



Jacks and Plugs for Portable Telephones

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Telephone Apparatus Development

PORTABLE telephones for subscribers were first made available by the Bell System in restaurants, hotels, and hospitals to permit patrons to receive or initiate telephone calls without having to go to a central location. To provide this service, jacks were installed at designated locations on the premises, and telephones were provided with plugs attached to the cords. A survey had indicated that more three-wire than two-wire circuits would be required, and that there would be a demand for flush jacks as well as for the non-flush type. Three-wire plugs and jacks were therefore used for both types of circuits, the jack being a non-flush type which could be arranged when required for flush mounting.

The contact portion of the plug provided was similar to the ordinary switchboard plug: one conductor terminating in the tip section of the plug, one in a metal ring just back of the tip, and the third in the sleeve or stem of the plug. The body section, however, was of greater diameter, and was provided with a hard rubber shell, enlarged at the cord end to make it easy to pull the plug out of the jack. It was subsequently found that the plug received such severe treatment in service that the hard rubber shell was frequently broken. As a result the design was changed to provide a sturdier shell uniform in diameter throughout its length. This plug, known as the No. 148, is shown in Figure 1. The cord entered through

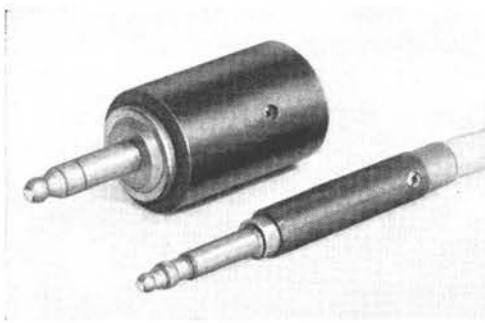


Fig. 1—The No. 148 plug differs from the ordinary switchboard plug in having a large hard rubber body, but the contact portion is of the same general type of construction

a hole in the end of the shell, and adequate space was provided for the connections, and for staying to take the strain off the conductors should the plug be pulled out by the cord.

The jack for use with this plug had a stamped metal base on which were mounted spring contacts for the tip and ring conductors. Contact to the sleeve of the plug was made by a bushing held out from the base on a punched metal support. All of these parts were

insulated from each other, and were equipped with binding screws for wire connections. A square drawn-metal shell, finished in black, fitted over the jack and had a hole in the front somewhat larger than the sleeve bushing. In this opening was sprung a hard rubber ring to insulate the shell from the bushing. There were holes in the punched metal base through which concealed wiring could be brought, and slots in the bottom edges of the shell for surface wiring to enter.

When it was necessary to mount the jack flush with the wall, the shell was not used. A blank plate such as is used with commercial flush outlet boxes was employed instead. This plate would be drilled for screws to fasten it to the jack, and with a hole at the center large enough to take the hard rubber ring surrounding the sleeve bushing. It would then be fastened over the outlet box into which the wiring had been run in the usual way.

Increased requirements for flush jacks later made it desirable to design

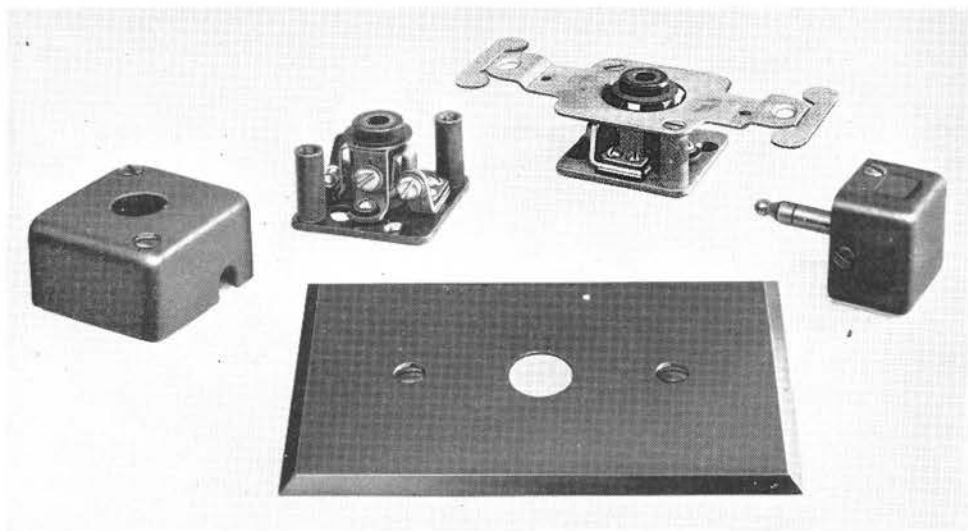


Fig. 2—An ordinary switchboard jack is too long to be used conveniently for surface mounting, and so a shorter construction was provided. The body of the plug was shortened also

a jack especially for this service so as to avoid the necessity of preparing the plates for each installation. In the first flush jack the use of separate insulators for the sleeves had proven particularly objectionable. They were not only difficult to manufacture but were frequently broken while being sprung into place or when hit by the plugs. In the design of the new jacks, therefore, the insulation was made an integral part of the sleeve bushing. With this change in construction it was, of course, necessary to design the jack to fit standard outlet boxes and plates, which might be used with it, and at the same time to keep the manufacturing costs low by using as many of the existing parts as possible. This new design is shown in Figure 2.

While the original portable telephone installations were in restaurants and hotels, the general popularity of this type of telephone has extended in recent years to offices and residences. This has involved the provision of wiring plans* and PBX services** which permit the portable telephone to be employed for many more purposes than simply answering and placing outside calls. Many of these new wiring plans require more than three conductors at the stations, and as a result plugs and jacks of more than three conductors would have to be provided for this type of service. Considering the probable demand for various numbers of contacts, it was decided to provide plugs and jacks of 3, 4, and 8 contacts: the 3-contact equipment serving when there were 2 or 3 conductors, and the 8, when there were from 5 to 8 conductors. Both flush and non-flush jacks had to be provided. The plugs and the non-flush jacks were finished in either

black or old brass, and the flush jacks in old brass or brush brass.

For three conductor service, the jacks already available were in general satisfactory but the non-flush type was changed to employ the new sleeve construction already employed with the flush type. For this new service plates were included with the flush jacks to facilitate installations and to assure finishes which would harmonize with associated apparatus.

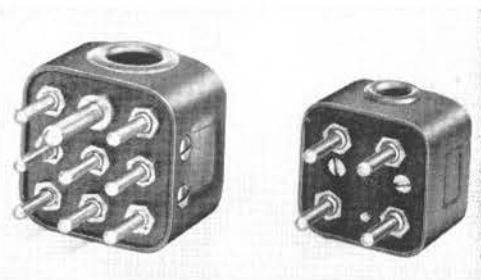


Fig. 3—With the four- and eight-contact plugs each contact is a smooth prong and provision is made to insure that the plug will always be inserted in the jack in the same way

To improve its appearance, the three-conductor plug was redesigned in the form shown in Figure 2. A shallow rectangular metal shell, instead of the cylindrical shell, was used to cover the cord connections. Considerable study was required to reduce the body elements to the small space allowed by the new cover. The cord enters through a bushed hole in the side of the cover, instead of through the face of the cover. This smaller plug, with the cord entering through the side, greatly reduced the effective projection from the wall.

For four- and eight-contact service, the type of plug and jack used for the three-contact circuits was not particularly suitable. Much laboratory study and ingenuity was necessary to design four- and eight-contact plugs and jacks

*RECORD, April 1932, p. 1.

**RECORD, April 1933, p. 244.



Fig. 4—The four- and eight-contact jacks have intermeshing spring contacts instead of the flat spring contacts of the three-contact type

which would meet the severe contact requirements, provide space for cord connections with terminals attached and for their staying, and at the same time occupy a small space. After a careful investigation it was determined that intermeshed helical springs in the jack engaging smooth cylindrical prongs on the plug would give most satisfactory contact. It is essential, of course, that any one prong of the plug should always connect to the same terminal in the jacks, and to insure this with the four-contact plug, the four prongs are not equally spaced but are located at the corners of a trapezoid. To secure the same result with the eight-contact plug an extra prong is employed which is much larger than the others. This arrangement has the additional advantages of making the union between plug and jack more rigid. These plugs are shown in Figure 3.

The jack construction is shown in Figure 4, where the arrangement of the interlocking springs may plainly be seen. The same body is used for both flush and non-flush types. Although this is economically desirable, it made the design more difficult since with the non-flush type, the body is fastened to the jack covers, while with the flush type, the body is fastened to the yoke, the plate being screwed to the yoke after it has been installed in the outlet box.

With these various forms of plugs and jacks all the more usual needs for portable telephones may be readily met. The jacks are small enough to be installed in almost any location and the variety of finishes provided make them inconspicuous. The plugs lie flat against the jacks where they are not likely to be in the way and are rugged enough to give long life under any ordinary conditions.