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2,236,973

TELEPHONE SUBSTATION APPARATUS

Filed March 3, 1939

3 Sheets-Sheet 1

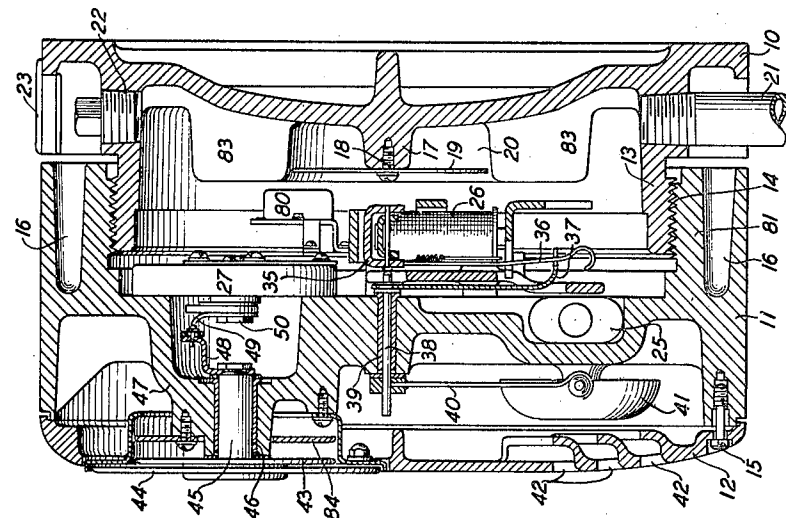


FIG. 2

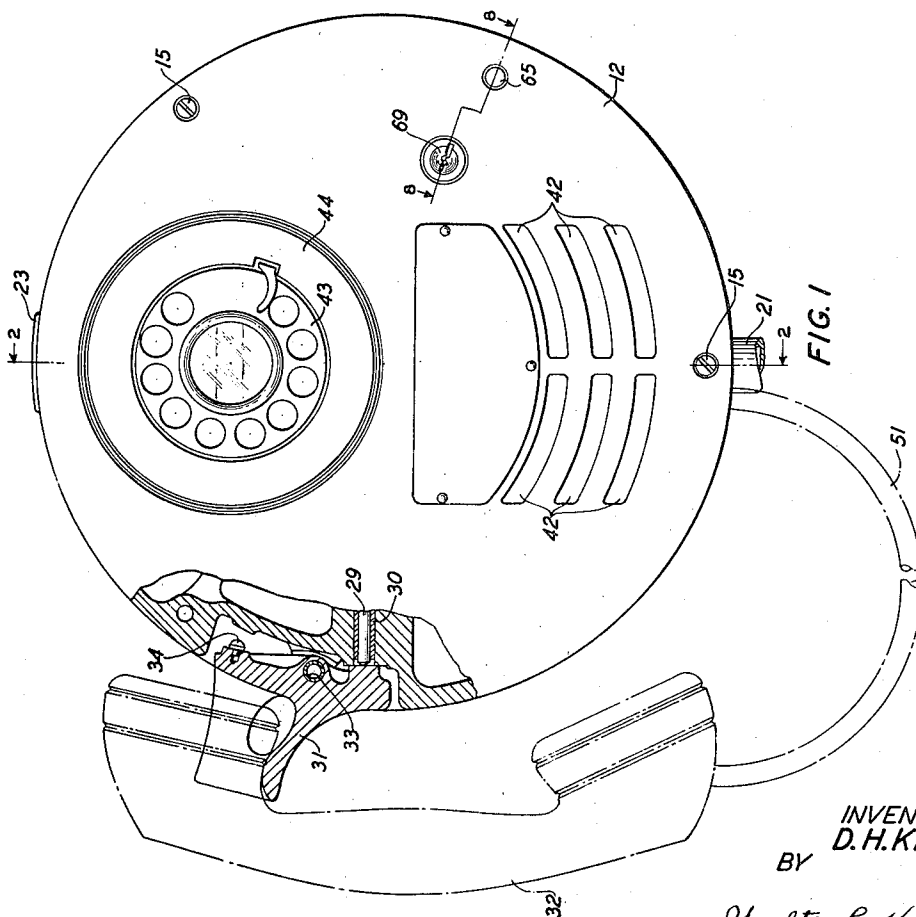


FIG. 1

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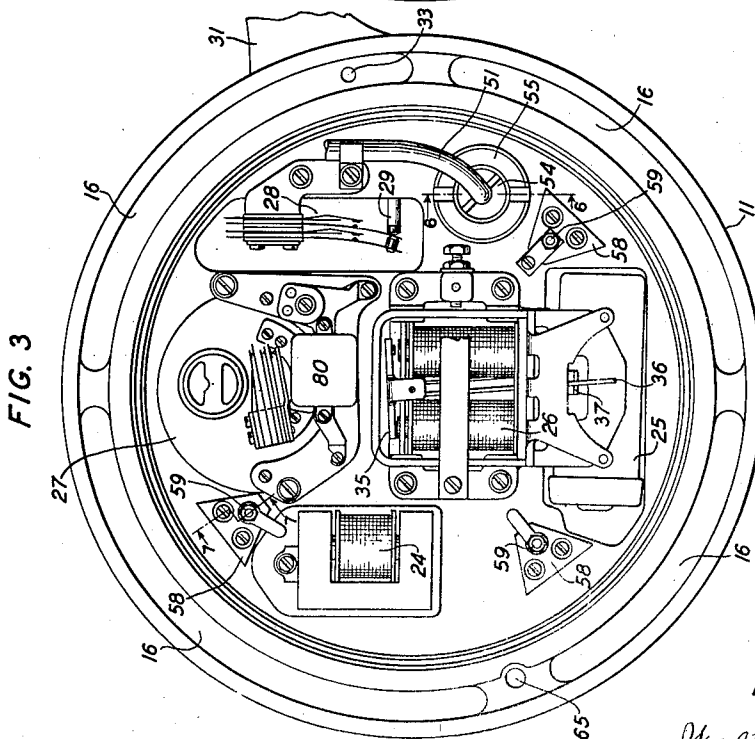
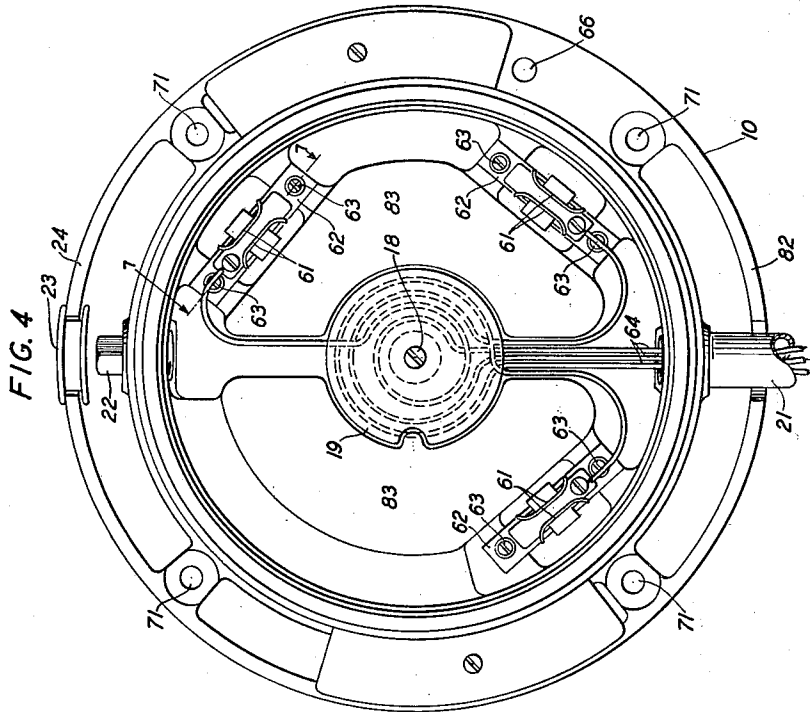
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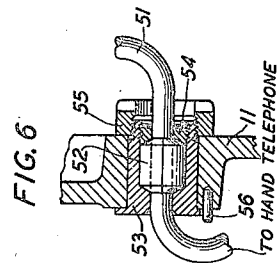
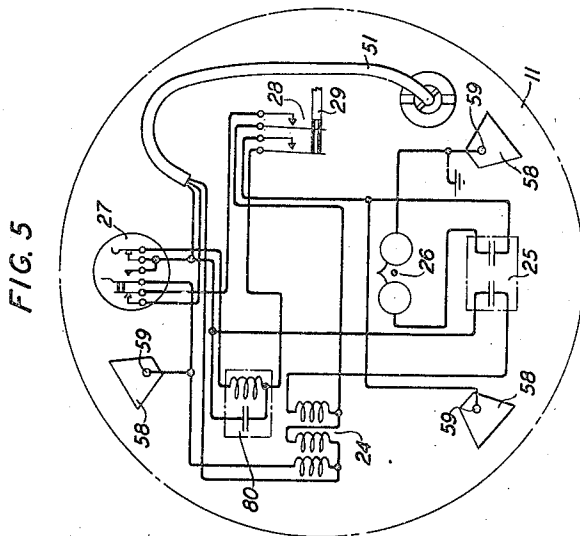
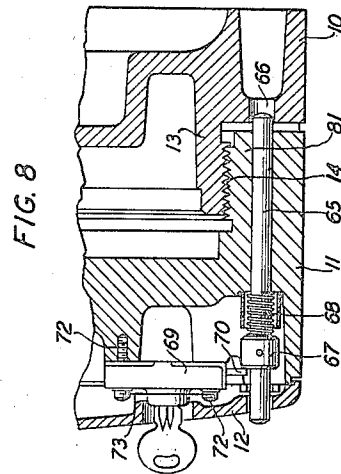
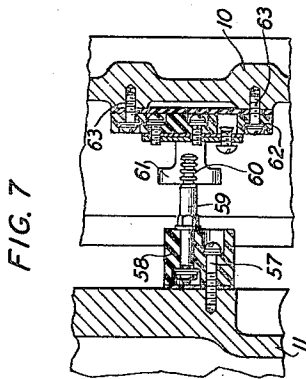
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3 Sheets-Sheet 3



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TELEPHONE SUBSTATION APPARATUS

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Application March 3, 1939, Serial No. 259,498

7 Claims. (Cl. 179—100)

This invention relates to telephone substation apparatus and more particularly to telephone sets especially adapted for use in locations, such as gas plants, chemical works, mines and the like, wherein the atmosphere may be explosive or easily ignited.

One general object of this invention is to prevent the generation, by operation, repair or installation of telephone substation apparatus, of sparks, or flames or gases of sufficient heat content to ignite the atmosphere in the vicinity of the apparatus.

Another object of this invention is to facilitate the installation and repair of telephone sets in easily ignitable or explosive atmospheres.

A further object of this invention is to simplify the structure of telephone sets particularly suitable for use in hazardous locations.

A telephone set illustrative of one embodiment of this invention comprises a mounting having a base member and a housing member, the latter having mounted thereon the various telephone instrumentalities such as the line contact switches, the ringer and the dial mechanism. The base and housing members are joined together to form a chamber in which the contacts and the electrical elements of the ringer and dial mechanism are disposed. The housing member carries also a cradle or hanger for accommodating a hand telephone, and mechanism is provided for actuating the line contacts in accordance with the placement of the hand telephone upon the cradle and removal thereof from the cradle. An external finger-piece is carried by the housing member and is connected to the dial mechanism through an explosion-proof coupling arrangement.

In accordance with one feature of this invention, the base and housing members are threaded to one another and are provided with cooperating plugs or studs and contacts which can engage one another only after the two members have been coupled to one another to such extent that the joint at the threaded portions thereof is of such character as to cool escaping gases to a safe temperature. The plugs and contacts are connected respectively to the telephone instrumentalities and to the line conductors.

In accordance with another feature of this invention, means are provided for locking the base and housing member in relative position after the housing member has been rotated upon the base member sufficiently to assure an efficient and low resistance engagement between each plug and the corresponding contact, and ad-

ditional means are provided for preventing accidental release of the locking means.

In accordance with a further feature of this invention, the instrument or instruments of the hand telephone are connected to terminals in the chamber by a multiconductor cord passing through an explosion-proof coupler in a wall of the housing member, and means are provided for preventing withdrawal of the cord while the base and housing members are joined to one another.

The invention and the foregoing and other features thereof will be understood clearly and fully from the following detailed description with reference to the accompanying drawing, in which:

Fig. 1 is a front view of a telephone set constructed in accordance with this invention, the hand telephone and cord being shown in phantom, and a portion of the mounting being broken away to show details of the cradle or hanger more clearly;

Fig. 2 is a view in section of the mounting, taken along line 2—2 of Fig. 1;

Fig. 3 is a rear view of the mounting shown in Figs. 1 and 2 with the base member removed;

Fig. 4 is a front view of the base member of the mounting showing the association of the contacts and the line conductors;

Fig. 5 is a circuit diagram showing the electrical association of the plugs and the substation instrumentalities mounted in the housing member of the mounting;

Fig. 6 is a detail view in section along line 6—6 of Fig. 3 illustrating the coupling between the telephone cord and the front wall of the housing member;

Fig. 7 is a detail view in section along lines 7—7 of Figs. 3 and 4 showing the cooperative relation of the plug and contact members; and

Fig. 8 is another detail view, mainly in section along line 8—8 of Fig. 1, illustrating the locating and locking means for positioning the base and housing members relative to one another when the plugs and contacts are in engagement.

Referring now to the drawing, the telephone set there illustrated comprises a mounting which includes a base member 10, a housing or intermediate member 11, and a cover plate 12, each of which may be of cast metal, for example aluminum. As shown clearly in Fig. 2, the base member 10 is provided with an integral cylindrical portion 13 which is threaded to a cylindrical portion 14 of the intermediate or housing member 11 as indicated at 14. The cover 12 is

secured to the housing member as by screws 15. The intermediate or housing member 11 is provided with arcuate recesses 16.

The base member is provided at its center with a raised or hub portion 17 to which there is affixed, as by a screw 18, a plate or disc 19 which forms a recess 20 with the base member. The portions 83 bounding the recess reduce the volume of the chamber. The base member is provided also with one or more threaded openings for receiving a pipe or conduit. In the specific embodiment shown, as illustrated clearly in Fig. 2, two diametrically opposite threaded openings are provided. One of these openings has threaded therein a pipe conduit 21 through which the line wires may be introduced into the mounting. The other opening is sealed by a threaded plug 22. A second plug 23, H-shaped in one section as shown in Fig. 4, is fitted in a groove in the peripheral wall 82 of the base member and overlies the plug 22. When the base and housing members are threaded together, the rim of the housing member is immediately opposite the plug 23 and locks it in place so that the plug 22 cannot be removed until the housing or intermediate member 11 has been unscrewed from the base member 10 to a predetermined distance.

Secured to the inner wall of the housing member 11 are the substation instrumentalities such as an induction coil 24, condenser 25, ringer 26, dial mechanism 27, filter 28 and the contact springs 28, each of which may be of standard or generally standard construction.

The contact springs 28 are actuated by a push rod 29 which is slidably fitted in a tubular bushing 30 fitted in turn in a bore in the side wall of the housing member 11. The bushing 30, which may be of bronze, is of such length and the clearance between the push rod 29 and bushing 30 is so small that any heated gases or flames produced within the mounting, for example, by sparks resulting from actuation of the contact springs 28, and leaking out between the push rod and bushing will be cooled to such an extent by the time they reach the atmosphere exterior of the mounting that they cannot ignite this atmosphere. The push rod 29 is actuated by a cradle or hanger 31, which is adapted to receive one end of a hand telephone 32, pivoted upon an axle or shaft 33 fitted in the housing member 11. The cradle or hanger 31 may be provided with a non-magnetic, for example, rubber, stop or bumper 34. It will be apparent that when the hand telephone 32 is suspended in the cradle or hanger, the push rod 29 is forced inwardly to actuate the contact springs 28. Conversely, when the hand telephone is removed from the cradle or hanger the springs 28 force the push rod 29 outwardly to rock the cradle or hanger.

The rockable armature 35 of the ringer 26 carries an arm 36 which extends into a slot in a second arm or lever 37. The arm or lever 37 is affixed at one end to a shaft or axle 38, which is fitted in an elongated bearing 39 and carries a clapper 40. The bearing 39 is of such length that any flames or heated gases produced in the mounting will be cooled to such a degree that any gases seeping between the bearing 39 and shaft 38 will be of insufficient temperature to ignite the atmosphere outside of the mounting. The clapper 40 extends between a pair of gongs 41, only one of which is shown, mounted on the front wall of the housing member 11. The cover plate 12 is provided with a plurality of arcuate apertures 42 adjacent the gongs 41 to allow egress of sound from the gongs. If desired, the housing member

may be provided with openings in the side wall thereof, adjacent the gongs.

A rotatable finger wheel 43 is located in an aperture in the cover plate 12 in alignment with a dial number plate 44 and a backing plate 64 and is carried by a shaft or axle 45 rotatably fitted in an elongated bearing 46 extending through a hub 47 on the housing member 11. The shaft or axle 45 has affixed thereto a finger 48 which securely engages a second finger 49 affixed to the operating shaft of the dial mechanism 27 by a nut 50. The bearing 46 and axle or shaft 45 also are so constructed that any gases or flames flowing outwardly therebetween will be cooled to such an extent that they cannot ignite the atmosphere exterior of the housing.

The instruments of the hand telephone 32 are connected to terminals within the mounting by a multiconductor cord 51 which passes through a slot, not shown, in the housing member 11 and through an aperture in the front wall of the housing member, as shown in Figs. 3 and 6. The cord 51 has affixed thereto, as by vulcanizing, an expansible, for example rubber, gland or gasket 52 which is clamped within a flanged cup-shaped insert or bushing 53 by a nut 54 threaded to the insert. The nut 54, when threaded in the insert 53, forces the gasket into gas-tight engagement with the insert 53. The insert 53 is fitted in the front wall of the housing member 11 and locked thereagainst as by a nut 55. A stop pin 56 may be provided to prevent rotation of the insert 53. It will be noted that, inasmuch as the gasket 52 is vulcanized to the cord 51 and the sleeve is locked in place by the nut 55, the cord cannot be moved or withdrawn unless the housing member 11 is removed from the base member 10. Hence, no leakage path for flames or hot gases can be established at the point where the cord 51 passes through the housing member 11, while the housing and base members are joined.

The housing member 11 has affixed to its inner surface, as by screws 57, a plurality, for example three, of insulating terminal blocks 58, each of which carries a metallic terminal stud or plug 59. The studs are arranged on a circle and the inner end of each may be grooved as shown at 60 in Fig. 7. The substation instrumentalities may be connected to one another and to the plugs or studs 59, as shown in Fig. 5, in any desired circuit arrangement.

The base member 10 has mounted thereon a plurality of pairs of spring contacts or blades 61 spaced in the same relation as the studs or plugs 59, as shown in Fig. 4. The contacts 61, which may be T-shaped arms formed in pairs from a metal sheet, are affixed to insulating blocks 62 secured to the base member 10, as by screws 63, as shown in Fig. 7.

The line conductors 64, which enter the mounting through the conduit 21 are held in position by the disc 19, and each of these conductors is connected to a corresponding one of the pairs of contacts 61.

As will be apparent, when the housing 11 is rotated upon the base member 10, each of the plugs 59 may be brought into engagement with a corresponding pair of the contacts 61 whereby the various substation instrumentalities are connected to the line conductors 64. It will be appreciated that when contact is made between the plugs 59 and contacts 61, sparks may be produced if the line wires 64 are carrying current. Such sparks might produce flames or gases of sufficiently high temperature to ignite the atmosphere. To pre-

vent egress of such gases, the threaded joint 14 between the base and housing members is designed so that the plugs 59 cannot engage the contacts 61 until the housing has been rotated through a sufficient number of turns to establish a cooling path of predetermined length at the junction 14 between the base and housing members, that is, until the junction is such that any hot gases which might seep therethrough are cooled to such a degree that they cannot ignite the atmosphere exterior to the mounting. For example, in a specific embodiment, the threaded portions of the base and housing members may have eight threads per inch and the plugs and contacts may be so spaced that engagement therebetween is not established until the housing member 11 has been rotated through at least five full revolutions upon the base member 10.

After initial contact between the plugs and contact springs, the housing member is rotated through a few, for example three, additional turns, so that a large area, and hence low resistance, contact is established between each plug 59 and the corresponding contact springs 61. During this rotation, the plugs 59 pass between and in wiping engagement with the contacts 61 so that any foreign matter is removed and the final electrical connections are highly efficient.

When the required number of revolutions of the housing member has been made so that each plug 59 is in good electrical engagement with the corresponding contacts 61, the housing member 11 may be locked to the base member 10 by a push rod or pin 65, which slides in a bore in the housing member 11, fits into an aperture 66 in the base member 10, as shown in Fig. 8, and projects from the cover plate 12. The push rod or pin 65 is provided with a collar 67 and is urged outwardly by a helical spring 68. It may be locked in place, that is, with one end thereof in the aperture 66, by a key operated lock 69 having a retractable latch 70 adapted to engage one end of the collar 67. The lock may be secured to the housing member by screws 72 which may have a sealing wire 73 extending there-through.

When the housing 11 is to be removed from the base member 10, the lock is operated to release the latch 70 whereby the spring 68 may act to withdraw the push rod 65 from the aperture 66. The housing 11 is then rotated and the engagement between the contacts 61 and plugs 59 thereby broken. When this disengagement occurs, it will be apparent that the junction 14 is sufficiently long to prevent escape of any hot gases to the external atmosphere without cooling thereof to a safe temperature.

The telephone set may be mounted upon a wall or other support by a plurality of bolts, not shown, extending through openings 71 in the base member 10. Inasmuch as the housing member 11 overlies these openings, the bolts cannot be removed without disengaging the housing and base members from each other.

Although a specific embodiment of the invention has been shown and described, it will be understood that it is but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined in the appended claims.

What is claimed is:

1. Telephone substation apparatus comprising a base member having an aperture therein, a housing member mounted on and rotatable with

respect to said base member, a plurality of terminals carried by said housing member, substation instrumentalities mounted on said housing member and electrically connected to said terminals, a plurality of contact members, one for each of said terminals, mounted on said base member, each contact member being engageable by the corresponding terminal upon rotation of said housing member upon said base member, a push rod carried by said housing member and insertable in said aperture, resilient means for holding said push rod out of said aperture, and lock means for securing said push rod in said aperture.

2. A telephone set comprising a base member and a housing member defining a chamber, said housing member being threadably joined to said base member and rotatable with respect thereto, substation apparatus mounted on said housing member and within said chamber, contact members mounted on said base member, terminal members, one for each of said contact members, mounted on said housing member, and means electrically connecting said apparatus to said terminal members, each of said terminal members being engageable with the corresponding contact member only after said housing member has been rotated upon said base member through a number of revolutions sufficient to provide an explosion-proof junction between the threadably engaging portions of said base and housing members.

3. A telephone set comprising a mounting including a base member and a housing member, said base and housing members having cylindrical portions threaded to one another whereby said housing member is affixed to said base member by rotation thereof, a plurality of contact members mounted substantially in a circle on said base member, a plurality of terminals, one for each of said contact members, mounted substantially in a circle on said housing member, and telephone apparatus carried by said housing member and electrically connected to said terminals, said cylindrical portions, terminals and contact members being so constructed and arranged that said terminal members can engage said terminals only after said housing member has been advanced toward said base member by rotation thereof through a number of revolutions sufficient to form a cooling path of minimum predetermined length between the contacting surfaces of said cylindrical portions.

4. A telephone set in accordance with claim 3 comprising means for fixedly positioning said housing member with respect to said base member when said terminals and contact members are in engagement, and means for locking said positioning means in place.

5. A telephone set in accordance with claim 3 wherein said base member is provided with a conduit opening, and comprising a plug sealing said opening, and means for preventing removal of said plug comprising a second plug overlying said first plug and locked in position by said housing member.

6. A telephone set comprising an explosion-proof housing including a pair of members having coaxial threaded cylindrical portions whereby said members may be joined by rotating one with respect to the other, spaced terminal studs carried by one of said members, substation apparatus mounted on said one member and electrically connected to said studs, and contact means, one for each of said studs, mounted on

the other of said members and spaced in the same relation as said studs, each of said contact means including spaced spring members adapted to receive a stud between them, and said studs and contact means being located on concentric circles coaxial with said cylindrical portions, whereby said studs pass between said spring members and in wiping engagement therewith when one of said first members is rotated with respect to the other.

5 7. A telephone set in accordance with claim 6 wherein the threaded portions of said cylindrical members have such pitch that said terminals can engage said contact means only after one of said first members has been revolved on the other to provide a cooling path of predetermined minimum length between contacting parts of said threaded portions.

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