparison of the embodiment of Figs. 6A-6F with that of Figs. 7A and 7B, the structure of the connector 11 is the same as that shown in Fig. 3. However, the locking structure shown in Figs. 7A and 7B differs from that of the Figs. 6A-6B embodiment in the configuration of

the plastic plate of the terminal member of the cable. That is, the plastic plate 17' of the terminal member in Figs. 7A and 7B has a rectangular protrusion or step 16 which is adapted to engage with the rectangular protrusion.

The locking structure is constructed as described above. Therefore, when the terminal member 35' of the flat electric cable is inserted between the inside surface of the connector 11 and the protruding partitions 41 formed on the opposite inside surface, the rectangular step 36 is engaged with the rectangular protrusion 33 as shown in Fig. 7A, that is, the terminal member 35' is locked with the connector 11. Similar to the case of Figs. 6A-6F, the retention force of the protruding partitions 41 is exerted on the locking part so that the terminal member is locked with a predetermined locking strength and the insertion and the removal of the terminal member can be readily achieved.

Similar to the locking structure of Figs. 6A-6F, the locking structure of Figs. 7A and 7B may be modified so that the rectangular protrusion and the rectangular step cover the entire width perpendicular to the axis or a predetermined part of the width. Alternatively, a plurality of rectangular protrusions and a plurality of rectangular steps can be provided to cover parts of the width. Thus, the cable removing force can be set as desired.

In the above-described embodiments of Figs. 6A-6F and 7A-7B, a rectangular protrusion is provided on the

connector. However, in accordance with the scope of the invention, the rectangular protrusion may be provided on the terminal member of the flat electric cable and the mating rectangular groove or step may be provided on the connector with the same advantageous effects obtained. In the case where a rectangular groove is formed in the connector, it is desirable that the angle between the inner surface of the connector housing and an extension of one side wall of the groove which is trapezoidal in section and which is closer to the cable insertion hole, be 45° or less. In this case, the terminal member can be readily removed from the connector and the molded connector can be readily removed from the mold.

In the case where the insulation of the flat electric cable is relatively thick and hard, it is not always necessary to bond the plastic plate to the cord and the rectangular protrusion or groove can be formed directly in the insulator.

Example

Terminal members were prepared for a flat cable having five flat conductors 0.08 mm^2 in sectional area and connectors with five pins or contacts were fabricated according to the locking structure shown in Fig. 4. The terminal members and the connectors had different heights of the rectangular protrusion on the inner surface of the connecting housing, different angles α and different numbers of steps as indicated in Table 1 below. The length perpendicular to the axis of the

connector of each protrusion was equal to the pitch of the contacts 3. The cable removing force was measured for each case.

Table 1

Height (mm) of Protrusion	Angle (α)	Number of steps			
		0	1	2	3
0.08	45°	0.3 kg	0.31 kg	0.31 kg	0.32 kg
0.15	45°	0.3	0.8	1.1	1.3
0.15	30°	0.3	0.8	1.1	1.2
0.20	45°	0.3	0.9	1.3	1.6

As is apparent from Table 1, as the height of the rectangular protrusion is increased, the cable removing force is increased. However, if the height is lower than 0.1 mm, no difference was observed. Also, the cable removing force is not greatly changed if the angle is changed from 45° to 30° or vice versa. However, it should be noted that, in drawing the molded connector with an angle of 45° from a mold, the top portion of the rectangular protrusion was removed.

As described above, in the locking structure according to the invention, a rectangular protrusion or groove extending perpendicularly to the axis of the connector incorporating the contacts is provided on the inner surface of one side wall of the housing of the connector, protruding partitions isolating the contacts from one another are formed on the inner surface of the opposite side wall of the housing, and

mating rectangular grooves or protrusions are formed on the terminal member of the flat electric cable so that the mating rectangular groove or protrusion is engaged with the rectangular protrusion or groove formed on the inner surface of the one side wall of the housing.

The locking structure of the invention has a simple construction and small size has no useless space. When the terminal member is inserted between the inner surface of the one side wall and the protruding partitions, the rectangular protrusion or groove engages with the mating one while the holding force of the protruding partitions is imparted to the locking part so that the terminal member is locked with the connector with a predetermined locking strength. The terminal member can be readily inserted and removed from the connector. Furthermore, the locking strength can be changed as desired by changing the length of the rectangular protrusion or groove or the number of rectangular protrusions or grooves. Thus, a locking structure having a high reliability, small size and low manufacturing cost is provided in accordance with the invention.

CLAIMS.

1. A cable connector for detachable connection to a flat electric cable, comprising a housing having a cable insertion hole formed therein to receive an end portion of said cable in electrical connection with contacts within the housing, and terminal members having legs of equal length extending outwardly from the housing initially in a single line, a first group of said legs being bent substantially at 90° to a first side of the housing and then at 90° to extend in the axial direction of the connector, a second group of said legs alternating with legs of the first group being bent substantially at 90° towards the opposite side of said housing from said first side and then substantially at 90° to extend parallel to said legs of the first group, the arrangement being such that end portions of the legs extending, after said bending, axially of the connector are staggered alternately in a zig-zag manner and are in two lines with the ends of the legs substantially in a plane, the pitch between adjacent legs in either of said groups of legs being equal to the pitch between said lines.



2. A cable connector for detachable connection to a flat electric cable, comprising a housing having a cable insertion hole formed therein to receive an end portion of said cable in electrical connection with contacts within the housing, and terminal members having legs of equal length extending outwardly from the housing initially in a single line, a first group of said legs being bent substantially at 90° to extend in a direction perpendicular to the axial direction of the connector, and a second group of said legs alternating with the legs of the first group being bent at a position closer to the centre of the housing than the legs of the first group at an angle of greater than 90° and being then bent at a position near an outer surface of the housing to extend in a direction substantially parallel to said legs of the first group, the arrangement being such that end portions of the legs extending, after bending, in a direction perpendicular to the axial direction of the connector are staggered alternatively in a zig-zag manner and are in two lines with the ends of the legs substantially in a plane, the pitch between adjacent legs in either of said groups of legs being equal to the pitch between said lines.



3. A connector according to Claim 1 or Claim 2 including a locking structure and wherein said housing is made of hard plastics material, adapted to accommodate contacts therein, a first rectangular protrusion or groove is formed on the inner surface of one side of said housing in such a manner that said first rectangular protrusion or groove extends perpendicularly to the axis of said connector, protruding partitions for isolating said contacts from one another are formed on the inner surface of another side wall opposite to said one side wall, and a second rectangular groove or protrusion is provided on a terminal member of said flat electric cable in such a manner that, when the terminal member of said flat electric cable is inserted between the inner surface of said one side wall and said protruding partitions, said second rectangular groove or protrusion is engaged with said first rectangular protrusion or groove, whereby said terminal member is locked in said connector.

4. A connector as claimed in Claim 3, in which said rectangular protrusion or groove provided on the inner surface of said one side wall of said housing covers the whole or a part of the width, perpendicular to the axis of said connector, of said inner surface of said one side wall of said housing.

5. A connector as claimed in Claim 3 or 4, in which said rectangular protrusion has a trapezoidal section whose outer base is small than the inner base, and said rectangular groove has a trapezoidal section whose outer base is larger than the inner base.



6. A connector as claimed in Claim 4, in which an angle which is formed between said inner surface of said one side wall of said housing of said connector and an extension of one wall of said rectangular protrusion which is formed on said inner surface and is trapezoidal in section, said one wall being further from a cable insertion opening than the other wall, or an angle between said inner surface and an extension of one wall of said rectangular groove which is formed in said inner surface and which is trapezoidal in section, with said one wall being closer to said cable insertion hole than the other, is 45 degrees or less.

7. A connector as claimed in any one of the preceding claims, in which said terminal member of said flat electric cable has a plastic plate bonded to one side of said flat electric cable, said plastic plate being longer than the length of conductors which are exposed at one end of said flat electric cable, and said rectangular protrusion or groove is formed on the outer surface of said plastic plate.

8. A connector as claimed in any one of Claims 3 to 7 in which said trapezoidal projection has a height of 0.1 mm. or more.

9. A connector to be attached to a flat electric cable, substantially as hereinbefore described with reference to Figures 2A-2C, or Figures 3A-3C, or Figures 6A-6F, or Figures 7A-7B of the accompanying drawings.

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