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TANK UNIT MOUNTING MEANS

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FIG. 1

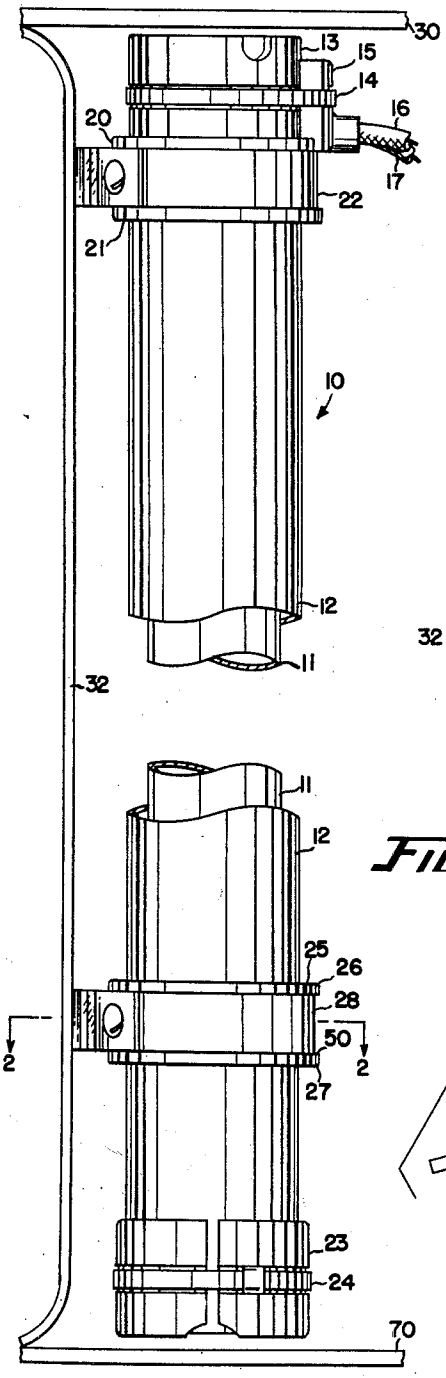


FIG. 2

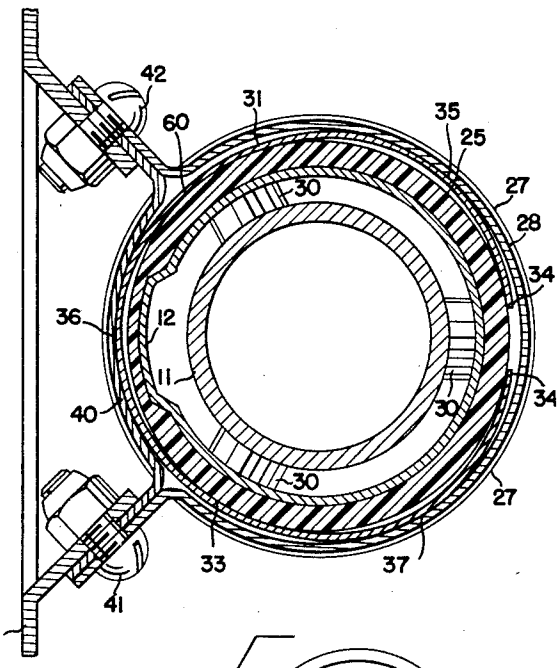
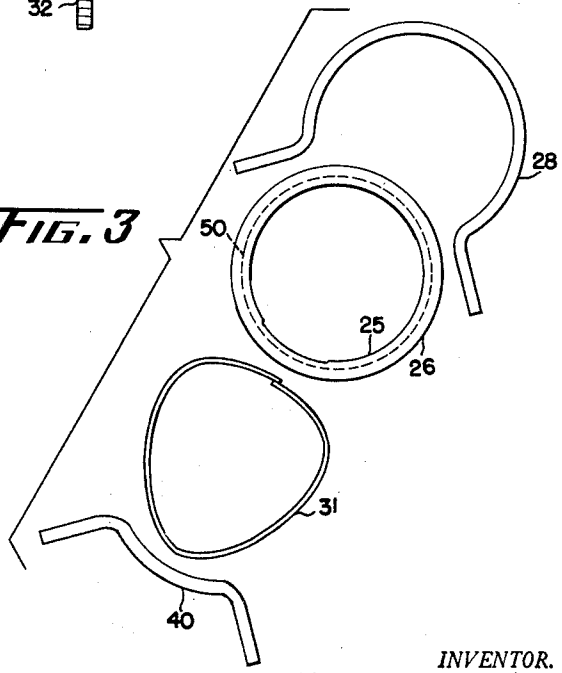


FIG. 3



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TANK UNIT MOUNTING MEANS

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The present invention is concerned with the manner of mounting impedance type liquid level sensing means. More particularly the present invention is concerned with the mounting of a capacitance type tank unit.

Present day aircraft require accurate fuel gaging means. If the fuel quantity can be accurately sensed, the extra fuel which must be carried as a safety factor can be reduced and the pay load of the craft increased. The capacitance type fuel gage has found wide acceptance because it gives the required accuracy. However, trouble has been experienced with these fuel gages especially when the fuel tank in which the gage is placed is empty. In this case vibration may be set up in the tank unit which may tend to damage the tank unit.

It is the purpose of the present invention to provide mounting means for a tank unit which mounts the tank unit to the fuel tank in no way disturbing the accuracy of the sensing means while resiliently mounting the tank unit to prevent damage due to vibration.

It is a further object of the present invention to provide a mounting ring encircling the tank unit and having an annular groove with a generally polygon-shaped spring, for example a spring substantially triangular in shape, placed in the groove and engaging the groove at a plurality of first portions and having a plurality of second portions spaced from the groove, and having a mounting clamp which is adapted to be rigidly mounted to the fuel tank and which is placed in the annular groove and engages the spring at the plurality of second portions.

These and other objects of the present invention will become apparent to those skilled in the art upon reference to the appended claims, specification, and drawing of which;

Figure 1 is a showing of the tank unit mounted in a fuel tank, with the fuel tank broken away and with the tank unit broken in the center;

Figure 2 is the cross-section of Figure 1 taken at 2—2; and

Figure 3 is a view showing the mounting ring, spring, and mounting clamp.

Referring specifically to Figure 1, the numeral **10** refers generally to a capacitance type tank unit having an inner electrode **11** and an outer electrode **12** forming the two capacitor plates. An insulator **13** is placed at the upper end of the tank unit and is encircled by a hose-type clamp **14** which mounts insulator **15** carrying wires **16** and **17**, which wires are connected to electrodes **11** and **12**.

Insulator **13** is provided with upper and lower annular shoulders **20** and **21**. The shoulders **20** and **21** define an annular groove in which a metallic mounting clamp **22** is placed. An insulator **23** is placed at the lower end of the tank unit and is rigidly fixed thereto by a hose-type clamp **24**.

Intermediate the insulators **13** and **23** is an insulating mounting ring **25** having an upper shoulder **26** and a lower shoulder **27** forming annular ridges and defining an annular groove **50** in which is placed a metallic mounting

clamp **28**. Mounting clamps **22** and **28** are similar in construction.

The numeral **30** designates the top of a fuel tank and the numeral **70** designates the bottom of the fuel tank, the remainder of the tank being broken away. The numeral **32** designates an internal strut or wall of the fuel tank to which the tank unit **10** is mounted as is shown more clearly in Figure 2.

Referring specifically to Figure 2, it can be seen that electrodes **11** and **12** are positioned relative to each other by a plurality of insulating spacers **30**. In this section view it can be seen that the mounting ring **25** has its inside surface formed to the outside contour of the electrode **12** and is mounted thereon. Within the annular groove **50** of mounting ring **25**, as defined by shoulders **26** and **27**, is placed a triangle shaped spring **31** which engages the annular groove at three portions **60**, **33** and **34**, and has three portions **35**, **36** and **37** which are spaced from the annular groove.

Also placed within the annular groove is the mounting clamp **28** which it can be seen engages the spring **31** at the three portions **35**, **36** and **37** which are spaced from the annular groove. Mounting clamp **28** includes a second portion **40**, and is rigidly fixed to the fuel tank member **32** by means of bolts **41** and **42**.

The upper end of tank unit **10** is also mounted to the fuel tank member **32** and this mounting means includes mounting clamp **22**. Mounting clamp **22** is identical to mounting clamp **28** and the mounting means including clamp **22** is identical to that above described with regard to Figure 2. In the case of the upper mount the mounting ring is a part of insulator **13**.

From Figure 2 it can be seen that a resilient clamping means has been provided and that while the tank unit **10** is mounted with respect to the fuel tank member **32** such mounting is a resilient mounting under the bias of spring **31** since spring **31** has only the first portions engaging the annular groove in mounting ring **25** and has the second portions engaging the inside of the mounting clamp **28** and thereby allows relative movement between the mounting ring and the clamp.

Figure 3 shows the substantially triangular shaped spring **31** in the relaxed position. When the spring **31** is opened and inserted in the annular groove, represented by the dotted line **50**, the spring **31** is placed under tension and engages the groove.

It can also be seen that the mounting clamp **28** must be open to a certain extent to slide over the annular groove **50** and it can also be seen that the circular portion of the clamp **28** is of larger diameter than the diameter of the annular groove **50** in the mounting ring **25**. Therefore, spring **31** engages both the annular groove **50** and the inside of the clamp **28** to resiliently space the mounting ring **25** from the clamp and allow relative movement between the mounting ring **25** and the clamp **28**.

It will be immediately recognized that the tank unit **10** need not be substantially circular in cross-section, as has been shown, and therefore that the inner surface of the mounting ring **25** need not be substantially circular. The inner portion of the mounting ring **25** can be formed to have the same shape as the cross-sectional shape of the tank unit to be mounted and is of substantially the same dimensions so that a tight fit is produced as the mounting ring encircles the tank unit. Likewise, the spring **31** need not be triangular in shape and may be any multi-side type spring which engages the mounting ring **25** at a first plurality of portions and engages the inside surface of the clamp **28** at a second plurality of surfaces to thereby allow relative movement between the mounting ring and the clamp.

It can therefore be seen that a resilient mounting means

has been provided for an impedance type liquid level sensing device. Other modifications will be apparent to those skilled in the art and it is intended that the scope of the present invention be limited only by the appended claims.

I claim as my invention:

1. A capacitance type tank unit comprising inner and outer tubular capacitor plates rigidly mounted and insulated from each other, an insulative mounting ring on the outer surface of said outer plate and having an annular surface defined by a pair of shoulders to form an annular recess, a substantially triangular spring in said annular recess engaging said annular surface at three points substantially equally spaced about said annular recess, and a circular mounting clamp having a circumference greater than said annular surface and less than said annular recess, said spring engaging said mounting clamp at three points substantially equally spaced about said circular clamp.

2. Apparatus comprising, liquid level sensing means, a mounting ring about said sensing means and having an annular surface with a shoulder portion on each side thereof to define an annular recess, a substantially polygon shaped spring in said recess biased to engage said annular surface at a plurality of areas around said annular surface, and mounting means having an annular portion placed in said recess over said spring and engaging said spring at a plurality of areas, said spring thereby positioning said mounting ring and said sensing means with respect to said mounting means while allowing relative movement between said sensing means and said mounting means under the bias of said spring.

3. Mounting means for tubular shaped liquid level sensing means comprising, a mounting ring having an inner surface to conform to the cross-sectional shape of the tubular liquid level sensing means to be mounted and having an outer surface having an annular recess, a polygon-shaped spring in said recess and biased to engage said annular recess at a plurality of first portions and having a plurality of second portions spaced from said annular recess, and a mounting clamp having a circular portion placed in said recess and engaging said spring at said plurality of second portions such that said mounting ring and mounting clamp are spaced relative to each other and relative movement is possible under the bias of said spring.

4. Liquid level sensing apparatus comprising, elongated impedance means adapted to be positioned in a tank containing liquid and responsive to the level of the liquid to change impedance as the level changes, a mounting ring encircling said impedance means and having an annular groove therein, a spring in said groove and shaped to engage said groove at a plurality of portions and having a second plurality of portions standing out from said groove, and a mounting clamp adapted to be rigidly fixed to the tank and placed in said groove to engage only said second portion of said spring to thereby resiliently hold said impedance means.

5. A capacitive type tank unit comprising, a first and a second electrode comprising capacitor plates, said electrodes being circular in cross section, means for mounting said first electrode within said second electrode, a mounting ring encircling and engaging said second electrode, said mounting ring having a pair of shoulders extending therefrom to define an annular groove, a multisided spring in said groove and having a plurality of first portions engaging said groove and a plurality of second portions spaced from said groove, and a mounting clamp in said groove and engaging said spring at only said plurality of second portions, said mounting clamp being adapted for rigid mounting to a tank.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 22,846	Morehouse	Feb. 25, 1947
470,698	Murdock	Mar. 15, 1892
539,462	Werant	May 21, 1895
624,484	Haskell	May 9, 1899
1,238,976	Zika	Sept. 4, 1917
2,147,963	Casciotti	Feb. 21, 1939
2,399,183	Harrison	Apr. 30, 1946
2,560,757	Bowar	July 17, 1951
2,728,546	De Giers	Dec. 27, 1955

FOREIGN PATENTS

802,699	France	June 13, 1936