May 17, 1966 A. S. WOODWARD 3,252,127

PLUG CONTACT

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Fig. 1.

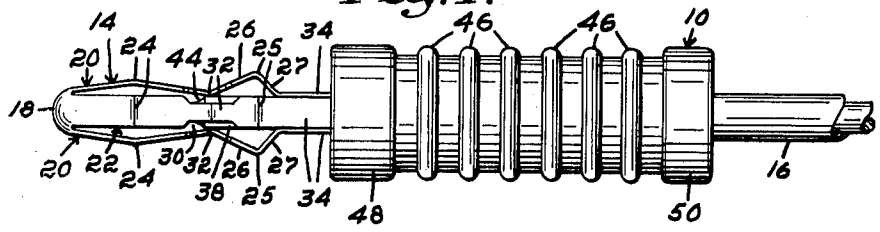


Fig. 2.

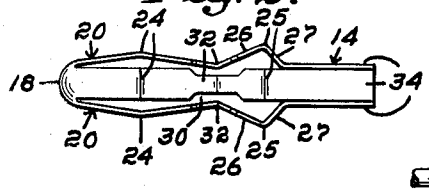


Fig. 3.

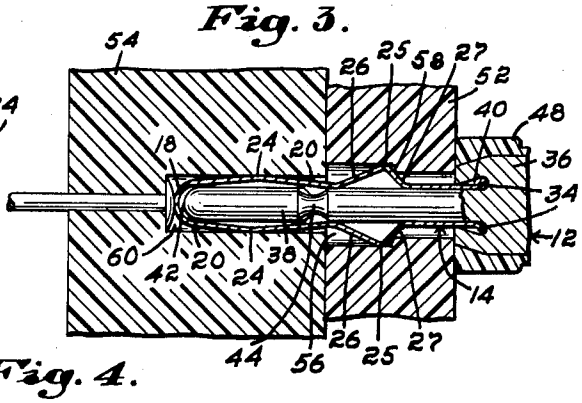


Fig. 4.

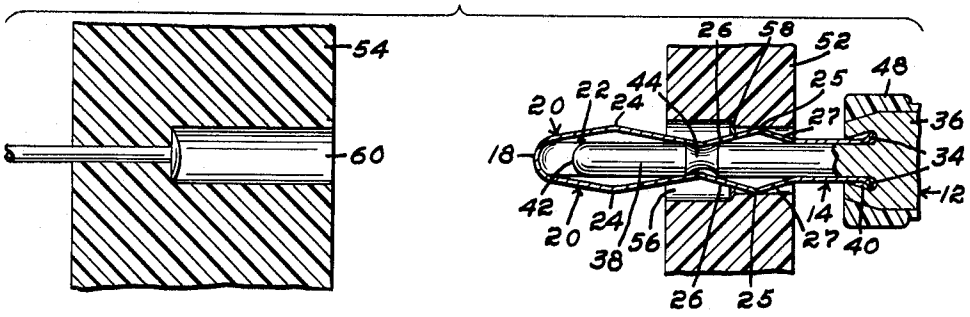
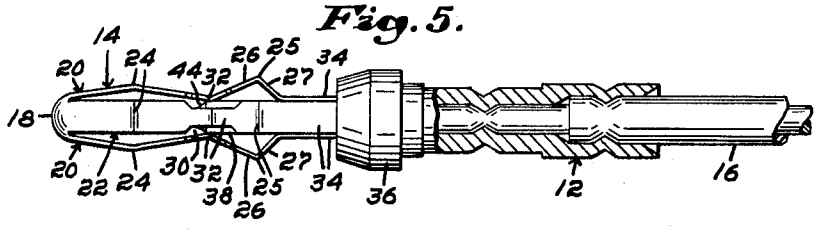


Fig. 5.



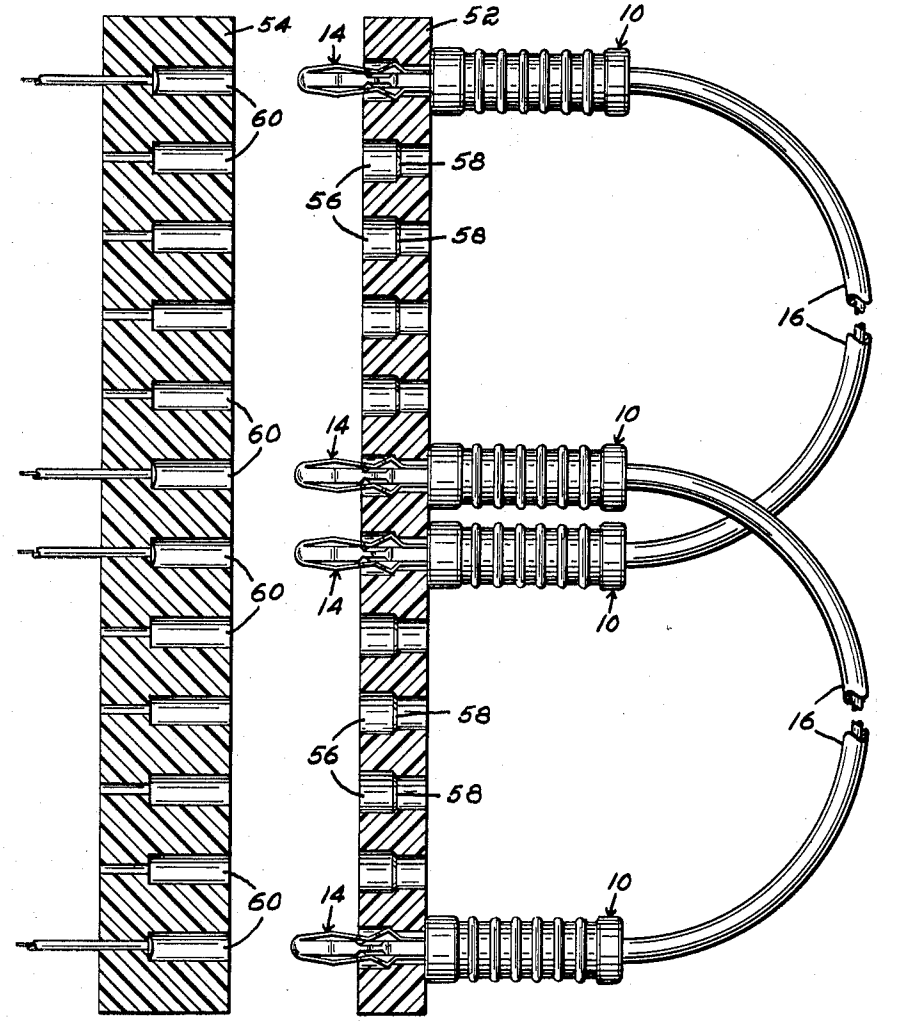
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Fig. 6.



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3,252,127

PLUG CONTACT

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Filed Oct. 3, 1963, Ser. No. 313,584
4 Claims. (Cl. 339—217)

This invention relates generally to contact devices and more specifically to the type of contact known as plug contact.

A primary object of the present invention is to provide efficient, easy axial insertion or axial withdrawal of a plug when the insertion or withdrawal forces are applied at the base, and having means of preventing axial withdrawal when the forces are applied at the terminal end of the plug.

Another object of the present invention is to provide a contact spring means having a configuration formed to prevent axial withdrawal on application of pressure at a terminal end.

Other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

In the drawings:

FIG. 1 is a side elevation of the contact assembly;

FIG. 2 is a side elevation of the spring element of the assembly shown in FIG. 1;

FIG. 3 is a section and part elevation of the assembly of FIG. 1 broken off and engaged with a jack panel and a template;

FIG. 4 is a section, partly in elevation, showing the contact of FIG. 1 broken off and partially engaged in a template panel and also a section of the jack panel;

FIG. 5 is a side elevation, partly in section, of the assembly shown in FIG. 1 with the plug cover removed; and

FIG. 6 is a section, partly in side elevation, of a series of the contacts shown in FIG. 1 engaged with a mating board and with a programing board.

Referring to the drawings, there is shown, in FIG. 1, a broken-off view of a programing patch cord assembly. This plug assembly comprises a cover **10**, a body element **12**, a spring member **14**, and a wire lead **16**. The cover **10** is formed of a material having insulating qualities and the applicant has discovered that a vinyl plastic is excellent for forming this part.

The spring member **14** comprises a series of four legs connected at one terminal end to form a bight portion **18**. Each pair of legs is in opposed relation to each other and a pair will be referred to as the engagement legs **20** and the remaining two legs as the guide legs **22**. The engagement legs **20** are in opposed relation to each other as are the guide legs **22** and each of the legs are spaced from the other to form a cage. Each of the engagement legs **20** and the guide legs **22** comprises a terminal end integral with the bight portion **18** and extending away from the bight portion **18** to form an obtuse angular portion **24** having a diverging portion and a converging portion. The converging portion is directed toward the axis of the spring member **14**. Integral with the converging portion is a second diverging portion **26** formed with a second converging portion **27** in a second angle portion **25** which is more acute than the angle formed by the obtuse angular portion **24**. The leg then continues as a free terminal end **34**, which is substantially in parallel relationship with the axis of the spring member **14**. The area defined by the angle formed by the converging portions and the second diverging portions **26** delineates a throat area or volume **30**. The width of the legs **22** and **20** is reduced to form a connecting portion **32** at the throat area **30**.

The body element **12** is formed of an electrically conductive material, such as brass and comprises a base portion **36** having a generally tubular configuration closed at one end from which a pin portion **38** extends. A channel or trepan **40** is formed adjacent to and circumscribing the point of jointure between the pin portion **38** and the base portion **36**. The pin portion **38** comprises a solid cylindrical rod of substantially less diameter than the remaining portion of the body element **12** and has a free arcuate terminal end **42**. A circumferential groove **44** is formed intermediate the free terminal end **42** and the beginning of the body element **12**.

The cover **10** is formed of a non-conductive material having a certain amount of elasticity, is generally tubular in configuration and has a series of spaced, circumferential ribs **46** formed around its external surface. A head collar **48** is formed around and adjacent one of the terminal ends of said cover **10** and at the other terminal end a base collar **50** is formed.

The terminal ends **34** of the spring member **14** are engaged with the body element **12** by collapsing the wall of the trepan **40** inwardly toward the axis of the body element **12** thereby placing the spring element **14** in a fixed relation thereto. In a relaxed or non-engaged position the circumferential center line (i.e. at the knuckle formed by the converging portion **24** and the diverging portion **26**) of the throat **30** is aligned just to the rear of the groove **44**. The bight **18** is spaced from the terminal arcuate end **42** of the pin **38**, and the legs **20** and **22** form a cage about the pin **38**.

A wire lead **16** is inserted into the tubular channel formed by the tubular body element **12** at the end opposite from the pin **38**. The body element **12** is then crimped at one or two predetermined points (FIG. 5) to lock the bared lead electrically with the body element **12**. It is also possible to crimp the body element **12** in another area (FIG. 5) about the insulation of the lead **16**. Obviously, the lead **16** is an insulated type which has insulation removed from the end in engagement with the body element **12**.

To engage the cover **10** with the assembly of the body element **12** and the spring member **14**, it may be integrally molded about the body element **12** and lead **16** so that the head collar **48** may be aligned adjacent the external point of juncture between the trepan **40** and the terminal ends **34** of the spring. Preferably, the head collar **48** will cover any exposed area of the base portion **36** which may occur. The base collar **50** will cover a portion of the lead **16** making a dust proof and water proof covering at that point. Naturally, the cover **10** may be slipped over the body element **12** if required.

To engage the patch cord assembly to a template **52** and a jack panel **54**, it is first engaged with a stepped hole **56** formed in the template **52**. The stepped hole **56** is open at both ends and has a shoulder **58** formed intermediate the open ends. One opening of the stepped hole **56** is slightly less in diameter than the knuckle diameter of the second angular portion **25**. During the insertion, the diverging portion **26** is flexed toward the axis of the spring element **14** thereby increasing the acuity of the obtuse angular portion **24** and in turn moving the center line of the throat **30** into annular alignment and engagement with the groove **44**. This action reduces the knuckle diameter of the second angular portion **25** formed by the diverging portion **26** and the converging portion **27** sufficiently to allow entrance into the stepped hole **56**. When the surface adjacent to the trepan **40** abuts the template **52**, the relationship of the second angle portion **25** to the shoulder **58** is such as to allow the obtuse angle portion **24** to return to its original state. This fact in turn allows the effective knuckle diameter of the second angle portion **25** to return to its original diameter thereby locking the assembly with the template **52** as shown in FIG. 3. The internal diameter of the

hole **56** is greater above the shoulder **58** than below. If an axial force were now applied to the bight portion **18** of the spring member **14**, the resultant action would increase the locking action of the second angle portion **25** against the shoulder **58** of the template **52** by increasing or urging the increase of the knuckle diameter. It is, therefore, apparent that the only efficient force of withdrawal must be applied at a point remote from the bight portion **18** and on or beyond the cover **10** in a manner which is the exact reversal of the manner and function of insertion.

The programming assembly, which includes the programming patch assembly and the template **52**, can now be engaged with a jack panel **54** without fear of accidentally pushing the patch cord assembly from the engagement with the template **25**. Furthermore, any accidental pressure against the bight **18** will have little or no disengagement effect on the programming assembly whether this may occur by accidental dropping on a floor or table or by hand. When it is accidentally dropped with the bight portion **18** in contact with a solid surface, the bight portion **18** will be forced against the free terminal end **42** of the pin portion **38** which will increase the acuity of the obtuse angle portion **24**. This, in turn, reacts on the diameter of the throat area **30** which in turn attempts to reduce itself. Since the throat area **30** surfaces are bearing on the solid surface of the pin portion **18** rearward of the groove **44**, this force is transmitted to the second angle portion **25** whose knuckle diameter is urged to increase within the limits of the stepped hole **56** and thereby once again further locking the assembly to the template.

When the programming assembly is engaged with the jack panel **54**, the bight portion **18** is inserted into a jack **60** with the following results. The obtuse angle portion **24** has a knuckle diameter greater than the internal diameter of the jack **60**; therefore, after insertion, this knuckle diameter is reduced to approximately the internal diameter of the jack **60** which in turn creates two forces, one of which increases the space, between the bight part **18**, and the free terminal end **42** and the second of which reduces the throat area **30** diameter with the results set forth above. It is important that when the throat surfaces are in engagement with the groove **44** that the legs remain spaced from each other, this is assisted by connecting portion **32**.

While there has been illustrated and described one preferred embodiment of the invention, it should be understood that the invention is best defined by the following claims.

I claim:

1. An electrical plug for engagement with a jack or the like, said plug comprising a cover, a body element, a spring member and a wire lead, said spring member comprising a bight portion and at least two legs having portions in spaced, opposed relation and extending from said bight portion, each of said legs having a first angular portion integral with said bight portion and a second angular portion integral with said first angular portion and being more acute than said first angular portion, said body element having a base portion, means engaging said legs and means for engaging said lead and said cover circumscribing in abutting relation said body element, and said body element having a pin, said pin having a free terminal end and extending from said base portion, between said legs and spaced therefrom and an annular groove formed on said pin intermediate said free terminal end and said base portion.

2. A plug as set forth in claim **1** wherein each of said first angular portions has a converging portion directed at the axis of said spring member and each of said second angular portions has a diverging portion integral with said converging portion to form a third angular portion adapted to engage said annular groove.

3. The combination of a plug and a template said plug comprising a cover, a body element, a spring member and a wire lead, said spring member comprising a bight portion and at least two legs having portions in spaced, opposed relation and extending from said bight portion, each of said legs having a first angular portion integral with said bight portion and a second angular portion integral with said first angular portion and being more acute than said first angular portion, said body element having a base portion, means engaging said legs and means for engaging said lead and said cover circumscribing in abutting relation said body element, and said body element having a pin, said pin having a free terminal end and extending from said base portion between said legs and spaced therefrom and an annular groove formed on said pin intermediate said free terminal end and said base portion, said template having an aperture formed therethrough, said aperture having an internal shoulder and said second angular portion engaging said shoulder.

4. An electrical plug for engagement with a jack or the like, comprising a cover, a body element, a spring member, and a wire lead, said body element having a base portion and a pin extending therefrom, said spring member having at least one leg engaging said base portion and having a free terminal end and having a first angular portion in close proximity to said terminal end and a second angular portion of more acuity than said first angular portion and lying intermediate said first angular portion and said base portion, said cover circumscribing in abutting relation said body element and said body element engaging said wire lead.

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