Sept. 21, 1943. N. R. SMITH 2,329,793

ELECTRICAL CONNECTOR

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Fig. 1.

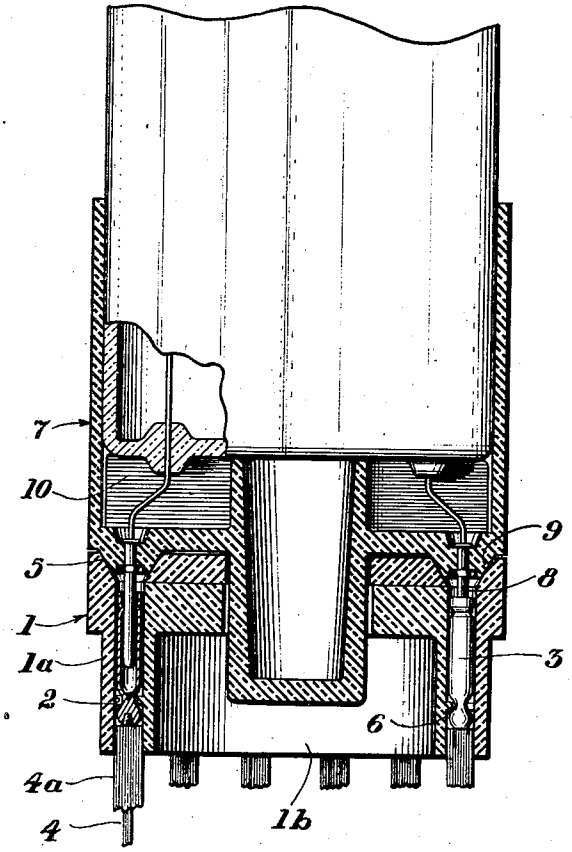
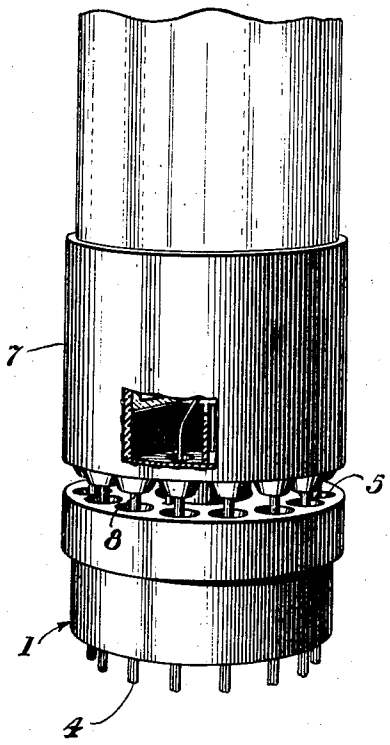


Fig. 2.



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ELECTRICAL CONNECTOR

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2 Claims. (Cl. 173—328)

My invention relates to multi-conductor connectors, particularly to combinations of male and female elements of the type used in cable connectors, in radio tubes and sockets, and the like.

The maximum voltage that may be applied between closely spaced conductors is limited by the dielectric medium between the conductors. The dielectric constant of air is lower than the dielectric constant of many of the common insulating materials, such as rubber and plastics of the "Bakelite" type, and it is found that the rarefied atmosphere, encountered in high altitude operation of aircraft, exhibits the peculiar property of ionizing and causing arc-over between exposed conductors at comparatively low voltages. Arc-over failures of sockets are usually caused by arcs along air paths between the conductors, and not through the solid insulation.

An object of my invention is connectors with male and female connector elements which effectively close all air paths between adjacent wires and contacts.

In accordance with my invention the socket body of the female connector element is provided with a plurality of female contactors set into the body with openings in the surface of the body communicating with each female contactor, the openings each being flared at its outer end to form a conical recess in said surface. The plug, base or male element of the combination comprises an insulating plate with a plurality of contact pins arranged to register with the female contactors of the socket. Each pin of the base is attached to the apex of a frustum, or conical fillet or knob, the taper and size of the frustum being the same as that of the recess in the socket. When the pins of the base are pushed home in the female socket contactors, the conical fillet of the base is seated in the conical recess of the socket. By providing for slight side-ways movement of the female contactors, the cones of the base may be made to accurately seat in the recess and completely close all air paths between any two pins.

The characteristic features of my invention are defined in the appended claims and one embodiment thereof is described in the following specification and shown in the accompanying drawing in which Figure 1 shows in section my novel combination of male and female connector elements and Figure 2 shows, in perspective, the combination of Figure 1.

By way of illustration, my novel combination of male and female connector elements is shown as a base and socket for a conventional radio tube. The socket body 1 is preferably of molded insulating material, such as a plastic of the type commercially known as "Bakelite" and is provided with a series of openings 2 arranged in a circle concentric with the body. In each opening is placed a tubular female contactor 3 connected at its lower end, preferably by welding or soldering, to a conductor 4. The upper end of the opening is flared to form a conical recess 5 in the top surface of the socket body. It has been found convenient to pre-form or cast the socket body in two members 1*a* and 1*b*, as shown in Figure 1, and to assemble the two pieces with the several metal female contactors locked into their respective openings by ledges or shoulders 6 on the inner member.

The base or male element 7 may likewise comprise a body of molded insulating material with the pins 8 arranged on the base to register with the female contactors. Each pin is supported at the apex of a cone-shaped fillet or right conical frustum 9, the sides of which are tapered with the same slope as the recess so that when the pins are pressed home in the socket each fillet seats snugly in the recess. Only slight pressure is necessary to insure good seating and effective closure of the air paths between the pins. A thin coating of wax, grease or similar viscous insulating ointment applied to the surface of either the conical recess or fillet will insure an airtight closure of the air paths and permit slight variations in both the taper of the cones and in spacings between the cone centers and still maintain a hermetic seal.

The insulating covering 4*a* on each wire conductor is preferably carried to the point where the conductor is joined to the lower end of the female contactor. In assembly, the contactors, with wires attached, are laid in longitudinal grooves on the side of inner socket member 1*b*, with the notch of the contactor astraddle the shoulder 6. The outer socket member is then slipped over the assembled contactors and inner member. The edge of the skirt of the outer member is preferably rounded so that it will ride onto and squeeze the wire insulation and hence effectively seal the bottom end of the socket opening.

Tests at high voltages in rarefied atmospheres show that bases and sockets made according to my invention will not fail due to arcing or flash-over at voltages which would destroy bases and sockets of ordinary construction. Fins 10 with-

in the base insulatingly partition the conductors to prevent arc-over there.

My novel base and socket may be made by the standard base making methods and the air seals between pins are insured merely by pressing home the base in its socket.

I claim:

1. A socket body comprising an inner cylindrical member of insulating material, said inner member having a plurality of grooves longitudinally along the outer surface of said inner member, a tubular female contactor laid in each groove, and a tubular outer insulating member telescoped over said inner member and over the contactors in their grooves, and means to hold the contactors in place, a conical recess in the socket body in coaxial alignment with one end of each of said grooves, a wire inserted in the opposite end of each of said grooves and connected to a contactor, an insulating covering on each wire, each covering being wedged in and sealed air-tight with the walls of the grooves at said opposite ends.

2. An electrical socket comprising an inner cylindrical member of pre-formed molded insulating material, said inner member having a plurality of longitudinally extending grooves along the outer surface of said inner member, a tubular female contactor in each groove, means to hold the contactors against longitudinal movement in said grooves, and a tubular outer member of pre-formed molded insulating material telescoped over said inner member and over the contactors in their grooves, a recess in the socket members in coaxial alignment with one end of each of said grooves, a wire extending into the opposite end of each of said grooves and connected to a contactor, an insulating covering on each wire each covering being wedged between the walls of said grooves and the inner surface of said outer member.

NEWELL R. SMITH.