ABSTRACT: The connector comprises an insulating support housing an electrical contact member formed by a metallic strip having an intermediate portion whose opposite edges slide in grooves in the support. The intermediate portion has a longitudinal tongue which clamps the contact member in one direction and is contiguous on one side with a wiring tab and on the other with a curved portion for contacting the printed circuit. The housing has a boss for locking the contact member between tongues in the strip. The contact member can be introduced into the housing from either side.
The present invention relates to improvements in connectors for insertable printed circuits. More particularly the invention relates to connectors for insertable printed circuits of the type comprising an insulating support and at least one electrical contact member housed in the support and constituted by a metallic strip including an intermediate portion of which the opposite edges are guided by parallel grooves provided in the insulating support, and open at their two ends, said intermediate portion being cut out so as to have a longitudinal tongue, cooperating with the insulating support to ensure positive clamping, in one direction, of the contact member.

said intermediate portion being, in addition, contiguous on one side with a tail for wiring and on the other with a curved portion adapted to ensure electrical contact with a conducting surface of a contact element such as a printed circuit card.

It is a particular object of the invention, to render connectors of the type concerned such that assembly of electrical contact members in the insulating support and disassembly of these contact members may be equally effected either from the side where fixing of the printed circuit occurs, or from the opposite side.

It is another object of the invention to improve the fixing of contact members in said insulating support so that the required precision of assembly is assured.

A connector for an insertable printed circuit of the type concerned is characterized by the fact that the intermediate portion of the said strip is curved so as to possess at rest a thickness greater than the height of said grooves, in order to hold the contact member in transverse direction with respect to the grooves, and that locking means of said strip in the support are provided and arranged to ensure positive clamping of said strip in a direction opposite to that previously defined and to enable the contact member to be introduced into the support and extracted from the latter equally either from the side where fixing of the printed circuit occurs, or from the opposite side.

Preferably, the locking means comprise, on the side of the insulating support, a boss arranged in each electrical contact member housing.

In a first embodiment, the locking means comprise, on the side of the electrical contact member, a second longitudinal tongue cut out in the curved part of the aforesaid metallic strip, the two tongues being situated in extension of one another and arranged head to tail and adapted to cooperate respectively with the two opposite transverse surfaces of said boss.

In a second embodiment, said locking means comprise, on the side of the contact member, an opening fashioned in the longitudinal tongue, said opening being adapted to receive said boss, two opposite transverse surfaces of this latter cooperating with two opposite edges of said opening.

The invention also relates to electrical contact members arranged to equip a connector defined above.

In order that the invention may be more fully understood, two embodiments of electrical contact members according to the invention are described below, purely by way of illustrative but nonlimiting examples, and with reference to the accompanying drawings in which:

FIG. 1 shows in perspective, with portions removed, an electrical contact member constructed according to a first embodiment of the invention;

FIG. 2 shows in elevation the embodiment of FIG. 1 introduced into an insulating support in section along the line II—II of FIG. 3, the assembly of support and contact member constituting a connector according to the invention;

FIG. 3 comprises a partial view from the left and a partial section along the line III—III of FIG. 2 of the insulating support equipped with several electrical contact members;

FIG. 4 is a perspective view of an electrical contact member constructed in accordance with a second embodiment of the invention;

FIG. 5 is a partial view in perspective, with portions removed, showing the fastening of the tongue of the member of FIG. 4 on the insulating support, and

FIG. 6 finally, is a sectional view showing the contact member of FIG. 4 installed in an insulating support 28.

Reverting now to FIGS. 1 to 3, it is seen that the electrical contact member 1 is constituted by a conducting metallic strip 2 having a slightly curved (downwardly in FIGS. 1 and 2) intermediate portion 3. The edges of this intermediate portion 3 are intended to be guided by grooves 35 fashioned in an insulating support 28 (FIG. 2). The overall thickness 20 (FIG. 1), at rest, of the portion 3 is greater than the height 41 (FIG. 2) of said grooves. The portion 3 is contiguous, on one side, with a tail 4 for wiring and, on the other, with an elastic loop 5 adapted to ensure electrical contact with a conducting surface (not shown). The intermediate portion 3 is cut out so as to present, on the one hand, at least one elastic longitudinal tongue 6 and, on the other hand, two abutment surfaces 56a, 56b intended to cooperate respectively with two holding surfaces provided on the support 28 to prevent the contact member from moving longitudinally.

The metallic strip 2 is relatively narrow and thin and constituted, preferably, of an elastic metal which is a good conductor of electricity such as phosphor-bronze or beryllium-copper.

A rectilinear end of this strip, narrower than the portion 3, constitutes the tail 4 on which a wiring may be effected for connection to an electrical or electronic assembly. Two discontinuities 7, symmetrical with respect to the middle line of the strip, are formed by different widths of the portion 3 and the tail 4.

The other end of the strip is curved and rolled, as shown in FIGS. 1 and 2, so as to form the loop, not closed, 5, elongated, of substantially elliptical longitudinal section, with large axis parallel to the middle lines of the tail 4 and of the portion 3.

The loop 5 has two highly curved zones 8 and 9, bounding the large axes of the longitudinal sections of the loop and connected by a zone 10 of slight curvature.

The zone 9 is extended by a zone 11, also of slight curvature, bounded by the terminal edge 12 of the strip. The zone 11 bears against a surface 13 (FIG. 2) of the portion 3. Through this fact, the loop 5 has great elasticity in a direction perpendicular to the plane of the strip, which direction is indicated in FIG. 2 by a double arrow A, for any flattening of the loop along this direction generates an opposing force due especially to cooperation of the zone 11 and the portion 3.

The zone 10 of the loop is intended to ensure electrical contact with a conducting surface (not shown). To improve this contact, there is advantageously included in the loop 5 at least one median slot 14 so as to multiply the support surfaces. This slot 14 divides the loop 5 in the longitudinal direction into two elemental loops 15 and 16 up to the vicinity of the edge 12 where the two elemental loops 15 and 16 concur to constitute the end 17 of the loop 5. This common end prevents separation of the two loops 15 and 16 from one another. The loop 5, like the tail 4, has a width less than that of the portion 3, so that two discontinuities 18, symmetrical with respect to the middle line of the strip, are formed at the junction of the loop 5 and of the portion 3.

This portion 3 is bent at its middle, in the same sense as zone 10, around an axis 19 (FIG. 1) perpendicular to the middle line of the tail 4, and has a wavy longitudinal profile while its transverse profile remains rectilinear. This curvature increases the thickness at rest 20 of the portion 3, which thickness is equal to the distance separating the straight lines 21 and 22, parallel to the middle edge of the tail 4 and bearing respectively on the two surfaces of the portion 3 while being spaced to the maximum from one another. By elastic deformation, this thickness may be reduced, which permits, as will be seen below, the sliding of the edges of this portion 3 in the grooves 35.

The strip has, at the level of its portion 3, two longitudinal tongues 6 and 23 arranged substantially along the arms of a
circumflex accent which would cover the large dimension of the portion 3.

The tongue 6, of rectangular shape, is obtained by cutting out a median zone of the portion 3 along three sides of a rectangle. A fourth side 24 of the rectangle, not cut out, is located towards the discontinuities 8 and is perpendicular to the middle line of the tail 4. The large side of the rectangle has a length less than the distance of the side 24 to the axis of curvature 19. After cutting out, the tongue 6 is separated from the portion 3, on the side of the latter opposite to that of the loop 5. A transverse band 27 extends between the side 24 and the slot 14.

The second tongue 23 is symmetrical with the tongue 6, with respect to a plane passing through the axis 19 and perpendicular to the middle line of the tail 4, and comprises a side 25 not cut out.

The stop surfaces 56a, 56b are constituted respectively by the free transversal edges parallel to the sides 24, 25 of the tongues 6 and 23.

The openings left in the portion 3 by the tongues are separated by a transverse band of metal 26 enabling the portion 3 to preserve good rigidity.

The contact members 1 are intended to be mounted in the insulating support 28, generally of parallelopipedic shape and allowing a plane of symmetry perpendicular to the planes of FIGS. 2 and 3. The lines of the plane of symmetry, are recorded, on FIGS. 2 and 3, respectively by the reference numerals 29 and 30. Housings 31, of substantially rectangular section, separated by partitions 32, are provided in the support and are generally arranged parallel to one another. These housings and these partitions form two symmetrical series with respect to the plane of the lines 29 and 30.

The two series of symmetrical partitions are separated by a distance H (FIG. 2) slightly greater than the thickness of the element (not shown) bearing a conductive surface, which element is generally constituted by a printed circuit card and which has to be introduced into the space E comprised between these series of partitions. A stop 33, to limit the introduction of this element, is advantageously provided on the support 28.

This latter bears holding or locking surfaces 37, 38, advantageously constituted by the surfaces of a boss 34 located inside each housing 31.

This boss 34 is arranged on the surface of the housing 31 parallel to the plane of line 29, substantially at half the length of the housing. Its section through the plane of FIG. 2 has the form of an isosceles trapezoid of which the small base 36, less than the width of the band 26, is parallel to the plane of symmetry of the support and turned towards this plane. This trapezoid has a large base greater than the width of the band 26. As seen in FIG. 3, the boss 34 may advantageously comprise a median longitudinal slot 39 of rectangular section, opening onto the small base 36 and onto the faces 37, 38 of the boss.

The grooves 35 extend over the surfaces of the housing 31 perpendicular to the plane of symmetry of the line 29 over the whole length of the housing 31 and they have their middle lines parallel between them and with the said plane of symmetry. The transverse section of these grooves is preferably rectangular. The edge 40 these grooves most spaced from the plane of symmetry is substantially flush with the base 36 of the boss 34. The width L (see FIG. 3) of the housing 31 at the level of the grooves 35 is equal, with very slight play, to the width of the portion 3 of the member 1. The height 41 of the grooves is equal to the distance between the edge 40 and the parallel edge 42. The grooves 35 are open at each of their ends.

To constitute the connector, there is introduced into the housings 31, previously selected, of the support, contact members 1 by making them slide along a direction shown by an arrow F (FIG. 2), the loop 5 being turned towards the plane of symmetry of the support. The introduction of a member 1 into the housing 31 can be effected equally through either of the two ends of said housing, that is to say, when the housing in the position of FIG. 2 is considered, from right to left or conversely.

It will be assumed, for the explanation which follows, that the introduction is made from the left towards the right of FIG. 2.

Care is taken to engage the edges of the portion 3 in the grooves 35 and there is exerted on the member 1 a thrust towards the right.

Due to the fact that the height 41 of the grooves is less than the total thickness 20, the portion 3 becomes deformed until it acquires an overall thickness equal to the height 41.

The elastic tongue 23 on arriving at the level of the boss 34, will be withdrawn downward until it clears the base 36.

At this moment, the elastic tongue 23 is raised and begins to cooperate with the transverse surface 37 of the boss 34 (FIG. 2), while the tongue 6 comes into cooperation with the surface 38 of the boss. The two surfaces of the boss are inclined and separated from one another, the locking of the tongues 6 and 23 on the boss 34 is ensured.

Cooperation of the two tongues 6 and 23 with this boss prevents, now, any displacement of the contact member 1 along direction F (FIG. 2).

The edges of the portion 3 of the contact member cooperate, as far as they are concerned, on the one hand, with the edge 40 of the groove 35 in two zones respectively neighboring the shoulders 17 and 18, and, on the other hand, with the edge 42 in a zone neighboring the axis 19. In this way, any displacement of the member with respect to the support in the direction of the arrow A is prevented.

Zone 10 of loop 5 projects into space E, comprised between the two symmetrical series of partition 32, and in which the element bearing the conducting surface with which the loop 5 must ensure electrical contact will be housed.

An introduction from left to right has been considered, but introduction of the contact member from the right to left is also possible since the loop 5 may be flattened and free the stop 33.

To disengage the contact member from the support, procedure may, as for the introduction, operate through any end of the housing 31. It suffices to introduce, from the right towards the left for example, between the portion 3 and the insulating support surface bearing the boss 34, a tool adapted to withdraw the tongue 23. The member 1 may then be pushed towards the left, out of the support.

In the case where the boss 34 comprises the median slot 39 (FIG. 3), the member 1 of the support 28 may advantageously be extracted from the side where the tool is introduced. In fact, by introducing through the left a tool of which the end is beveled, the tongue 6 is first displaced, the tool is then made to penetrate into the slot 39 so that the beveled end becomes inserted into the space 43 (FIG. 3), comprised between the support 28 and the tongue 23, and comes to withdraw this latter. At this moment, it is possible to withdraw the member 1 of the support towards the left.

Referring to FIGS. 4 to 6, there may be seen a second embodiment of an electrical contact member and of a connector according to the invention.

In these Figures, there are denoted by the same reference numerals elements identical or analogous to those of FIGS. 1 to 3.

The contact member 1 only comprises the single tongue 6 of which the width 83 (FIG. 5) is greater than the width 54 of the longitudinal holding surfaces 37 and 38.

The tongue 6 bears two stop surfaces 56a, 56b. The latter are advantageously constituted by the transverse edges of an opening 55, rectangular, fashioned in said tongue 6. The boss 34 becomes engaged in the opening 55.

The free end 17 of the loop 5 has a width 50 (FIG. 4) slightly less than the width 51 along which the portion 3 of the loop 2 is cut out. The portion 3, fashioned by the edges 52 of the opening fashioned in the portion 3, becomes borne against the tongue 6 by separating this latter from the portion 3. The pres-
sire of the end 17 on the tongue 6 favors the cooperation of this latter and boss 34.

The large base of this latter having a length greater than that of the opening 55, the stop surfaces 56a and 56b, (FIG. 6) parallel to the above-said side 24, will become simultaneously in contact with the sloping walls of the boss 34 and fastening of the tongue 6 will be effected without play in the longitudinal direction.

The said tongue 6 overlaps on both sides of the said boss, in the longitudinal direction, through surfaces 57 (FIG. 5). Due to the fact of the camber of the tongue 6, the distance of this latter to the bottom of the support 28 increases when it is separated longitudinally from the boss 34, which permits the sliding easily of a tool T in the form of a tapered rod (FIG. 6) between the tongue 6 and the bottom of the support 28 to withdraw the said tongue and disengage the boss 34 from the opening 55. This operation may be effected equally through the front or the rear of the support 28, that is to say, in the case of FIG. 6, at the right or at the left.

According to a variation (not shown), the stop surfaces may be constituted by those of a boss bore by the tongue and the holding surfaces by those of a cavity fashioned in the support, in which cavity this boss may come to be housed. The boss bore by the tongue can be obtained by stamping or be fastened on this tongue.

The mounting and dismounting of such an electrical contact member in its support 28 are obvious following the previously given explanations.

Whatever the method of production adopted there is obtained a connector for an insertable printed circuit such that mounting of the electrical contact member 1 in the support 28 may be effected equally through each of the ends of the housings 31, that is to say, either from the side where the fixing of the printed circuit is effected, or from the opposite side (wiring side). In the same way, dismounting of the member 1 of the support 28 may be effected equally from both sides. This is particularly advantageous when it is necessary to replace, in an installation, defective electrical contact members 1, the replacement then being possible from the side of the connector which is most accessible.

Due to the positive locking of the contact 1 in the support along two opposite directions parallel to the direction of fixing of the printed circuit, the insertion or extraction of this latter in the space E cannot cause a relative displacement of the member 1 and the support 28.

The position of the contact tail 4, relative to the support 28, is ensured with precision since there is no play along the directions F and A. This precision enables automatic wiring to be effected, by machine, with connectors equipped with such contact members.

Finally, the elasticity of the loops 5 enables a good electrical contact to be ensured with the conducting surface of a printed circuit card and this despite nonnegligible variations of thickness of the card of which the manufacturing tolerances are rather wide.

What we claim is:

1. Connector for an insertable contact element such as a printed circuit card, said connector comprising in combination, an insulating support and at least one electrical contact member housed in said support and constituted by a metallic strip comprising an intermediate portion whose opposite edges are guided by parallel grooves provided in the insulating support and open at their two ends, said intermediate portion being cut out so as to have a longitudinal tongue, cooperating with the insulating support to ensure positive clamping of the contact member in one longitudinal direction, said intermediate portion being, in addition, contiguous on one side with a tail for wiring and on the other with a curved portion adapted to ensure electrical contact with a conducting surface of a contact element,

the intermediate portion of said strip having a curved portion which, in view of the intermediate portion towards said curved portion so as to have when relaxed a greater thickness than the height of said grooves, in order to hold the contact member in transverse direction with respect to the grooves and locking means located inside the support being provided and arranged to ensure positive clamping of said strip in a direction opposite to said one longitudinal direction unaffected by insertion or extraction of the contact element and to enable the contact member to be introduced in the support and extracted therefrom, either on the side where the insertion of the contact element is effected, or on the opposite side.

2. Connector according to claim 1, wherein the locking means comprise, on the side of the insulating support a boss arranged in each housing for an electrical contact member.

3. Connector according to claim 2, wherein the locking means comprise, on the side of the electrical contact member, a second longitudinal tongue cut out in the curved portion of the aforesaid metallic strip, the two tongues being situated in extension of one another and arranged head to tail and adapted to cooperate respectively with the two opposite transverse surfaces of said boss.

4. Connector according to claim 2, wherein the locking means comprise, on the side of the contact member, an opening defined in the longitudinal tongue, said opening being adapted to receive said boss, two opposite transverse surfaces of the latter cooperating with two opposite edges of said opening.

5. Connector according to claim 2, wherein the bosses have a longitudinal section of trapezoid shape and are contiguous through their large base with the insulating support.

6. Connector according to claim 3, wherein the bosses have a longitudinal section of trapezoid shape and are contiguous through their large base with the insulating support.

7. Connector according to claim 4, wherein the bosses have a longitudinal section of trapezoid shape and are contiguous through their large base with the insulating support.

8. Connector according to claim 1, wherein the curved portion of the contact member contiguous with the intermediate portion is constituted by an elastic loop.

9. Connector according to claim 4, wherein the contact member is arranged so that the end of the loop becomes supported against the tongue and the curved portion of the contact member contiguous with the intermediate portion is constituted by an elastic loop.