

[54] **DETACHABLE CONNECTION FOR ELECTRICAL CONTACTS OF A PLUG AND SOCKET**

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[58] Field of Search.....**339/41, 40, 36, 191, 63, 206, 339/207, 209, 196**

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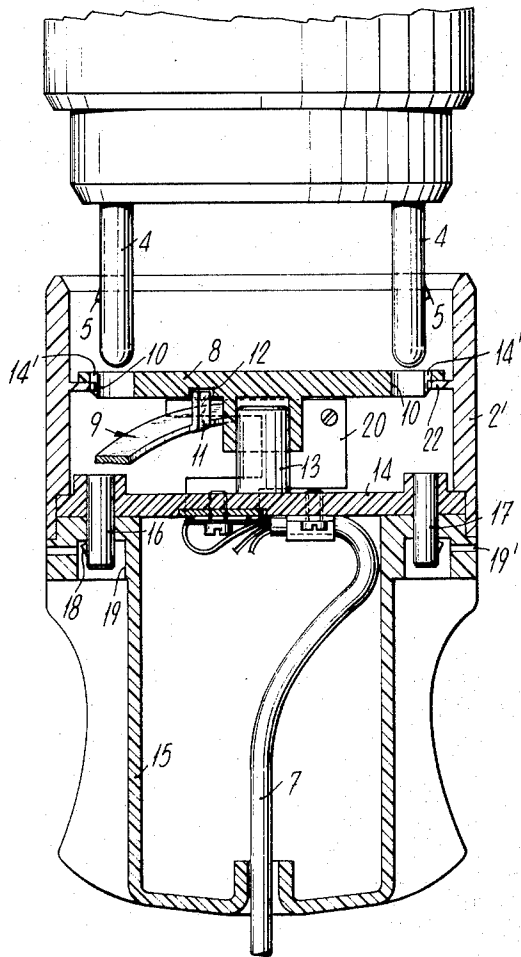
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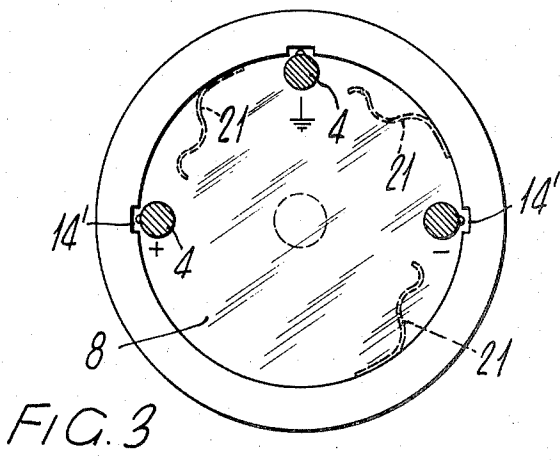
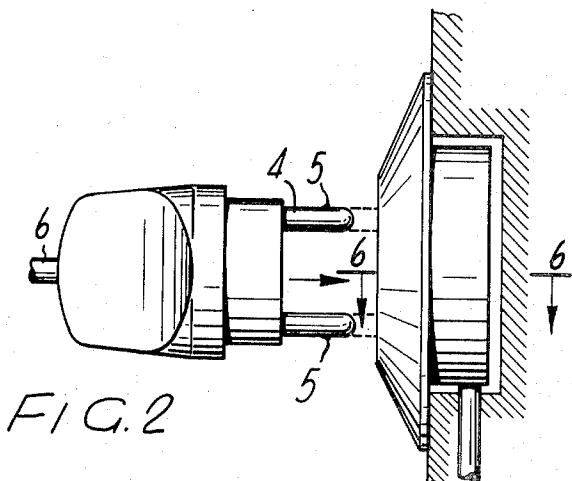
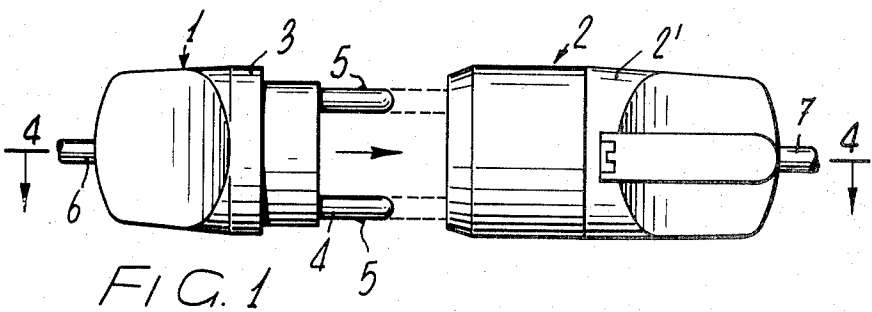
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[57] **ABSTRACT**

A detachable connection for electrical contacts of a plug and socket arrangement which incorporates means for securing the electrical contacts against undesired or unintentional release, especially in the presence of traction forces, and that additionally means are provided by virtue of which the electrical contacts are covered towards the outside and safeguarded against unintentionally being contacted.

6 Claims, 6 Drawing Figures





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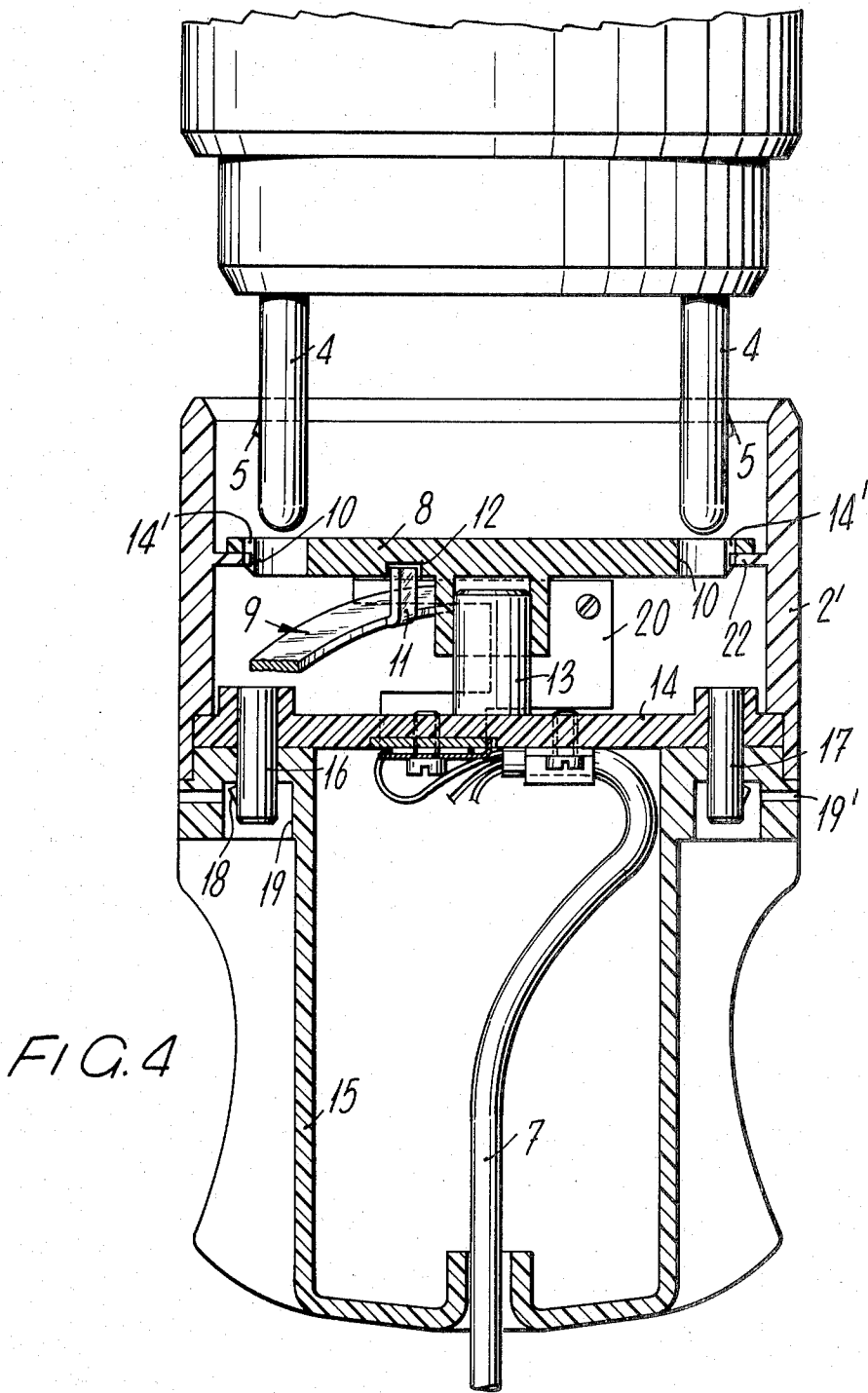


FIG. 4

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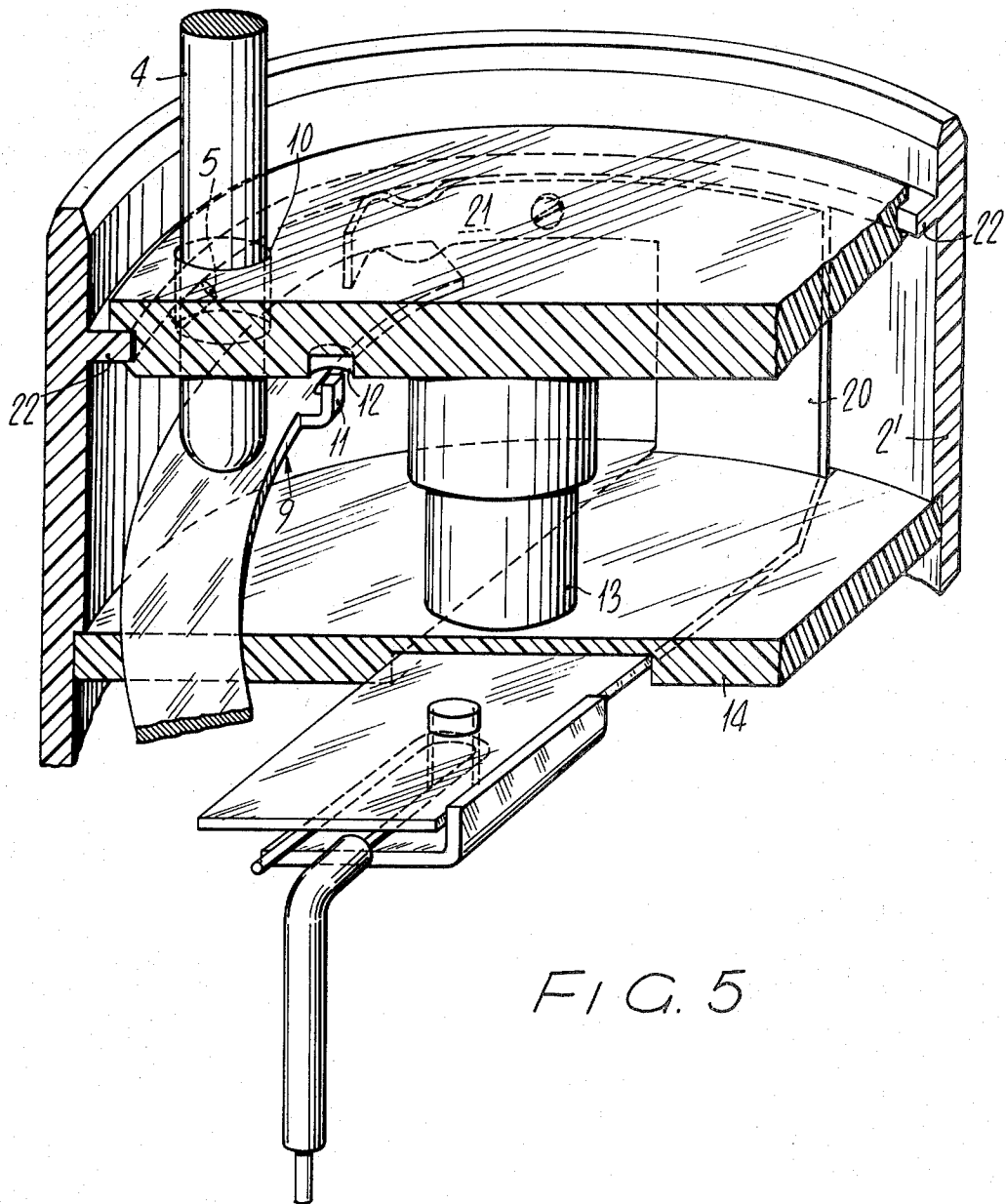


FIG. 5

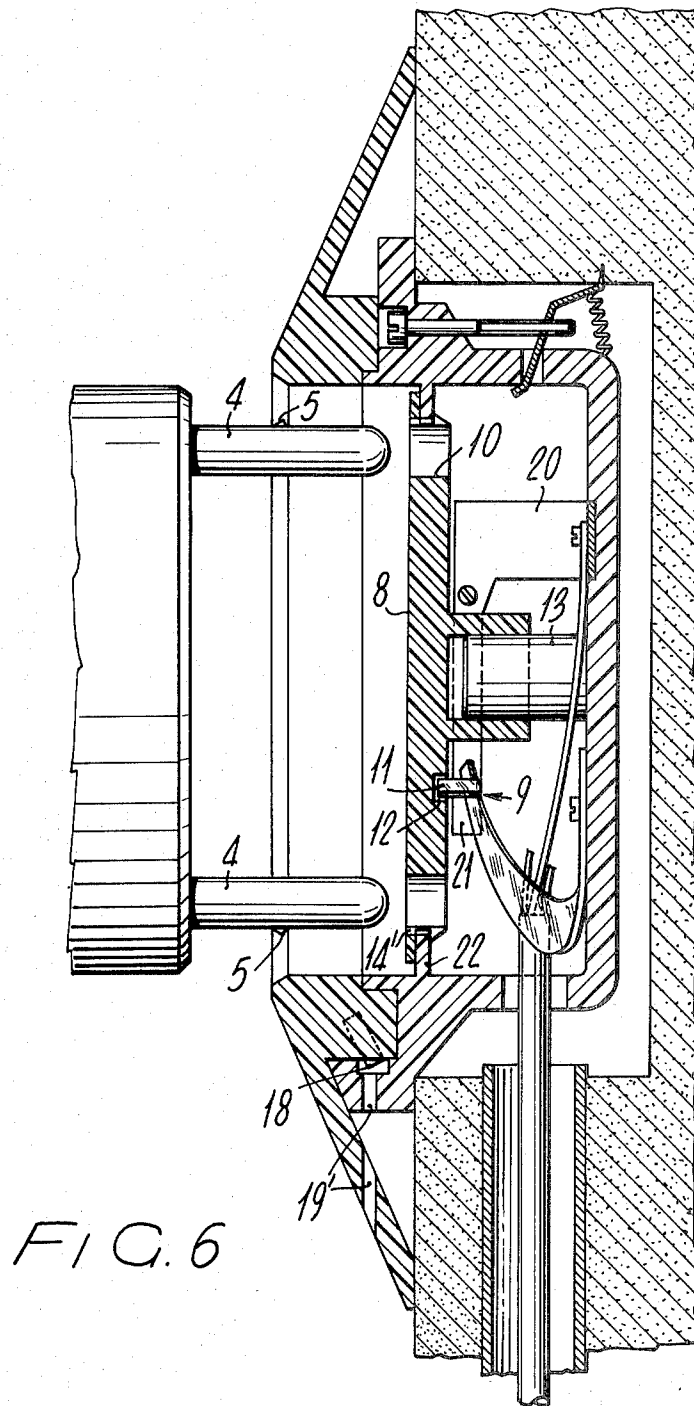
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DETACHABLE CONNECTION FOR ELECTRICAL CONTACTS OF A PLUG AND SOCKET

BACKGROUND OF THE INVENTION

The present invention relates to a new and improved detachable connection for the electrical contacts of a plug and socket.

The conventional detachable connections for electrical contacts, which are known to the art in a multiplicity of different physical manifestations, above all possess the noteworthy drawback that they fail to provide security measures against undesired or unintentional release of the electrical connection, especially in the presence of tractional or pulling forces, or, in those few exceptional cases where some attempt at this safety feature has been made, it was only through the expenditure of relatively extensive and complicated constructions, where still nonetheless the danger existed that during handling of the device unintentional contact with contacts carrying a voltage still existed. This danger is especially present for children who do not fully recognize the dangers of electricity and who oftentimes are injured or killed by electrical shocks. For instance, it is not uncommon for children when playing with some type of electrically conductive object or pin to intentionally or unintentionally bring such into contact with freely exposed electrical contacts situated behind the inlet openings of plugs, wall sockets or the like.

While certain attempts have been made in the art to minimize this danger, such as providing "dummy" plugs which can be inserted into unused wall sockets for instance, such does not provide an absolute guarantee for the safety of the child since such dummy plugs can easily be removed, again exposing the dangerous electricity carrying contacts of the wall socket.

SUMMARY OF THE INVENTION

Hence, there is still present a real need in the art for a detachable connection for the electrical contacts of a plug and socket which is not associated with the aforementioned drawbacks of the prior art constructions. Therefore, a primary objective of the instant invention is to provide just such type device which effectively and reliably fulfills the existing need in the art and overcomes the aforementioned negative factors existent with the state-of-the-art constructions.

Another and more specific objective of the present invention is to avoid the aforementioned drawbacks of the prior art constructions and to provide an improved detachable connection for electrical contacts which aims at providing high safety during use.

Still a further significant object of the present invention is to provide a plug and socket arrangement wherein unintentional removal of the plug from the socket through simple tractional forces exerted upon the plug cord is obviated, and disengagement of plug and socket can only be carried out by performing precise manipulations, whereby typically children are not prone to unintentionally or even intentionally be able to remove the plug from the socket and expose the dangerous contacts carrying current.

Now, in order to implement these and still further objects of the invention which will become more readily apparent as the description proceeds, broadly speaking, the invention contemplates the provision of means

by virtue of which the electrical contacts are secured against undesired or unintentional release, especially in the presence of traction forces, and that additionally means are provided by virtue of which the electrical contacts are covered towards the outside and secured against being unintentionally contacted.

As will be readily apparent during a more detailed discussion of the invention with the inventive construction of detachable connection for electrical contacts there is ensured that there does not occur any unintentional release even in the presence of traction or pulling forces and that every danger of accidents because of unintentional contact with the current conducting contacts is eliminated.

Now, according to a preferred embodiment of the invention, the means for securing the electrical contacts against unintentional release comprises substantially nose-like projections arranged at the electrical contact pins and which, during electrical contact, bear against associated countersupports.

According to a further preferred embodiment of the invention, the aforementioned means for covering and securing against unintentional contact with the electrical contacts comprises a disk or plate member provided with receiving or insert openings for the electrical contact pins, which plate member is rotatable between two terminal positions, and such means further comprises blocking mechanisms associated with the electrical contact pins. The just-mentioned plate or disk member, upon assuming one of its terminal positions covers towards the outside countercontacts for the electrical contact pins, and the blocking mechanisms render possible the rotation of the plate or disk member into its other terminal position necessary for carrying out the contact action only then when all of the contact pins are inserted into the receiving or aforementioned insert openings.

Each blocking mechanism preferably comprises a substantially circular ring-shaped spring element, especially in the form of a blade or leaf spring which engages by means of an engagement portion with a recess of the plate member and upon introduction of the electrical contacts into the receiving openings is placed out of engagement with this recess, so that the plate member can be rotated from one to the other terminal position.

It is advantageous if the insert or receiving openings possess the same size and configuration as the electrical contact pins and are equipped in each instance with a groove for the throughpassage of the nose-like projections.

According to a particularly advantageous physical manifestation of the invention, the electrical contact pins are connected with the housing of an electrical plug and extend externally thereof, whereas the electrical countercontacts are arranged in the housing of a wall or coupling socket which accommodates the rotatable disk or plate, the blocking mechanisms and the countersupports. It is advantageous if the countersupports consist of a collar which engages behind the nose-like projections upon rotation of the plate member into the terminal position for establishing the electrical contact.

Furthermore, in accordance with another preferred structural manifestation of the invention, the housing

of the plug and/or the socket is equipped with a removable housing portion for attachment of an electrical cable or cord, this removable housing portion being detachably connected by pins with the housing. These pins are advantageously equipped with spring-loaded clamping elements which, upon insertion of the pins connected with the housing into the associated throughpassage openings of the housing portion, engage behind widened portions of the throughpassage openings. Additionally, it is of advantage if means are provided for pressing back the spring-loaded clamping bodies or elements.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and objects other than those set forth above, will become apparent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a schematic representation of a first preferred embodiment of inventive detachable connection in the form of a coupling connection between a plug and coupling socket;

FIG. 2 is a schematic representation of a second preferred embodiment of inventive detachable connection in the form of a socket connection incorporating a plug and wall socket;

FIG. 3 is a schematic representation of a part of the inner portion of the inventive coupling- or wall socket with inserted electrical contact pins;

FIG. 4 is an enlarged cross-sectional view of the arrangement of FIG. 1 taken along the line 4—4 thereof and showing the plug in side view;

FIG. 5 is a perspective fragmentary view, again on an enlarged scale, of a coupling- or wall socket illustrating an inserted contact pin; and

FIG. 6 is a cross-sectional view, similar to the showing of FIG. 4, but this time taken substantially along the lines 6—6 of the arrangement of FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, in FIG. 1 there is schematically illustrated one structural form of the invention which relates to use of the inventive concepts in a coupling connection incorporating a plug 1 and a coupling socket 2. Electrical contact pins 4 are arranged in a housing 3 of the plug 1. These electrical contact pins 4 extend out of the housing 3 from the end face thereof confronting the coupling socket 2. Each electrical contact pin 4 is equipped with a respective substantially nose-like projection 5. Both the plug 1 and the coupling socket 2 are connected with associated electrical cords or cables 6 and 7 respectively.

Further details of the arrangement illustrated in FIG. 1 can be gleaned from the showing of FIGS. 4 and 5. By referring to these figures, it will be seen that in the housing 2' of the coupling socket 2 there are arranged a disk or plate member 8 and blocking means 9. Disk or plate member 8 is selectively rotatable between two terminal positions limited by any suitable and therefore non-illustrated stop members. This disk or plate 8 is provided with continuous receiving or insert openings 10 for accommodating the electrical contact pins 4 discussed above. The blocking means 9, in each in-

stance, are here shown in the form of a substantially circular ring-shaped or arcuate spring element, designed in the manner of a blade spring, which is equipped with an engagement or blocking portion 11. Each such blocking or engagement portion 11 is in blocking or locking engagement with an associated recess 12 provided at the disk member 8 when it assumes that terminal position for the reception of the contact pins 4. Disk member 8 is rotatably mounted at a pin or plug 13 fixedly connected with a plate 14 of the housing 2', as best shown by referring to FIG. 4.

The circular ring-shaped blocking means or elements 9 discussed above are arranged in such a fashion that their circular ring-shaped configuration substantially corresponds to the circular path of the contact pins 4, and particularly that circular path which is transcribed by these contact pins 4 during rotation of the plug 1. In this manner, it is ensured that during such rotation, especially also when the disk member assumes that terminal position affording the electrical contact, the engagement or blocking portion 11 is then brought out of operable association or engagement with the associated recess 12.

The insert openings 10 possess the same size and configuration as the contact pins 4 which are advantageously constructed to possess a cylindrical configuration, so that the cylindrical contact pins 4, during introduction through the receiving or insert openings 10 are guided by such openings. These openings 10 are equipped with a respective groove 14', as best observed by referring to FIG. 3, these grooves permitting throughpassage of the associated nose-like projections 5.

Serving as the countersupport for the nose-like projection 5 is a collar member 22 which may be either secured to the inner wall of the cylindrical housing 2' or formed as one piece together therewith. This collar member 22, during rotation of the disk or plate 8 and the plug 1 into the position serving to establish electrical contact, ensures against withdrawal of the plug 1 out of the coupling socket 2.

Furthermore, it is to be understood that a housing portion 15 is detachably connected with the housing 2' and which can be removed for the purpose of attaching the electrical cable 7. Removable housing portion 15 is equipped with throughpassage openings 16 into which there can be inserted the pins 17 attached to the plate 14. Pins 17 are each provided with spring-loaded clamping elements 18 which when each such pin 17 is inserted through the walls of the throughpassage openings 16 are initially pressed back into a retracted position and then, when the upper end face or wall of the removable housing portion 15 bears against the underside or underface of the plate 14, engage with or into widened portions or widened recesses 19 of the continuous openings 16, as best observed by referring to FIG. 4. In order to release this thus detachably connected housing portion 15 there are advantageously provided bore means 19' through which there can be introduced any suitable type of pin for pressing back the clamping bodies or elements 18, so that thereafter the housing portion 15 can be again removed from the housing 2'.

The end of the electrical cable 7 can be introduced into the housing portion 15 so that its current-conduct-

ing conductor can be detachably connected in any suitable manner with the plate member 14, such as for instance, by the conventional connection elements illustrated in the drawings and not particularly referenced. As will be recognized by referring to FIG. 5, a current conducting conductor of the electrical cable 7 is electrically coupled with a contact rail 20 connected with the plate member 14, contact rail or track 20 being upwardly guided within the cylindrical housing 2' and terminating in a resilient contact portion or contact blade 21 which, insofar as its configuration or shape is concerned, is accommodated to that of the cylindrical contact pins 4. In this connection, reference is also made to the showing of FIG. 3.

With the benefit of the foregoing description of the invention, the mode of operation will now be described and is as follows:

When the plug 1, together with the electrical contact pins 4 is inserted into the coupling socket 2, that is to say introduced into the insert or receiving openings 10 of the rotatable disk or plate member 8, the previously considered circular ring-shaped designed resilient blocking elements 9, connected in any suitable fashion at one end with the housing 2', are downwardly depressed. As a result, the corresponding engagement or blocking portions 11 are placed out of engagement with the recesses 12 at the rotatable disk 8. Now this disk or plate 8 can be rotated through the action of the plug 1 and, more specifically through the action of the therewith connected contact pins 4, into its terminal position providing the electrical contact. In other words, the disk or plate 8 together with the contact pins 4 can be rotated in such a way that a portion of the side walls of these contact pins 4 comes into electrical conductive relationship with the bent portions of the associated electrical contacts 21, of which only one has been particularly shown in FIG. 5. Owing to the flexed configuration of the resilient contacts or contact blades 21, the plug 1 is retained in the described electrical contact position.

Now, importantly, during rotation of the plug 1 and the associated contact pins 4, the nose-like projections 5 connected with these contact pins 4 come into engagement with the collar 22 constructed as a counter-support. More precisely, what happens is that the nose-like projections 5 engage behind such collar 22, so that the plug 1 is secured against being pulled out of that position in which the electrical contact is established, especially when a tractional or pulling force is exerted upon the plug.

Now, in order to release this connection between the plug 1 and the coupling socket 2, the plug 1 is rotated in the opposite direction, the nose-like projections 5 now coming out of engagement with the collar 22 in that terminal position of the rotatable disk or plate 8 which affords withdrawal of the plug 1. In this position, the plug 1 can be pulled out of the coupling socket 2. As will be readily apparent from what has been explained above, the current conducting contacts 21 of the coupling socket 2 are significantly completely covered towards the outside by the rotatable disk or plate 8. Hence, when the plug 1 has been removed, the current conducting contacts 21 cannot be physically contacted from the outside, so that all danger against accidents, especially in the case of children, is avoided or at least substantially minimized.

Since each of the contact pins 4 has associated therewith a blocking means or element 9 of the type discussed above, the disk or plate 8 can only then be rotated if all of the blocking elements 9 are simultaneously downwardly depressed, as such would be the case upon proper introduction of the individual contact pins 4 into the coupling socket 2. Hence, even in the situation where a child, during playing with an object or pointed element is able to introduce such through one of the receiving openings 10 and is able to thereby depress the blocking element 9 situated below such opening, still security is provided against any unintentional or undesired contact with the current conducting contacts 21 in that, as already mentioned, the disk or plate 8 is only capable of being turned into its electrical contact establishing-terminal position when all of the blocking elements 9 have been downwardly depressed. It is quite unlikely that a child would be able to figure out the mechanism preventing rotation of the plate or disk member, thereby affording extreme safety of a high degree for exposed sockets.

Although as previously discussed, each contact pin is provided with a separate blocking element 9, for the sake of simplifying the illustration in the drawing only a single blocking element or blocking means 9 has been depicted. The additional blocking elements or blocking means 9 will be understood to possess a similar construction to what has been described and are similarly arranged with respect to their associated contact pins.

The embodiment of FIGS. 2 and 6 of plug and socket shows such arrangement in a plug and wall socket environment as opposed to a plug and coupling socket, and since the general construction of this modified version of the invention is similar to that which has been previously discussed in conjunction with FIGS. 1, 3, 4 and 5, it will be understood that as a matter of convenience the same reference characters have been used in FIGS. 2 and 6 to denote components similar or analogous to those considered heretofore in conjunction with the description of the initially considered embodiment of coupling connection embodying a plug and coupling socket. Since both embodiments essentially correspond in all material aspects to one another, no further description of the arrangement of FIGS. 2 and 6 would appear to be necessary as its construction and mode of operation should be apparent from what has been explained above.

Although the concepts of the invention have been discussed as having particular utility in conjunction with plugs and coupling- or wall sockets, the teachings of the invention are obviously not limited to just this environment of use. This is especially so because the concepts of the invention can be used for almost any optional type of electrical contact connections as well as also for non-electrical connections which are concerned with the same general problems as solved by this invention.

While there is shown and described present preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.

What is claimed is:

1. A detachable connection arrangement for the electrical contacts of a plug and a socket, comprising the combination of:

- a. a plug provided with a plurality of electrical contact pins;
- b. a socket equipped with electrical contact means and serving to receive said electrical contact pins of said plug to establish an electrical connection with said electrical contact means thereof;
- c. said electrical contact pins of said plug and said socket being provided with respective cooperating means defining engagement means wherein said engagement means of said electrical contact pins engage with said engagement means of said socket to safeguard against undesired release of the electrical connection to maintain the electrical contact which has been established;
- d. a rotatably mounted plate member provided for said socket, said plate member having receiving openings for said electrical contact pins of said plug, said rotatable plate member being rotatable between a respective first and second position, said rotatable plate member when assuming its first position and when said contact pins have been withdrawn from said socket serving to cover said electrical contact means of said socket from the outside by means of said rotatable plate member and ensuring against unintentional contact of said electrical contact means from the outside, said plate member when assuming said second position enabling said electrical contact means of said socket to contact said electrical contact pins of said plug;
- e. blocking means provided for said socket which in said first position of said rotatable plate member lock said rotatable plate member against undesired rotation, so that said plate member is only rotatable into its second position upon insertion of all of said electrical contact pins of said plug into said socket;
- f. said rotatably mounted plate member being provided with recess means; and
- g. each said blocking means comprising a substantially arcuate ring-shaped resilient element having a blocking portion engageable with an associated one of said recess means of said plate member and upon introduction of said electrical contact pins into said receiving openings of said rotatable plate member said blocking portions are brought out of engagement with said associated recess means so that said plate member can be rotated from said first position into said second position.

2. The combination as defined in claim 1, wherein said engagement means of said electrical contact pins comprises protruding nose means, and wherein said engagement means of said socket comprises collar means providing a countersupport behind which engage said protruding nose means upon rotation of said plate member into said second position.

3. The combination as defined in claim 2, wherein said receiving openings are each provided with groove means for enabling throughpassage of said protruding nose means.

4. The combination as defined in claim 1, wherein said electrical contact means of said socket possess a resilient construction and serve to retain said electrical contact pins together with said plug in the position assumed thereby when said plate member is rotated into its second position.

5. The combination as defined in claim 1, wherein said plug and said socket each possess a respective housing means, one of said housing means incorporating a removable housing portion for attachment of an electrical cable, pin means for detachably connecting said removable housing portion with its associated housing means, said removable housing portion having throughpassage openings merging with widened recess means for receiving said pin means, each of said pin means being equipped with spring-loaded clamping elements for retaining said pin means in the associated one of said widened recess means, and means for placing into an ineffectual position said clamping elements so as to release said pin means from said associated widened recess means, to thereby disconnect said detachable housing portion from its associated housing means.

6. A socket construction for receiving electrical contact pins of a plug for purposes of establishing an electrical connection, comprising a socket housing, electrical contact means and a plate member within said housing, means for rotatably mounting said plate member in said housing for movement between a first terminal position and a second terminal position, said plate member being provided with a plurality of throughpassage openings for receiving electrical contact pins of the associate plug, said plate member when in its first terminal position having said throughpassage openings arranged to receive the electrical contact pins of said plug and covering said electrical contact means towards the outside, said rotatably mounted plate member being provided with recess means, blocking means disposed in cooperative relationship with at least one of said throughpassage openings and releasably engageable with said plate member for normally fixing said plate member in said first terminal position when the plug is removed from the socket, said blocking means being actuated by insertion of said plug into said socket to release said plate member for rotation into said second terminal position to establish an electrical connection between said plug and said socket, each said blocking means comprising a substantially arcuate ring-shaped resilient element having a blocking portion engageable with an associated one of said recess means of said plate member and upon introduction of said electrical contact pins into said receiving openings of said rotatable plate member said blocking portions are brought out of engagement with said associated recess means so that said plate member can be rotated from said first position into said second position, and means provided at said socket for preventing unintentional release of said plug when said plate member has assumed said second terminal position.

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