

Sept. 14, 1943.

D. H. KING

2,329,471

ELECTRICAL TERMINAL

Filed Aug. 7, 1942

2 Sheets-Sheet 1

FIG. 1

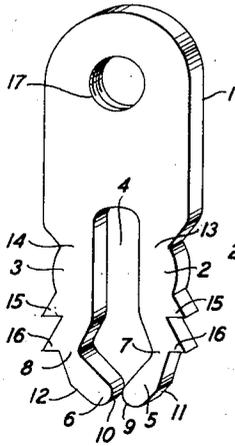


FIG. 2

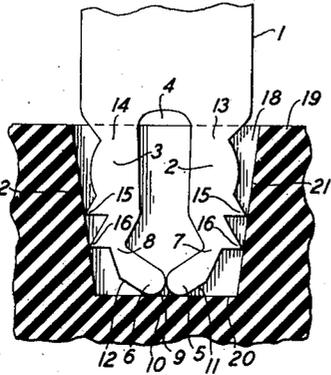


FIG. 3

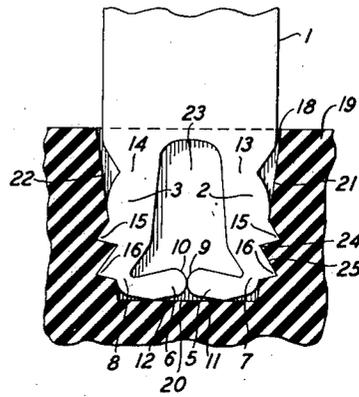


FIG. 4

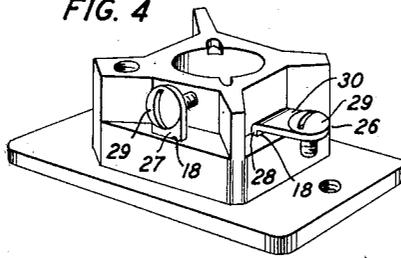


FIG. 5

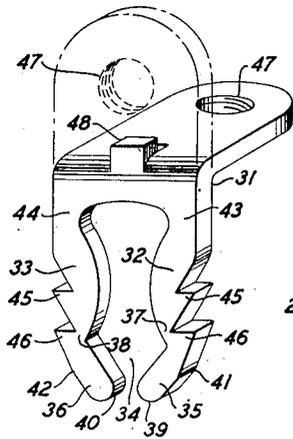


FIG. 6

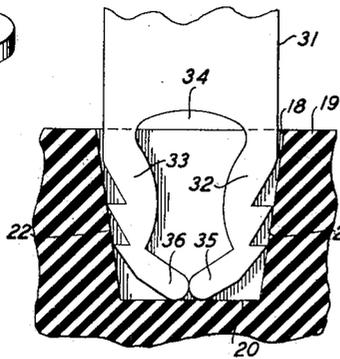
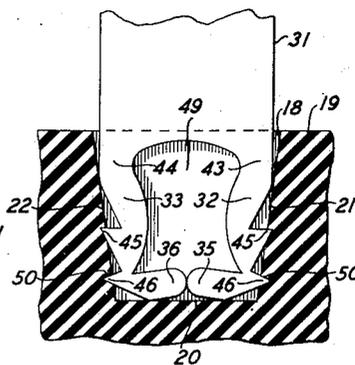


FIG. 7



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2 Sheets-Sheet 2

FIG. 8

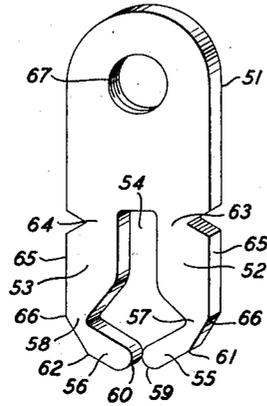


FIG. 9

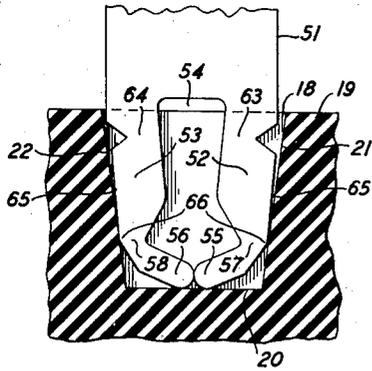
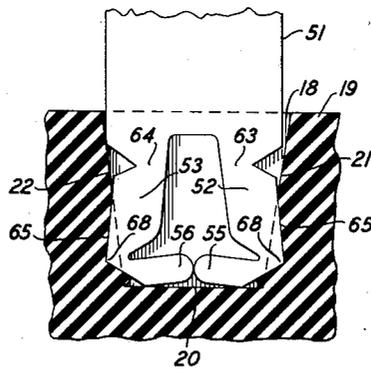


FIG. 10



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UNITED STATES PATENT OFFICE

2,329,471

ELECTRICAL TERMINAL

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Application August 7, 1942, Serial No. 453,953

7 Claims. (Cl. 85—2)

This invention relates to electrical terminals and more particularly to electrical terminals constructed and arranged for mounting in a support by having a portion of the terminal driven into a recess provided in the support.

The object of the invention is to provide a terminal which when driven into a recess formed in a support of insulating material will remain securely anchored in the support.

A feature of the invention resides in the form and construction of one end portion of the terminal.

In the drawings:

Fig. 1 is a view in perspective of one form of the terminal embodying the invention;

Fig. 2 is a view, partly in section, of a fragmentary portion of an insulating support with a recess formed therein and the lower portion of the terminal, Fig. 1, placed in the recess;

Fig. 3 corresponds to Fig. 2 but shows the terminal driven within the recess so that the terminal is securely anchored in place;

Fig. 4 is a view in perspective of an insulating support with two terminals of this invention secured in place and with one of the terminals modified so that the unsecured end portion of the terminal extends angularly of the secured end portion. Fig. 4 is drawn on a smaller scale than the preceding figures and shows the terminals as having screws mounted on the unsecured end portions;

Fig. 5 is a view corresponding to Fig. 1 but showing a modification of the invention and indicating that the terminal may be of either straight or bent form;

Fig. 6 shows the lower portion of the terminal, Fig. 5, placed in the recess in an insulating support;

Fig. 7 corresponds to Fig. 6 but shows the terminal secured in place;

Fig. 8 shows a modified form of the terminal;

Fig. 9 shows the lower end of the terminal, Fig. 8, placed in a recess in a support; and

Fig. 10 corresponds to Fig. 9 but shows the terminal secured in place.

Terminal blocks and other insulating supports for terminals are often made of thermoplastic insulating material such, for instance, as hard rubber. The terminal to be supported in the insulating support is often set and held in place in a mold while insulating material is being molded to form the required support. In doing this it is often necessary to have an expensive jig or fixture to hold the terminal in a required position during the molding operation.

In some cases in order to eliminate the necessity of using jigs or fixtures to hold the terminals in position during the molding of the insulating support, recesses have been formed in the insulating support either during or after the molding operation, the recesses being provided to receive the terminals. After the insulating support is molded and a recess is formed therein the terminal is driven into the recess and is held in place by frictional engagement of the terminal against the walls defining the recess. In an effort to make it more difficult to withdraw the terminal from the recess teeth have been provided on the portion of the terminal entered in the recess, the idea being that the teeth will dig into the walls of the recess. In such arrangements, however, the recess is made smaller than the entered portion of the terminal and when the terminal is being driven into place the teeth cut their way into the walls of the recess and form grooves behind them through which the teeth may pass when separation of the terminal from the insulating support is attempted.

My invention is an improvement in driven-in type terminal structures and arrangements and provides a construction and arrangement which permits ready placing of the terminal in the recess and when the terminal is driven down within the recess the entered portion of the terminal takes such form that the terminal remains securely anchored in place.

In Fig. 1 the terminal 1 which may be made of sheet metal or other suitable material, is provided with leg members 2 and 3 extending in substantial parallel spaced relation on opposite sides of an aperture 4 formed longitudinally in the lower portion of the terminal. The aperture 4 resembles an inverted keyhole but is not entirely closed at the lower end when the terminal 1 is originally formed. The lower end of the leg member 2 is provided with a foot 5 which is toed inwardly toward a corresponding foot 6 formed on and extending from the leg member 3. The feet 5 and 6 slope downwardly and inwardly toward each other and are in almost toe-to-toe engagement in Fig. 1. The upper end of the foot 5 is narrowed at 7 and the upper end of the foot 6 is narrowed at 8 to make the feet more readily bendable at these points. The lower ends of the feet 5 and 6 are rounded at 9 and 10, respectively, and the outer edges of the feet 5 and 6 are curved at 11 and 12 for a purpose to be later explained. The leg members 2 and 3 are reduced in width at the respective points 13 and 14 to make the leg members more readily bendable at these

points and the outer edges of the leg members 2 and 3 are contoured to provide teeth 15 and 16, the teeth 15 and 16 on each leg member being directed in the direction of the line of thrust of the leg member. The advantage provided by this arrangement of the teeth will be subsequently explained. A tapped hole 17 is provided in the upper portion of the terminal 1 to receive a screw, not shown, but which may be employed in fastening a wire to the terminal.

As shown in Fig. 2 a tapered recess 18 is formed in a support 19 made of insulating material, the recess 18 being rectangular in form, the rectangular form being longer at the top than at the bottom. The depth of the recess 18 is slightly less than the length of the aperture 4 and the lower end 20 of the recess is flat. The end walls 21 and 22 of the recess 18 slope inwardly from the top to the bottom. The length of the recess 18 gradually decreases from the top to the bottom and is so dimensioned that when the terminal 1 is being placed in the recess the teeth 15 and 16 on the leg members 2 and 3 will not cut into the end walls 21 and 22 until the teeth 15 and 16 on the leg members are part way down the recess 18. Since the feet 5 and 6 are not in mutual engagement when the terminal 1 is originally formed the leg members 2 and 3 may be slightly sprung toward each other as the terminal 1 is being moved to the position shown in Fig. 2, the springing of the leg members 2 and 3 toward each other being accomplished by the camming action of the end walls 21 and 22 against the teeth 15 and 16.

When the terminal 1 reaches the position shown in Fig. 2 the feet 5 and 6 are in toe-to-toe engagement and are in engagement with the lower wall 20 of the recess 18. After the terminal 1 is placed in the recess 18 in the position shown in Fig. 2 the terminal is driven downwardly in the recess 18 to the position shown in Fig. 3. During this driving-in operation the feet 5 and 6 bend at the narrowed portions 7 and 8 and since the feet 5 and 6 are in toe-to-toe engagement the leg members 2 and 3 cannot come closer together. The feet 5 and 6 are moved into substantially flat-foot engagement with the lower wall 20 of recess 18 and into the position shown in Fig. 3. In taking this position the feet 5 and 6 force the leg members 2 and 3 away from each other so that the teeth 15 and 16 are driven into the end walls 21 and 22 of the recess 18, the leg members 2 and 3 bending at the narrowed portions 13 and 14 and so that the aperture 4 shown in Figs. 1 and 2 takes the form of the aperture 23 shown in Fig. 3. The feet 5 and 6 are curved at 11 and 12, respectively, so that the feet 5 and 6 will rock on the flat surface of the lower wall 20 of the recess 18 when the terminal 1 is being driven to final position. The rounded ends 9 and 10 permit slight turning up of the toe-to-toe engaged portions of feet 5 and 6 and so that the feet 5 and 6 when moving to final position pass through a dead center position relative to each other and in final position are slightly above the dead center position.

The teeth 15 and 16 on each leg member as above mentioned are formed and arranged so that they point in the direction of the line of thrust of the leg member. The advantage in this construction and arrangement of the teeth 15 and 16 is that when the terminal 1 is being driven down in the recess 18 and so that the tooth 16 on leg member 2, for instance, cuts a way for itself in the wall 21 of the recess 18, the tooth 15 in

cutting a way for itself in the wall 21 will force material from the wall 21 into the valley portion 24 between the teeth 15 and 16 and against the upper wall 25 of the tooth 16. The material forced down by the tooth 15 against the upper wall 25 of the tooth 16 and into the valley portion 24 serves in some measure to prevent withdrawal of the leg member 2 from the recess 18. It will be seen that in order to withdraw the leg members 2 and 3 from the recess 18 it would be necessary to move the leg members 2 and 3 toward each other and that this is prevented by the feet 5 and 6 which are in toe-to-toe engagement and which would have to be moved downward through and beyond dead center position before the leg members 2 and 3 could come closer together.

Fig. 4 shows a terminal block 26 equipped with terminals made in accordance with this invention, the terminals 27 and 28 having been driven down within the tapered recess 18 formed in the terminal block 26. The terminal 27 may be like the terminal 1 shown in Figs. 1, 2 and 3 and be equipped with a screw 29 in the tapped hole 17. The terminal 28 may be of like construction but having the outer end portion 30 bent angularly relative to the end portion secured in the block 26.

In the modification shown in Figs. 5, 6 and 7 the terminal 31 follows, in general, the pattern of the terminal 1 above described and is provided with leg members 32 and 33 extending in substantially parallel spaced relation on opposite sides of an elongated aperture 34 formed longitudinally in the lower portion of the terminal. The lower end of the leg member 32 is provided with a foot 35 which is toed inwardly toward a corresponding foot 36 formed on and extending from the leg member 33. The feet 35 and 36 slope downwardly and inwardly toward each other and are in almost toe-to-toe engagement in Fig. 5. The leg member 32 is narrowed at 37, and the leg member 33 is narrowed at 38 to make the leg members more readily bendable at these points. The lower ends of the feet 35 and 36 are rounded at 39 and 40, respectively, and the outer edges of the feet 35 and 36 are curved at 41 and 42. The leg members 32 and 33 are reduced in width at the respective points 43 and 44 to make the leg members more readily bendable at these points, and the outer edges of the leg members 32 and 33 are contoured to provide teeth 45 and 46, the teeth 45 and 46 on each leg member being directed toward the top of the terminal. The terminal 31 may be straight as indicated by the dot-dash lines in the figure or may be bent as shown in full line and is provided with a tapped hole 47 to receive a screw, not shown, but which may be used in connecting a wire to the terminal.

In Fig. 6 the terminal 31 is placed in the tapered recess 18 formed in a support 19 made of insulating material, the recess 18 being of the form described in connection with Figs. 2 and 3 and having its depth slightly less than the length of the aperture 34. After the terminal 31 is placed in the recess 18, as shown in Fig. 6, and with the feet 35 and 36 in engagement with the lower wall 20 in the recess 18 and with each other, the terminal 31 is driven downwardly in the recess 18 to the position shown in Fig. 7. If the terminal 31 is of bent form such as shown in full lines in Fig. 5, a lug 48 may be formed on the terminal 31 to serve as an anvil to receive a blow applied to the terminal in driving the terminal downwardly in the recess 18. During the driv-

ing-in operation the leg members 32 and 33 bend at the narrowed portions 37 and 38, respectively, and the feet 35 and 36 are in toe-to-toe engagement and move into substantially flat foot engagement with the lower wall 20 of the recess 18 and into the position shown in Fig. 7. In taking this position the feet 35 and 36 force the leg members 32 and 33 away from each other and so that the teeth 45 and 46 are driven into the end walls 21 and 22 of the recess 18, the leg members 32 and 33 bending slightly outwardly from the narrowed portions 43 and 44 and so that the aperture 34 shown in Figs. 5 and 6 takes the form of the aperture 49 shown in Fig. 7.

It will be seen in Fig. 7 that the teeth 45 and 46 have been driven into the walls 21 and 22 of the recess 18 and that each tooth 45 in moving to its final position in the recess 18 has forced some of the material in the end wall of the recess against the upper portion 50 of the tooth 46. Also, that the feet 35 and 36 in taking their final position have passed slightly above a dead center condition, and the leg members 32 and 33 by reason of the position of the feet 35 and 36 cannot easily be made to move toward each other if an effort is made to withdraw the terminal 31 from the recess 18.

In Fig. 8 which shows a modified form of the terminal there are no teeth on the leg members of the terminal. The terminal 51 shown in this figure follows in other respects the general pattern of the terminal 1 shown in Fig. 1. The terminal 51 is provided with leg members 52 and 53 extending in substantially parallel spaced relation on opposite sides of an aperture 54 formed longitudinally in the lower portion of the terminal. The lower end of the leg member 52 is provided with a foot 55 which is toed inwardly toward a corresponding foot 56 formed on and extending from the leg member 53. The feet 55 and 56 slope downwardly and inwardly toward each other and are in almost toe-to-toe engagement in Fig. 8. The upper end of the foot 55 is narrowed at 57 and the upper end of the foot 56 is narrowed at 58 to make the feet more readily bendable at these points. The lower ends of the feet 55 and 56 are rounded at 59 and 60, respectively, and the outer edges of the feet 55 and 56 are curved at 61 and 62 to permit the feet to rock on the lower end 20 of the recess 18 shown in Figs. 9 and 10. The leg members 52 and 53 are reduced in width at the respective points 63 and 64 to make the leg members more readily bendable at these points. The outer edges of the leg members 52 and 53 as above pointed out are not provided with teeth but are straight, each leg member having a straight outer edge portion 65 extending to a corner 66 where the leg members 52 and 53 terminate in the feet 55 and 56, respectively. A tapped hole 67 is provided in the upper portion of the terminal 51 to receive a screw, not shown, but which may be employed in fastening a wire to the terminal.

As shown on Fig. 9, the terminal 51 is placed in a tapered recess 18 formed in the support 19 made of suitable insulating material. In the position shown in Fig. 9 the feet 55 and 56 are in engagement with the lower wall 20 of the recess 18 and the feet 55 and 56 are in toe-to-toe engagement with each other. The straight outer edge portion 65 of the leg member 52 is in engagement with the wall 21 of the recess 18 and straight outer edge 65 of the leg member 53 is in engagement with the wall 22. After the terminal 51 is placed in the position shown in Fig. 9 the

terminal 51 is driven downwardly in the recess 18 to the position shown in Fig. 10. During this driving-in operation the feet 55 and 56 bend at narrowed portions 57 and 58 and since the feet 55 and 56 are in toe-to-toe engagement the leg members 52 and 53 cannot come closer together. The feet 55 and 56 are moved into substantially flat-foot position relative to the lower wall 20 of the recess 18 and into the position shown in Fig. 10. In taking this position the feet 55 and 56 force the leg members 52 and 53 away from each other and so that the corners 66 are driven into the end walls 21 and 22 of the recess 18, the leg members 52 and 53 bending at the narrowed portions 63 and 64 during this outward movement of the leg members.

It will be seen as shown in Fig. 10 that the corners 66 shown in Figs. 8 and 9 have become obtuse angles 68 thrust rather deeply into the walls 21 and 22 of the recess 18 and that the greater portion of the straight outer edge 65 of each leg member extends into the wall of the tapered recess 18. Also that the taper of the lower portion of the terminal 51 in its final form is substantially opposite to the form of the recess 18. It would be extremely difficult to remove the terminal 51 from the support 19, when the terminal 51 is in the final position shown in Fig. 10, since the leg members 52 and 53 are engaged in the walls 21 and 22 of the recess 18 and the leg members 52 and 53 are held in this final position by the toe-to-toe engaged feet 55 and 56 which have also passed upwardly beyond dead center position.

What is claimed is:

1. An electrical terminal suitable for mounting in a support by driving a portion of said terminal into a recess formed in the support, said terminal comprising a pair of leg members arranged to enter the recess in said support, a foot on each leg member extending downwardly and inwardly toward a corresponding foot on the other leg member, each foot being connected to its leg member by an integral readily bendable portion, the feet on said leg members being arranged to engage each other in a toe-to-toe manner and cooperatively spread said leg members apart when the terminal is driven into the recess, and the feet on said leg members being operable during the driving in of said terminal to move through and slightly above a dead center condition and so that they will be cooperating to hold said leg members in spread apart condition in the recess in said support and in holding engagement with walls of the recess.

2. An electrical terminal driven into a recess formed in a support of insulating material, said terminal comprising a pair of leg members extending in said recess, inwardly toed feet on said leg members engaging the bottom of said recess and engaging each other in a toe-to-toe manner, each of said feet being connected to its supporting leg member by a weakened portion which is bent during the driving in of said terminal, and said feet having been moved upwardly and slightly beyond a dead center condition but still cooperating to hold said leg members spaced apart in said recess and in holding engagement with the walls of said recess.

3. An electrical terminal suitable for driving into a recess formed in a support of insulating material, said terminal comprising a pair of leg members arranged to enter said recess, a foot on each leg member toed downwardly and inwardly toward a corresponding foot on the other leg member, the juncture of each foot and leg

member being relatively narrow to make the structure readily bendable at these points, said feet being arranged to engage the bottom of said recess and to engage each other in a toe-to-toe manner when said terminal is inserted in said recess and said feet being arranged to operate in the manner of levers on said leg members and cooperate to force the lower ends of said leg members away from each other and so that said leg members will be forced into holding engagement with the walls of said recess and will be maintained in holding engagement with walls of said recess when said terminal is driven into said recess.

4. An electrical terminal suitable for driving into a recess formed in a support of insulating material, said terminal comprising a lower portion formed to provide spaced leg members, teeth formed on the outer edges of said leg members, said teeth being directed in the line of thrust of said leg members, feet on said leg members extending angularly downward of said leg members and inwardly toward each other, said feet being arranged to engage each other in a toe-to-toe manner and force said leg members outwardly within the recess and force said teeth into walls of the recess when said terminal is driven into the recess, said feet cooperating to hold said leg members in such condition that said teeth are maintained in holding engagement with the walls of the recess.

5. An electrical terminal suitable for mounting in a support by driving a portion of the terminal into a recess formed in the support, said terminal comprising a lower portion having an elongated aperture formed therein, a pair of leg members extending in spaced relation and defining said aperture, a foot on each leg member sloping downwardly and inwardly toward a corresponding foot on the other leg member, teeth formed on the outer edge of each leg member, said teeth being directed toward the lower end of said terminal, said feet being readily bendable at the junctures of said feet with said leg mem-

bers and being arranged to engage each other in toe-to-toe manner and to outwardly thrust said leg members to project said teeth into the walls of said recess and lock said leg members in this position when said terminal is driven into said recess against the lower wall of said recess.

6. An electrical terminal suitable for mounting in a support by driving a portion of the terminal into a recess formed in the support, said terminal comprising a lower portion having an elongated aperture formed therein, a pair of leg members extending in spaced relation and defining said aperture, a foot on each leg member sloping downwardly and inwardly toward a corresponding foot on the other leg member, said feet being readily bendable at the junctures of said feet with said leg members and being arranged to engage each other in a toe-to-toe manner and outwardly thrust said leg members into holding engagement with the walls of said recess and lock said leg members against withdrawal from said recess when said terminal is driven into said recess and against the lower wall of said recess.

7. An electrical terminal suitable for mounting in a support by driving a portion of the terminal into a recess formed in the support, said terminal comprising a lower portion having an elongated aperture formed therein, a pair of leg members extending in spaced relation and defining said aperture, a foot on each leg member sloping downwardly and inwardly toward a corresponding foot on the other leg member, teeth formed on the outer edge of each leg member, said teeth being directed toward the upper end of said terminal, said feet being readily bendable at the junctures of said feet with said leg members and being arranged to engage each other in a toe-to-toe manner and to outwardly thrust said leg members to project said teeth into the walls of said recess and lock said leg members in this position when said terminal is driven into said recess and against the lower wall of said recess.

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