June 11, 1963 H. EGE 3,093,433

WIRE TERMINALS AND LEAD CONNECTOR DEVICES

Filed Dec. 27, 1960

Fig. 1

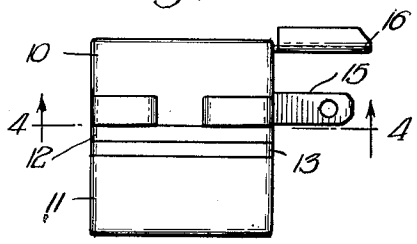


Fig. 2

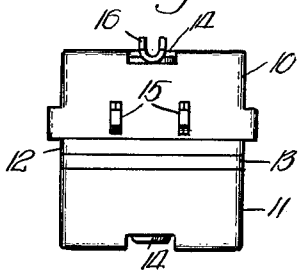


Fig. 3

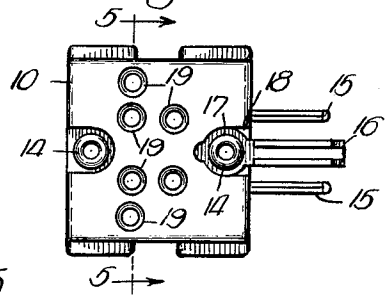


Fig. 4

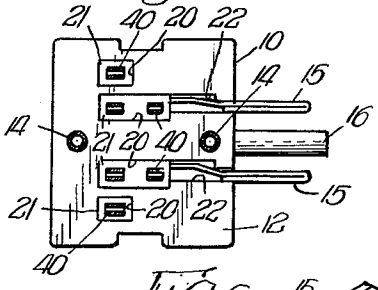


Fig. 5

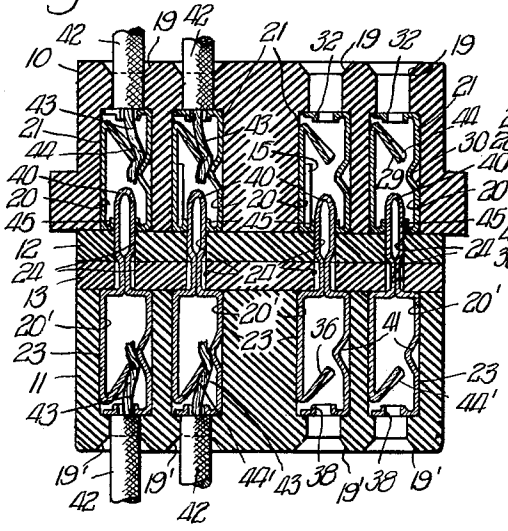


Fig. 6

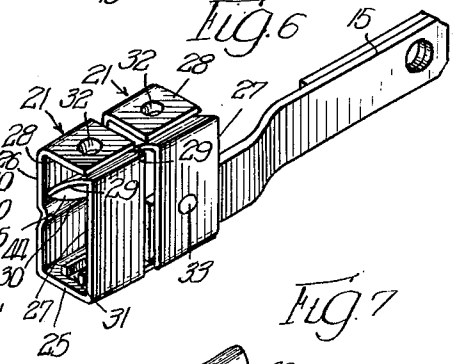
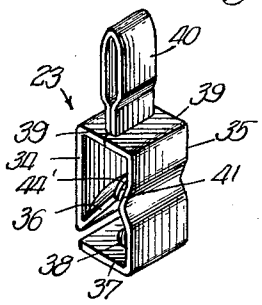


Fig. 7



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WIRE TERMINALS AND LEAD CONNECTOR DEVICES

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6 Claims. (Cl. 339—95)

The present invention relates to terminal means of new and improved design providing for improved efficiency in making wire lead connections. More specifically, the invention is directed to wire lead terminals and disconnect devices particularly adapted for use in interconnecting terminal blocks, the terminals being of new and improved design providing for unique wire lead connection thereto in a new and improved manner.

It is an object of the present invention to provide a new and improved wire lead connection arrangement for use in attaching a wire lead to a terminal.

Another object is to provide new and improved terminal devices for wire lead connection thereto, the terminal devices being particularly adapted for use in terminal blocks and further including means whereby a plurality of terminal blocks may be interconnected in ready disconnect relation by use of said terminal devices.

Still a further object is to provide a new and improved wire lead connector device which functions as a terminal for the lead, the connector device being formed with cooperating lead locking strip means which receive a wire lead therebetween and cooperatively lock and terminate the same merely upon insertion of the wire lead between the locking means, the termination and connection provided by the device being of a sufficiently permanent nature to provide for good electrical conductive contact between the lead and connector device.

Still another object is to provide a new and improved terminal for wire lead connection thereto, the terminal including confined lead connector means of new and improved design which are capable of mechanically locking and electrically terminating a wire lead merely upon the insertion of said lead into the terminal and connector means.

Other objects not specifically set forth will become apparent from the following detailed description of the present invention made in conjunction with the accompanying drawing wherein:

FIG. 1 is a side elevation of a pair of interconnected terminal blocks making use of the new and improved lead connector and block interconnection means of the present invention;

FIG. 2 is an end elevation of the interconnected blocks of FIG. 1;

FIG. 3 is a plan view of the interconnected blocks of FIG. 1;

FIG. 4 is a bottom plan view of one of the blocks of the unit of FIG. 1 taken generally along line 4—4 therein and further illustrating the block interconnection means in section;

FIG. 5 is an enlarged cross sectional view of the terminal block assembly of FIG. 1 taken generally along line 5—5 in FIG. 3;

FIG. 6 is an enlarged perspective of female-type wire lead connectors forming a part of the present invention; and

FIG. 7 is an enlarged perspective of a male-type lead connector forming a part of the present invention.

FIGS. 1 and 2 illustrate a pair of terminal blocks 10 and 11 in interconnected relation, each of these blocks being formed from any suitable material such as molded plastic and being provided internally thereof with recessed openings and grooves in which the terminal strips and disconnect terminals of the present invention are mounted. The interconnected faces of the blocks 10 and 11 are each provided with a cover plate 12 and 13, respectively, formed from insulating material and suitably attached to the blocks by fasteners such as rivets 14. The block 10 is provided with a pair of projecting male plug members 15 in the form of prongs or blades for receiving in a suitable female socket member or receptacle in the known manner. The top block 10 also carries a third U-shaped guide prong 16 which functions as a ground for the assembly and which is adapted to be received in a suitable recess in a female receptacle. The guide prong 16 as best shown in FIG. 3 is formed with a circular base portion 17 received in a suitable recess 18 in the top of the block 10 and secured therein by a rivet 14. A ground connection to the rivet 14 or prong 16 can be readily made in any suitable manner.

FIGS. 3 and 4 illustrate the top and bottom surfaces of the terminal block 10. Referring to FIG. 3, the top surface of the terminal block 10 is provided with a plurality of circular openings 19 which extend downwardly into the interior of the block 10 into communication with rectangular recesses 20 shown in FIG. 4. The recesses 20 extend through to the bottom face of the block 10 and are at least partially closed off by the cover plate 12. Received in the recesses 20 are a plurality of wire lead connectors 21 in the form of terminal strips. The male plug blades 15 are in the form of metallic strips which extend into the block 10 through suitable end face openings therein and through slots 22 into communication with the lead connectors 21 for attachment thereto in a manner to be described. The outer ends of the blades 15 are reversely folded in the known manner.

Referring particularly to FIG. 5, the specific manner in which the blocks 10 and 11 are interconnected for ready disconnection is best illustrated. The block 11 is constructed similarly to the block 10 with the exception that no recesses or openings are provided in the block 11 for the receipt of male plug blades. Thus for ease of identification of similar parts, the recesses and openings in the block 11 similar to those described in conjunction with the block 10 are identified by primed reference numerals. The rectangular recesses 20' of the block 11 have received therein a plurality of male-type wire lead connectors 23 which function as disconnect terminals. Each of the cover plates 12 and 13 are provided with aligned rectangular openings 24 through which the block connection means forming a part of the male connectors 23 extend into block interconnecting engagement with portions of the female connectors 21.

FIG. 6 illustrates the structural features of the female lead connectors 21 and their connection with a male plug member 15. Each connector 21 is formed from a single strip of electrical current conductive resilient material. The strip is folded and shaped to define a lead connection portion of generally rectangular outline. As illustrated in FIG. 6, the bottom end portion 25 is integrally formed with upstanding side portions 26 and 27 which parallel one another in an upwardly direction. The side portions 26 and 27 are in the form of resilient strip means with the upper end of the strip means 26 being formed with a right angled flange portion 28 which constitutes the opposite end surface of the connector. The upper edge of the side strip 27 terminates short of the free edge of the top flange portion 28 and has integrally formed therewith a downwardly and inwardly inclined wire lead locking flange 29. This flange extends diagonally toward the inner surface portion of the side strip 26 into close proximity to a base marginal portion of a wire lead locking rib 30. The rib is formed in the side strip 26 and extends transversely thereof between the side margins. The rib 30 is in the form of a deep generally U or

V-shape and, in effect, provides a projection extending into the interior of the connector **21** for cooperative functioning with the locking flange **29**. The end wall **25** of the connector **21** constitutes a disconnect terminal means having a centrally located, generally rectangular aperture **31** therethrough to receive a male connector **23** in the manner to be described. The opposite end flange **28** constitutes a wire lead insertion flange and is provided with a centrally located aperture **32** through which a wire lead is inserted into the interior of the connector **21**.

As more specifically shown in FIG. 6, a pair of female lead connectors **21** are formed from a single metallic strip. This is accomplished by integral formation of the end portions **25** of each of the connectors **21** as a continuous base strip. However, it will be understood that each connector **21** may be readily formed as a single element and referring to FIG. 5, the outermost connectors **21** are single members. The second female connector **21** of FIG. 6 is of the same construction as the connector described above and the innermost end of the male blade **15** is received interiorly thereof. As previously described, the blade **15** is formed from a flat strip of metallic material and the innermost end of the blade is suitably attached to the connector **21** by a rivet **33** anchored in the side strip **27** thereof. The outer end portion of each blade **15** is slightly offset from the inner end portion thereof to provide for adequate spacing of the blades as shown in FIG. 4 for insertion in a female receptacle.

FIG. 7 illustrates a male-type lead connector **23** formed from a single strip of electrical current conductive metallic material. The connector **23** includes a pair of parallel side strip portions **34** and **35** the bottom margin of the side strip **34** as viewed terminating in a reversely folded wire lead locking flange **36** which extends inwardly and upwardly into the interior of the connector. The bottom edge of the strip **35** as viewed terminates in a right angled wire lead insertion flange **37** which is provided with a central aperture **38** through which a wire lead is received into the interior of the connector. The upper ends of the side strips **34** and **35** are each provided with right angled, inwardly directed shoulder portions **39** which are integrally joined through an upwardly projecting prong-like member **40** which is similar to a blade of a male plug and which is dimensioned to be frictionally received through a disconnect terminal opening **31** of a female-type connector **21**. The blade portion **40** is shaped with an enlargement toward the outer end thereof of generally oval outline and the material used is adequately resilient to provide for tight confinement of the blade **40** in an opening **31** of a connector **21**. The side strip **35** is formed with an inwardly projecting rim or rib **41** which cooperates with the lead locking flange **36** in a manner to be described, the free end of the locking flange **36** terminating in close proximity to a base margin of the rib **41**.

FIG. 5 illustrates operative use of the connectors **21** and **23** in the terminal block assembly previously described. Referring to the pair of female connectors **21** located to the left as viewed in FIG. 5, suitable wire leads including insulation covering **42** and at least one strand of wire **43** are inserted in each of the openings **19** of the block **10**. The insulation **42** is received well into the opening **19** and the wire lead **43** projecting from the end thereof is inserted through the aperture **32** of a lead guide flange **28** of a connector **21**. The aperture **32** is preferably flanged as best illustrated in FIG. 5 to eliminate any sharp surfaces that might damage the wire. Furthermore, it should be understood that where a wire of smaller diameter is used, the entire wire including the insulation thereof may be actually received through an opening **32**. The wire lead is forced into the opening **19** to an extent that the bare wire end **43** contacts the adjacent surface of a locking flange **29** and is guided by the same over the free edge thereof into abutment with the adjacent base of the cooperating locking rib **30**. Continued forceful insertion of the bare wire **43** results in the same moving between the locking flange **29** and over the rib **30**. During this movement the locking flange **29** is actually bent slightly away from the locking rib **30** due to the resilience of the material from which it is formed. Following adequate insertion of the wire lead **43** between the cooperating locking elements of the connector **21**, the insertion force is discontinued and the locking flange **29** functions to clamp or grip the bare lead **43** between its free edge and a surface portion of the rib **30**.

To aid in guiding the bare lead **43** into position between the free edge of the flange **29** and rib **30**, the flange **29** is preferably dished or provided with a bare lead contacting concave surface **44**. With the locking flange **29** thus being transversely arcuate, the bare lead **43** is guided thereon for substantial central locking between the flange and the rib. The locking flange **29** is preferably inclined relative to the side strip **27** of which it forms a part to establish an angle of approximately 40° therebetween. With the resilient locking of the bare wire lead **43** between the flange and the rib, the conductor cannot be readily withdrawn and an efficient electrical connection is made. Actually, with the structural features described, it has been found that a very substantial amount of force must be applied to the conductor to separate the same from the connector. Such force greatly exceeds that which would normally occur in use of the terminal blocks and is of such magnitude that would even result in separation of a standard soldered connection.

Referring to the male lead connectors **23**, the two connectors shown in the block **11** to the left as viewed in FIG. 5 have received therein bare lead wires **43** which are clamped in the same manner as previously described. Thus the male connectors **23** function in the same manner as the female connectors **21** in providing an insertion type connection of a lead wire. The apertures **38** of the lead insertion flanges **37** are preferably defined by a tubular flange projecting into the interior of the device to protect the bare wire or insulation which might be inserted therethrough.

The male-type blade **40** of the male connectors **23** extend through the openings **24** in the cover plate **13** of the terminal block **11** and project substantially therefrom. When the terminal block **11** is connected with the terminal block **10** as shown in FIG. 5, the blades **40** are inserted through the aligned openings **24** of the cover plate **12** and are forced into the apertures **31** of the end portions **25** of the aligned female connectors **21**. The apertures **31** are preferably provided with inwardly directed flange portions **45** which function to guide the blades **40**, provide increased surface contact therewith for efficient electrical conduction, and function to wipe the same for good electrical contact. The apertures **31** and the blades **40** are dimensioned so that the blades are actually compressed and frictionally held in the apertures to thus provide for an adequately strong connection between the blocks **10** and **11**. With this arrangement the blocks may be readily disconnected and reconnected at will.

From the foregoing description it will be appreciated that a lead wire terminal connection can be quickly and efficiently made by use of the special connectors or terminals of the present invention. The connection arrangement completely eliminates the necessity of soldering a bare lead to a terminal, loosening and tightening terminal screws or the like, and separate manual movement of resilient terminal parts during lead wire insertion. The connectors are simply constructed and can be economically manufactured either as single terminals or as a series of integrally interconnected terminals.

Obviously certain modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. A terminal for lead connection thereto, said terminal being formed from a single strip of electrical current conductive resilient material, said strip centrally thereof being reversely folded to define a lead connection portion of generally rectangular outline, said lead connection portion at one end thereof forming a disconnect terminal means, the other end of said lead connection portion including a right angled apertured lead insertion flange constituting one end of said single strip and a diagonally inwardly folded lead locking flange constituting the other end of said single strip, said locking flange being located inwardly of said lead insertion flange with the free end thereof being in close proximity to a side marginal base of a lead locking rib formed in said strip inwardly of said lead insertion flange, said locking rib being formed from an inwardly offset transverse portion of said strip and projecting into said lead connection portion for cooperative functioning with said locking flange in resiliently engaging a lead therebetween which lead is inserted into said lead connection portion through the aperture of said lead insertion flange.

2. The terminal of claim 1 wherein said disconnect terminal means constitutes a right angled centrally apertured area adapted for connection with a male-type terminal means.

3. The terminal of claim 1 wherein said disconnect terminal means is in the form of a male-type projection having outwardly bowed strip portions defining the same for resilient insertion in a female-type terminal means.

4. The terminal of claim 1 wherein said locking flange defines an angle of approximately 40° with that portion of said strip from which it is formed.

5. A lead terminal for lead connection thereto, said terminal being formed from a single strip of electrical current conductive resilient material, said strip centrally

thereof being reversely folded to define a lead connection portion of generally rectangular outline, said lead connection portion at one end thereof forming a disconnect terminal means, the other end of said lead connection portion including a right angled apertured lead insertion flange constituting one end of said single strip and a diagonally inwardly folded lead locking flange constituting the other end of said single strip, said locking flange being located inwardly of said lead insertion flange with the free end thereof being in close proximity to a side marginal base of a lead locking rib formed in said strip inwardly of said lead insertion flange, said locking rib extending transversely of said strip and projecting into said lead connection portion for cooperative functioning with said locking flange in resiliently engaging a lead therebetween which lead is inserted into said lead connection portion through the aperture of said lead insertion flange, said locking flange being transversely bowed to present a concave face to a lead during insertion thereof and defining an angle of approximately 40° with that portion of said strip from which it is formed.

6. The terminal of claim 5 wherein said disconnect terminal means is in the form of a male-type projection having outwardly bowed strip portions defining the same for resilient insertion in a female-type terminal means.

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