July 8, 1941. W. P. HERMAN 2,248,082

CONTACT PLUG ASSEMBLY

Filed Feb. 2, 1933 2 Sheets-Sheet 1

Fig. 1

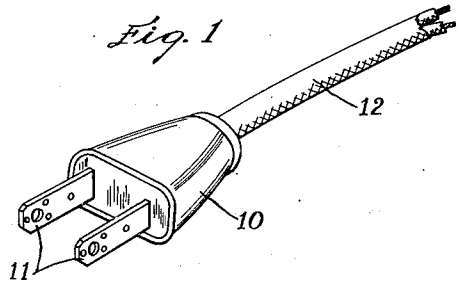



Fig. 2

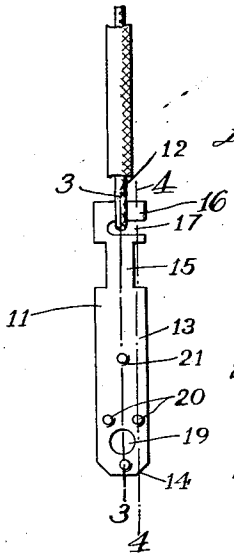



Fig. 3

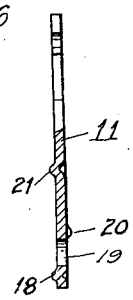



Fig. 4

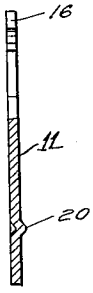



Fig. 5

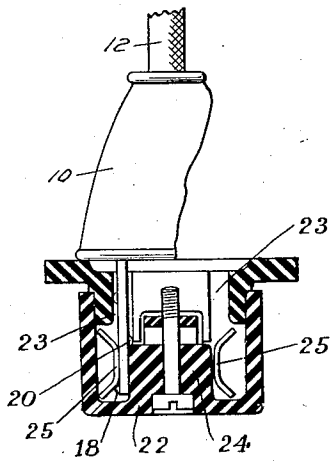



Fig. 6

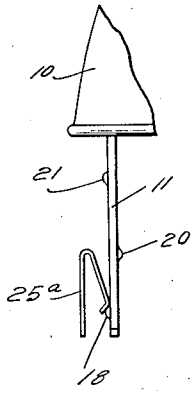



Fig. 7

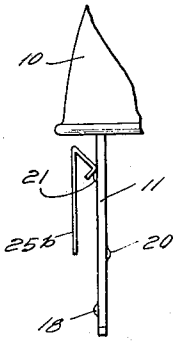



Fig. 8

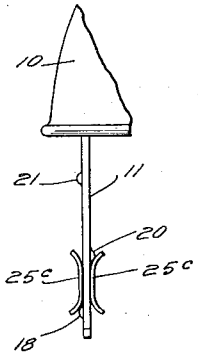



Fig. 9

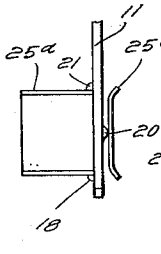
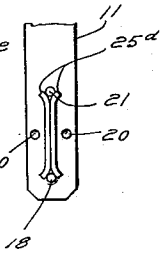



Fig. 10




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Fig. 11 Fig. 12 Fig. 13 Fig. 14 Fig. 15

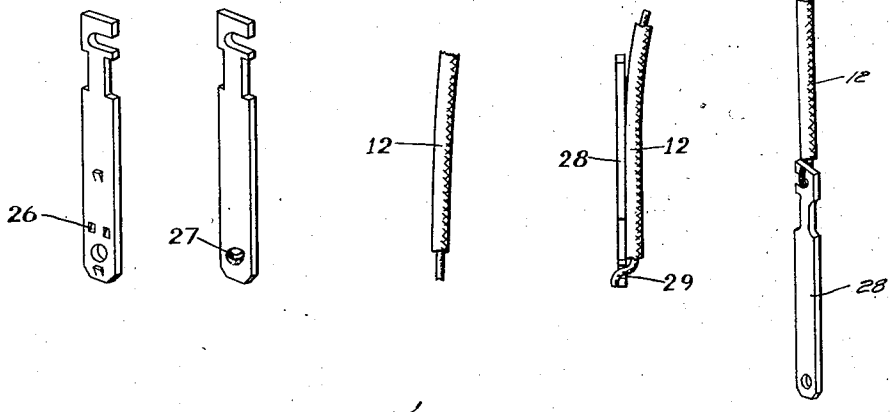



Fig. 16

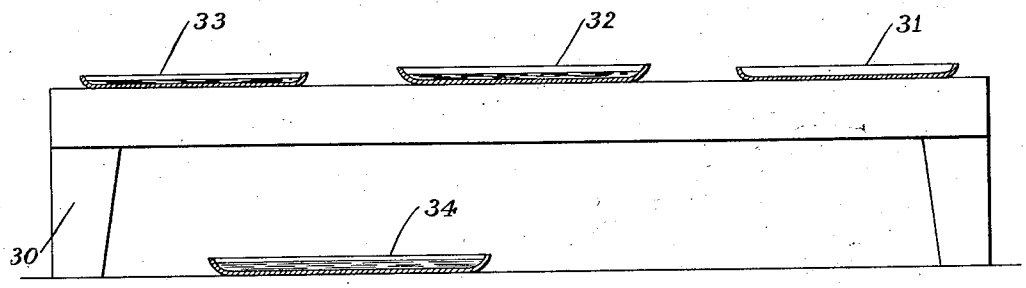



Fig. 17 Fig. 18 Fig. 19

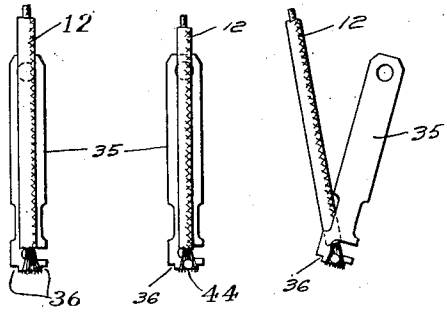



Fig. 20

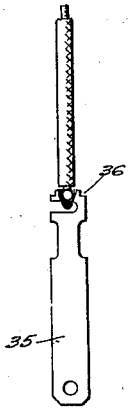
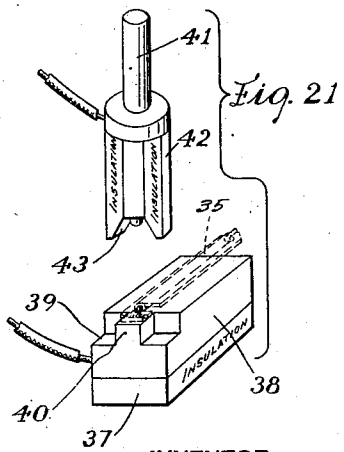



Fig. 21




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# UNITED STATES PATENT OFFICE

2,248,082

## CONTACT PLUG ASSEMBLY

William P. Herman, Providence, R. I.

Application February 2, 1938, Serial No. 188,262

2 Claims. (Cl. 173—361)

My present invention relates to the manufacture of electrical contact plugs and has particular reference to a novel construction of contact blades and novel methods of assembly of the contact blade with the electric cord.

It is the principal object of my invention to provide a contact blade which is firmly attached to the cord lead wire against abnormal pulls and which provides additional anchorage for the blade in the socket.

It is an additional object of my invention to provide frictional engagement means on the contact blade which are universally applicable to all the standard types of electric plug sockets or receptacles.

Another object of my invention is to provide various methods which will facilitate the securing of cord lead wire to the contact blade, which are easy and economical to practice, and which will facilitate assembly of the final plug.

With the above and other advantageous features in view, my invention consists of novel methods of manufacture and assembly, and a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more specifically defined in the claims appended hereto.

In the drawings,

Fig. 1 is a perspective view of a completely assembled plug with the contact blades of the present invention;

Fig. 2 is a plan view of a contact blade of the present invention with the cord lead wire attached thereto;

Fig. 3 is a vertical section taken along line 3—3 of Fig. 2;

Fig. 4 is another vertical section taken along line 4—4 of Fig. 2;

Fig. 5 is a sectional view of an electric socket with the contact plug of the present invention inserted therein, one side of said plug being broken away;

Fig. 6 is a diagrammatic view of a contact blade of the present invention in contact with one form of plug socket engagement means;

Fig. 7 is a similar view with another form of plug socket engagement means;

Fig. 8 is a similar view with another form of plug socket engagement means;

Fig. 9 is a similar view, the plug socket being of the T-shaped type;

Fig. 10 is a side elevation of the T-shaped formation shown in Fig. 9;

Figs. 11 and 12 are perspective views of modified forms of contact blades;

Fig. 13 is a plan view of a multiple strand cord lead wire with the end stripped;

Fig. 14 is an edge view of a blade with the cord lead wire inserted therein preparatory to soldering;

Fig. 15 is a perspective view of the blade and cord soldered and ready for assembly;

Fig. 16 is a diagrammatic view of the working layout for soldering;

Fig. 17 is a plan view of a contact blade with the cord lead wire superimposed thereon ready for spot welding;

Fig. 18 is a similar view showing the cord spot welded to the blade;

Fig. 19 is a plan view showing the spot welded cord inserted into the slot and partially twisted;

Fig. 20 is a plan view of the spot welded cord and blade ready for assembly, and

Fig. 21 is a perspective view partially diagrammatic showing the spot welding method and apparatus.

Referring more in detail to the drawings illustrating my invention, numeral 10 generally designates a standard plug body made of either hard or resilient rubber, "Bakelite," or any other suitable material. The plug body 10 has two spaced contact blades 11 protruding in a conventional manner from one end, and a cord lead wire 12 extending to the opposite end. The contact blade 11 is preferably of the self-anchoring type, having a rectangular elongated contact portion 13 tapered at the end as at 14, a relatively narrow portion 15 adapted to engage abutting shoulders of the contact plug body and a rectangular end portion 16 having a transverse slot 17 into which the cord lead wire 12 is anchored. Instead of the narrow portion 15 and abutting shoulders, other self-anchoring means such as struck plugs may be used. I provide the contact portion 13 of the blade 11 with a plurality of detents or pips protruding from both sides thereof. The detents are carefully spaced and arranged so that they will engage every type of standard receptacle construction as will be hereinafter more fully described.

The detent 18 is placed adjacent the tapered end 14 of the contact blade and centrally located between the tip of the blade and the standard opening 19 in the blade. On the other side of the opening 19, approximately ⅛ along the contact portion of the blade from the ta-

pered end thereof are a pair of spaced detents 20. The detents 20 are on the opposite of the blade from the detent 18. Spaced from the detents 20 is a detent 21 approximately the same distance from the detents 20 and from the detent 18. The detent 21 is on the same side of the blade as the detent 18 and in vertical alignment therewith. The contact blade 11 is so anchored in the plug body 10 that the single detents 18 and 21 face outwardly and the pair of detents 20 face inwardly.

Referring specifically to Fig. 5 of the drawings, the plug receptacle 22 has the conventional contact blade receiving slots 23, an abutting shoulder portion 24 between the slots and arcuate spring contact members 25 placed to extend in the path of the inserted contact blade. When the contact blade is inserted into the slot of this type of socket the detent 18 will slide beyond the contact spring 25 and releasably resist outward pull of the plug from the receptacle. The pair of detents 20 on the opposite side of the blade will bear against the abutting shoulder 24 and push the contact blade towards the contact spring and insure a firmer frictional electric contact.

Figs. 6, 7 and 8 diagrammatically show the action of the contact blade with various standard forms of plug receptacle contact spring members. In each instance, one or more of the detents are brought into such contact with the spring members 25*a*, 25*b*, 25*c*, 25*d* and 25*e*, that there will be a releasable lock to the removal of the contact blade from the receptacle. Figs. 9 and 10 illustrate the action in a standard form of receptacle with a T-shaped slot.

The contact blades 11 may also be constructed to accomplish the desired result by using outwardly extended lugs 26, as in Fig. 11, which are placed in the same position as the detents 18, 20 and 21. A plurality of detents may be put in the lower and upper portion of the contact blade instead of the single detents 18 and 21. Another form of blade such as shown in Fig. 12 may be used in conjunction with the detents, this form including the retention of the cut-out portion 27 of the opening 19 in the form of a struck up lug to accomplish the same purpose.

Referring to the standard forms of plug receptacle with the various types of contact spring members illustrated in Figs. 5 to 10 inclusive, it is obvious that the spacing of the detents is of the utmost importance if the desired result is to be accomplished.

As illustrated in applicant's copending application Serial No. 99,848, filed September 8, 1936 and entitled Connector plug assembly apparatus the method and apparatus of the assembly require that the cord lead wire 12 be attached to the contact blade prior to the assembly of the plug. It has been found that a multiple standard cord lead wire is the most suitable and is therefore the most universally used for this purpose. The cord lead wire may be soldered or spot welded by the methods hereinafter described.

It is obvious that the hereinafter described methods may be used with any type of contact blade, either with or without detents or lugs. However, to ensure a connection which will withstand much more than the minimum amount of pull required by the Underwriters Laboratories, it is desirable that the blades be slotted, as at 17, and that the hereinafter described methods be used.

In soldering the cord lead wire 12 to a contact blade 28 the end of the wire is stripped of its insulation for about ¼ of an inch. The bare end of the wire is slipped into the slot 29, the wire lying flat in parallel relation to the contact blade 28 while the bare end is manually pressed against the blade and turned upwardly (see Fig. 14) the wire being held in such a position that the end will not extend beyond the end of the contact blade. The method of soldering is facilitated by the arrangement shown in Fig. 16, a stove 30 being placed upon the work table and containing three shallow trays numbered 31, 32 and 33; trays 31 and 33 are preferably made of metal and tray 32 is preferably made of glass or similar material. Tray 31 normally contains the contact blades which are heated to as high a temperature as is possible without scorching the hands of the assembler or operator; this amounts to a preheat which will facilitate the subsequent steps of the process. The cord lead wire 12 is slipped into the slot 29 in a manner hereinbefore described (see Fig. 14), and the cord end and blade end are now dipped into the tray 32 which contains the soldering solution, which may be any standard type, but a preferred formula is three to four parts of water to one part of soldering salt, mixed and allowed to stand overnight. In order to prevent the solder from filling the slot 29 through capillary action, it is extremely important that the soldering be confined to the very tip of the blade; the soldering solution should therefore be kept at a depth no greater than $\frac{7}{100}$ of an inch. The blade end and cord end are immediately dipped into the tray 33 which contains the solder mixture comprising approximately 65 parts of tin to 35 parts of lead, which mixture should also have a depth no greater than $\frac{7}{100}$ of an inch. The cord and blade are now immediately dipped into a fourth glass tray 34 containing a cooling, neutralizing solution comprising approximately 50% commercial ammonia and 50% water.

Referring more particularly to Figs. 14 and 15, the contact blade 28 is now pulled back in a vertical plane with the cord lead wire until the wire and blade assume the position in Fig. 15, this turning action of the blade twisting the multiple strand wire and tending to take up any slack in the strands and ensure perfect electric conductivity. The blade and cord are now ready for assembly in the plug.

If it be desirable or preferable to spot weld the wire to the blade, instead of soldering, that can be done as follows:

The cord lead wire 12 is superimposed upon the contact blade 35 with the bare end of the wire extending across the slot as in Fig. 17. The loose strands of the multiple cord wire are preferably flattened in a fan shaped manner against the bottom edge of the contact blade, and the contact blade 35 is also preferably cut out at the corners as at 36 to facilitate in the welding. The welding operation is performed in a welding block comprising a dielectric base 37 of rectangular cross-section on which is superimposed a metallic rectangular block 38. The block 38 has two rectangular cut-out portions 39 at one end thereof, leaving a relatively narrow raised portion 40 which corresponds in width to the width of the lower edge of the contact blade 35 after it is cut out, the block 38 also having a suitable

electric cord connection to one arm of an electric circuit. The spot welding is done by a metal rod 41 having two dielectric guiding posts 42 oppositely disposed on said rod; the posts 42 have diverging portions 43 at the bottom portions thereof which straddle the upwardly raised portion 40 of the block 38. The rod 41 is connected in suitable manner with the other arm of the electrical circuit, and the contact blade and wire, arranged as in Fig. 17, are placed across the block 38 with the slotted portion of the contact blade and the fan shaped bare end of the contact wire extending across the upward raised portion 40 of the block. The rod 41 is brought down upon the blade so that the bottom ends of the insulated portions 42 of the rod 41 will ride into the cut-out portion 39 in the block 38. The sloping sides 43 of the insulated portions tuck any loose ends of wire under the weld and the wire becomes completely spot welded to the contact blade below the slot, as at 44, see Fig. 18. The cord lead wire is then swung through the slot and the contact blade is turned, as in Fig. 19, into the position shown in Fig. 20 to give the multiple strand wire the desired twist.

While I have described specific constructional embodiments of the invention, and specific methods for assembly, it is obvious that these are merely illustrative, and that changes in the size and shape of the parts, in their relative arrangement, and in the methods followed, may be made to suit the requirements for different plug designs, without departing from the spirit and the scope of the invention as defined in the appended claims.

I claim:

1. In a contact plug adapted to be inserted in a receptacle having spring contact members, a pair of straight flat rigid contact blades anchored in said plug and having contacting portions extending therefrom to engage said spring contact members, each of said portions having a projection extending from the outer face adjacent the lower end thereof, a projection extending from the inner face intermediate the ends thereof, and a projection extending from the outer face adjacent the upper end thereof, said projections being positioned to permit at least one of them to pass beyond the effective contacting area of a spring contact member, whereby passage of said projection permits movement of said spring member to yieldingly interpose itself into the path of return movement of said projection.

2. A contact blade for a contact plug, comprising a flat rigid blade of generally rectangular form, said blade having a centrally positioned end projection extending from one face thereof, a pair of aligned spaced projections spaced from said end projection and extending from the opposite face thereof, and an additional contrally positioned projection spaced beyond said aligned projections and extending from the same face as said first named centrally positioned projection.

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