

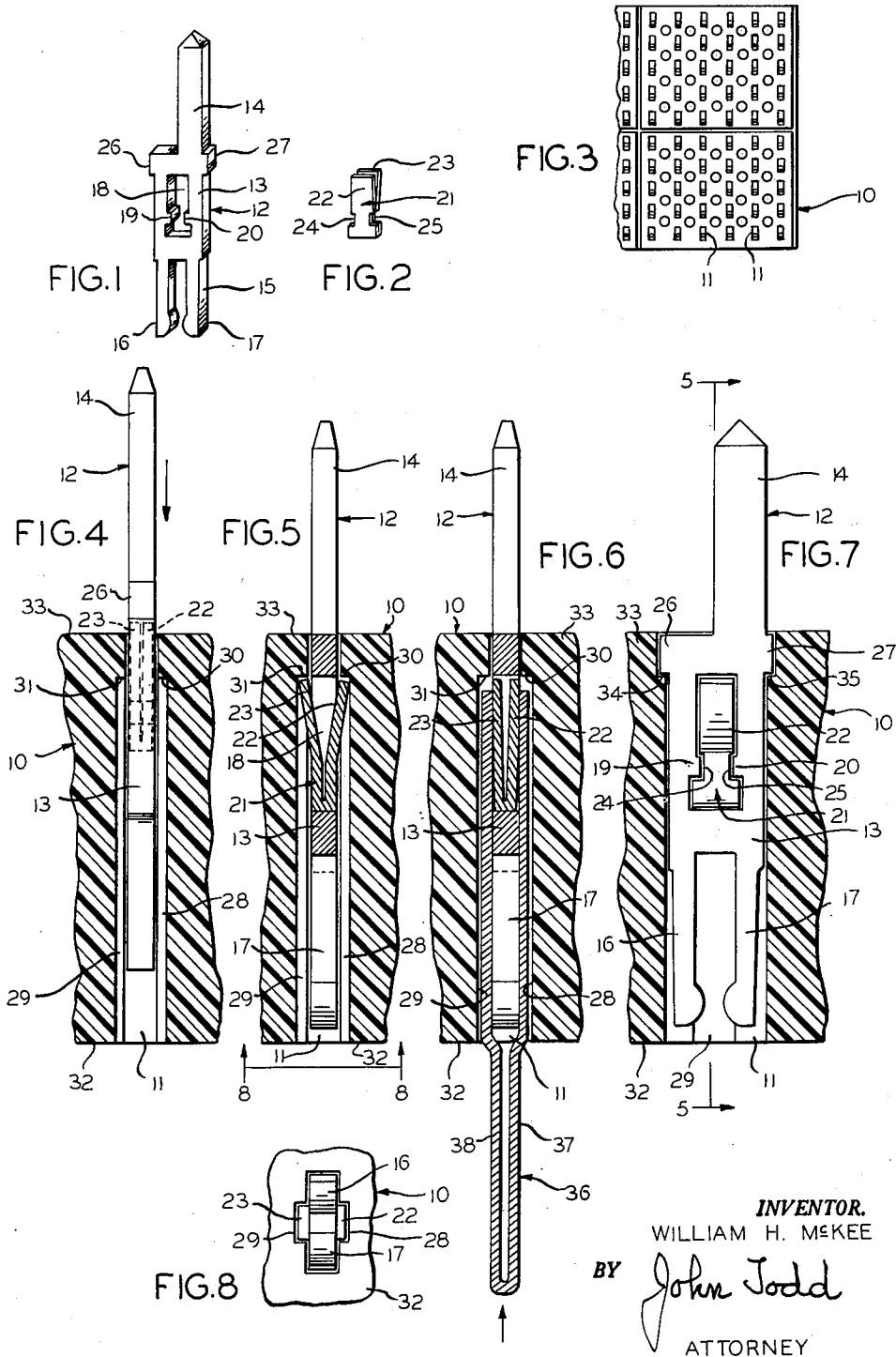
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W. H. McKEE

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SPRING CLIP SNAP-IN CONTACT

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INVENTOR.
WILLIAM H. McKEE

BY

John Todd
ATTORNEY

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SPRING CLIP SNAP-IN CONTACT

William H. McKee, West Covina, Calif., assignor to
United-Carr Fastener Corporation, Boston, Mass., a
corporation of Delaware

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This invention relates to an electric connector structure, and more particularly to a snap-in contact and connector part therefor.

Connector structures are used to releasably interconnect a plurality of conductors constituting one circuit network with the respective conductors of another circuit network, and therefore usually include a pair of connector body parts each equipped with a plurality of contacts so that when the connector parts are moved into juxtaposition, the contacts of the connector parts respectively mate to establish the desired electric connections. Since each contact must be connected to a conductor therefor, and because of the difficulty inherent in making such connections after the contacts are mounted in the connector parts as a consequence of the proximity of each contact with those adjacent thereto, snap-in contacts have been developed which permit such contacts to be mounted in the connector parts therefor after the contacts have been respectively connected to their conductors.

In many instances, it is necessary to permit selective removal of the contacts, and certain specifications require a minimum number of contact insertion-mountings and withdrawal-removals without significant deterioration in the snap-in locking structure of the contacts. Such requirements have presented difficult problems because the contacts are ordinarily quite small and therefore the snap-in fastener structure is even smaller, the materials employed for the contacts must be good electric conductors, the fastener structure must provide constraint against a specified minimum withdrawal force, and the manner of selectively releasing and withdrawing the contact must be convenient. An object of the present invention is to provide a connector and snap-in contact combination of improved character that obviates the problems ordinarily encountered.

Another object of the invention is in the provision of a contact member that automatically snaps into interlocking engagement with a connector body part when inserted into a passage therein and defines a positive interlock that progressively increases in the value of its resistive force when a withdrawal force is applied to the contact member without first selectively releasing the interlock. Still another object is that of providing a connector body part and snap-in contact therefor, in which the locking element provided by the contact member is positively released with convenience and facility upon linear insertion or longitudinal movement of a simple tool into the connector passage having the contact member mounted therein. Yet another object is to provide a snap-in contact member adapted for use with a connector body part, and in which the spring-type locking means of the contact member may be formed of any suitably desirable material having the requisite resilience and biasing force since it is structurally separate from the contact member.

A further object of this invention is in the provision of a connector body part and snap-in contact therefor (either male or female), in which the contact member has an intermediate portion mounted within a passage therefor in the connector body part—the contact member being generally planar throughout such intermediate portion and being provided with an opening therein that removably receives a locking element constrained against

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longitudinal movements with respect to the contact member and having a pair of resilient locking fingers that project outwardly from the contact member on opposite sides thereof for respective engagement with abutment elements located within the connector passage so as to prevent longitudinal displacement of the contact member in one direction, the passage having a pair of channels respectively defining the abutment elements and permitting insertion of a tool into the passage for compressing the locking fingers toward the plane of the contact member to permit withdrawal thereof from the passage. Additional objects and advantages of the invention will become apparent as the specification develops.

An embodiment of the invention is illustrated in the accompanying drawing, in which—

FIGURE 1 is a perspective view of a contact member embodying the invention; FIGURE 2 is a perspective view of the locking element for the contact member shown in FIGURE 1; FIGURE 3 is a broken bottom plan view of a connector body part for the contact member of FIGURE 1; FIGURE 4 is an enlarged, transverse sectional view of the connector body part illustrating one of the passages therein and the contact member at one position during its insertion thereinto; FIGURE 5 is an enlarged, transverse sectional view similar to that of FIGURE 4 but showing the contact member fully positioned within the connector passage, the section being taken generally along the line 5—5 of FIGURE 7; FIGURE 6 is an enlarged, transverse sectional view substantially the same as that of FIGURE 5 but illustrating a tool positioned within the passage for compressing the locking element prior to withdrawing the contact member from its passage; FIGURE 7 is an enlarged, vertical sectional view taken generally along the plane or face of the contact member as shown in FIGURE 5; and FIGURE 8 is an enlarged, top plan view of the connector body part and contact member taken generally along the plane 8—8 of FIGURE 5.

For purposes of illustrating an embodiment of the present invention, only one section of the usual two-section structure is shown since the other section thereof may be substantially identical except that the contact members will have male or prong-equipped ends rather than the illustrated receptacle-equipped ends. With respect to either section, a connector body part having one or more longitudinally extending passages therein is provided, and a plurality of contact members are respectively positioned within the passages. The connector body part will be formed of an insulating material, as is well known in the art, and may be a cast thermo-setting synthetic resin plastic such as Bakelite. The contact member will be formed from an electric conductive material such as Phosphor bronze, and will be equipped with means such as a tail to permit connection thereof to an electric conductor.

In the drawing, the connector body part is designated with the numeral 10, and is provided with a plurality of passages 11 extending longitudinally therethrough and arranged in a plurality of longitudinally and transversely aligned rows. A plurality of contacts 12 are adapted to be respectively mounted in the passages 11, and each contact is equipped with an intermediate portion 13 of generally planar configuration having a tail 14 extending from the other end thereof and a contact-making end 15 extending from the other end thereof. In the specific structure, the end 15 is a socket having spaced spring legs 16 and 17 adapted to resiliently and frictionally engage a prong inserted therebetween to establish an electric connection therewith, but as stated hereinbefore, the contact-making end 15 could be a male component, in which case it would ordinarily project outwardly from the face of the body part 10. The tail 14 in the form shown is

generally rectangular, and is adapted to be connected to a conductor by having an end of such conductor wrapped tightly thereabout, but the tail 14 may take other forms particular to other types of connection.

The contact 12, and more particularly the generally planar intermediate portion 13 thereof, is provided with an opening 18 therein which is equipped intermediate its ends with a pair of spaced apart, inwardly extending protuberances 19 and 20 oriented in lateral alignment. Adapted to be removably mounted within the opening 18 is a locking element 21 having a pair of outwardly biased resilient locking fingers 22 and 23 that define a generally V-shaped configuration and are joined integrally with each other at one of their ends. Adjacent such end, the locking fingers 22 and 23 are disposed in substantially contiguous relation, and are provided with recesses 24 and 25 respectively receiving the protuberances 19 and 20 therein which cooperate with the recesses to constrain the locking element against longitudinal movements relative to the contact member 12. As seen best in FIGURE 5, the locking fingers 22 and 23 extend outwardly from the plane of the intermediate portion 13 of the contact member on opposite sides thereof, and the intermediate portion 13 along its merge with the tail 14 has a pair of laterally and outwardly extending stops or shoulders 26 and 27 which cooperate with the connector body part 10, as will be described subsequently.

Each of the passages 11 is provided with a pair of transversely spaced and longitudinally extending channels 28 and 29 formed in the respectively associated transverse walls of the passage and each channel has a terminal end within the passage, and such ends respectively define abutment elements 30 and 31. At their other ends, the channels 28 and 29 extend to the face 32 of the connector body part 10. Adjacent the opposite face 33 of the body part 10, each passage 11 has a lateral enlargement forming stop members 34 and 35 adapted to respectively cooperate with the stops 26 and 27 of the contact member 12. As is shown most clearly in FIGURES 4 through 6, the passage 11 is dimensioned transversely with respect to the thickness of the contact member 12 so as to snugly but freely receive the same therein. FIGURES 7 and 8 show most clearly that the channels 28 and 29 approximate in width but are slightly larger than the locking fingers 22 and 23 so as to freely receive the same therein.

In use of the structure, the locking element 21 is inserted into the opening 18 in the contact member by first respectively aligning the recesses 24 and 25 with the protuberances 19 and 20, and then moving the locking element bodily in a transverse direction from one face of the contact member toward the other. Then, the contact member (and assuming connection of the tail 14 thereof with an appropriate conductor) is disposed with the end 15 thereof adjacent the face 33 of the connector part 10 and in alignment with a passage 11, whereupon the contact member is moved longitudinally relative to the connector part to insert the contact member into the passage. Longitudinal movement of the contact member 12 in the direction of the arrow in FIGURE 4 brings the locking element 21, and more particularly the locking fingers 22 and 23 thereof, into engagement with the transverse edges of the passage 11; and continued movement of the contact member in the same direction compresses the locking fingers generally into the transverse dimensional limits of the planar intermediate portion 13 of the contact member, and thus enables it to be moved completely into the passage as shown in FIGURE 5.

When such complete insertion is accomplished, the locking fingers 22 and 23 spring or snap outwardly as a consequence of the intrinsic biasing force thereof, and into the channels 28 and 29 and into substantial engagement with the abutment elements 30 and 31 thereby constraining the contact member against longitudinal movement in the reverse direction. At this same time, the stops 26 and 27 provided by the contact member are in

substantial engagement with the stop members 34 and 35 of the passage 11, as shown in FIGURE 7, and this relationship constrains the contact member against further longitudinal movement in the direction of its insertion. At this time then, the contact member is locked within the passage 11 and cannot be inadvertently displaced therefrom.

If it is desired to remove the contact member 12, a tool of the type shown in FIGURE 6 may be employed which is effective to compress the locking fingers 22 and 23 of the locking element inwardly and into the plane of the intermediate portion 13 of the contact member. Such tool in FIGURE 6 is denoted with the numeral 36, and is of forked configuration having a pair of substantially parallel tines or legs 37 and 38 dimensioned both in thickness and width so as to be slidably receivable within the channels 28 and 29 and having a length sufficient to permit engagement thereof with the locking fingers. As the legs of the tool 36 are moved into the channels 28 and 29 and into engagement with the locking fingers 22 and 23, the locking fingers are squeezed inwardly so as to release the same from the abutment elements 30 and 31, whereupon the contact member can be withdrawn longitudinally from the passage 11.

Since the locking element 21 is the only component that is subject to fatigue as the contact member is inserted and withdrawn from the passage 11, and since structurally it is separate from the contact member, it may be replaced whenever necessary. More importantly, however, and because the locking element does not contribute materially to the current flow characteristics of the contact member, it may be made from a dissimilar material such as hardened brass which has relatively low fatigue, affords the requisite resilience, and provides the desired biasing or spring force. It will be noted that a wedging action occurs when a withdrawal force is applied to the contact member with the locking fingers 22 and 23 in the extended position thereof shown in FIGURE 5, and such wedging action tends to spread the locking fingers wherefore the force thereof resisting such movement of the contact member becomes progressively greater as withdrawal forces of larger magnitude are applied to the contact member. Thus, a positive and effective lock or constraint against longitudinal movement in one direction is defined by the locking element, and the engagement of the stops 26 and 27 with the stop members 34 and 35 define a positive stop preventing longitudinal movement of the contact member in the opposite direction. It will be apparent that since the locking fingers 22 and 23 are disposed in transverse alignment and must be received almost bodily within the transverse dimensional limits of the body portion 13 of the contact member, each locking finger 22 and 23 should be no greater in thickness than about half the thickness of the intermediate body portion of the contact member.

While in the foregoing specification an embodiment of the invention has been set forth in considerable detail for purposes of making a complete disclosure thereof, it will be apparent to those skilled in the art that numerous changes may be made in such details without departing from the spirit and principles of the invention.

I claim:

1. In combination with a connector body part having a longitudinally extending passage therein provided intermediate its ends with a transversely spaced abutment element, a contact member having a generally planar intermediate portion positioned within said passage and provided with an opening therein, a locking element removably mounted within said opening, said locking element having a resilient locking finger biased outwardly from the plane of said planar intermediate portion and into substantial engagement with said abutment element to prevent longitudinal displacement of said contact member in one direction relative to said body part, said passage being dimensioned transversely to snugly pass the thickness of said generally planar intermediate por-

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tion therethrough, said passage having a transversely spaced and longitudinally extending channel therein receiving said locking finger, said channel having a terminal end intermediate the end of said passage and defining said abutment element, said locking finger being pressed inwardly and generally into the plane of said planar intermediate portion upon longitudinal movement of said contact member into said passage and springing outwardly and into engagement with said abutment element when moved into alignment with said channel, and cooperative abutment structure having parts respectively provided by said contact member and connector body part to prevent longitudinal displacement of said contact member in the other direction relative to said body part.

2. The combination of claim 1 in which said contact member and locking element have cooperating projection and recess means constraining said locking element against longitudinal movement relative to said contact member.

3. In combination with a connector body part having a longitudinally extending passage therein provided intermediate its ends with a pair of transversely spaced abutment elements, a contact member having a generally planar intermediate portion positioned within said passage and provided with an opening therein, a locking element removably mounted within said opening, said locking element having a pair of resilient locking fingers respectively extending outwardly from said generally planar intermediate portion on opposite sides thereof and being biased outwardly and into substantial engagement with said abutment elements to prevent longitudinal

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dinal movement of said contact member in one direction relative to said body part, said passage being dimensioned transversely to snugly pass the thickness of said generally planar intermediate portion therethrough, said passage having a pair of transversely spaced and longitudinally extending channels therein respectively receiving said locking fingers, each of said channels having a terminal end intermediate the ends of said passage and respectively defining said abutment elements, said locking fingers being pressed inwardly and generally into the plane of said planar intermediate portion upon longitudinal movement of said contact member into said passage and springing outwardly and into engagement with said abutment elements when moved into substantial alignment with said channels, and cooperative abutment structure having parts respectively provided by said contact member and connector body part to prevent longitudinal displacement of said contact member in the other direction relative to said body part.

References Cited in the file of this patent

UNITED STATES PATENTS

1,747,896	Gates	Feb. 18, 1930
2,691,147	Sutton et al.	Oct. 5, 1954
2,694,799	Del Camp	Nov. 16, 1954
2,736,875	Protz	Feb. 28, 1956
2,762,026	Knohl	Sept. 4, 1956
2,834,951	Aquillon et al.	May 13, 1958

FOREIGN PATENTS

531,393	Belgium	Sept. 25, 1954
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