Aug. 5, 1947. H. HUBBELL ET AL 2,424,986

MULTI-UNIT WIRING RECEPTACLE

Filed March 19, 1942 2 Sheets-Sheet 1

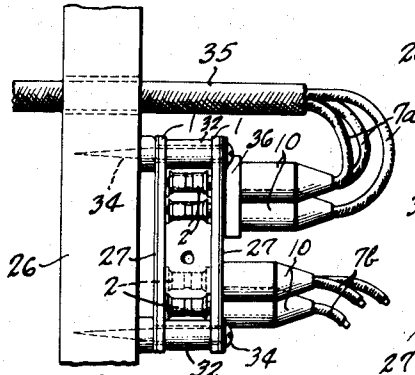


Fig. 1.

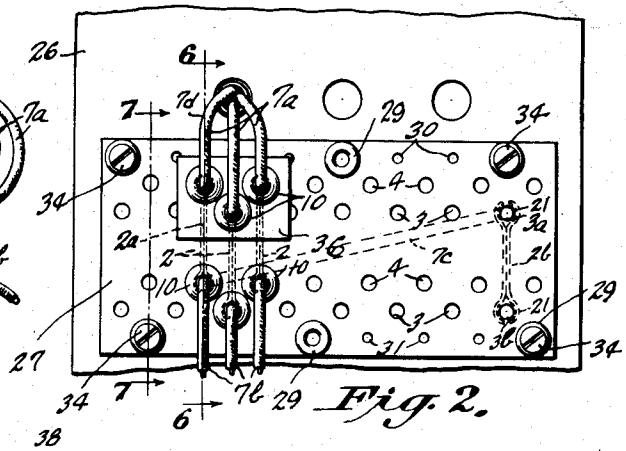


Fig. 2.

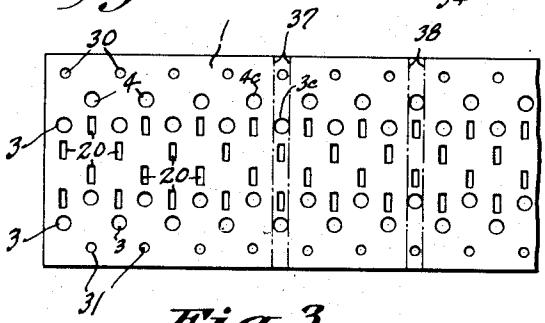


Fig. 3.

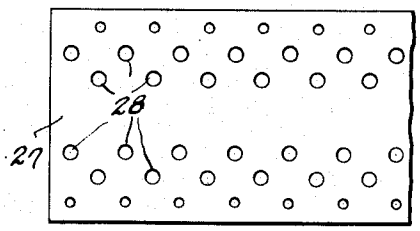


Fig. 4.

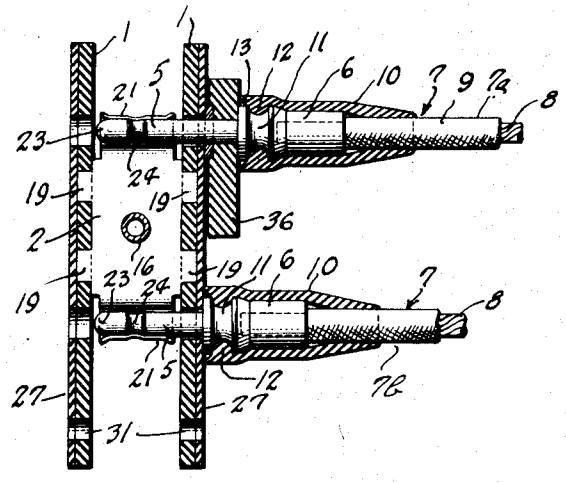


Fig. 6.

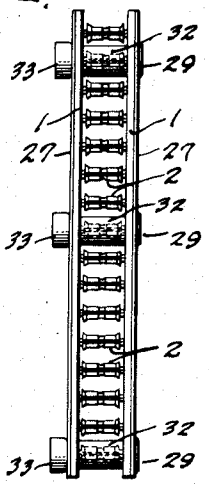


Fig. 5.

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MULTI-UNIT WIRING RECEPTACLE

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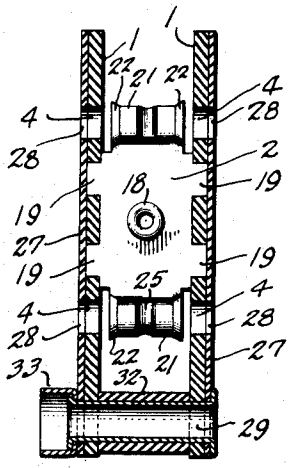


Fig. 7.

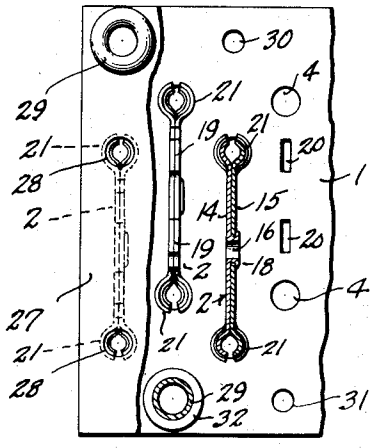


Fig. 8.

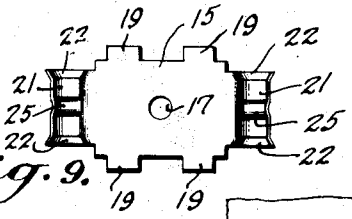


Fig. 9.

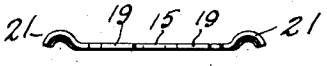


Fig. 10.

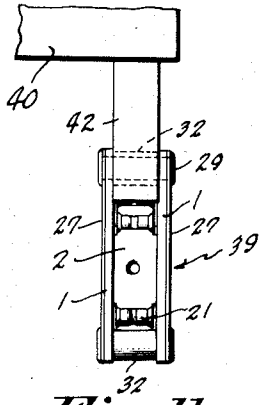


Fig. 11.

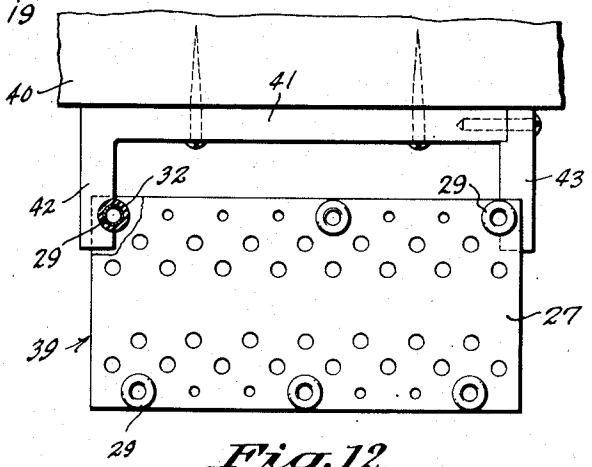


Fig. 12.

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MULTIUNIT WIRING RECEPTACLE

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Application March 19, 1942, Serial No. 435,374

11 Claims. (Cl. 173—334)

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This invention relates to electrical wiring systems and particularly to a multi-unit wiring receptacle, and has for an object to provide an improved receptacle adapted to replace portions of the present wiring system of aircraft, boats and the like, as a means for easily and quickly connecting up the wiring for instruments and various accessories employed.

It is also an object to provide a construction in which any number of instruments or devices may be plugged into any one or more of a plurality of circuits and to reduce the time required for wiring up such devices as aircraft, boats, radios, bombsights, gun sights, and so forth.

It is a further object to provide a construction for this type of device to facilitate its manufacture, including a construction in which insulating parts may be made and punched in long strips and then cut to the proper lengths for any given number of units to obviate the necessity of making tools for and keeping on hand a large number of different sizes.

With the foregoing and other objects in view we have devised a construction one form of which is illustrated in the accompanying drawings forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details and arrangement shown but may employ various changes and modifications within the scope of the invention.

In these drawings:

Fig. 1 is an end view of a receptacle constructed according to the present invention mounted on a supporting panel and showing by way of example how various connections may be made;

Fig. 2 is a front elevation thereof;

Fig. 3 is a plan view of one of the insulating plates showing how it may be manufactured of indefinite lengths and then cut up to make receptacles of any given number of units;

Fig. 4 is a similar plan view of a strip for forming cover plates;

Fig. 5 is a top plan view of the device of Fig. 2 removed from the panel;

Fig. 6 is a transverse section of the receptacle on an enlarged scale taken substantially on line 6—6 of Fig. 2;

Fig. 7 is a similar section taken substantially on the line 7—7 of Fig. 2;

Fig. 8 is a partial front elevation and partial section with portions of the front plate removed, looking from the right of Fig. 7;

Fig. 9 is a plan view of one of the plates used in forming the receptacle contact;

Fig. 10 is an edge view thereof;

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Fig. 11 is an end elevation showing a different means for mounting the receptacle, and

Fig. 12 is a front elevation thereof with parts broken away to more clearly show the construction.

This improved receptacle construction comprises a pair of laterally spaced plates 1 of insulating material, such for example as Bakelite or similar plastics, between which are mounted the stationary or receptacle contacts 2. The plates 1 are punched with a series of openings 3 and 4 for entrance of the connector contacts 5 of plug-in caps or connectors 6 on conductor leads 7 leading from any suitable source of current or to any instrument or other device to which current is to be carried, or to devices which are to be interconnected. The metal caps or connectors 6 are electrically connected to the wires 8 of these leads by any suitable means, the conductors 8 usually being made up of a number of small wires so as to be flexible and covered with suitable insulation 9. The caps or connectors 6 are also preferably enclosed in and covered by an insulating rubber cover 10 which is usually flexible live rubber enclosing the cap to insulate it and also give a good grip for insertion or removal of the contacts 5 into and from the receptacle. To retain the cover in place the metal member 6 may be provided with an annular groove 11 and the cover 10 with an internal rib 12 to seat in this groove and hold the cover in place. The free edge of the cover may be tapered, as shown at 13, to facilitate insertion of the cap 6 and also provide a flexible edge to fit tightly against the surface of the receptacle to keep out dirt and moisture.

The receptacle contacts 2 may be made in various ways, but in the preferred construction shown comprise two metal plates 14 and 15 secured together side by side. They may be secured together in various ways, but that shown obviates the use of different elements as rivets. The connector shown comprises a tubular rivet 16 punched and drawn from one of the plates, as plate 14, adapted to pass through an opening 17 in the other plate 15 and then spun over as shown at 18 to fasten the two plates together. At the opposite edges the plates are formed with one or more lugs 19 to seat in similarly shaped openings 20 punched in the insulating plates 1 between each pair of openings 3 and 4. These lugs in the openings 20 positively locate the contacts and retain them in proper position between the plates 1 and 2 and the contacts also form spacing means for the plates 1.

The opposite end portions of the contact plates are formed to provide spring contacts to receive and engage the connector contacts 5. They are thus curved transversely to form a substantially semi-circular portion 21 and the plates are assembled so that these curved portions are opposed to form substantially cylindrical sockets or contacts to receive the contacts 5. They may be flared at their opposite ends as shown at 22 to facilitate entrance of the contacts 5, and the ends of the contacts 5 may be rounded as shown at 23 to facilitate insertion in the receptacle and the contact portion 21. This arrangement provides yieldable spring contacts to receive the contacts 5 as the rounded portions may yield laterally, and they will therefore grip the contact 5 to make a good electrical connection. It is also preferred to form an annular groove 24 in the contact 5 and a similar bead or rib 25 in the contact portions 21 to seat in this groove to yieldingly hold the contacts 5 in the receptacle and prevent their accidental release from the receptacle with ordinary strain on the lead, but will permit insertion and removal of the contact 5 in making or breaking or changing the connection, as desired. Of course the curved portions 21 are so located as to be in alignment with the openings 3 and 4 in the insulating plates 1.

It is not necessary that the openings 3 and 4 be in both plates 1, particularly where the receptacle is mounted as shown in Figs. 1 and 2 on the face of a supporting panel 26, as in this case the connectors are all plugged into the openings in the front plate, but it is preferred to have these plug-in openings in both plates so that the receptacle may be mounted with either side out or exposed, or if it is mounted so that both sides are exposed then the connectors can be plugged in from either side as desired.

In assembling the receptacle the lugs 19 of the contacts are seated in the openings 20 in the insulated plates 1 which automatically locates the contact portions 21 in alignment with the plug-in openings 3 and 4. On the outside of the plates 1 are placed thin cover plates 27 of insulating material such as Bakelite or similar material to cover the ends of the lugs 19 and the openings 20 so that these lugs are not exposed to produce a possible short circuit or grounds. The cover plates 27 are also punched with openings 28 in alignment with the plug-in openings 3 and 4 in the plates 1 to permit insertion of the connector contacts 5. The plates are secured together by suitable means such for example as transversely extending hollow rivets or eyelets 29 passing through openings 30 and 31 punched in the plates 1 and 27, preferably outwardly of the openings 3 and 4 or near the edges of the plates. The openings 30 adjacent one edge of the plate are preferably in staggered relation to the openings 31 adjacent the other edge of the plate, as shown in Figs. 3 and 4. These rivets or eyelets 29 are embraced by an insulating spacer element or sleeve 32 between the plates 1 and are spun over at their opposite ends to permanently secure the insulating plates together. At one end they may secure a spacer cup 33 to rest against the surface of the panel or other support, as shown in Fig. 1, to space the receptacle a short distance outwardly of the face of the panel or other support. It may be mounted on the panel by suitable screws 34 or other suitable securing means passing through the hollow rivets 29.

It will thus be seen that the receptacle or stationary contacts 2 have their curved contact portions 21 in alignment with a pair of the plug-in openings 3 or 4 and therefore a contact bridges the openings of each pair so that when connector contacts 5 are inserted in a pair of openings 3 or a pair of openings 4 they are electrically connected by the stationary or receptacle contact 2. Thus if the upper lead 7a of Fig. 6 is from a source of electric current the lower lead 7b would be led to any instrument as desired, to electrically connect the instrument in the circuit. Thus in Fig. 1, if the cable 35 carrying any suitable number of leads 7a from a source of current or other instruments or devices is plugged into any corresponding number of upper openings 3 and 4, any number of leads 7b may be plugged into the lower openings 3 and 4 and electrically connected with the corresponding leads 7a. The plug-in caps may be individual caps one for each lead and separate so as to be plugged in independently, or a plurality may be mounted in a single support and properly located and positioned to correspond with the spacing and positioning of the plug-in openings 3 and 4. Thus as shown in Figs. 1 and 2 by way of example, three of the plug-in caps enclosed in the covers 10 are mounted on a single insulating block 36 and properly spaced and located corresponding to the spacing and location of three openings 3, 4, so that with one operation all of the contacts carried by this block 36 may be inserted in the receptacle, reducing the number of operations and time required in making the connections. Of course the number of connector contacts carried by a single block 36 is not limited to three but may be any number, as desired.

It is not necessary that the connector contacts on the leads 7b be plugged into the same receptacle contacts 2 that the connector contacts on the lead 7a are plugged into. For example bridging conductors with a connector plug on each end may be used to connect any contact 2 with any other contact in the receptacle. Thus one of the short bridging conductors could be plugged into the conductor 2a of Fig. 2 in place of the lead 7b and plugged into some other conductor 2, as for example 3a, as indicated by the dotted lines 7c, to connect the contact 2a with the contact 2b, and another lead 7b plugged into the contact 2b at 3b. In other words, this would then connect contact 2b with the supply lead 7d. These are merely examples of how this receptacle can be used to make any one of a large number of different connections by merely plugging in the proper connector contacts from the proper leads to the various receptacle contacts.

Another advantage of this construction is that it is not required to make different sized dies to produce different size receptacles, or, that is, receptacles with a different number of units or contacts.

That is, a strip 1 as shown in Fig. 3 can be punched with the openings 3, 4, 20, 30 and 31 at the proper spacing in relative location throughout any length desired, the openings being punched in sets across the strip in a suitable punch press either with a hand or automatic feed, and with a pilot punch associated and acting with the punches making the opening so as to insure proper location and spacing, and these long punched strips can then be kept in stock. The same operation can be used for the cover plates 27, as shown in Fig. 4. Then when orders are received for receptacles of a certain specified number of units or that is a certain number of stationary contacts 2, these punched strips can

be cut off to the proper length and assembled. In this way the same tools can be used for making all the different sizes of receptacles and it is not necessary to keep in stock a number of different sizes. For example, as shown in Fig. 3, if an eight-unit receptacle is desired the strip 1 is cut by a saw cut transversely, as indicated by the broken lines 37, the cut being wide enough to remove the material between these lines of a width corresponding to the diameter of the opening 3c, so as to give the same spacing between the next opening 4c and the end of a strip as is provided for the openings 3 at the other end. The whole strip may be cut up into the same lengths if a number of receptacles of that size are desired. Similarly, if a smaller receptacle is desired, as for instance a four-unit receptacle, then the strip would be cut into lengths corresponding to the distance between the cuts 37 and 38, and so on for any size receptacle comprising any desired number of units. Then after the plates are cut the receptacles can be assembled with the contacts 2 and any desired number of rivets or eyelets 29 in the desired number of openings 30 and 31.

Figs. 11 and 12 show a modified arrangement of mounting the receptacle. As shown in these figures the receptacle 39 which may be the same size as that of Figs. 1 and 2 or a different size if desired, is suspended from a support 40 by a depending bracket 41, having feet 42 and 43 recessed to engage the two end spacing elements 32. The advantage of mounting it in this manner is that both sides of the receptacle are exposed and easily accessible so that the connecting plug contacts 5 may be inserted from either side of the receptacle.

In use a receptacle of any desired number of units may be mounted at a suitable location in the mechanism or device to be wired. Thus it may be mounted on a suitable support in an airplane and all the leads of the wiring system for the plane led to this receptacle and the leads plugged into it taken to the various instruments, making a very simple and quickly connected arrangement for wiring the various instruments and accessories on the plane, this receptacle replacing the present wiring system of permanent connections, which require much more time and trouble in assembling and connecting up. With this device any number of instruments or devices can be readily and quickly connected into any one or more circuits, greatly reducing the time required for the wiring operations and increasing production. It is of course not confined to use in airplanes but may be used in various devices, as boats, in radio cabinets, in the base of bomb sights, gun sights, and so forth.

Having thus set forth the nature of our invention, we claim:

1. A wiring receptacle comprising laterally spaced plates of insulating material at least one of which has spaced openings therein for insertion of connector contacts, receptacle contacts extending transversely between the plates and comprising metal plates having lugs on their opposite edges seating in other openings in the first plates and shaped at their opposite ends to form spring contacts to engage connector contacts inserted in the first openings, cover plates of insulating material on the outer sides of the first plates to cover the ends of said lugs and having insert openings in alignment with the first said openings, and means extending between the first plates securing them together.

2. A wiring receptacle comprising laterally spaced plates of insulating material at least one of which has spaced openings therein for insertion of connector contacts, receptacle contacts extending transversely between the plates having lugs on their opposite edges seating in other openings in the plates and having spring contacts to engage connector contacts inserted in the first openings, rivets extending transversely between the first plates to secure them together, and spacers on the rivets at the outer side of one of the insulating plates to engage a support to space the receptacle therefrom.

3. The method of making wiring receptacles which comprises punching a strip of insulating material with a series of pairs of openings uniformly spaced longitudinally of the strip for insertion of connector contacts and other openings uniformly spaced longitudinally for transversely extending securing means, cutting the strip transversely to lengths containing a given number of pairs of the first openings, assembling a pair of the cut lengths in laterally spaced relation with receptacle contacts between them having spring contacts in alignment with the openings of each pair to engage connector contacts inserted therein, and securing the assembled cut lengths and contacts together.

4. The method of making wiring receptacles which comprises piercing a strip of insulating material with pairs of openings spaced transversely of the strip adapted for insertion of connector contacts and other openings in the strip between the openings of each pair, the pairs of openings being uniformly spaced longitudinally of the strip, cutting the strip to lengths containing a given number of the pairs of openings, assembling a pair of the cut lengths in parallel laterally spaced relation with a receptacle contact extending between them for each pair of openings and having lugs seated in the second mentioned openings, said contacts also including spring contacts in alignment with the first mentioned openings of that pair to engage connector contacts inserted therein, and securing the assembled cut lengths and contacts together.

5. The method of making wiring receptacles which comprises piercing a strip of insulating material with a plurality of pairs of openings, the openings of each pair being spaced transversely of the strip and the pairs of openings being uniformly spaced longitudinally of the strip, cutting the strip transversely to provide a pair of plates each having a given number of the pairs of openings, assembling these plates in laterally spaced parallel relation with stationary contacts between them one for each pair of openings and formed to engage connector contacts inserted in the openings of that pair, and securing the assembled plates and contacts together.

6. A wiring receptacle comprising a pair of laterally spaced plates of insulating material and of substantially uniform thickness throughout having openings therethrough for insertion of connector contacts, and metal separators comprising metal plates extending transversely between the insulating plates with their opposite edges engaging the inner surfaces of the latter plates to hold them in spaced relation for free circulation of air between them and each having a plurality of spring contacts in alignment with a plurality of said openings to engage the connector contacts inserted therein and form a bridge between them, cooperating means on the edges of the metal plates and the insulating plates to re-

tain the metal plates in position, and means connecting the insulating plates together.

7. A wiring receptacle comprising a pair of laterally spaced plates of insulating material and of substantially uniform thickness throughout, at least one of which has spaced openings therein for insertion of connector contacts, and a metal separator between the plates arranged with its opposite edges engaging the plates to retain them in spaced relation for free circulation of air between them and having lugs on its opposite edges seated in openings in the plates to retain it in position in the space between the plates, and said separator including spring contacts in alignment with the first openings to engage the connector contacts inserted therein and form a bridge between them, and means securing the plates together.

8. A wiring receptacle comprising a pair of laterally spaced plates of insulating material and of susbtantially uniform thickness throughout, at least one of which has spaced openings therein for insertion of connector contacts, a receptacle contact extending transversely between the plates comprising a pair of metal plates secured together side by side with their opposite edges engaging the first plates to retain them in spaced relation for free circulation of air between them and having lugs at their opposite edges seated in openings in the first plates to retain the contact in position in the space between said plates, said receptacle contact also having spring contacts in alignment with said first openings to engage the connector contacts inserted in said openings and to electrically connect them, and means retaining the plates in assembled relation.

9. A wiring receptacle comprising a pair of laterally spaced substantially parallel flat plates of insulating material and of substantially uniform thickness throughout, at least one of which has spaced openings therein for insertion of connector contacts, a receptacle contact extending transversely between them comprising a pair of metal plates secured together side by side with their opposite edges engaging the first plates to retain them in spaced relation for free circulation of air between them and having lugs on their opposite edges seated in openings in the first plates to retain the contact in position in the space between said plates, said contact plates also having portions at their opposite ends transversely curved and opposed to form sockets in alignment with the openings in the first plates to receive the contacts inserted therein and form an electrical conductor between them, and means securing the plates in assembled relation.

10. A wiring receptacle comprising a pair of laterally spaced substantially parallel flat plates

of insulating material and of substantially uniform thickness throughout, at least one of which has spaced openings therein for insertion of connector contacts, receptacle contacts extending transversely between the plates with their opposite edges engaging the plates to retain them in spaced relation for free circulation of air between them and having lugs on their opposite edges seated in other openings in the plates to retain the contacts in position in the space between said plates, and said contacts including spring contacts in alignment with the first openings to engage the connector contacts inserted in said openings, and cover plates of insulating material on the outer surfaces of the first plates covering the outer ends of said lugs and having openings in alignment with the first said openings to permit insertion of the connector contacts, and means securing the plates in assembled relation.

11. A wiring receptacle comprising a pair of substantially parallel laterally spaced plates of insulating material and of substantially uniform thickness throughout, at least one of which has spaced openings therein for insertion of connector contacts, receptacle contacts extending transversely between the plates each comprising a pair of metal plates arranged side by side with their opposite edges engaging the first plates to retain them in spaced relation for free circulation of air between them and having lugs at their opposite edges seated in openings in the first plates to retain the contact in position in the space between said plates, said contacts being formed at their opposite ends to provide spring contacts to engage connector contacts inserted in the first openings, one contact plate of each pair having a rivet extruded laterally therefrom passing through an opening in the other plate and spun over to secure the two together, and means for securing the insulating plates together.

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