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Part I

The New Combined Hand Microtelephone and Bell Set

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A new telephone is described in which the telephone instrument and bell set are combined in the same moulded case. The advantages claimed are ease of fitting and reduction of fault liability. Provision has been made for one, two or three press buttons to be mounted on the instrument, thus permitting a variety of extension and interconnection facilities to be given.

Introduction.

THERE has recently been developed by the Post Office Engineering Department, working in conjunction with Messrs. Ericssons Telephones, Ltd., a new standard subscriber's set in which the bell, condenser and induction coil are mounted as an integral part of the telephone instrument and not as a separate bell set as hitherto.

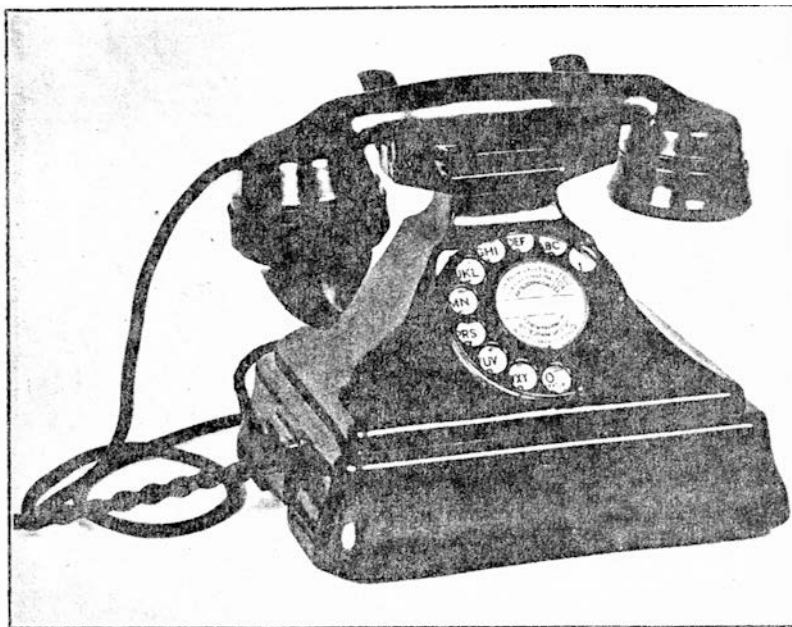


FIG. 1.—TELEPHONE NO. 162 MOUNTED ON BELL SET.

When the Telephone No. 162 was introduced in 1929 it was considered that the demand for a combined set, i.e. one in which the telephone and bell set form a single unit, would be insufficient to justify the development of a special piece of apparatus and consequently the only provision for such an item was the arrangement whereby the standard bell set (No. 25) intended primarily for wall fitting could also be mounted under the telephone in the familiar manner shown in Fig. 1. Experience has shown, however, that even with such an admittedly makeshift

arrangement as this, approximately half the micro-telephone instruments are fitted as combined sets and doubtless with the new design an even greater proportion of the demands will be for this class of instrument.

There is, however, a serious disadvantage in combining the bell with the telephone in residences where the bell has to be heard in all parts of the house. In such instances the best position for a bell is in the hall, whereas the telephone may be anywhere that is convenient. For this reason the new set is regarded as being primarily suitable for business subscribers and plan number installations, although its use is not, of course, restricted to these spheres.

The advantages of combining the telephone apparatus in a single unit are, first, the economy of a single case and chassis as compared with the variety of mouldings which make up the Telephone No. 162, and, second, the ease and simplicity of fitting. With a single unit the fitter has, on direct exchange lines, to connect only two wires to the block terminal and need not open up the instrument to do so. Thus the new instrument materially reduces the possibility of errors in fitting. Its use will also generally reduce the disfigurement to walls which is occasioned by this operation, since the block terminal can frequently be located on a window-frame or skirting-board and the fitter thus saved the plugging of the walls. A very prolific source of faults is bad fitting and the combined set is well suited for fitment by relatively unskilled staff.

General Design.

Fig. 2 shows the general appearance of the new set. Although the external shape is based on that of an instrument designed by the Swedish Ericsson Co., the internal arrangement is entirely new. The design of the case is centred around the use of a plastic moulding and the result is considered to be an extremely

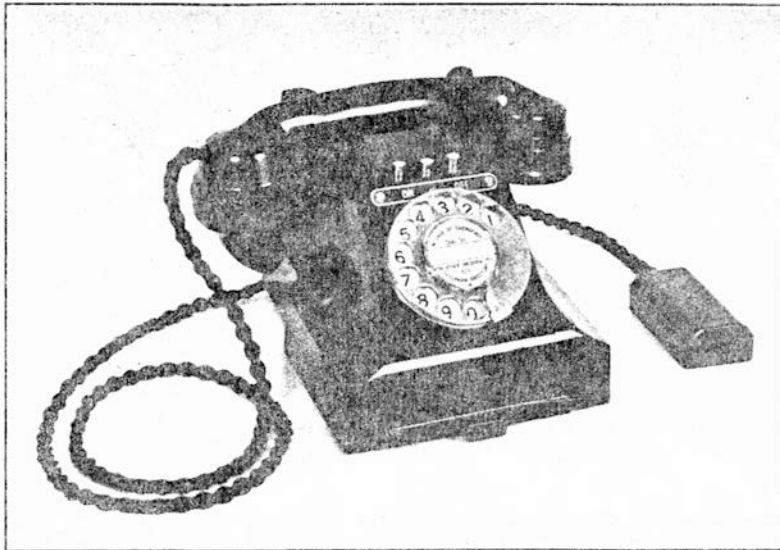


FIG. 2.—NEW COMBINED HAND MICROTELEPHONE AND BELL SET.

sturdy construction and ideally adapted for production in large quantities and in colours. The mould from which it is produced is practically a straight "draw-out," the only loose part being that which forms the dial aperture.

It will be appreciated that an important factor in the success or failure of any design of telephone instrument is the reaction of the general public to its external appearance. It is thought that the new set will be popular on this account as it has already received very favourable comment from many acknowledged authorities on design and was especially selected by the Duke of Windsor when Prince of Wales during his visit to the Stockholm Exhibition in October, 1932, for use in his own private residence.

The original design did not include the sliding tray in the base and it can hardly be claimed that this addition has improved the general appearance of the set. This tray (Fig. 3) was designed as a convenient holder for the list of "dialling codes" in those areas where a subscriber obtains other exchanges by the dialling of two or three routing digits, but it has been decided to provide it on all telephones as a container for a subscriber's private directory.

The shape of the H.M.T. rest has been designed so as to facilitate the removal and replacement of the hand microphone and it is anticipated that the use of the button type of "switch-hook," in lieu of the pattern used in the Telephone No. 162, will obviate the "sticking" trouble experienced with the latter class of instrument. Another important feature of the case design is its convenient width for gripping when lifting although it must be conceded that the weight of the set does to some extent mitigate against any great ease in this respect.

With the exception of the dial all the various components are mounted on a single chassis plate (Fig. 4). The condenser is the only component for which it has been found necessary to introduce a special variety on account of the new set. Advances in the technique of condenser manufacture have made it possible to produce a $2 + 0.1 \mu\text{F}$ condenser which

is little more than half the size of the $2 \mu\text{F}$ pattern at present used in bell sets. This new item will be the standard size for use in all future designs of bell sets and telephones.

The layout is such that all the main components with the exception of the switch springs and dial are revealed and made accessible for maintenance operations by the removal of the under-base, while the removal of three further screws frees the chassis from the case and enables any maintenance work on these two items to be easily carried out. Every effort was made to render the dial directly removable from the front of the instrument but this has not been found possible without spoiling the appearance of the set.

Circuit Arrangement.

The circuit of the CB and Auto. type is given in Fig. 5 and is simply the standard anti-sidetone arrangement (Coil Induction No. 22) which has been described elsewhere. The local battery circuit remains a sidetone arrangement and is practically the standard three winding induction coil circuit as at present used when a Telephone No. 196 is connected to a Bell Set No. 31. Although the local battery set will eventually disappear as a subscriber's instrument it will still presumably be necessary for private wires, etc., and it is likely that for these uses a local battery anti-sidetone induction coil will be introduced, but no entirely satisfactory design of coil is yet available. Space has been left, however, to permit of the use of any design of anti-sidetone coil which can be envisaged at the moment.

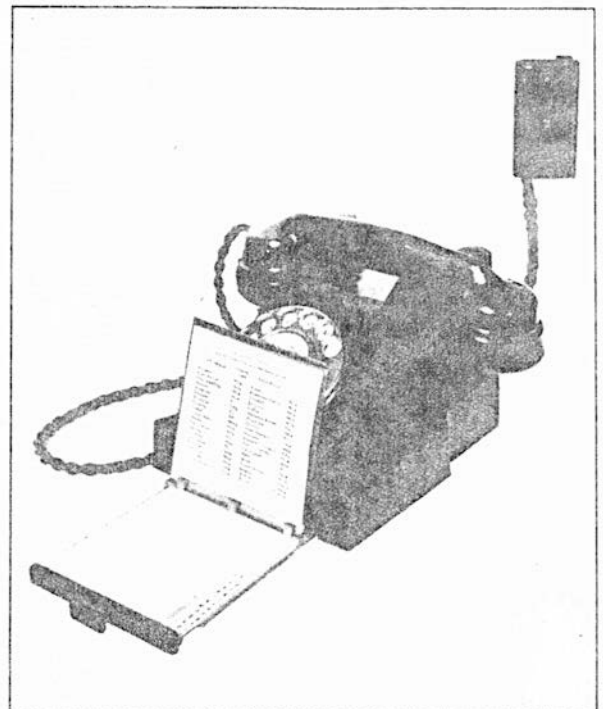
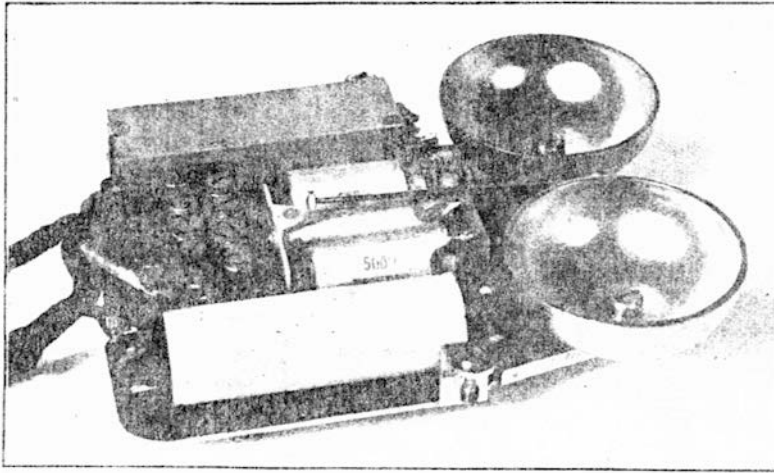


FIG. 3.—TRAY CONTAINING LIST OF DIALLING CODES.



A feature of both C.B. and L.B. circuits, which is novel to subscriber's sets in this country, is the shunting of the transmitter by a 0.1 μ F. condenser.

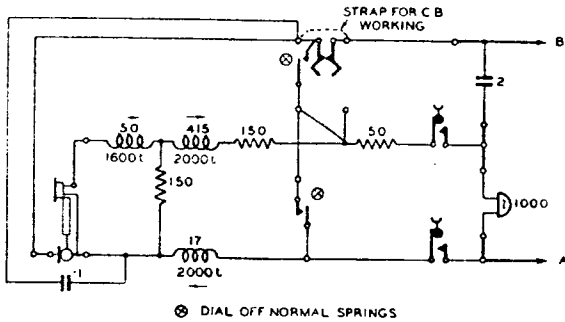


FIG. 5.—CIRCUIT OF AUTO AND CB TELEPHONE.

This condenser, besides preventing the rectifier action of the transmitter from causing interference between the telephone and nearby radio sets and vice versa, also has the effect of reducing the likelihood of the transmitter becoming packed by current surges occasioned by automatic switching, etc. A filter for preventing the dialling impulses from causing radio interference has also been designed and it has been arranged that, when required, it can be connected directly to the dial strip terminals as shown in Fig. 6.

There are in all some seven main varieties of the new instrument, excluding the sub-varieties necessitated by director and non-director working and the several colours. Patterns of both C.B. and L.B. types incorporating a trembler bell will be available for plan number working and these instruments will include a radio interference suppressor for dealing with the disturbance created by the bell contacts. This same suppressor will also act as a spark quench for the contacts and, in addition, reduce the disturbance created by the use of the bell when connected directly across C.B. and auto exchange lines.

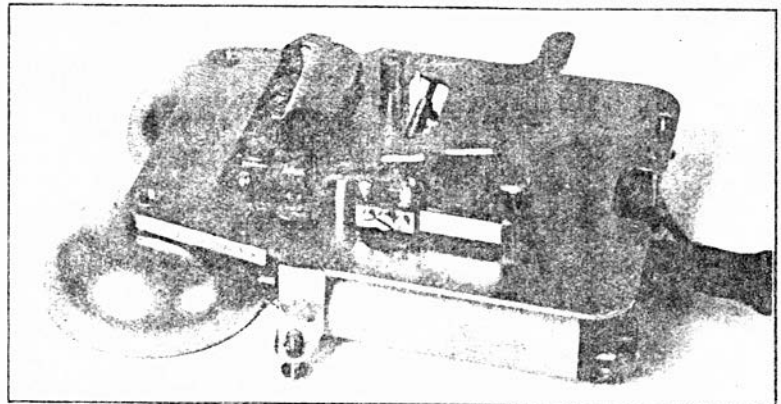


FIG. 6.—VIEW OF CHASSIS SHOWING DIAL INTERFERENCE SUPPRESSOR.

Controls for Extension Instrument Installations, Plan Number Working.

One of the main features of the new instrument is the facility for accommodating on the telephone the controls for plan number working. This facility has for some time past been a feature of the telephone instruments used by certain continental administrations but the design of the British Post Office apparatus has not until now been such as would permit of the easy inclusion of switches and keys, etc. The whole of the facilities necessary for the existing plan numbers (excluding Nos. 5 and 7) as well as many others are provided by means of three key units, two of which are identical except that for economy one is equipped with just sufficient switch springs to meet the more popular of the

plan number arrangements, whereas the other is equipped with enough springs to deal with all anticipated demands. The third key is fitted with one make contact only and is mounted and wired as an integral part of one particular variant of telephone, important uses of which will be as an extension instrument for P.B.X's, where the press button will be used for transferring calls.

There are several distinct advantages both to the subscriber and to the Post Office which are obtained by locating switching apparatus as part of the telephone. For the subscriber it simplifies operation and for the Post Office it simplifies fitting and enables the instrument to be prepared at the fitting centre complete with keys, terminal block, etc., ready for wiring. The labour economies possible from such an arrangement are obvious.

The convenience of this form of control and the fact that it may be linked with the switch-hook operation (switch hook release feature) has made possible considerable improvements in plan number facilities and it is anticipated that a complete revision of these will be undertaken in the near future together with the introduction of a simple house exchange system catering for up to three extensions with exchange line facilities. The switch-hook release feature is of particular importance because of the

facility which it affords of returning conditions to normal at the completion of a call thereby obviating mis-operation due to forgetfulness in this respect on the subscriber's part.

A further economy to be introduced with this set is the standardisation of the label, it having been found possible to meet all the envisaged demands for plan number working by ten varieties of engraved label. Up to the present the labelling of keys on plan number installations has been carried out with mechanically engraved xylonite labels mounted adjacent to the keys. The new labels are a chemically engraved metal type of rather neater appearance than the old pattern and cheaper to produce.

Key Units.

Fig. 7 shows the larger of the two similar units, each of which consists of three plunger-type keys

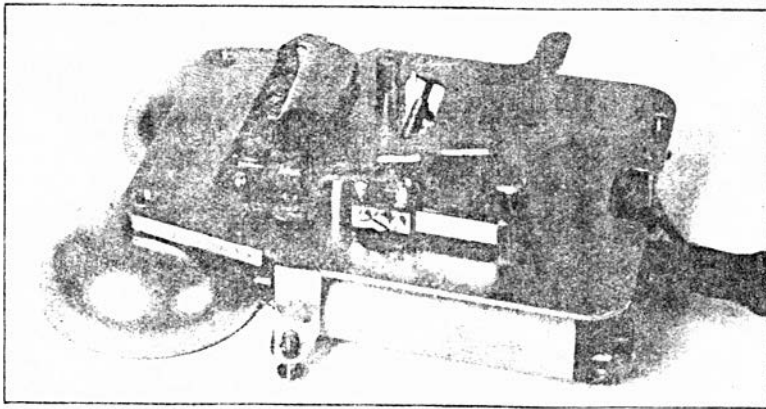


FIG. 7.—CHASSIS WITH LARGER TYPE KEY UNIT MOUNTED IN POSITION.

operated by press buttons located in front of the handset. The keys may be interlocked in various manners, e.g. all three can be left quite independent of each other to act as separate press buttons or it can be arranged that the first when depressed shall be locked in the operated position and only released from this position by the operation of the second or third. Alternatively the first or third may be locked down when operated and released by the replacement of the telephone on the rest, and so on.

These facilities are all controlled by means of the very simple control plate shown in Fig. 8. The key when operated is held in position by the lip of the spring latch plate meeting the projection on the key in ratchet and pawl fashion. The depression of a second similar button will, of course, force out the latch-plate and release the first button. To render any key non-locking, therefore, it is only necessary to prevent the latch-plate from overlapping the key projection. This is done by filling the lip with a portion of the control plate. The arrangement is such that the control plate may be mounted in a

variety of positions on the latch-plate. In each of these positions it provides one form of interlocking between the three keys.

Switch-hook release is provided by removing a second control plate from the key frame where it is located for convenience and attaching it to the switch-hook mechanism of the telephone. The sloping face forming the underside of the top projection on the plungers has been provided to cater for cases where the subscriber inadvertently depresses two locking buttons simultaneously and where the conditions are such that there is no other means of releasing them. To obviate this the top lip is designed so that if either button is depressed beyond its locked position it will force the latch plate outwards and release the second button.

The key unit switch springs incorporate twin contacts and are mounted vertically to reduce fault liability. When one or two keys are not required the buttons are replaced by dummies.

Conclusion.

The new telephones and keys offer what are, in the writer's opinion, unique facilities for mechanical switching associated with the telephone and facilities, moreover, which could only otherwise be provided by complicated lever type keys or by press buttons with relays, either of which arrangements would indubitably be considerably more expensive than the new system, and it is considered that the new apparatus represents a real advance in telephone instrument design.

In conclusion the author wishes to tender his thanks to Messrs. Ericssons Telephones, Ltd., for the provision of

the photographs used for the majority of the illustrations.

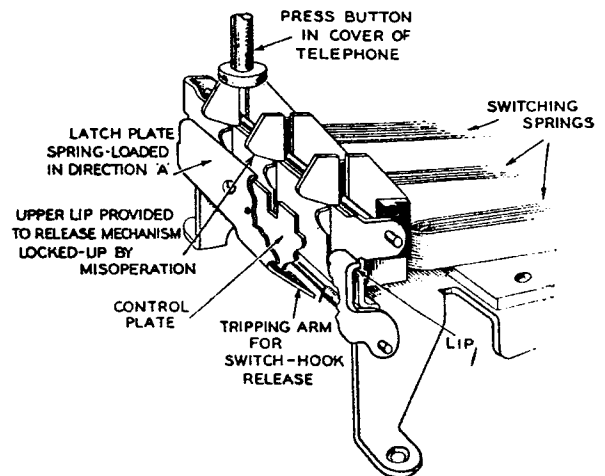


FIG. 8.—KEY INTERLOCKING MECHANISM.