Sept. 29, 1953 J. L. ARTHUR 2,654,078

CONNECTOR ASSEMBLY

Filed Nov. 3, 1950

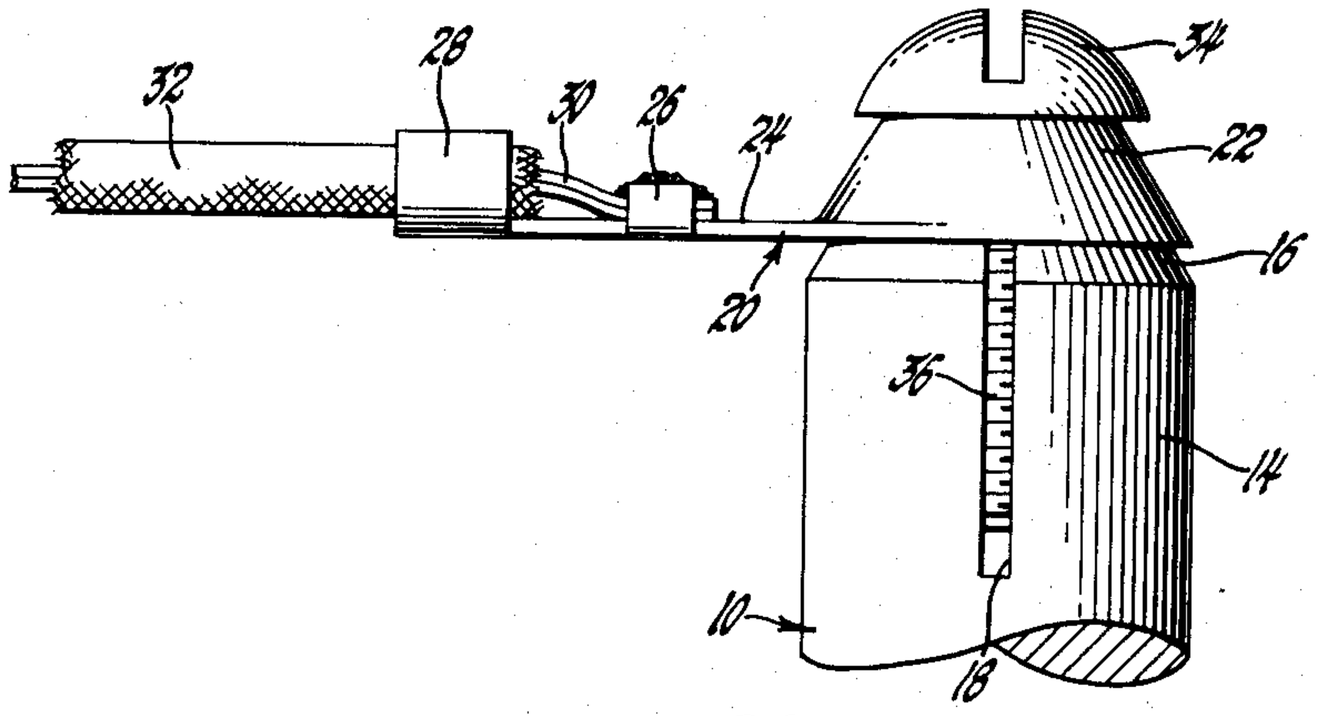

Fig. 1

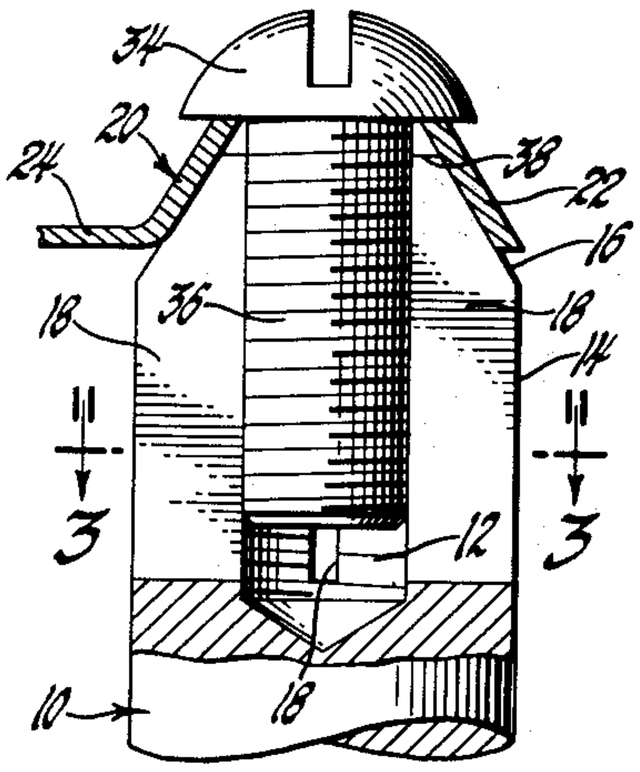

Fig. 2

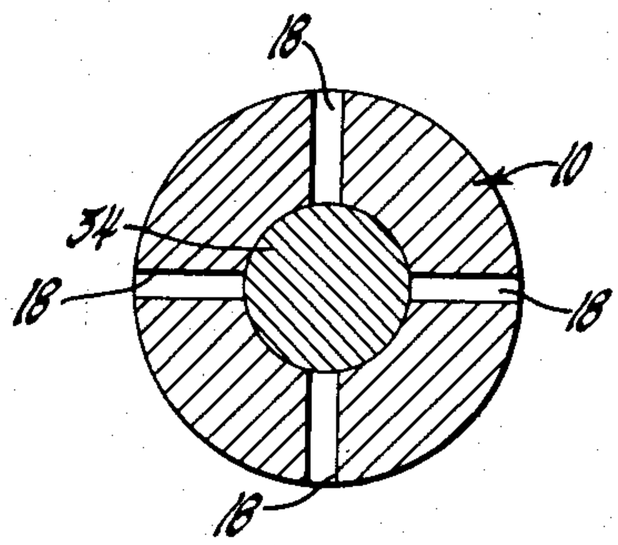

Fig. 3

Inventor
James L. Arthur
By
Willits, Helwig & Baillio
Attorneys

Patented Sept. 29, 1953

2,654,078

UNITED STATES PATENT OFFICE

2,654,078

CONNECTOR ASSEMBLY

James L. Arthur, Indianapolis, Ind., assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Application November 3, 1950, Serial No. 193,981

2 Claims. (Cl. 339—263)

1

This invention relates to a connector assembly and particularly to a self-locking screw and terminal assembly which provides an excellent electrical connection while eliminating the need of lock washers or similar parts.

A principal object of the invention is to provide an electrical connector construction wherein a lead terminal, a screw and a terminal stud all become securely locked as one composite assembly so as to constitute a simple and dependable means of assuring a reliable electrical circuit.

A further object of the invention is to provide a terminal assembly which is particularly adaptable for use with thermocouples, such as those used in measuring engine temperatures. Such thermocouples develop very low total voltages, 50 millivolts being a typical value, necessitating that these thermocouple circuits be provided with very tight and electrically secure connections under all conditions of engine operation to minimize voltage loss. This requirement is satisfied in accordance with the present invention by providing an electrical connector assembly which is constructed and arranged so as to be capable of withstanding severe vibrations without loosening the connector members or otherwise impairing the electric circuit.

A still further object of the invention is to provide a connector assembly which not only effectively locks together the various elements in the assembly, as hereinbefore mentioned, but also permits the lead terminal to be forcefully rotated on the stud in either direction without loosening the screw. This feature is highly desirable inasmuch as it permits deliberate or inadvertent rotation of the terminal when a thermocouple or other connected member is in use, while permitting the terminal connection to remain physically and electrically secure.

These and other desirable features are obtained in accordance with the invention by providing a connector assembly comprising a coned terminal for a lead wire, a mating coned and split stud and a screw which is locked to the stud to secure the various members together.

Other objects and advantages of the invention will more fully appear form the following description of the preferred embodiment of the invention shown in the accompanying drawing, in which:

Figure 1 is an elevational view of a self-locking nut and terminal assembly showing the lead terminal, screw and terminal stud in assembled relation;

Figure 2 is a fragmentary view, partly in section and partly in elevation, of the self-locking nut and terminal assembly shown in Figure 1; and

2

Figure 3 is a sectional view of the stud and screw along the line 3—3 of Figure 2.

Referring now to the drawing and particularly to Figures 1 and 2, there is shown an electric connector assembly having a terminal stud, designated generally by 10, having a generally cylindrical bore provided with internal threads 12. This stud includes an outer cylindrical portion 14 and a symmetrically tapered upper portion 16. This portion 16 is preferably of a frusto-conical shape as shown. Longitudinal slots 18 are provided in the stud walls defining the bore into axially extending, laterally flexible segments. This construction can be best seen in Figure 3 where the slots are shown as dividing the stud into quadrants.

A lead terminal, generally designated by 20, has a frusto-conical collar or sleeve portion 22 formed at one end to cooperate with the tapered portion 16 at the end of the stud. The conical surfaces of the sleeve portion and the tapered stud portion 16 are formed at equal angles to the axes of these members. Extending from the frusto-conical portion 22 of the terminal is a flat shank 24 which is provided with ears 26 and 28. The ears 26 are folded over the lead wire 30, which is additionally secured to the lead terminal by soldering, welding or other suitable means, while the ears 28 are bent over the insulation 32 on the wire 30 to prevent movement of the lead wire relative to the lead terminals.

Rotatably securing the terminal 20 to the stud 10 is a screw 34 whose external threads 36 engage the internal threads 12 of the stud. This screw may be any suitable type such as a conventional machine screw.

The various parts of the connector device are assembled in the following manner. The sleeve or cone portion 22 of the lead terminal is seated over the tapered top of the stud 10, the screw 34 then being inserted through terminal portion 22 to engage the internal threads 12 in the stud. Tightening of the screw forces the frusto-conical sleeve portion of the lead terminal into surface engagement with the tapered end of the stud and laterally flexes the axially extending segments of the stud between the slots inwardly to tightly press against the screw threads so as to lock the screw within the stud. Thus tightening the screw assures good electrical connection both at the terminal and between the screw and the stud. As shown in Figure 2, the composite end

face of the stud formed by the individual end faces 38 has a diameter slightly larger than the internal diameter of the smaller opening in the frusto-conical sleeve protion of the lead terminal. This dimensional arrangement prevents the head of the screw from contacting the upper end surfaces 38 of the stud when the screw is tightened in the stud, thus providing a self-locking combination which permits the screw to be locked as securely as desired, thereby insuring a highly satisfactory connection both from a mechanical and an electrical standpoint.

The conical surfaces of both the sleeve portion 22 of the lead terminal and the tapered upper end 16 of the stud are shown as formed at an angle of approximately 30° from the axes of these members. This arrangement of mating conical surfaces permits rotation of the lead terminal relative to the stud without loosening the terminal screw, irrespective of the direction of rotation, a highly desirable characteristic. If it is desirable under particular conditions to have even greater assurance that rotation of the lead terminal on the stud would not loosen the screw, this 30° angle from the axes of the members can be decreased as appropriate.

It is normally inadvisable to use an angle of less than 10°, however, because the lead terminal might then tend to become wedged too tightly on the stud, resulting in difficulty in rotating or removing the terminal when the stud is loosened.

It is usually also undesirable in most instances to form the conical surfaces at an angle which is very much larger than 60° from the vertical as this would appreciably increase the tendency for the screw to become loosened when the lead terminal is rotated. In all instances, of course, the range of angles between which the screw will have no tendency to rotate with the terminal is influenced by the relative coefficients of sliding friction of the contacting surfaces of the stud, lead terminal, and screw and by the respective areas of sliding contact between these surfaces.

The self-locking screw and terminal assembly hereinbefore described eliminates the necessity for using either a plain washer or a lock washer, thus being particularly adapted for thermocouple

use where the high temperatures frequently encountered cause lock washers to lose their temper.

While the described embodiment of the present invention constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the following claims.

I claim:

1. A connector assembly comprising an internally threaded stud having a symmetrically tapered end and longitudinally slotted walls, a connective member having an unthreaded frusto-conical sleeve portion in surface engagement with the tapered end of the stud, and a screw having a head abutting one edge of the sleeve portion and a threaded portion in engagement with the internal threads on the stud, said sleeve portion being axially slidable relative to said stud by regulation of the screw tension for inwardly flexing the slotted walls of the stud upon the threads of the screw, said sleeve portion being independently rotatable relative to said stud and screw.

2. A connector assembly comprising an internally threaded stud having a symmetrically tapered end and longitudinally slotted walls, a connective member having an unthreaded frusto-conical sleeve portion in surface engagement with the tapered end of the stud, and a screw having a head abutting one edge of the sleeve portion and a threaded portion in engagement with the internal threads on the stud, said sleeve portion being axially slidable relative to said stud by regulation of the screw tension for inwardly flexing the slotted walls of the stud upon the threads of the screw, the area of contact between said edge of the sleeve portion and said screw head being sufficiently small to permit rotatability of the sleeve portion relative to said stud without rotating the screw.

JAMES L. ARTHUR.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
625,668	Gilliland	May 23, 1899
1,716,489	Garlick	June 11, 1929