

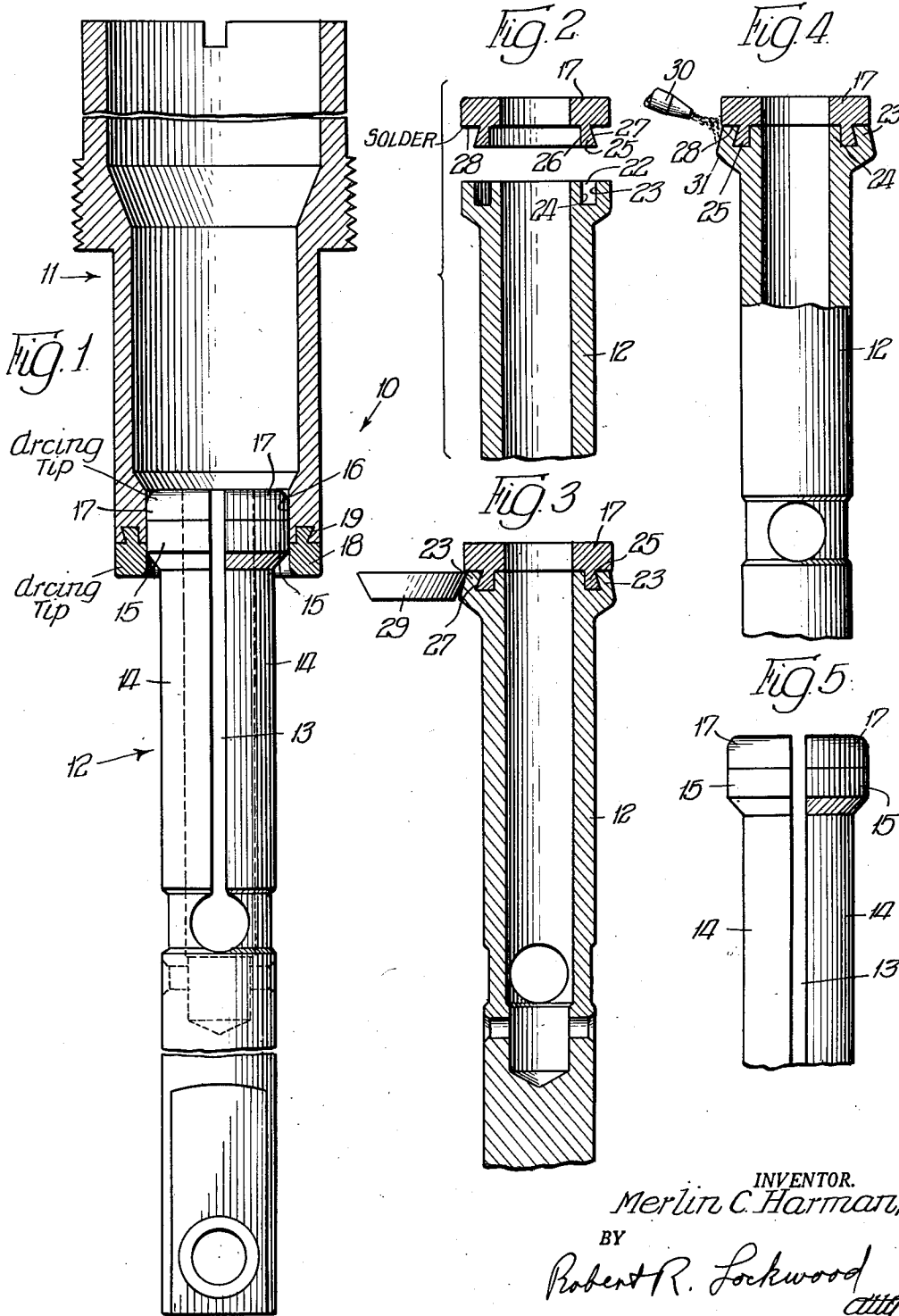
Jan. 1, 1952

M. C. HARMAN
CONTACT CONSTRUCTION

2,580,910

Filed Feb. 8, 1949

2 SHEETS—SHEET 1



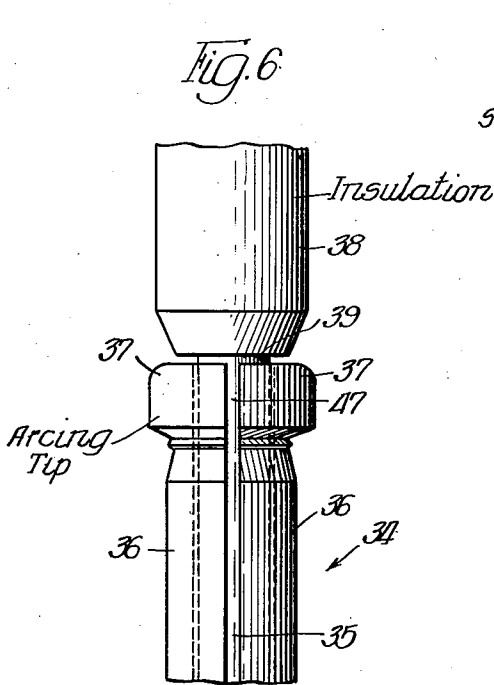
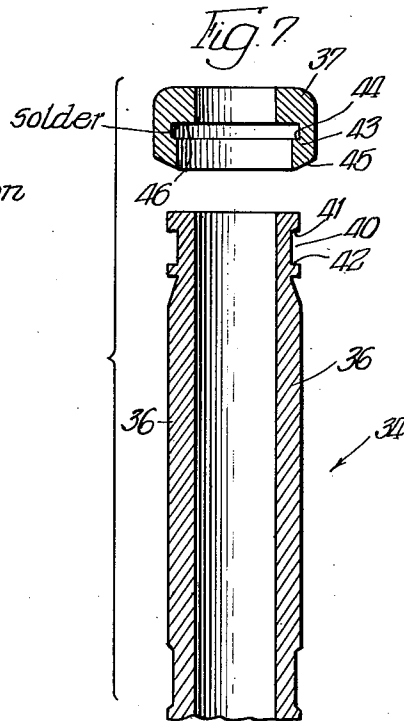
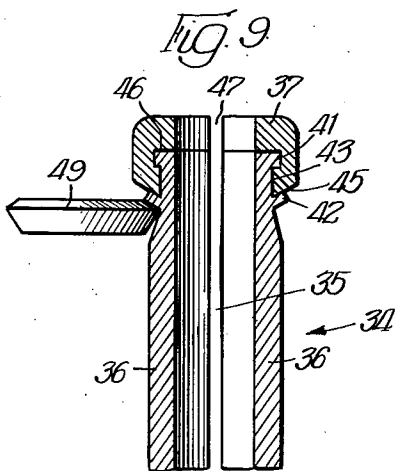
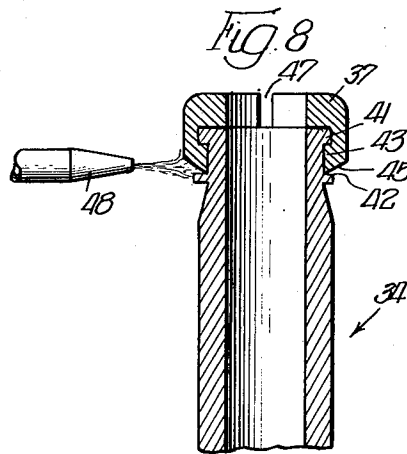
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2 SHEETS—SHEET 2



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2,580,910

CONTACT CONSTRUCTION

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6 Claims. (Cl. 200—166)

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This invention relates, generally, to contact constructions, and it has particular relation to the construction of contacts for circuit interrupters which are not only required to carry relatively high current but also are required to interrupt the flow of such current by separation of their contacts. The contact of this invention is especially adapted for use in the interrupter unit that is employed in the switch constructions shown in Patent No. 2,351,826, issued June 29, 1944, to Lindell et al. and in application Serial No. 41,597, filed July 30, 1948, both assigned to the assignee of this application. However, its use is not limited to these particular switch constructions but it may be employed otherwise as will be apparent readily to those skilled in the art.

In the switch constructions shown in the aforesaid patent and application, the circuit is first completed and finally opened through an interrupter unit which is operated in conjunction with a disconnecting switch blade. This unit comprises a hollow cylindrical stationary contact and a movable bifurcated contact which has relatively small dimensions and light weight. The fingers of the movable contact are biased apart so as to engage the cylindrical inner surface of the stationary contact under pressure and thus reduce the contact resistance and losses incident thereto. When the circuit is to be opened, the movable contact is separated from the stationary contact at a high speed and is withdrawn into a bore in insulating material from which an arc extinguishing medium is evolved. A trailer, also formed of material which evolves an arc extinguishing medium under the heat of the arc, is arranged to follow the movable contact into the bore so that the arc is confined between the bore and the outer surface of the trailer.

Since the arc is drawn or struck between the adjacent ends of the stationary or movable contacts, arcing tips of good arc resisting material, such as silver tungsten, are provided thereon. This material is relatively hard. The tips are carried on support members formed of good conducting material, such as brass, which is a relatively soft material. The tips should be held securely on their support members so as to be inseparable therefrom and capable of withstanding severe operating conditions and high heat caused by arcs formed therebetween.

The interrupter unit is required to interrupt not only currents of the order of a few amperes but also currents of the order of several hundred amperes. The arc confining space is small to extinguish low current arcs and the parts are of

light weight and small dimension to permit rapid acceleration during the opening and closing operations. When currents of the order of several hundred amperes are interrupted by this same unit, the heat incident to the arcs drawn is sufficient to melt out material, such as silver, used to braze the arcing tips to their supports and to cause them to warp. This reduces the thermal and electrical contact therebetween and increases the likelihood of failure of the unit on succeeding operations.

Accordingly, among the objects of this invention are: To provide for securing a contact tip to a support member in such manner that it is inseparable therefrom even when subjected to relatively high heat incident to the drawing of an arc; to employ a dovetail joint for this purpose; to employ this construction for fastening a ring-like tip to a cylindrical support member; to provide a mortise with at least one reentrant side in the support member and a correspondingly shaped tenon on the arcing tip for interfitting therewith; and to employ this mortise and tenon construction with a tip and support in end to end relation and also in telescoping relation.

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

For a more complete understanding of the nature and scope of this invention, reference can be had to the following detailed description, taken together with the accompanying drawings, in which:

Figure 1 is a view, partly in side elevation and partly in section, showing separable contacts constructed in accordance with this invention;

Figures 2, 3, and 4 show different steps in the assembly of the movable contact;

Figure 5 is a view, in side elevation, of the finished movable contact, only the upper end portion being shown;

Figure 6 is a view, in side elevation, of a modified form of movable contact construction; and

Figures 7, 8, and 9 illustrate different steps in the assembly of the contact construction shown in Figure 6.

Referring now particularly to Figure 1 of the drawings, it will be observed that the reference character 10 designates, generally, a pair of separable contacts which may include a generally cylindrical stationary contact 11 and a rod-like movable contact 12. The movable contact 12 is slotted longitudinally as indicated at 13 to form branches of a bifurcated construction. Near its upper end the movable contact 12 has an outer cylindrical contact surface 15 on each of the

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branches 14 for engaging a corresponding inner cylindrical contact surface on the stationary contact 11. Since the inner cylindrical contact surface 15 is continuous, it is essential that there be some degree of resiliency in the movable contact 12 and it is for this purpose that the bifurcated construction is provided by the longitudinal slot 13 so as to form the branches 14. This resiliency is required in order to permit relative movement between the contacts 11 and 12 and at the same time to maintain an adequate contact pressure between the contact surfaces 15 and 16 so as to provide good electrical contact.

Since the contacts 11 and 12 are arranged not only to carry current when engaged but also, on separation, to interrupt the flow of this current, an arc resistant tip 17 is provided at the upper end of each of the branches 14 and a similar arc resistant tip 18 is provided at the lower end of the stationary contact 11. It will be understood that the upper cylindrical support portion of the contact 11 and the branches or supports 14 are formed of good conducting material such as brass which has relatively poor arc resisting characteristics. The arcing tips 17 and 18 are formed of a material, such as silver tungsten, which has relatively good arc resisting characteristics. The present invention is particularly addressed to the manner in which the arcing tips 17 and 18 are secured in position on their respective contacts.

It will be noted that the arcing tip 18 is generally ringlike in character and that it is secured to the lower end of the stationary contact 11 by a dovetail joint 19. This same type of joint is employed for holding the arcing tip 17 onto the upper end of the movable contact 12. Since the method of fastening the arcing tip 18 to the stationary contact 11 is essentially the same as the method used for fastening the arcing tip 17 to the movable contact 12, only the latter will be described in detail herein.

As illustrated in Figure 2 of the drawings, an annular groove or mortise 22 is cut in the upper enlarged end of the movable contact 12. Initially the groove or mortise 22 has straight side walls 23 and 24.

The arcing tip 17 initially is ringlike in shape and has a tenon 25 extending from the side which is juxtaposed to the upper end of the movable contact 12. The tenon 25 has a straight side wall 26 and a reentrant side wall 27. In order to facilitate brazing of the arcing tip 17 to the movable contact 12 to join them in good electrical and thermal contact, a layer 28 of silver solder is provided on the under surface of the arcing tip 17, as illustrated.

The width of the groove or mortise 22 is sufficient to receive readily the tenon 25 and, as shown in Figure 3 of the drawings, it is inserted therein. Thereafter, the side wall 23 is deformed by a suitable forming wheel 29 so that it engages the reentrant side wall 27 as illustrated. This serves to hold the ringlike arcing tip 17 mechanically onto the upper end of the movable contact 12.

As illustrated in Figure 4, heat from a gas torch 30 now is applied to the arcing tip 17 assembled on the upper end of the movable contact 12 so as to melt the layer 28 of silver solder and braze the tip 17 to the contact 12. Thus, in addition to the good mechanical interconnection between the ringlike arcing tip 18 and the cylindrical movable contact 12 which is provided by the dovetail construction formed by the tenon 25 interfitting with the groove or mortise 22, a good

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electrical and thermal connection is provided by the brazing operation since the assembly is heated sufficiently to cause the layer 28 of silver solder to flow over the entire area of the mutually engaging parts.

After the brazing operation as illustrated in Figure 4 has been completed, the projecting ridge 31 is turned down so as to provide a cylindrical surface of uniform diameter at the upper end of the movable contact 12. Next, the assembly is slotted longitudinally as indicated at 13 to provide the bifurcated construction formed by the branches 14 having the required degree of freedom and resiliency for engaging the inner cylindrical contact surface 16 of the stationary contact 11 and also the inner cylindrical contact surface of the ringlike arcing tip 18.

Now it will be understood that the ringlike arcing tip 18 can be assembled on the lower end of the stationary contact 11 in the manner described for assembling the arcing tip 17 onto the upper end of the movable contact 12. Since the stationary contact 11 is continuous and rigid, the longitudinal slotting step is omitted.

Referring now particularly to Figure 6 of the drawings, it will be observed that the reference character 34 designates, generally, a movable contact which may be employed in lieu of the movable contact 12 shown in the preceding figures and described hereinbefore. The movable contact 34 is generally rod-like in character and is longitudinally slotted at 35 to provide branches 36, thereby affording the desired degree of resiliency for the purpose outlined above. An arcing tip 37 is provided at the upper end of each of the branches 36 for the purposes previously described.

For illustrative purposes it is pointed out that a trailer 38 of insulation can be secured by a rod 39 to the movable contact 34 so that the trailer 38 moves conjointly with the contact 34 is separating from the associated stationary contact. The trailer 38 is employed to confine the arc drawn between the stationary and movable contacts between its outer surface and a bore in a suitable insulating member through which the contact 34 moves in opening the circuit.

The manner in which the arcing tip 37 is assembled on each of the branches 36 is illustrated in Figures 7, 8 and 9 of the drawings. As illustrated in Figure 7, the contact 34 is tubular and has an annular groove or mortise 40 cut in its outer surface near the upper end. The groove or mortise 40 has straight side walls 41 and 42.

Also as shown in Figure 7 the arcing tip 37 initially is ringlike in character and it has a radially inwardly extending tenon 43 with one straight side wall 44 and a reentrant side wall 45. A layer 46 of solder is provided, as illustrated, to permit brazing of the ringlike arcing tip 37 to the contact 34 after it is assembled therewith.

The ringlike arcing tip 37 is slotted as indicated at 47 to permit the resulting halves to be telescoped with the upper end of the contact 34 with the tenon 43 interfitting with the groove 40 as shown in Figure 8. Next heat is applied to this assembly by a gas torch 48 to braze the two halves to the contact 34.

Next, as shown in Figure 9, a forming wheel 49 is employed for turning the straight side wall 42 over into engagement with the reentrant side wall 45 on the tenon 43. This operation serves to hold the arcing tip 37 mechanically to the contact 34 in addition to the brazed connection therebetween.

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After the turning operation has been completed as illustrated in Figure 9, the tubular contact 34 is longitudinally slotted at 35 in conformity with the slot 47 between the arcing tips 37. The finished construction is illustrated in Figure 6.

Since certain further changes can be made in the foregoing constructions and different embodiments of the invention can be made without departing from the spirit and scope thereof, it is intended that all matter shown in the accompanying drawings and described hereinbefore shall be interpreted as illustrative and not in a limiting sense.

What is claimed as new is:

1. A contact construction comprising, in combination, a cylindrical support member having relatively poor arc resisting characteristics, and a ringlike arcing tip having relatively good arc resisting characteristics secured to one end of said cylindrical support member by a dovetail joint.

2. A contact construction comprising, in combination, an annular support member having relatively poor arc resisting characteristics and a mortise in one end with at least one reentrant side, and a ringlike arcing tip having relatively good arc resisting characteristics and an outflared tenon along one side interfitting with said mortise in said support member.

3. A contact construction for a circuit interrupter adapted to carry relatively high current and also to open the circuit in which current is flowing accompanied by an arc comprising, in combination, a cylindrical support member formed of a relatively soft metal having relatively poor arc resisting characteristics, and a ringlike arcing tip on said support member formed of a relatively hard metal having relatively good arc resisting characteristics, said arcing tip being secured to said support member by a dovetail joint.

4. A contact construction for a circuit inter-

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rupter adapted to carry relatively high current and also to open the circuit in which current is flowing accompanied by an arc comprising, in combination, an annular support member formed of a relatively soft metal having relatively poor arc resisting characteristics and a mortise in one end with at least one reentrant side, and a ringlike arcing tip on said support member formed of a relatively hard metal having relatively good arc resisting characteristics and an outflared tenon along one side interfitting with and brazed to said mortise in said support member.

5. A contact construction comprising, in combination, a bifurcated annular support member having relatively poor arc resisting characteristics with an annular mortise in the end of each branch having at least one reentrant side, and a semi-ringlike arcing tip having relatively good arc resisting characteristics and an outflared tenon along one side interfitting with the mortise of each branch of said support member.

6. A contact construction comprising, in combination, a bifurcated annular support member having relatively poor arc resisting characteristics with an annular mortise in the side of each branch near one end having at least one reentrant side, and a semi-ringlike arcing tip having relatively good arc resisting characteristics telescoped with each branch, each arcing tip having a radially inwardly extending outflared tenon interfitting with the mortise in its branch of said support member.

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The following references are of record in the file of this patent:

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Number	Name	Date
2,301,991	Zollner	Nov. 17, 1942
2,351,826	Lindell et al.	June 20, 1944
2,406,327	Friedrich	Aug. 27, 1946