Feb. 22, 1938.

S. MANDL

2,108,866

SOCKET WRENCH

Filed April 17, 1936

2 Sheets-Sheet 1

Fig. 1.

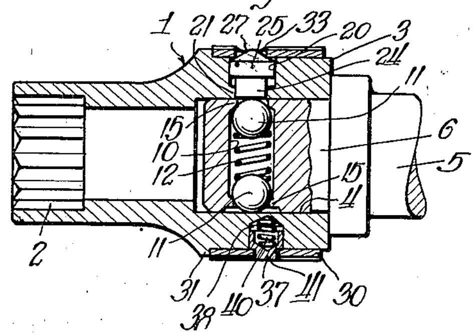


Fig. 2.

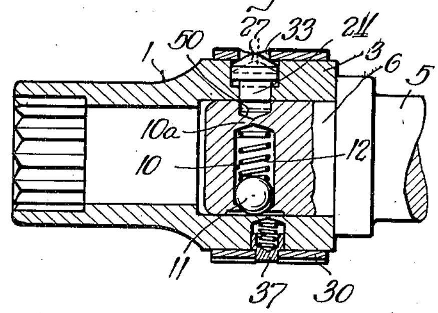


Fig. 3.

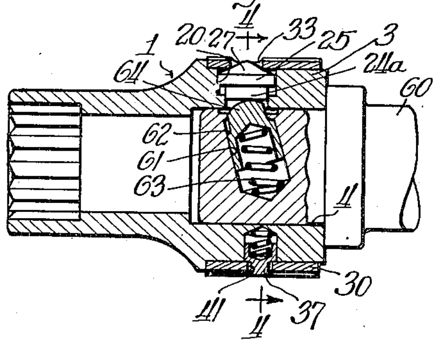


Fig. 4.

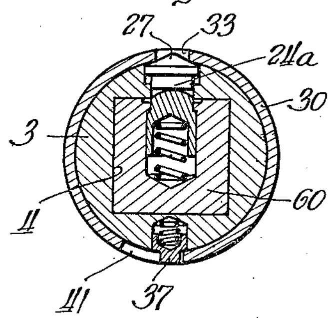


Fig. 5.

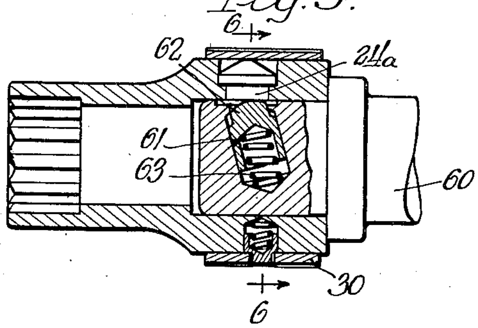
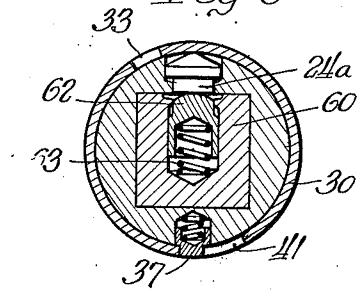


Fig. 6.



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SOCKET WRENCH

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Fig. 7.

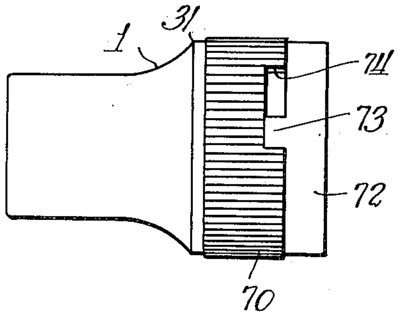


Fig. 8.

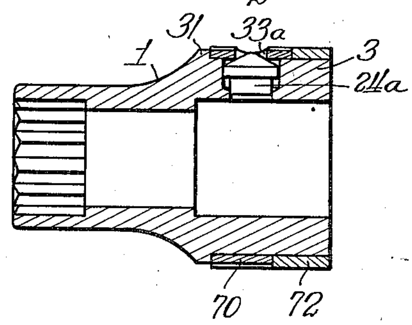


Fig. 9.

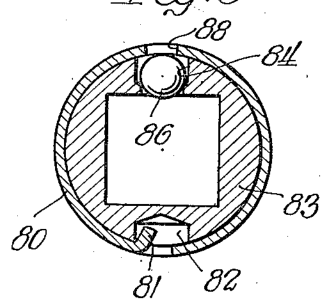


Fig. 10.

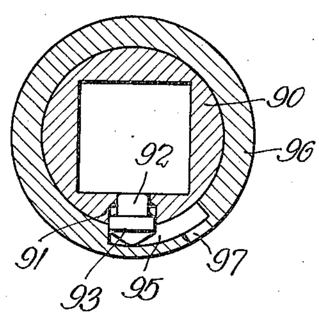


Fig. 11.

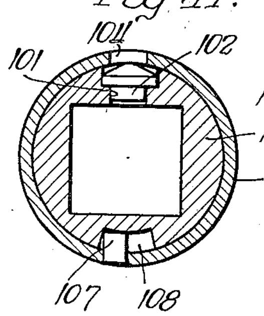


Fig. 12.

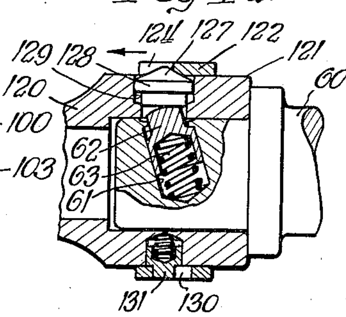
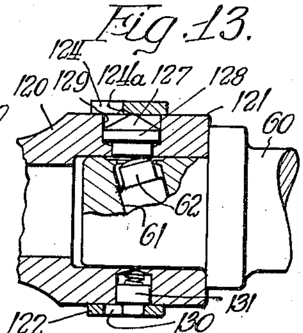


Fig. 13.



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Patented Feb. 22, 1938

2,108,866

UNITED STATES PATENT OFFICE

2,108,866

SOCKET WRENCH

Sigmund Mandl, Milwaukee, Wis., assignor to Blackhawk Mfg. Co., Milwaukee, Wis., a corporation of Wisconsin

Application April 17, 1936, Serial No. 74,881

7 Claims. (Cl. 287—119)

The present invention relates generally to socket wrenches and the like, and is more particularly concerned with the provision of a new and improved socket wrench construction in which novel means for locking and unlocking the shank from the shank receiving socket is included.

It is common practice at the present time in socket wrench construction to provide spring pressed plungers and the like in the shank and arranged to engage in a transverse opening in the shank receiving socket for the purpose of locking the socket and shank together, and the principal object of the present invention is the provision of means on the socket to facilitate locking and unlocking the parts. It is also an object of the present invention to provide a shift ring on the socket so constructed and arranged that by moving the same in one direction the shank and socket are locked together in a positive manner, and moving the shift ring in the other direction unlocks the parts and permits their ready separation.

Another object of the present invention is the provision of new and improved means for holding the shift ring in proper position while accommodating its locking and unlocking movements.

These and other objects and advantages of the present invention will be apparent to those skilled in the art after a consideration of the following detailed description of the preferred structural embodiments, taken in conjunction with the accompanying drawings illustrating the same.

In the drawings:

Figure 1 is a sectional view taken through a wrench socket and the cooperating portion of a shank cooperating therewith, with one form of my improved latching and locking means embodied therein, together with one form of shift ring retaining means;

Figure 2 is a view similar to Figure 1 but showing a slightly modified form in which substantially the same principles have, however, been embodied;

Figure 3 is a sectional view taken through another form of socket wrench construction embodying the principles of the present invention;

Figure 4 is a section taken substantially along the line 4—4 of Figure 3;

Figure 5 is a view similar to Figure 3 but showing the socket and shank in unlocked relation, whereas Figure 3 illustrates the socket and shank in locked relation;

Figure 6 is a section taken along the line 6—6 of Figure 5;

Figures 7 and 8 illustrate one form of shift ring construction which may be employed in any one of the several forms of my invention;

Figures 9, 10, and 11 illustrate other forms of shift ring construction included in the present invention; and

Figures 12 and 13 show a further form of the present invention in which the shift ring is movable axially in locking and releasing the socket.

Referring now more particularly to Figure 1, the wrench socket is indicated by the reference numeral 1 and includes a nut receiving end 2 and an enlarged portion 3 provided with a shank receiving recess or opening 4. The wrench includes a shank 5 having a polygonal end 6 adapted to be disposed, as illustrated, in the socket opening or recess 4, which is also polygonal, these cooperating parts usually being square in cross section.

The shank 6 is provided with a transverse opening 10 in which a pair of ball plungers 11 are disposed for movement, being pressed outwardly by a spring 12 disposed in the transverse shank opening 10. The latter is formed with its outer ends shouldered, as at 15, so as to retain the ball plungers 11 in position in the shank 6.

The socket 3 is also provided with a transverse opening 20 which is adapted to register with the transverse shank opening 10 when the parts are brought into operating position. The transverse socket opening 20 has a reduced or shouldered inner end 21, and disposed within the socket opening 20 is a socket plunger 24 having an inner end adapted to engage one of the ball plungers 11 and an enlarged outer head section 25 which is engageable with the shouldered portion 21 of the transverse socket opening 20 for retaining the socket plunger 24 in position. The outermost end of the socket plunger 24 is formed with a generally conical or spherical section 27 serving as a part that cooperates with a shift ring 30 mounted for limited rotation on the socket 3 and against a shoulder 31 formed on the latter. If desired, and as illustrated in Figure 9 which will be referred to later, the socket plunger 24 may be a ball, such as the ball plunger 11 of the shank. The shift ring 30 is provided with an opening 33 which, when brought into registry with the transverse socket opening 20, permits the part 27 of the socket plunger 24 to enter the opening 33 under the influence of the spring pressed ball plunger 11. As best shown in Figure 1, in this position the parts are so arranged that the socket sleeve may

be removed from the shank 5 by simply withdrawing the latter from the socket recess 4. If, however, the shift ring 30 is rotated so as to move the opening 33 away from the conical part 27, the socket plunger 24 is forced inwardly against the tension of the spring exerted thereon through the ball plunger 11, whereby the inner end of the socket plunger 24 enters the transverse shank opening 10 and securely locks the parts 1 and 5 together, but the shift ring 30 itself is not subjected to any thrust due to any tendency of the shank to rotate or to shift relative to the shank receiving socket 1.

The shift ring 30 is held against axial movement in one direction relative to the wrench socket 1 by being disposed up against the shoulder 31. Movement of the shift ring 30 in the other direction is prevented by means of a small plunger 37 movably disposed in a bore 38 formed in the socket end 3, preferably opposite the transverse socket opening 20 and pressed outwardly by a spring 40. The outermost end of the plunger 37 is reduced and is received in a slot 41 formed in the shift ring 30 and extending circumferentially of the latter a sufficient distance to permit the shift ring 30 to be rotated so as to bring the opening 33 thereof into and out of registry with the socket plunger 24.

The construction shown in Figure 2 is similar in many respects to the construction just described. In this case, the wrench socket 1 is not provided with a shoulder 31, such as is shown in Figure 1, but instead the spring pressed plunger 37 is relied upon for holding the shift ring 30 against axial displacement relative to the socket 1 in both directions. It is also to be noted that the shank 5 shown in Figure 2 is not provided with two ball plungers 11, but only with one, the end of the transverse shank opening 10 being closed as at 10*a* but the shank is provided with a transverse opening 50 in line with the opening 10 and in a position to receive the movable plunger 24 whose conical outer end 27 constitutes a part engageable by the shift ring 30 for the purpose of being forced inwardly into engagement in the shank recess 50 for the purpose of locking the socket on the shank 5. It is to be noted in Figure 2, that in the locking operation the member 24 is not moved against the tension of the spring 12, as is the case in the construction shown in Figure 1, but in both figures it is to be observed that the plunger 24 constitutes a movable member which, when moved inwardly into the transverse shank opening, effectively locks the parts together. In Figure 2, the position of the member 24 when locking the parts together is shown in dotted lines. In Figure 1, when the socket is locked onto the shank 5, the member 24 occupies a similar position.

Figures 3 to 6 illustrate the principles of the present invention as applied to a wrench construction embodying the shank construction shown in the patent to Edward M. Phauser, No. 1,927,844, issued September 26, 1933. In Figures 3 to 6, inclusive, the socket construction is substantially the same as has been described in connection with Figure 1, and hence the same reference numerals have been applied. The shank, indicated by the reference numeral 60, is of substantially the same configuration as the shank 5 shown in Figures 1 and 2. However, the transverse shank opening 61 is inclined at an angle with relation to the transverse axis of the shank and receives a generally cylindrical plunger 62 which is urged outwardly of the shank recess 61 by a spring 63. The inclination of the opening 61 disposes the outer end 64 of the plunger 62 in such a position that a portion of the edge of the end 64 is always retained within the outer face of the shank 60, which facilitates the insertion of the shank into the socket 1, as explained in the aforesaid patent. The plunger 62, carried by the shank 60, constitutes a movable member which is adapted to be moved outwardly into the transverse socket opening 20, and to this end the socket plunger 24*a* shown in Figure 3 is somewhat shorter than the plunger 24 shown in Figures 1 and 2. Otherwise the wrench socket construction of Figures 3 to 6 is substantially the same as in Figures 1 and 2. Making the plunger 24*a* shorter permits the movable member 62 to enter the socket opening 20 to lock the parts together, rather than having the socket plunger enter the shank opening, as in Figures 1 and 2.

It is to be observed, however, that in all three forms of construction so far described the socket and shank members are each provided with a transverse opening therein, one of which receives a movable member adapted to be projected into the transverse opening in the other member, all under the control of a part disposed in the transverse opening of the socket member which, in turn, is controlled by means of a shift ring carried on the socket itself. In Figures 1 and 2 the movable member is carried by the socket and is actually projected into the transverse opening in the shank, while in Figures 3 to 6, the movable member is carried in the transverse shank opening and is projected into the transverse opening in the socket member, this action being permitted by the retraction of the socket plunger when the opening 33 in the shift ring is brought into registry therewith, as indicated in Figure 3. When, however, the shift ring is moved from the position shown in Figures 3 and 4 to the position shown in Figures 5 and 6, the opening 33 is carried away from the conical part 27, and this forces the socket plunger 24 inwardly which presses the movable member or plunger 62 into the shank opening 61 against the action of the spring 63 until the inner end of the plunger 24*a* and the outer end of the member 62 are substantially flush with the engaging surfaces of the shank 60 and the socket recess 4. With the parts in this position, the wrench socket and the shank may be readily separated. As best shown in Figures 4 and 6, the length of the slot 41, which is also employed in the construction shown in Figures 1 and 2, is such that the movement of the opening 33 out of line with the plunger 24 and the transverse socket and shank openings is limited, so that it is a simple matter to rotate the shift ring 30 from one position to another as desired.

Figures 7 and 8 illustrate a modified form of shift ring construction which may be employed in place of the shift ring member shown in Figures 1 to 6, inclusive, described above. In Figures 7 and 8, the wrench socket member 1 is provided with the shouldered section 31 mentioned above but the shift ring, indicated by the reference numeral 70, is somewhat narrower than the shift ring 30 in Figures 1 to 6. However, the shift ring 70 is provided with an opening 33*a* corresponding to the opening 33 in the shift ring 30 and functions in substantially the same manner in controlling the position of the plunger 24*a*. As is obvious, the plunger associated with the shift ring 70 may be of substantially the same

form as the plunger 24 shown in Figures 1 and 2, instead of the plunger 24a. The shoulder 31 retains the shift ring 70 against axial movement relative to the wrench socket 1 in one direction, and in order to retain the shift ring 70 against movement in the other direction, the construction shown in Figures 7 and 8 employs a retaining ring 72 that is pressed onto the end 3 of the socket member 1. The retaining or stop ring 72 is provided with a projection 73 which is adapted to be disposed in a slot 74 formed in one edge of the shift ring 70, as best shown in Figure 7. The projection 73 serves substantially the same purpose as the plunger 37 shown in Figures 1 to 6, inclusive, so far as limiting the permissive rotation of the shift ring 70 is concerned.

In Figure 9 I have shown a somewhat simplified construction of wrench socket in which the shift ring, indicated by the reference numeral 80, is provided with a tongue 81 punched out of the material of the ring 80 and bent over into a bore or slot 82 formed in the socket 83. The latter is provided with a transverse opening 84 adapted to be aligned with the transverse opening in the associated shank. I have also shown in Figure 9 a somewhat simplified form of socket plunger, preferably in the shape of a ball 86, instead of a generally cylindrical member having an enlarged head, as shown in Figures 1 to 6 and 8, and described above. The operation of the ball plunger 86 is, however, substantially the same as in the case of a cylindrical plunger, the shift ring 80 being provided with an opening 88 which, when moved away from the plunger 86, forces the latter inwardly to lock or release the shank, depending upon whether the latter is of the form shown in Figures 1 and 2, or of the form shown in Figures 3 to 6. When a shank of the latter type is employed, the ball 86 is somewhat smaller than when a shank of the type shown in Figures 1 and 2 is employed.

In Figure 10 I have shown a further simplified form of construction in which the socket member, indicated by the reference numeral 90, is provided with a transverse opening 91 therein receiving a plunger 92 of the same general configuration as the socket plungers 24a referred to above. However, the plunger 92a has a somewhat extended head 93, as compared with the plunger 24a, so as to extend a small distance into a circumferential slot 95 formed in a shift ring 96 which is somewhat thicker than the shift rings 30 and 70 described above. The slot 95 serves the purpose of limiting the rotation of the shift ring 96 and also serves to retain the latter in proper axial position. Adjacent one end of the slot 95 is a shift ring opening 97 which, when registered with the conical outer end 93 of the plunger 92, permits the plunger to move radially outwardly and thus provides for the projection of a shank plunger, such as the plunger 62 shown in Figure 3, to engage in the inner end of the transverse socket opening 91. If desired, of course, the plunger 92 may be made somewhat longer than is shown in Figure 10, in which case the socket would be adapted to be used with shanks of the type shown in Figures 1 and 2. Comparing Figures 9 and 10, it will be noted that the shift ring and socket carry means cooperating with one another for the purpose of holding the shift ring in proper position on the socket, and the same is true of the other constructions previously described.

In Figure 11, the socket 100 is provided with a transverse socket opening 101 which receives a plunger 102 of substantially the same form as the plunger 24a shown in Figures 3 to 6, and the shift ring 103 is provided with an opening 104 adapted to register with the plunger 102 so as to permit the socket plunger 102 to move radially outwardly. In Figure 11, the means retaining the shift ring 103 in position takes the form of a short pin or stud 107 which is fixed to the shift ring 103 and projects into a bore or slot 108 formed in the socket member 100 and which may be of the same or similar configuration as the slot or bore 82 formed in the socket member 83 shown in Figure 9. The pin 107 and slot 108 thus limit the rotation of the shiftable ring 103 and also serves to retain the latter in proper axial position on the socket 109. Obviously, if desired, the plunger 102 may be in the form of a ball or in the form of the plunger 24 shown in Figures 1 and 2, depending upon the type of shank with which the socket is to be used.

Figures 12 and 13 show a form of invention in which the shift ring is not rotated but is moved axially of the socket in locking and releasing the latter from the shank. Referring now to these figures, the shank is the same as shown in Figure 3 and hence the same reference numerals have been applied. The socket 120 has a smooth shift ring receiving surface 121 upon which a ring 122 is mounted for axial movement. The ring 122 has a slot 124 near one edge large enough to receive the outer generally conical or spherical shaped head 127 of the socket plunger 128, which may be a ball, like that shown in Figure 9, if desired mounted for movement in a transverse socket opening 129. The shift ring 122 also has a slot 130 which receives the outer end of a spring pressed plunger 131 which is of substantially the same construction described above and shown in Figures 3, 4, 5, and 6. The slot 130 is formed to accommodate and limit the axial movement of the ring 130 and to prevent rotation of the latter on the socket 120.

The inner end of the socket plunger 128 engages the outer end of the shank plunger 62. When the ring opening 124 registers with the outer conical or spherical head 127 of the socket plunger, the spring 63 forces the outer end of the shank plunger 62 outwardly into the transverse socket opening 129 and locks the socket on the shank 60, as shown in Figure 12. When the ring 122 is pulled axially, preferably in the direction shown by the arrow in Figure 12, which is the natural direction to pull the socket off the shank, the ring 122 is first shifted axially to the position shown in Figure 13, and then the pull is continued so as to remove the socket. These motions are reversed when the socket is applied. The inner end of the slot or opening 124 is beveled, as at 124a, to facilitate axial movement of the ring 122.

While I have shown and described above the preferred forms in which the principles of the present invention have been embodied, it is to be understood that my invention is not to be limited to the specific details shown and described above, but that, in fact, widely different means may be employed in the practice of the broader aspects of my invention.

What I claim, therefore, and desire to secure by Letters Patent is:

1. In combination, a socket having a shank receiving opening and a transverse opening, a shank adapted to be disposed in said socket and having a transverse opening adapted to be registered with the transverse opening in said socket,

a member carried in one of said transverse openings and movable into the other to hold said shank and socket together, means for locking and unlocking the shank and socket including a shift ring movable on said socket and having an opening therein, and a part disposed in the outer end of said socket opening and adapted to be forced inwardly when said shift ring is moved to carry the opening in the latter away from the transverse opening in said socket member, and a spring pressed member carried by said socket separately from said first member and engageable in a slot in said shift ring for retaining the latter in position on the socket.

2. In combination, a socket having a shank receiving opening and a transverse opening, a shank adapted to be disposed in said socket and having a transverse opening adapted to be registered with the transverse opening in said socket, a spring pressed plunger movably disposed in said shank opening, a second plunger movably disposed in said transverse socket opening and having a part extending exterior thereof, a locking ring carried by said socket and having an opening receiving the outer end of said second plunger when the latter is moved outwardly by the movement of the first plunger into the transverse opening in said socket, movement of said locking ring to carry the opening therein away from the outer end of said second plunger serving to act through the latter to force the first plunger inwardly of the shank, and means carried by the socket and acting against said locking ring for retaining the latter in proper position on said socket.

3. In a wrench, the combination of a socket having a polygonal opening, a polygonal shank having a transverse bore and a spring-pressed plunger and adapted to be disposed in said opening, means carried by said socket for forcing said spring-pressed plunger inwardly including a plunger carried by said socket and a locking ring operatively associated with said socket-carried plunger for moving the same inwardly, and a second spring-pressed plunger carried by said socket and cooperating with said locking ring for holding the latter in position on said socket.

4. In a tool, a socket having a shank receiving opening and a transverse bore, said bore being provided with a shouldered inner end, a plunger mounted within said bore and being retained in said bore by said shoulder, a shift ring mounted exteriorly of said socket and having an opening adapted in one position of the ring to receive the outer portion of said plunger when the latter is moved radially outwardly of the socket away from said shoulder, there being an exterior shoulder formed on said socket against which said shift ring is disposed, a retaining ring fixed to said socket at the opposite side of said shift ring and serving to retain the latter in position, and cooperating means formed on said retaining ring and said shift ring for limiting the rotation of the latter relative to said socket.

5. In a wrench, the combination of a socket having a polygonal opening, a polygonal shank having a transverse bore and a spring-pressed plunger and adapted to be disposed in said opening, means carried by said socket for forcing said spring-pressed plunger inwardly including a plunger carried by said socket and a locking ring operatively associated with said socket-carried plunger for moving the same inwardly, and means carried by said socket and acting against said locking ring for holding the latter in position on said socket.

6. In a wrench, the combination of a socket having a polygonal opening, a polygonal shank having a transverse bore and a spring-pressed plunger and adapted to be disposed in said opening, means carried by said socket for forcing said spring-pressed plunger inwardly including a plunger carried by said socket and a locking ring operatively associated with said socket-carried plunger for moving the same inwardly, one of said plungers being a ball, and means carried by said socket and acting against said locking ring for holding the latter in position on said socket.

7. In combination, a socket having a shank receiving opening and a transverse opening, a shank adapted to be disposed in said socket and having a transverse opening adapted to be registered with the transverse opening in said socket, a spring pressed plunger movably disposed in said shank opening, a second plunger movably disposed in said transverse socket opening and having a part extending exterior thereof, a locking ring carried by said socket and having an opening receiving the outer end of said second plunger when the latter is moved outwardly by the movement of the first plunger into the transverse opening in said socket, movement of said locking ring to carry the opening therein away from the outer end of said second plunger serving to act through the latter to force the first plunger inwardly of the shank, thereby unlocking said socket and shank, and a second spring pressed plunger carried by said socket and cooperating with said locking ring for holding the latter in position on said socket.

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