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Schleicher et al.

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[54] **LOCKING MECHANISM**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **339/75 M,** 339/119 R

[51] **Int. Cl.** **H01r 13/54**

[58] **Field of Search** 339/75–79, 82, 91, 119, 120

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[57] **ABSTRACT**

A removable locking mechanism for a plug-in connection of two complementary parts contains one part of the connection and a locking element. This element comprises a shoulder which is located on a base and which also has a lug. When assembled in the connection part the element can be caused to slide in a longitudinal direction between two limiting positions by means of locating means actuable from outside the connection. In one position the shoulder, passing through the contact surface of the plug-in connection, causes the lug to engage with the other connection part thereby preventing separation of the plug-in connection in a transverse direction.

4 Claims, 3 Drawing Figures

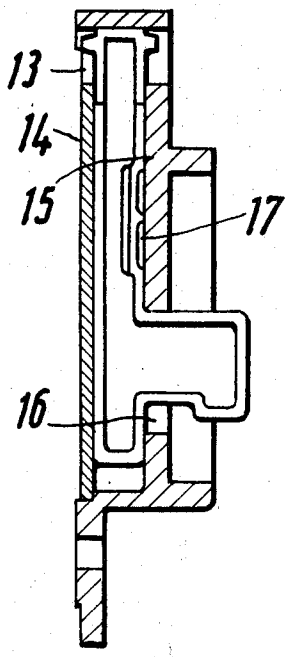


Fig. 1

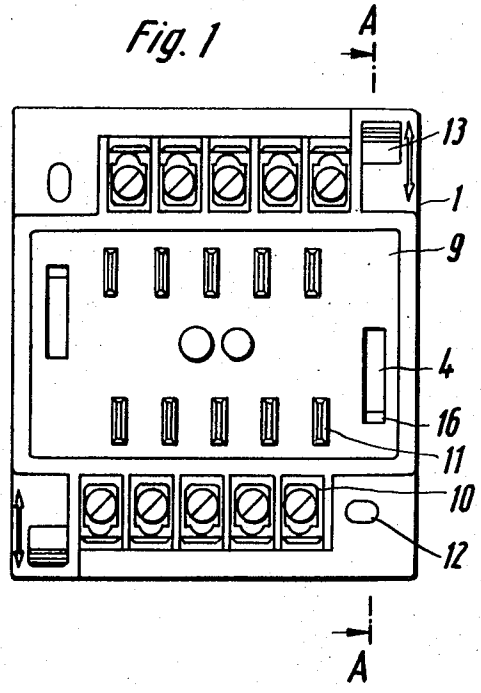


Fig. 2

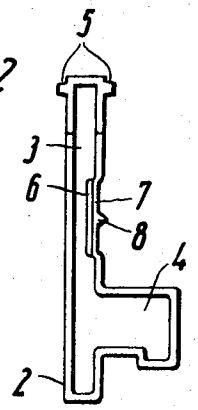
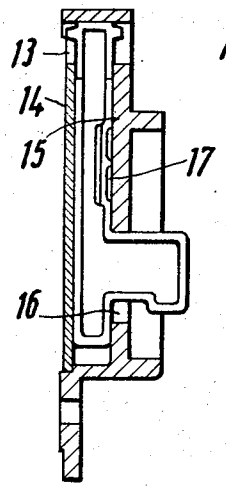


Fig. 3



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LOCKING MECHANISM

The invention relates to a releasable locking mechanism for plug-in connections or the like, having one or more locking members that are accommodated by the plug bracket.

In general, quick release and interlocking connections are established by connecting the socket leads with a contact plug *via* appropriate spring contacts, thus creating a largely resistance-free connection. Such plug-in connections are customary for normal plugs and have long proved their worth in practice. Difficulties are particularly likely to occur if the plug-in connections are subjected either to frequent stress, e.g. vibration or the like, or if the plug-in connections are particularly heavy and massive in construction as required for special circumstances. Cap clips linked to one half of the connection have often been employed here to enable the one half to be arranged, preferably spring-mounted, over the other half after making the plug-in connection. Particularly durable plug-in connections can also be made by establishing a screw connection in the respective socket after insertion of the plug, but this must firstly be released before separating the plug parts.

Problems arise when the one half of the connection is an electrical or electronic unit such as part of a printed circuit, an actuation mechanism with a synchronous induction motor, a contactor, a measuring instrument or a time-lag relay. At one lower front face such devices are provided with a plug contact rib over which all the necessary contacts of the unit are supplied, designed to secure the appliances in place easily and to enable them to be exchanged without difficulty. A corresponding plug contact bracket, usually in the form of a socket plate, is analogously shaped and can be secured firmly in position to a panel or the like.

For the above-mentioned electrical and electronic equipment it is important for reasons of operational safety of the complete plant, such as production lines, that the plug-in connections remain durable even under mechanical stresses and do not accidentally work loose. In order to prevent the accidental loosening of a device attached to a socket plate, two swivelable clip-like bars can be mounted on the socket plate, and are preferably mounted on opposite side faces of the socket plate. When in the locked position, the clip overlaps a corresponding rim at the base of the unit so clamped. To detach the plug-in connection, the clip members must be disengaged from the attached unit, e.g. the time-lag relay or the like, by hand or by means of a tool such as a screw-driver, and only after this can disconnection be effected.

Such slip members have the considerable disadvantage that dismantling of the plug-in connection can only be accomplished by a swivelling movement from the base, which requires additional space. Cascade connections which are used for numerous measuring instruments, indicators and the like, demand for utility that the smallest amount of space is used. The individual components are thus attached as closely together as their base shape allows on the panel so that valuable space is not lost. Moreover, the known clip members are also disadvantageous because once they are brought into engagement with the holder, they are difficult to reach and can often be detached only with appropriately long and slender tools. Faulty construction often results in damage to the unit during securement.

The present invention sets out to overcome these disadvantages, by providing a removable locking mechanism for a plug-in connection of two complementary parts, which locking mechanism comprises; a first part of said connection capable of receiving the second part of said plug-in connection in a transverse direction and a locking element which element comprises:

a. a base adapted to move slideably in a longitudinal direction between two limiting positions;
b. a shoulder extending transversely from said base and capable of passing through the abutting surface of the second part of said plug-in connection;
c. a lug on said shoulder; and
d. a locating means which can be actuated from outside the plug-in connection to cause the base to slide, whereby in one position of said base the lug engages with the said second part of the plug-in connection so as to prevent separation of said plug-in connection at least in a transverse direction.

Since the locking members may be associated with an L-shaped shoulder on a longitudinal edge of a bar, it can be arranged that they do not overlap the base area of the plug bracket inside which they are located, either in the locked or in the unlocked position. The L-shaped formation that actually performs the locking action is advantageous, as with this, one simple unidirectional movement is necessary to effect locking, without an additional movement in a second direction — as is the case with a bent hook. Because the locking member stays within the plug bracket or the socket plate, respectively, and never leaves this base area, the devices provided with this locking mechanism can be placed uninterruptedly side by side or adjacent other devices without the intervening space hitherto required for the locking member.

Desirably each locking member has at least one, preferably two actuation lugs, which are openly accessible to facilitate locking and unlocking of the plug-in connection from both sides of the bracket. These lugs may be positioned inside an opening in the socket plate and can be easily reached by hand or with a simple tool. One particular advantage is that the locking member can be operated from the front of the socket plate, and from behind it. This provides the socket plate equipped with the locking member(s) of this invention with manifold uses without the necessity for structural measures to be taken or changes made.

Preferably the elongated bar of the locking mechanism has a slotted passageway passing through it, which is bridged over by a stay carrying the lug for stopping the locking mechanism in two positions. This arrangement of the locking mechanism is particularly advantageous, as it enables the stay to act as a kind of flat spring causing the lug to click into position under spring tension *via* a stop-shoulder within the socket plate in which the locking member is guided. In the production of a plastics locking member, i.e., in the use of an appropriately shaped injection casting mould, no additional work cycle or expenditure is required to produce the narrow, slot-shaped opening in the bar so as to provide the bridging stay with the necessary spring tension.

Advantageously the side face carrying the rest of the mechanism is offset by an amount corresponding to the height of the rest along the length of the slot-like opening. The lockin member can be easily slid through this depression within the socket plate, which may be

shaped like a flat casing, and the stop-shoulder counteracting lug exclusively, requires a slight protrusion preferably corresponding in cross-section to the cross-section of the above-mentioned lug.

Conveniently two locking rests with accompanying locking members are provided within the plug area of the plug-in connection and diametrically opposite sides. A satisfactorily stable mounting is ensured without the need for more than two locking members by the opposing senses of the locking members.

Optionally the locking member consists of a die-cast portion which is visually distinguished from the plug bracket by another color. The locking member of its actuating shoulders, which are easily accessible *via* a passage within a corner of the socket panel, can be visually detected without difficulty so that the person using it is faced with no great problem in performing the locking or unlocking operation.

The present invention will be further described by way of a non-limiting embodiment with reference to the accompanying drawing in which:

FIG. 1 is a top view of a plug socket panel with the locking mechanism according to the invention with the locking element inserted;

FIG. 2 is a side section of the locking element according to the invention; and

FIG. 3 is a cross-section along the line A—A of FIG. 1.

The socket bracket 1 as usual carries several connections 10 along one or several terminal strips. Here the connections can take the form of screw clips or flat plug-in terminals; corresponding soldering tags can also be used. Each of the connections 10 is associated with a contact socket which is located underneath accompanying slot guides 11 for the plug contacts. Oval apertures 12 can be advantageously located in the socket panel 1 approximately at the terminal strip level but at opposite corners of the socket panel. These enable the socket panel to be secured to a mounting by screws, rivets or the like.

Rectangular apertures 13 are positioned at the face in the remaining corners of the square socket panel 1 of this embodiment to facilitate free access to the locking members.

The locking shoulder 4 of the locking member 2 (FIG. 2) projects through corresponding recesses in the face of the socket panel and can be attached thereto by moving the locking member after having mounted the second half of the plug-in connection. The protruding shoulders 4 of the locking members can be advantageously positioned inside the plug-in surface 9 of the socket panel 1 and as far apart as possible. This impedes loosening of the retained plug-in connection.

For reasons of simplicity and manufacturing cost the locking member is of plastics material that can be produced in a die mould in a single work cycle. Locking member 2 consists mainly of an elongated bar 3 which engages in a locking position along a flat side surface with a locking shoulder 4. The edge configuration of the locking member is reinforced and/or broader in shape than the body so as to achieve stability with the least materials. Locking shoulder 4 is L-shaped and the angular foot section of the L-shaped locking shoulder can be positioned to engage with a counterpart piece inside the second half of the plug-in connection so as to prevent loosening of the connection when in locked position. Within the locking member 2 on the same side as the locking shoulder 4 there is an aperture 6 that is slot-like in appearance and is laterally positioned to run in the longitudinal or axial direction, and this is overlapped by the broad, reinforced edge configuration taking the form of shoulder 7. In the center of this a stud projection 8 is located, the upper edge of which is in alignment with the side face end sections of locking member 2. This shoulder 7 is offset over the length of the passage by an amount corresponding to the height of stud 8. The configuration of shoulder 7 and the slot-like passage ensures that stud 8 is provided with a resilient mounting so that on shifting locking member 2, and thus stud 8 has snap action with a corresponding retains stops inside the socket panel without deflecting the locking member 2 in any direction other than the required one.

At the upper end of the bar 3 of the locking member 2 there are two opposite actuation studs 5 which slide in one of the rectangular recesses 13 located at opposite corners of the front face and which can be operated by hand or by a screwdriver or the like from outside. The locking member can be fairly narrow in width and extend lengthwise perpendicular to the length of the locking shoulder 4. The head section of the actuating studs 5 is relatively broadened, so that manipulation of the locking member is possible by pressing on the actuation studs 5 with normally available tools.

In FIG. 3 the locking member of FIG. 2 is shown in the socket panel. The socket panel 1 is formed from a flat and rectangular housing having spaced walls 14 and 15. The locking member is mounted for slideable movement between these two walls. MOvement is limited by the length of the recess 16 within the front wall 15 of socket panel 1, as the locking shoulder 4 protrudes through this. Stud 8 is depicted in the unlocked position on one side of the accompanying retaining stud 17 on front wall 15. Stud 8 moves over the retaining shoulder 17 on moving locking member 2 due to its spring mounting, i.e., the presence of the slot-like passage 6, to remain in its locking position at the other side of the retaining stud. Actuation of the locking member 2 is effected through the rectangular recesses 13 with the aid of the actuation studs 5. FIG. 3 shows clearly that actuation can be effected both from the front as well as from the back of the socket panel. In order to clearly distinguish the locking member visually from the socket panel, it is advantageous and desirable to color it differently from the socket panel. A bright color such as red or yellow is particularly favorable in this respect for the finishing of the locking member, guiding the eye to the passage 13 and thus to the actuation studs 5.

The present invention provides plug-in connection for electrical and electronic equipment which is plugged into the socket panel and which, as a result of its method of operation and constructional shape, can be light, and can, therefore, easily work loose in the absence of a locking device. The plug-in connection is particularly useful in connection with a time-lag relay.

Front plate 14 is detachably secured secured to the socket panel, i.e., by screws or other means, for reasons of assembly and manufacture as well as to facilitate easy access to the separate contact terminals.

We claim:

1. A removable locking mechanism for a plug-in connection of two complementary parts, said locking mechanism comprising a first part of said connection

capable of receiving the second part of said plug-in connection in a transverse direction, said first part comprising a pair of spaced walls, and a locking element comprising an integral L-shaped member including an elongated base mounted for longitudinal sliding movement between said walls between two limiting positions, said base having an integral shoulder extending transversely from said base through one of said walls and adapted to pass through the abutting surface of the second part of said plug-in connection, said shoulder having a lug thereon that is disposed outside and spaced from said one wall, locating means actuable from outside the plug-in connection to cause said base to slide lengthwise wherein in one position of said base the lug engages with said second part of the plug-in connection so as to prevent separation of said plug-in connection at least in a transverse direction, and snap-action locking means on said first part of said connection and on said locking element engaging with each other to define said two positions of said locking element between which said locking element moves with a snap action, said snap-action means comprising interengaging studs on said locking element and one said wall.

2. A mechanism as claimed in claim 1, and means mounting said stud on said locking member for inward displacement when said studs pass over each other.

3. A mechanism as claimed in claim 2, said mounting means for said locking member stud comprising a spring mounting that bridges over a passage in said locking member, said locking member stud being carried by said spring mounting.

4. A removable locking mechanism for a plug-in connection of two complementary parts, said locking mechanism comprising a first part of said connection capable of receiving the second part of said plug-in connection in a transverse direction, said first part comprising a pair of spaced walls, and a locking element comprising an integral L-shaped member including an elongated base mounted for longitudinal sliding movement between said walls between two limiting positions, said base having an integral shoulder extending transversely from said base through one of said walls and adapted to pass through the abutting surface of the second part of said plug-in connection, said shoulder having a lug thereon that is disposed outside and spaced from said one wall, and locating means actuable from outside the plug-in connection to cause said base to slide lengthwise wherein in one position of said base the lug engages with said second part of the plug-in connection so as to prevent separation of said plug-in connection at least in a transverse direction, said locating means comprising a pair of opposed recesses extending through both of said walls and surrounded on all sides by said walls, said base having oppositely outwardly extending actuation studs thereon that are disposed in said recesses whereby said locking element may be manipulated from opposite sides of said first part of said connection by pressing against either of said actuation studs in the direction of longitudinal sliding movement of said locking elements.

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