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Bazille, Jr.

[11] **3,858,157**

[45] **Dec. 31, 1974**

[54] **SOLDERLESS TAP CONNECTOR**

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[73] Assignee: **Minnesota Mining and Manufacturing Company**, St. Paul, Minn.

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[21] Appl. No.: **443,368**

[52] **U.S. Cl.** ..... **339/98**, 339/97 R

[51] **Int. Cl.** **H01r 11/20**

[58] **Field of Search** ..... 339/98, 97 P, 97 R, 99 R, 339/96, 95 R, 95 D

[56] **References Cited**

UNITED STATES PATENTS

3,233,206	2/1966	Fiala	339/98
3,309,645	3/1967	Noschese	339/98
3,576,518	4/1971	Bazille, et al.	339/98
3,609,644	9/1971	Seim	339/98

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Attorney, Agent, or Firm—Alexander, Sell, Steldt & DeLaHunt

[57] **ABSTRACT**

A solderless connector for insulated wires, comprising a transversely grooved body with parallel longitudinal wire-receiving channels, and a slotted metal plate contact element insertable in a transverse groove for making electrical contact between wires supported in said channels, includes a displaceable wire-stop disposed across a said channel near an open end thereof and which may be folded into a recess in said body under forceful insertion of a wire into said channel.

7 Claims, 10 Drawing Figures

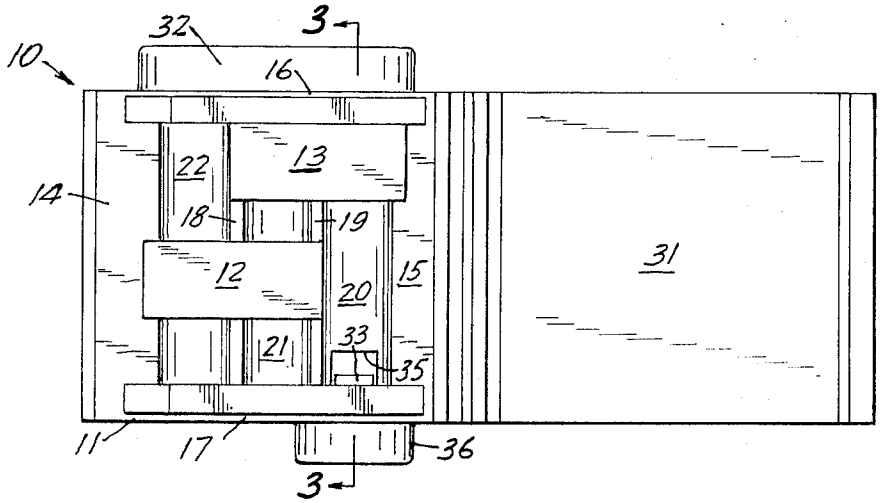


FIG. 1

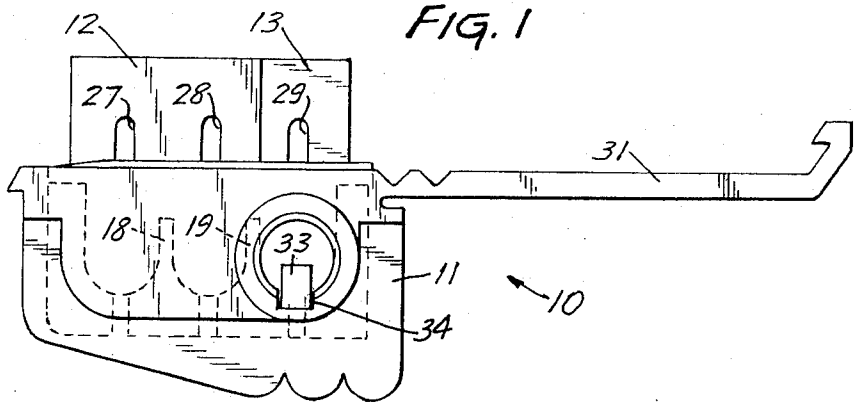


FIG. 2

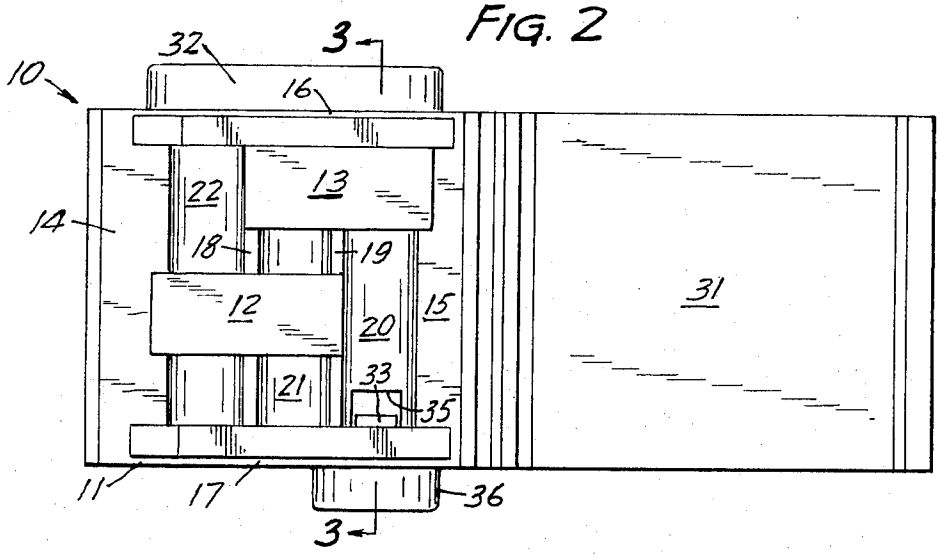


FIG. 3

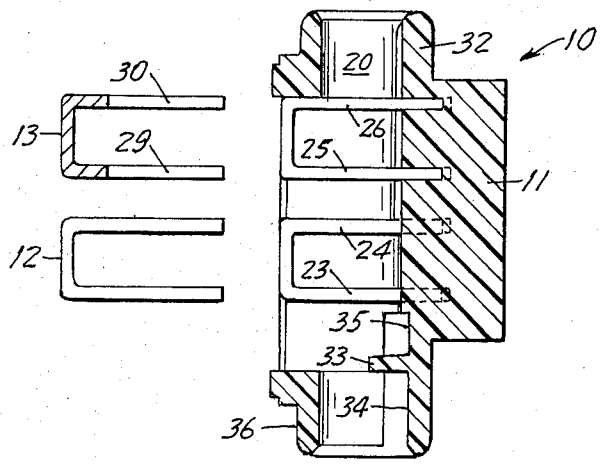


FIG. 4

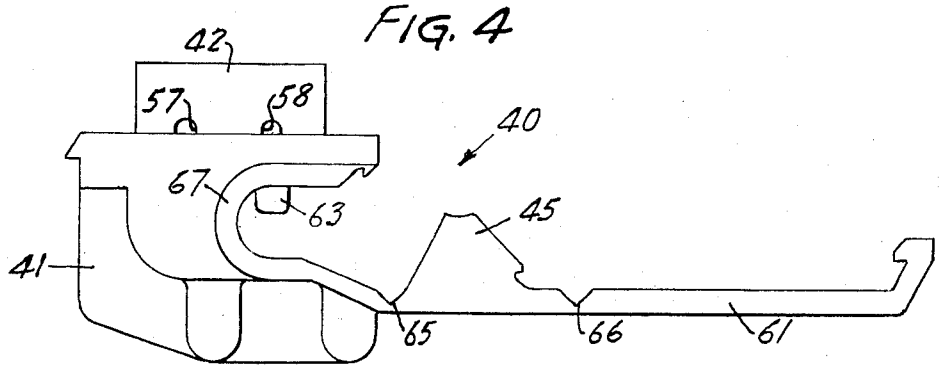


FIG. 5

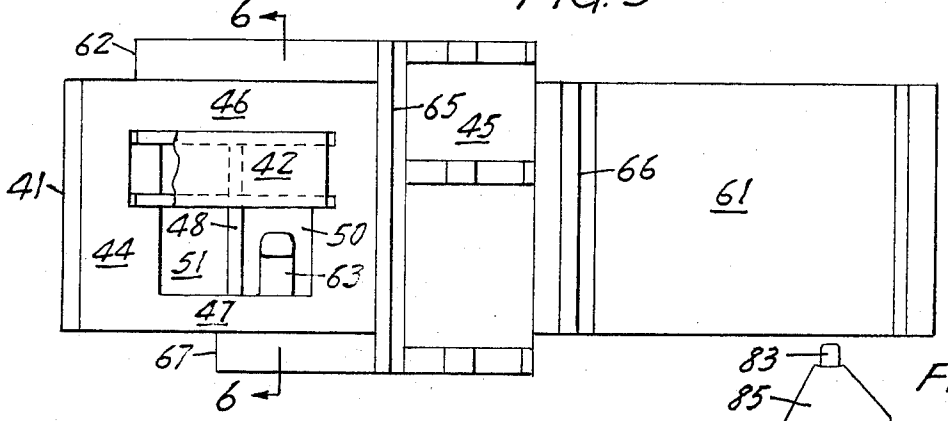


FIG. 8

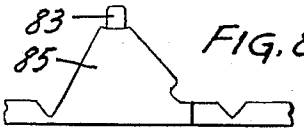


FIG. 6

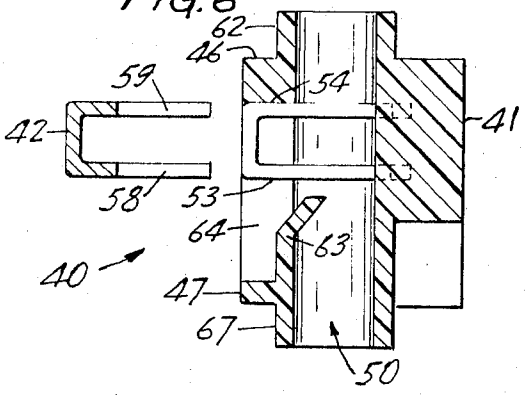


FIG. 9

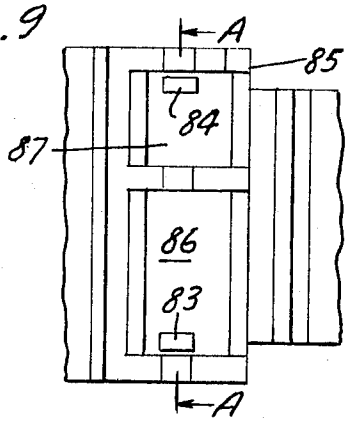


FIG. 7

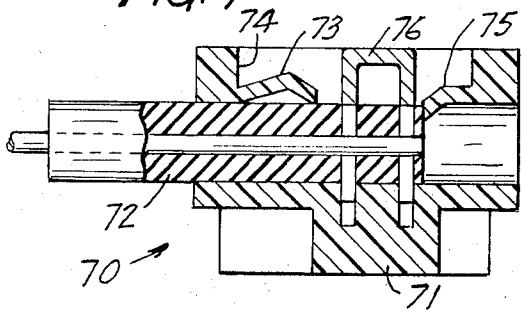
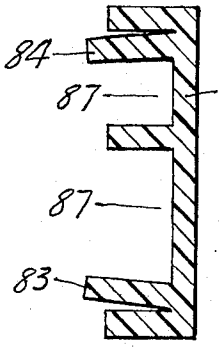


FIG. 10



SOLDERLESS TAP CONNECTOR

This invention relates to wire-connectors for making in-line, tap and pigtail connections between insulated wires.

In-line, tap and pigtail connections are required in many electrical wiring circuits. All are used, for example, in house wiring and in automotive wiring circuits, where two or more wires may be terminally interconnected in a pigtail or in-line splice, or one or more wires may be connected terminally to a through or run wire in a tap or T connection.

A form of connector described in U.S. Pat. No. 3,388,370 permits the solderless splicing of insulated wires in either pigtail, tap or in-line mode. The connector comprises an insulating body having longitudinal wire-receiving channels and transversely grooved for insertion of a slotted metal contact plate. Wires may be inserted either from the side or from an end. The modification illustrated in FIG. 4 of the patent provides an end stop for the inner channel thus permitting only endwise insertion of the inner wire; the second wire may then be inserted in the outer channel either endwise to form a pigtail or in-line splice, or from the open side in forming a tap connection. However, making a pigtail or in-line connection with such a connector requires careful and precise manipulation and observation to insure that the wire-end is inserted far enough to make full contact while still retaining the tip of the wire within the insulating body.

The present invention likewise may provide at least one closed-end channel for receiving a wire-end, and another channel open at both ends for receiving either a wire-end or a continuous wire section. The invention further provides a wire-stop which, unlike the end stop shown in U.S. Pat. No. 3,388,370, is capable of displacement during insertion of a wire. Thus, the stop assures proper positioning of a wire-end in making a pigtail splice while still permitting the preparation of a tap or in-line splice.

A number of illustrative embodiments of the novel connector of this invention are shown in the drawing, wherein

FIGS. **1, 2** and **3** are side elevation, top plan, and sectional views respectively of a first embodiment,

FIGS. **4, 5** and **6** are similar views of a second embodiment,

FIG. **7** is a longitudinal sectional elevation at a location analogous to that shown in FIG. **6** but of a modified form of connector and with a wire-end in place, and

FIGS. **8–10** are views of a portion of still another form of connector otherwise similar to that of FIGS. **4–6,** showing the hinged side wall in end elevation in FIG. **8,** side plan view in FIG. **9,** and longitudinal section along line A—A in FIG. **10.**

The connector **10** of FIGS. **1–3** comprises an insulating body **11** and two doubly folded contact plates or elements **12, 13.** The body has side walls **14, 15,** end walls **16, 17** and inner walls **18, 19,** defining three parallel open-faced wire-receiving channels **20, 21, 22.** Transverse grooves **23, 24, 25, 26** in side and inner walls permit insertion of the two doubly folded contact elements **12, 13,** shown partially inserted in FIGS. **1** and **2** and in position for insertion in FIG. **3.** The elements are slotted to provide narrow open-ended slots **27, 28, 29, 30,** and other similarly spaced slots not

shown, each in alignment with the axis of the appropriate wire-receiving channel so as to make full spring compression reserve contact with a wire supported in the channel when the contact is forced thereagainst. Alternatively a single contact element extending across all channels and slotted in line with each may be used, although requiring increased force in making the connection. A cover **31** is provided, to be folded and locked in place over the exposed upper surfaces of the contact elements after the contacts have been completed.

Channels **21** and **22** are open only at one end, i.e., through circular openings (not shown) in collar **32** and end wall **16.** Channel **20,** on the other hand, is open at both ends, i.e., at collars **32** and **36.** However, a stop **33** extends upwardly from the floor or channel **20** and provides partial blocking of that channel. As a result, wire-ends inserted through the sleeve **32** into the three channels will each be stopped within the body **11** in position for making electrical contact with the elements **12, 13** in a three-wire pigtail splice.

The stop **33** resists deformation under normal wire-insertion forces and serves to locate the wire-end in a position where fully effective contact may be made while still retaining the wire-end within the protective enclosure of the insulating body. However, on the application of additional force the stop is folded or displaced from the upright position shown in FIG. **3** into a recess **34** provided for the purpose in the floor of the channel **20,** to an extent sufficient to permit the wire to be passed through the channel and into position for making a tap or in-line splice. In the embodiment illustrated, an optional second recess **35** is provided adjacent the other side of the stop **30,** so that the stop may alternatively be folded out of the path of a wire inserted in the opposite direction.

In a specific example of a connector for use with No. 14 to No. 12 building wire, the body is made of polypropylene, the circular wire-accepting openings in collars **32** and **36** and end wall **16** have a diameter of 0.180 inch, the stop **33** is 0.100 inch in width, 0.030 inch in thickness at the free end, and to assure proper mold release, the inner face tapers at an angle of 4° with the outer. The recesses **34** and **35** extend 0.016 inch below the base line of the channel **20** and are 0.110 inch in width. The stop extends 0.125 inch above the flat floor of the recesses.

The resiliency of the plastic material is such that the stop **33** may be tipped into the recess **34** by simply pushing a No. 14 insulated wire axially into and through the channel under strong hand pressure. Thereafter the stop continues to press against the wire with a resiliency which assists greatly in maintaining the wire in position within the insulating body.

The connector **40** of FIGS. **4–6** similarly comprises a body **41** and a doubly folded or U-shaped element **42.** The body has a side wall **44,** end walls **46, 47** and an inner wall **48** defining two wire-receiving channels **50, 51.** An opposing side wall **45** is foldably connected to the body at hinge **65** and to a cover **61** at hinge **66.** The contact element **42** fits into grooves **53, 54** with its open-ended slots **57, 58, 59** (and another not shown) in alignment with the axis of the appropriate channel **50, 51.** The channels are open-ended at wall **46** and collar **62,** and channel **50** is open also at the opposite end in collar **67.**

A stop **63** extends from the inner surface of the end wall **47** into the open channel **50** and angles downwardly into the path of a wire-end inserted through collar **62**, serving the same purpose as the stop **33** of FIGS. **1–3.**

Unlike the vertically disposed stop **33** of FIG. **3**, the stop **63** of FIG. **6** is not easily displaceable by force applied axially of a wire-end inserted from the collar **62.** However, the wire may be inserted sidewise through the open side of the body which is then subsequently closed with the wall **45** when the cover **61** is folded over the body and locked in place. In this case, the stop **63** folds upwardly into the open space **64** above the channel to permit entry of the wire in making a tap or running splice.

As a specific example of a connector for Nos. 12 to 14 insulated copper wires made as indicated in FIGS. **4–6**, the body is again made of polypropylene. With the end wall **45** in closed position, the channels are 0.166 inch in width. The stop **63** is 0.080 inch in width and 0.040 inch in thickness. The stop extends from the wall **47** and parallel to the axis of the channel for a distance of 0.065 inch and then downwardly at an angle of 45° to a distance of 0.140 inch from the inner end wall surface.

Double stops may be used. One such construction is shown in FIG. **7** where the body **71** of a connector **70** is shown with a wire-end **72** inserted, forcing a first stop **73** upwardly into the recess **74** and being held by a second stop **75** within the insulating body and in position for contacting the contact element **76.**

FIGS. **8–10** illustrate another modification wherein opposing stops **83, 84** extend from the floor of recesses **86, 87** within a hinged side wall **85,** said wall and stops replacing the wall **45** and stop **63** of the structure of FIGS. **4–6.** The stops extend substantially perpendicularly above the inner surface of the wall and into the wire-receiving channel a distance sufficient to make effective contact with a wire-end inserted within the channel from either end, and provide the same retarding and retaining action as do the stops **73, 75** of FIG. **7.** The slight inclination of these stops toward each other together with the rounded tips of the stops, also assists in permitting them to be folded down into the recesses under the forces involved in inserting a wire sidewise through the open side and into the wire-receiving channel of the connector body.

In the specific connectors illustrated, the contact elements are doubly folded and each provides two doubly slotted contact plates, whereas the connector of U.S. Pat. No. 3,388,370 contains but a single plate. The latter construction may equally well be employed in the practice of the present invention, and other modifications and combinations will be apparent to those skilled in the art on consideration of the foregoing description.

What is claimed is as follows:

1. In a connector assembly for making solderless inline, pigtail or tap electrical connection between insulated wires and comprising a base having parallel longitudinal wire-supporting channels and being grooved transversely of said channels, and a resilient slotted metal plate contact element fitting within a said groove and with slots in alignment with said wire-supporting channels, the improvement comprising a resiliently displaceable stop member extending from a wall of said channel and blocking said channel between an outermost groove and the adjacent end of the channel, and said base being recessed to provide an open space adjacent said stop member for receiving said stop member upon its displacement under forceful insertion of a wire into said channel.

2. Connector of claim **1** wherein said stop member extends inwardly from a wall of said channel and generally perpendicular to the axis thereof.

3. Connector of claim **2** wherein said wire-supporting channels are open-faced and said stop member extends from the bottom of a said channel.

4. Connector of claim **2** wherein at least one of said wire-supporting channels is in part defined by a hinged side wall and said stop member extends from said side wall.

5. Connector of claim **1** wherein are included two of said stop members, one near each end of said channel.

6. Connector of claim **1** wherein said stop member extends from an end wall of said body into, and at an acute angle with the axis of, said channel.

7. Connector of claim **6** wherein are included two of said stop members, one near each end of said channel.

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