Dec. 6, 1966 L. G. M. PAYNE ETAL 3,290,641

ELECTRICAL PLUG-AND-SOCKET CONNECTIONS

Filed June 15, 1964 2 Sheets-Sheet 1

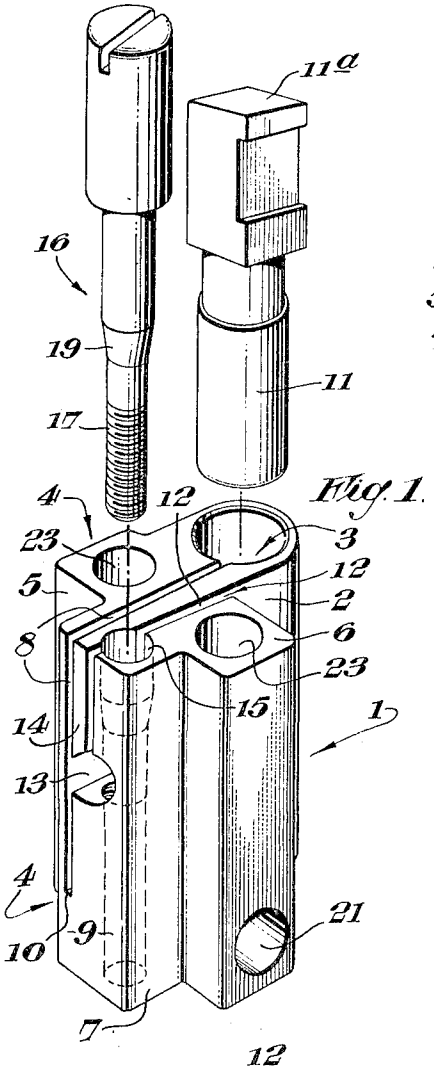


Fig. 1.

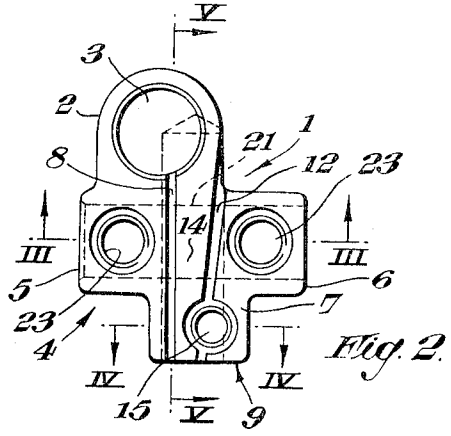


Fig. 2.

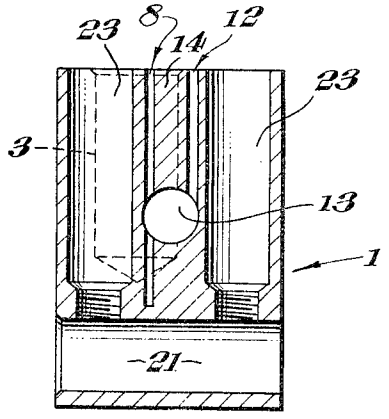


Fig. 3.

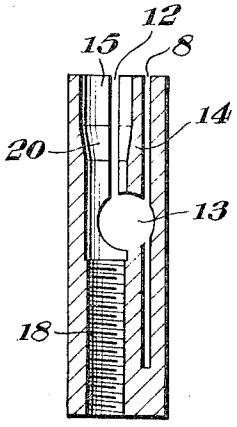


Fig. 4.

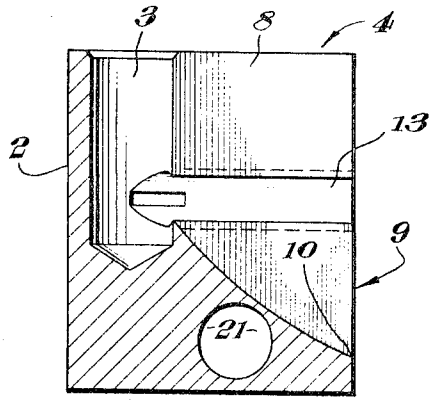


Fig. 5.

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ELECTRICAL PLUG-AND-SOCKET CONNECTIONS

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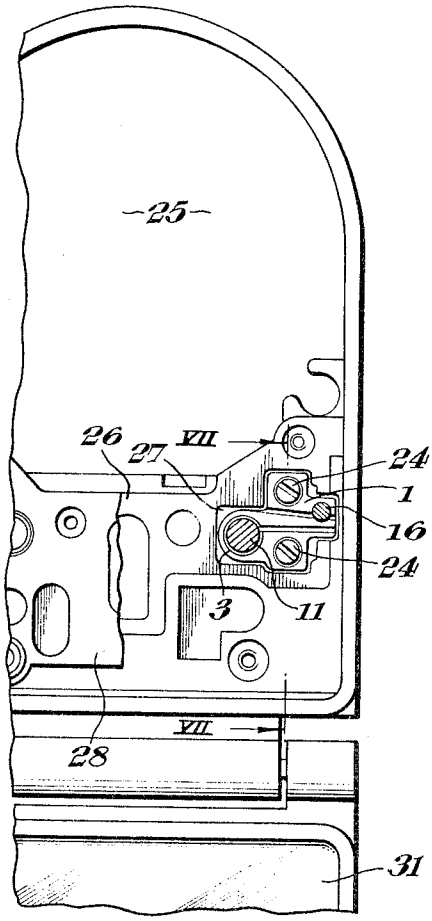


Fig. 6.

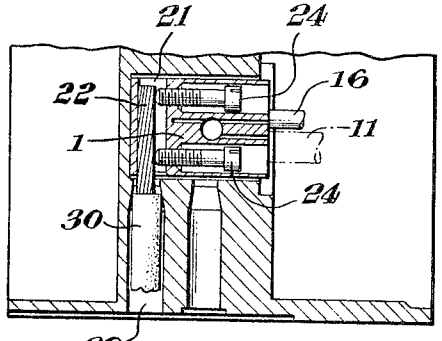


Fig. 7.

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3,290,641

ELECTRICAL PLUG-AND-SOCKET CONNECTIONS

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1 Claim. (Cl. 339—266)

This invention relates to improvements in electrical plug-and-socket connections particularly for time switches, and has for its primary object to reduce contact resistance between plug and socket thus reducing the heat generated in the connection and avoiding too high a proportion concentrating in the plug part of the connection. Such a concentration with the attendant poor dispersion of heat has manifest disadvantages, and this is particularly so when the plug extends rigidly from an instrument or the like which is plugged into the socket.

The invention is particularly applicable to, but not limited to, plug-and-socket connections for electric time switches fitted with a pair of rigidly projecting plugs for insertion in a pair of sockets (load and line) in an electrical circuit for automatically controlling the current supply to an electricity consuming point at predetermined times. In such an application the invention minimises the amount of heat conveyed by the plugs into the time switch mechanism. With high rated loads especially, e.g. of over 60 amps. it is highly desirable to avoid over-heating of the time switch.

According to the said invention an electrical plug-and-socket connection includes a metal socket block for the reception of a plug, said block having a socket part containing a socket hole, and a main body integrally extending from said socket part and containing a first slot lying in a plane parallel to the axis of said hole cutting into the latter and opening out at one face of the said body to form a longitudinally split socket, a second slot in said main body not cutting into the socket hole thereby forming a clamping tongue in the main body, in combination with a bore in said main body parallel to the axis of the socket hole, and intersected by the second slot, said bore containing a clamping pin adapted by rotation to flex the said clamping tongue and close the socket into a plug gripping condition.

By this means the two-piece plug-and-socket connection, from the point of view of heat dispersion, becomes the equivalent of an integral solid mass comprising the metal socket block together with the solidly gripped plug, and heat generated at the connection is more readily dissipated by such a larger mass than simple plug-in arrangements, being dispersed to a greater extent through the socket block structure which usually includes an extra block mass carrying lead-in attachment devices and an insulated encasement therearound. Also, the plug is firmly retained mechanically in the socket with no posssibility of vibrating loose or working loose by the continual unplugging and re-plugging during use of the connection.

In the aforesaid application of the invention to a plug-and-socket connection for a time switch, there is usually employed an insulated casing having an integrally moulded part containing a pair of recesses for the reception of a brass or other socket block in each, the two blocks being each formed with the socket part of the connection to take the respective complemental plugs of the time switch; each moulded recess is made with a lead-in cable entry hole opening thereinto and leading from a hole on the exterior of the casing through which the electrical cable for the socket can be introduced and the conductor wire clamped in the brass block by

terminal screws. The present invention is useful for such an application, the recesses in the moulded part being shaped so as to correspond with the configuration of the metal socket block of the invention.

An embodiment of the invention will be described by way of example with the aid of the accompanying drawings wherein:

FIGURE 1 is a perspective view of a plug-and-socket connection according to the invention, with the plug and a clamping pin removed;

FIGURE 2 is a plan view of the socket;

FIGURE 3 is a section on III—III of FIGURE 2;

FIGURE 4 is a section on IV—IV of FIGURE 2;

FIGURE 5 is a section on V—V of FIGURE 2;

FIGURE 6 shows part of the casing and lid of an electric time switch in which there is shown the socket part of a plug-and-socket connection according to the invention; and

FIGURE 7 is a section through VII—VII of FIGURE 6.

Like numerals of reference indicate the same or corresponding parts in the several views.

A brass socket block designated generally **1** has a socket part **2** containing a socket hole **3** extending only partly therethrough and preferably cylindrical, say about two-thirds the length of the said socket part from top to bottom, so as to leave the bottom solid. This socket part **2** is mainly cylindrical on its external surface and is a lateral projection from an integral main body designated generally by the numeral **4** of similar length thereto, the top and bottom faces of the socket part and main body being co-planar. The reference to top and bottom assumes, for convenience of description, that the block is disposed with the face which contains the socket entry on top in a horizontal plane, but it is to be understood that the direction of the plug-in operation may be vertical, horizontal, or inclined to the vertical. The main body **4** is conveniently of T-section, the top bar of the T at **5** and **6** (FIGURES 1 and 2) being wider laterally than the cylindrical socket part **2**, the leg **7** of the T extending in a direction away from the latter, and being offset from the axis of the socket hole **3**. Thus, one end **6** of the T-crossbar forms a longitudinal projecting flange with respect to the socket part **2**, and the other **5** a shorter flange.

Cut longitudinally through the main body **4** from its top face is a first slot **8** lying in a plane substantially parallel to the axis of the socket hole **3**, slightly spaced thereform, and extending downwardly to a depth roughly equal to the length of the socket hole. The plane of the said slot **8** may coincide with the axis of the socket hole, and the description "substantially parallel" is intended to cover this. This first slot **8** cuts into the hole **3** and opens out at the vertical face **9** of the body formed by the base of the leg **7** of the T-section at a point **10** (FIGURES 1 and 5) away from the bottom thereof, thus forming a longitudinaly split socket for the reception of the plug **11** (FIGURE 1). The plug is preferably solid and unsplit longitudinally. A second slot **12** is cut in the main body **4** also leading from its top face and lying in a plane substantially parallel to that of the first slot **8**. The description "substantially" in this case includes a deviation from parallelism, say a few degress such as 4°–10°. This slot **12** extends partly towards the bottom of the main body **4** to a distance less than that of the first slot **8** and, like the latter, opens out at the face of the main body formed by the base of the leg of the T-section. This second slot does not cut into the socket hole **3** but lies in a plane which touches the external surface of the socket part **2** of the block. Thus, when the said socket part **2** is mainly cylindrical

on its external surface, then the second slot **12** would lie in a plane approximately tangential to the cylindrical exterior of the socket part **2**. At the bottom of the second slot **12** a transverse hole **13** is bored from the vertical face of the main body at which the two slots open, this transverse hole also cutting through one wall **14** of the first slot **8**, thereby forming this wall **14** into a clamping tongue in the main body **4** for the aforesaid longitudinal splitting of the socket **3**.

It will be clear that by providing means for flexing the said clamping tongue **14** in a direction towards closing the first slot **8** it will cause a plug (which has been inserted into the split socket **3**) to be tightly gripped. For this purpose the following construction is provided. From the top of the main body **4** of the plug, in the part thereof constituting the leg **7** of the T-section, a vertical hole **15** is bored parallel to the axis of the socket hole **3**, and this bore is in a position whereby it is intersected by the second slot **12** (see FIGURES 1, 2 and 4). This bore **15** is used for a spreading device to thrust the aforesaid clamping tongue **14** into its gripping position. Thus, a clamping pin **16** (FIGURE 1) is fitted into the bore. This pin is threaded at its inner end as at **17** so as to enter into the tapped bottom end **18** (FIGURE 4) of the bore, the threads having sufficient clearance to allow for misalignment, and the rest of the length of the pin is unthreaded and of larger diameter than the threaded end. A conically tapered section **19** of the pin joins the threaded and unthreaded sectons and co-acts with part of the bore at **20** (FIGURE 4) to flex the clamping tongue **14** when the pin is screwed as tightly as possible as possible into the bore. Means other than a taper on the pin **16** co-acting with a taper bore may be adopted to bring about the flexing of the clamping tongue **14** by turning a pin such as **16**.

Transversely across the bottom of the block, and through the cross-bar **5**, **6** of the T-section, a hole **21** is drilled for the reception of a lead-in wire **22** (FIGURE 7), and one or more access holes **23** (preferably two) for terminal clamping screws **24** are provided parallel to the socket hole **3** and vertically at right-angles to the said transverse hole **21** in the main body of the block from the top face, one in each end of the cross-bar of the T-section.

With the present plug-and-socket connector the face of the socket block containing the mouth of the socket will also have projecting therefrom the aforesaid clamping pin **16** readily accessible for turning so as to clamp up the plug **11** in its socket.

It has already been mentioned that the block may be disposed in various attitudes other than vertical as illustrated in FIGURES 1–5 which was assumed for convenience of description. In FIGURES 6 and 7 there is shown an application of the invention to an electric time switch casing wherein the socket block **1** lies at

right-angles to the position shown in FIGURES 1–5, so as to expose the face containing the mouth of the socket hole **3** in a vertical plane.

Referring to FIGURES 6 and 7, there is an insulated casing **25** moulded with a solid block-like portion **26** in which various recesses and holes are made to suit the particular time switch and its fittings with which, except for the socket blocks **1**, the invention is not concerned. There are two socket blocks **1** for load and line, only one of which is shown, each being inserted in a recess **27**, it being understood that a second block **1** and its recess **27** would be in the omitted part of FIGURE 6. The blocks are left and right handed, i.e., the unillustrated one being a mirror reflection of the one shown. When the blocks **1** have been inserted, an insulated cover plate (having holes giving access inter alia to the screws **24**, socket **3** for plug **11**, and bore **15** for the clamping pin **16**) is fixed in position on top of the insulated block **26**. The latter has a channel **29** to take the cable **30** which is clamped in the bore **21** of the block **1**. A hinged lid **31** is usually provided.

The plug **11**, in the foregoing application to an electric time switch, will be an immovable fixture to and projecting from the time switch, the end **11***a* being constructed in any suitable manner for this purpose.

We claim:

An electrical plug-and-socket connection including a metal socket block for the reception of a plug, said block having a socket part of which one face contains a socket hole extending from said face only partly through the socket part, and a main body integrally extending from said socket part and having a face coplanar with the aforesaid face containing the socket hole and an end face at right-angles thereto, said main body containing a first slot lying in a plane substantially parallel to the axis of said hole cutting into the latter and opening out at the said co-planar face of the said body and also at the right-angular face to form a longitudinally split socket, a second slot in said main body not cutting into the socket hole and lying substantially parallel with the first slot, thereby forming a clamping tongue in the main body, both slots extending only partly through the main body, in combination with a bore in said main body parallel to the axis of the socket hole, and intersected by the second slot, said bore containing a threaded clamping pin having a conical tapered part adapted by rotation to flex the said clamping tongue and close the socket into a plug gripping condition.

References Cited by the Examiner

FOREIGN PATENTS

1,091,782 11/1954 France.

EDWARD C. ALLEN, *Primary Examiner.*

P. TEITELBAUM, *Assistant Examiner.*