Dec. 14, 1948. C. J. FOSTER 2,456,118

TERMINAL MEMBER

Filed May 14, 1943

Fig-2

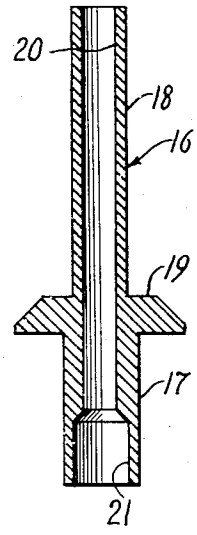


Fig-3

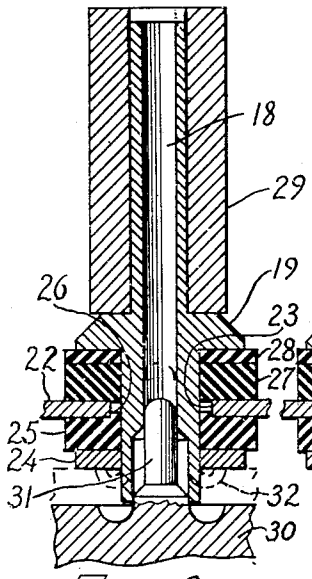


Fig-4

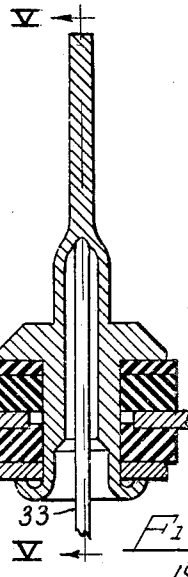


Fig-5

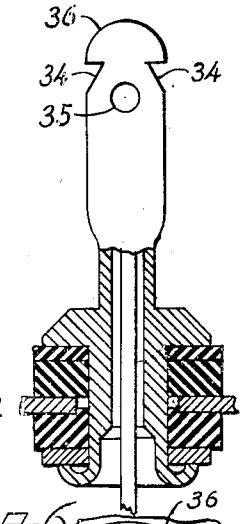


Fig-6

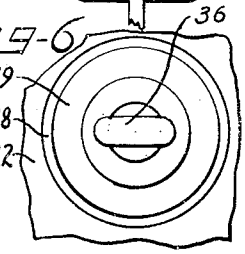


Fig-7

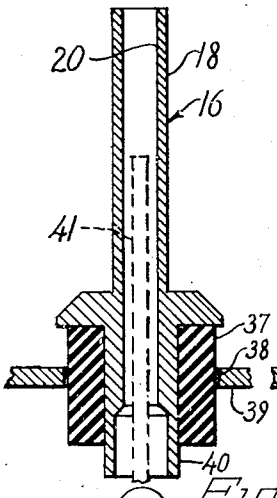


Fig-8

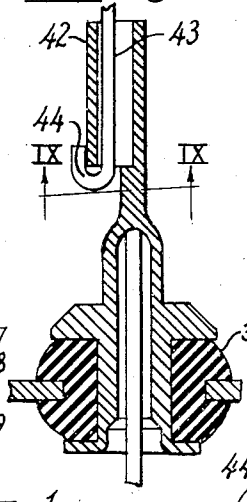


Fig-10

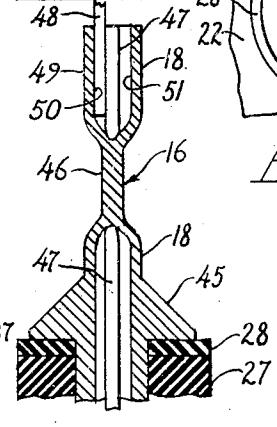


Fig-11

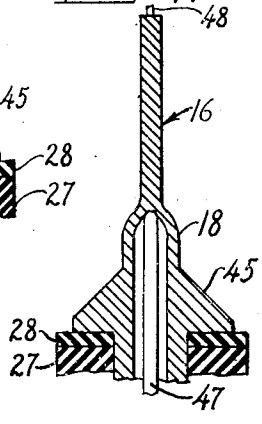


Fig-9

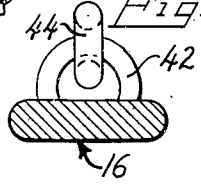
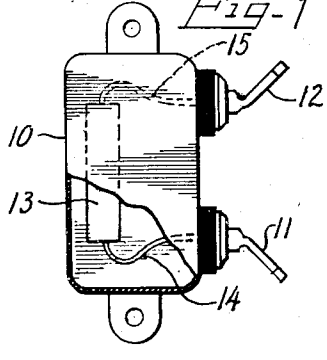


Fig-1



Inventor

CYRIL J. FOSTER

by Charles W. Hills Attys.

Patented Dec. 14, 1948

2,456,118

UNITED STATES PATENT OFFICE

2,456,118

TERMINAL MEMBER

Cyril J. Foster, Chicago, Ill., assignor, by mesne assignments, to Thomas Hawkinson and Harrison Burnett, both of Chicago, Ill., copartners, trading as Crimp Seal Products Co.

Application May 14, 1943, Serial No. 486,933

1 Claim. (Cl. 174—153)

1

This invention relates to a terminal member and assembly and more particularly to an electric terminal member and assembly which is particularly well adapted for use on electrical devices such as condensers, transformers, chokes, etc. which are enclosed in metallic or plastic housings containing oil, wax, tar or other insulating gas, fluid or semi-fluid.

Many small electrical devices are housed in a closed container which is filled or partially filled with a liquid or gaseous insulating substance. One or more electrical leads must be brought through the wall of the container for an exterior connection. Accordingly, some provision must be made to prevent the escape of the liquid or gaseous insulating substance at each point where a conductor passes through the container wall. Each conductor should also preferably be insulated from the container wall.

One of the objects of the present invention is to provide a novel seal and terminal member possessing the above desired characteristics.

Another object of the present invention is to provide a novel combination rivet, seal and terminal member.

A further object of the present invention is to provide a novel terminal member assembly.

Another and further object of the present invention is to provide a novel plastic gasket or washer for a terminal member assembly.

Another and still further object of the present invention is to provide a novel method for forming an electric terminal and assembly.

Still another and further object of the present invention is to provide a novel method and means for securing a conductor to an electric terminal.

The novel features which I believe to be characteristic of my invention are set forth with particularity in the appended claim. My invention itself, however, both as to its manner of construction and method, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a plan view of a container for an electric element having a pair of terminal members extending from the side thereof and embodying novel features of the present invention;

Figure 2 is a longitudinal sectional view of a terminal and rivet member which forms one embodiment of the present invention;

Figure 3 is a sectional view showing the terminal and rivet member of Figure 2 in a die press about to be assembled on a wall member.

2

Figure 4 shows the terminal member riveted in place and shows the upper end of the terminal member sealed off;

Figure 5 is a partial sectional view of the terminal member assembly taken in a vertical plane at right angles to that of Figure 4 as taken along the line V—V;

Figure 6 is a top view of the terminal member and assembly as shown in Figure 4;

Figure 7 is a sectional view of a terminal member and assembly showing a modified form of the present invention;

Figure 8 is a sectional view of the terminal member and assembly of Figure 7 after it has been removed from a die press and sealed off;

Figure 9 is a view of the upper portion of the terminal member and assembly as shown in Figure 8 as taken along the lines IX—IX thereof;

Figure 10 is a sectional view of a modified form of terminal member assembly; and

Figure 11 is a view similar to Figure 10 with an outside conductor sealed thereon.

In order to indicate the general environment of the present invention I have illustrated in Figure 1 a container 10 having a pair of terminals 11 and 12 on one of the walls thereof. Housed within the container 10 is an electric element 13 such, for example, as a condenser, which is electrically connected to the terminals 11 and 12 by conductors 14 and 15 respectively. The container 10 provides a fluid-tight housing for the element 13 and may contain any suitable insulating fluid, and the terminal members 11 and 12 completely seal off the respective openings in the wall of the container through which the electrical conductors 14 and 15 extend.

The present invention relates primarily to a terminal member and seal which before it is assembled on the wall of the container has the shape illustrated by way of example in Figure 2 of the drawings. This terminal member and seal as shown in Figure 2 and as generally indicated by the reference character 16 is in the form of a double shank, tubular, rivet-like member having two shank or stem portions 17 and 18 with an integral head portion 19 lying therebetween. The member 16 has a tubular passageway 20 extending through both shank portions 18 and 17 as shown. The counterbore 21 is provided in the shank portion 17 and thus provides a thinning of the material in that region which enables it to be readily and easily upset to rivet the member 16 in its assembled position on a container wall. For a reason which will be more fully explained hereinafter the exterior diameter of the shank

portion 18 is substantially the same as the interior diameter of the counterbore 21. It will thus appear that the exterior or outer diameter of the shank portion 17 is greater than the outer diameter of the shank portion 18.

The member 16 is preferably made of a soft metal such as soft steel or copper.

To assemble the member 18 on a wall portion 22 of the container 10 an opening 23 is provided in the wall 22 which is larger than the outside diameter of the shank portion 17. A group of washers are then placed on either side of the opening 23, which group of washers includes a metal washer 24, a washer 25 of insulating material such as fiber, rubber or Bakelite having a small raised end portion 26 which extends partly into the opening 23 and centers the terminal member 16 therein, a second insulating washer 27 on the outer side of the wall portion 22 and a third washer of rubber or other suitable material 28. This group of washers 24, 25, 27 and 28 are assembled together with the shank portion 17 of the member 16 on the wall portion 22 of the container 10. The entire assembly is then placed in a die press having an upper die member 29 and a lower die member 30, the lower die member 30 being provided with a central stud 31 which extends up into the tubular portion 20 of the member 16 to center the assembly on the lower die member. The upper die member 29 is arranged to be seated directly on the head 19 of the member 16 and thus is directly above the wall of the counterbored portion 21 of shank 17. Since the outer diameter of shank 18 is not greater than the inner diameter of counterbore 21, the compression force of the die members is applied directly and lengthwise of the counterbore wall portion of shank 17. As the die members 29 and 30 are moved toward each other the lower end of the shank portion 17 is rolled outwardly as at 32 which securely rivets the terminal member 16 and the washer assembly to the wall portion 22 of container 10.

With the terminal member assembly in this position we now have a member which is substantially like that shown in Figure 3 with the exception that the die members have not been removed and the lower end of the shank member 17 has been rolled over as shown by the dotted lines in Figure 3. In this position a conductor 33 which extends from the electrical element within the container 10 is inserted up through the entire length of the tubular passageway 20 of the member 16. Now with the wire extending entirely through the passageway 20 the upper portion of the shank 18 is compressed in a vise or other suitable compression means until this upper portion of the shank 18 is mashed completely flat. This causes the upper end of the terminal member 16 to be completely sealed off as is shown in Figure 4. I have found that when a terminal member is composed of a soft material such as soft steel or copper that the two confronting inner surfaces of the shank portion 18 are affectively bonded together with the end of the conductor 33 extending therethrough. This bonding of the confronting surfaces of the inner passageway 20 of the shank 18 causes a complete fluid-tight seal to be formed as well as to cause a substantially perfect electrical connection between the end of the conductor 33 and the upper end of the terminal member 16. This crushed or compressed upper portion of the terminal member 16 may be given any suitable shape such, for example, as that shown in Figure 5 wherein sides of the upper portion have been notched out as at 34, an aperture provided as at 35 and the tip portion rounded as at 36.

From the above description it will be apparent that by providing a double shank hollow, rivet-like member with an intermediate head portion, I have provided a member which acts as a rivet, a terminal member, and a fluid-tight seal for an opening in a container wall.

The general appearance of the top of the assembly after it has been completely formed and assembled is shown in Figure 6 of the drawing.

In Figures 7, 8 and 9 of the drawings I have illustrated a modified form of the present invention. In this form of the invention a plastic sleeve 37 is employed instead of the washer assembly previously described in connection with Figures 2 to 6 of the drawings. More particularly a sleeve of some suitable thermoplastic material is inserted through an opening 38 in a container wall portion 39. The shank portion 17 of the terminal member 16 is then inserted through the sleeve 37. This assembly is then placed in a die press and under pressure the lower end portion 40 of the terminal member 16 is rolled back over the lower end of the sleeve 37 and at the same time the sleeve 37 is compressed lengthwise. This compression of the sleeve lengthwise causes the plastic material to flow back over the adjacent edge of the wall portion 39 which defines the opening 38. After compression, the plastic sleeve member 38 has the shape as shown in Figure 8 of the drawings. It will thus be seen that the plastic member 37 forms its own insulating washer assembly since it extends over the edge of the opening on both sides of the wall portion. In Figure 7 of the drawing I have shown in dotted lines the position of a conductor 41 coming from the electrical element housed within the container 10. An intermediate portion of the upper shank 18 of the terminal member 16 is then crushed under pressure to cause the two confronting faces of the passageway 20 in the shank 18 to be bonded together along with the upper end of the conductor 41. This compression of the intermediate portion may be made in a die having a sharp edge portion which will leave the upper portion 42 of the shank 18 in its original tubular wall form as shown in Figure 8. An exterior conductor 43 may then be extended down through this upper tubular portion 42 and hooked over the inner edge thereof as at 44. The conductor 43 may then be soldered or otherwise suitably secured to the upper portion 42 of the terminal member 16.

The third embodiment of the present invention is shown in Figures 10 and 11 of the drawings. In this form of the invention the head portion 45 of the terminal member 16 is shaped in such a manner to make an obtuse angle with the shank portion 18. An intermediate portion 46 of the terminal member 16 is crushed as at 46 with the inner conductor 47 which leads from the electrical element within the container extending entirely through the upper shank portion 18 of the terminal member. When an exterior conductor 48 is to be connected to the terminal member the end of such a conductor 48 is inserted in the upper portion 49 of the terminal member so that it lies alongside of and against the upper end of the conductor 47. The upper end 49 is then crushed to cause a bonding of the confronting inner faces 50 and 51 of the upper portion 49 of the shank along with the two conductors 47 and 48 together. The assembly after the upper portion

49 has been crushed then has the appearance as shown in Figure 11.

This third embodiment of the invention has the distinctive advantage of making a very satisfactory type of connection between the inner conductor 47 and the outer conductor 48 without the means of solder and at the same time provides a complete seal for a container on whiich the terminal member is mounted. By providing a head portion 45 whose upper surface makes an obtuse angle with respect to the shank portion 18, danger of shearing at this point is greatly reduced.

While I have shown particular embodiments of my invention it will, of course, be understood that I do not wish to be limited thereto so that many modifications may be made and I, therefore, contemplate by the appended claim to cover all such modifications as fall within the true spirit and scope of my invention.

I claim as my invention:

A terminal member and seal for an apertured container housing an electric element comprising a tubular member having an intermediate flange with stem portions extending from either side thereof and having an interior passageway therein, a conductor connected to said electrical element disposed in said passageway one of said stem portions being inserted through said housing aperture, an annular mass of deformable, fluid impervious, electrically insulating material surrounding said one stem portion and disposed intermediate said flange and one side of the housing, an additional annular mass of deformable, fluid impervious, electrically insulating material surrounding said one stem portion and abutting the other side of the housing, the outer end of said one stem portion being deformed outwardly and compressed axially to compress said masses of insulating material into fluid sealing engagement with the aperture defining walls of

the housing, the other of said stem portions having an intermediate portion thereof whose opposite wall portions are completely collapsed to form a bond with each other and with said conductor therein sufficiently for hermetically sealing off the interior of said container and also electrically connecting said conductor to said terminal member, the remaining tubular end portion of said last stem having the end of said conductor lying therein, an exterior connecting conductor having an end disposed within said end portion of said last stem alongside of and against said first conductor, the opposite wall portions of said end portion being collapsed to form a bond with each other and with both of said conductors therein.

CYRIL J. FOSTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
650,862	McTighe	June 5, 1900
1,011,439	Kaisling	Dec. 12, 1911
1,643,150	Conner	Sept. 20, 1927
1,657,208	Greaves	Jan. 24, 1928
1,677,968	Hughes	July 24, 1928
1,927,382	Andrew	Sept. 19, 1933
1,937,431	Mendel	Nov. 28, 1933
1,953,188	Norviel	Apr. 3, 1934
2,034,090	Douglas	Mar. 17, 1936
2,052,700	De Lange	Sept. 1, 1936
2,071,164	Galvao	Feb. 16, 1937
2,095,045	Webb et al	Oct. 5, 1937
2,164,311	Doran	July 4, 1939
2,211,659	Johanson	Aug. 13, 1940
2,368,548	Kalstein	Jan. 30, 1945
2,374,084	Dubilier	Apr. 17, 1945