Sept. 23, 1969 S. F. BARBER 3,468,008

METHOD OF FORMING A TUBULAR PART HAVING A PASSAGEWAY FORMED IN THE WALL THEREOF

Filed Feb. 16, 1967 2 Sheets-Sheet 1

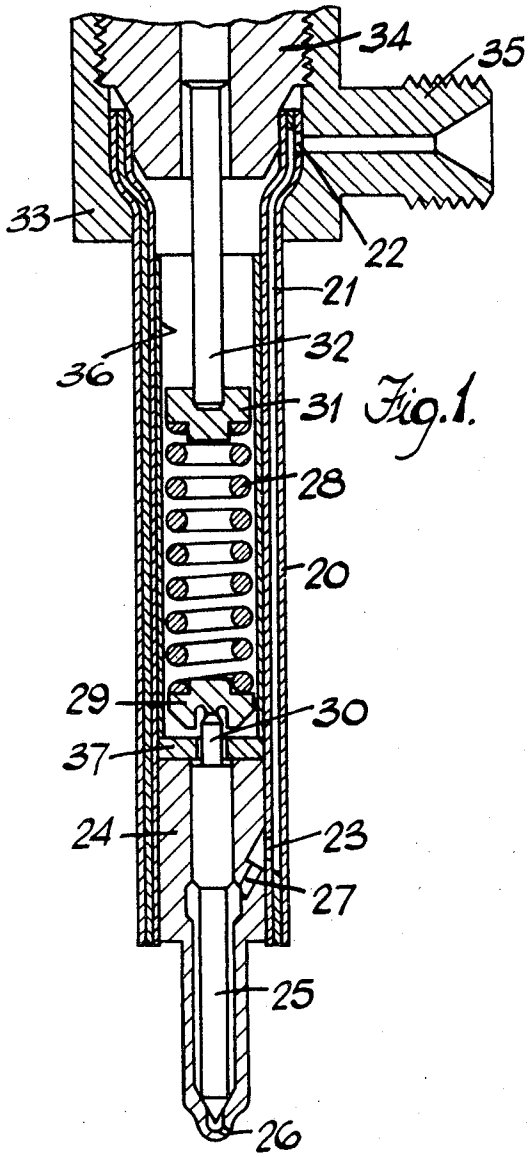


Fig. 1.

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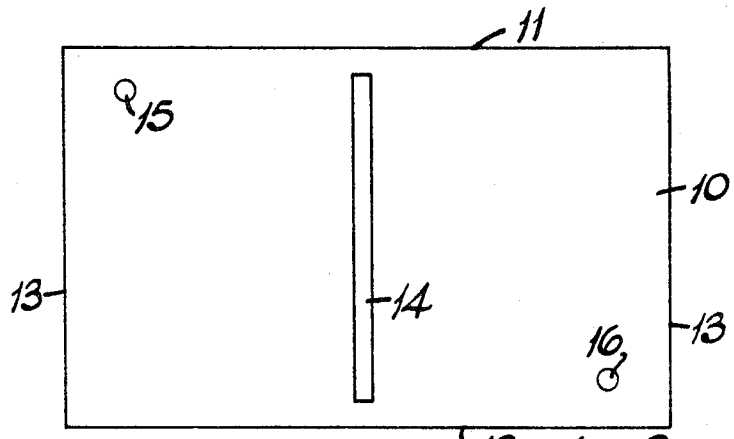


Fig. 2

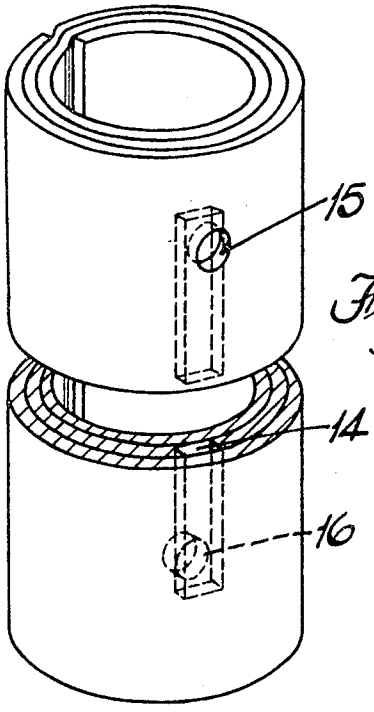


Fig. 3.

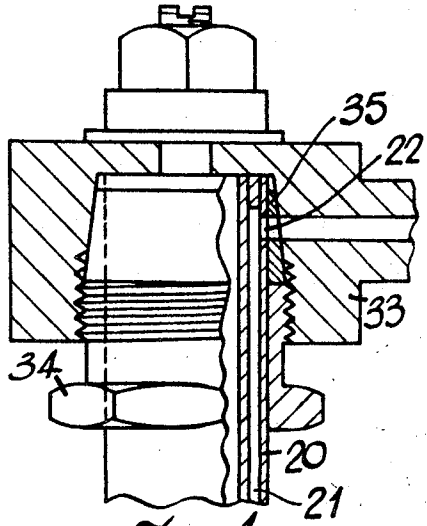


Fig. 4.

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3,468,008

METHOD OF FORMING A TUBULAR PART HAVING A PASSAGEWAY FORMED IN THE WALL THEREOF

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U.S. Cl. 29—157 2 Claims

ABSTRACT OF THE DISCLOSURE

A tubular part having a passage formed in the wall, the part being formed by rolling a sheet blank having a slot **14** formed therein, so that at least the major portion of the slot is overlapped both internally and externally by imperferate portions of the sheet blank.

This invention relates to a method of forming a tubular part having a passageway formed in the wall thereof and has for its object to provide such a method in a simple and convenient form.

A method in accordance with the invention comprises forming in a sheet blank a slot of appropriate shape and subsequently rolling the sheet blank into a tube so that at least the major portion of the slot is overlapped both internally and externally by imperforate portions of the blank.

One example of the invention will now be described with reference to the accompanying drawings in which:

FIGURE 1 is a sectional side elevation of a fuel injection nozzle incorporating a part constructed in accordance with the invention.

FIGURE 2 is a plan view of a piece of sheet material before folding,

FIGURE 3 is a sectional perspective view of the sheet after being rolled and

FIGURE 4 shows an alternate arrangement of part of the nozzle shown in FIGURE 1.

Referring to FIGURE 2 of the drawings there is provided a rectangular metal sheet blank **10** having upper and lower edges **11, 12** respectively and side edges **13.** Formed in the sheet blank is a slot **14** which is positioned substantially mid-way between the side edges **13.** The slot terminates, short of the upper and lower edges. Moreover, at positions removed from the slot **14** and on opposite sides thereof there is provided a pair of apertures or holes **15, 16.** The hole **15** lies near the upper edges of the plate whilst the hole **16** lies near the lower edge of the plate. The blank sheet thus formed is rolled as is shown in FIGURE 3 to form a tubular piece and the diameter of the rolled piece together with the distances of the holes **15, 16** from the slot **14** is chosen so that the holes are aligned with the slot, the major portion of which is closed internally and externally by imperforate portions of the sheet. By this construction there is defined a passage within the wall of the tubular piece the passage having an opening to the exterior of the piece at one end, and to the interior of the piece at the other end. During the rolling operation the sheet is brazed in known manner, so that the presented faces of adjacent portions of the sheet are secured together and in this manner the risk of fluid under pressure leaking from the passageway is minimized.

It will be appreciated that the slot could be extended to the upper or lower edges of the sheet and in which case only one aperture or hole would have to be provided, the inlet or outlet end of the passage being formed in the end wall of the tubular piece. Alternatively the slot could be formed diagonally with respect to the sheet

and the sheet rolled in such a manner that the ends of the slot are exposed on the inner and outer surfaces of the tubular piece.

Such a tubular piece may be used as the body portion of a liquid fuel injection nozzle unit. Referring now to FIGURE 1 one example of such a nozzle unit comprises a body part **20** which is formed in the manner described and which incorporates a passageway **21** in its wall the passageway having an inlet **22** at its upper end and an outlet **23** at its lower end. Within the lower end of the body part **20** is secured a nozzle head **24** in which is slidably mounted a valve member **25.** The nozzle head defines an orifice **26** at its outer end and the valve member serves to control the flow of fuel through this orifice from an inlet passage **27** formed in the nozzle head and in communication with the outlet **23** of the passage **21.** The valve member is loaded towards a closed position by a coiled compression spring **28** which is mounted within the body part, and which bears upon a spring abutment **29** which bears against a projection **30** extending from the valve member **25.** The other end of the spring bears against a further abutment **31** which is located within the body part upon a rod **32** extending from the other end thereof.

This end of the body part is of enlarged diameter and is located within a clamp comprising a hollow cylindrical member **33** which is shaped on its internal periphery to closely correspond with the shape of the body part. Within the member **33** is engaged a clamping plug **34** having a spigot portion which is located within the body part and which serves to outwardly press the body part into contact with the shaped surface of the member **33.** In this manner a fluid tight seal is obtained between the body part and the cylindrical member. The cylindrical member **33** is provided with a radially extending inlet connection **35** in which is formed a fuel passage which is in communication with the inlet **22.** The rod **32** is adjustably mounted within the clamping plug **34** so that the force exerted by the coiled compression spring **28** upon the valve **25** can be adjusted. Moreover, within the body part there is provided a sleeve **36** which is arranged to retain a stop plate **37** in position adjacent the inner end of the nozzle head **24.** The stop plate acts to limit the movement of the valve member **25** when fuel under pressure causes the valve member to move against the action of the spring **28** to allow fuel to flow through the orifice **26.**

By the arrangement described what has previously been a difficult and expensive operation i.e. the provision of the passage **21** in the body part, no longer presents difficulties, in addition the body part itself is formed from a sheet of material and therefore expensive machining operations which have previously been necessary are no longer required.

In the alternative arrangement as shown FIGURE 4 the cylindrical member **33** is provided with a blind bore which at its inner end tapers inwardly and which at its outer end is formed with a screw thread with which is engaged a hollow cylindrical nut **34** which surrounds the body part **20.** Surrounding the end of the body part is a sleeve **35** having a cylindrical internal and a tapered outer periphery and the arrangement is such that when the nut **34** is tightened the sleeve **35** is forced inwardly to grip the end of the body portion and also to form a fluid tight seal. The sleeve **35** is provided with an aperture so that fuel can flow from the inlet passage formed in the member **33** to the inlet **22** formed in the body part.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. A method of forming a tubular part having a passageway formed in the wall thereof, said method com-

prising providing a sheet blank having a slot of appropriate shape and also an aperture at one side of and spaced from said slot, and rolling the sheet blank into tubular form with the aperture registering with the slot to define the passageway so that the remaining portion of the slot is overlapped both internally and externally by imperforate portions of the blank.

2. A method of forming a tubular part having a passageway formed in the wall thereof, said method comprising providing a sheet blank having a slot of appropriate shape and also a pair of apertures on appropriate sides of and spaced from the slot, and rolling the sheet blank into tubular form with the apertures registering with the slot to define the passageway so that the remaining portion of the slot is overlapped both internally and externally by imperforate portions of the blank.

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29—476.5; 113—116; 156—184; 239—533