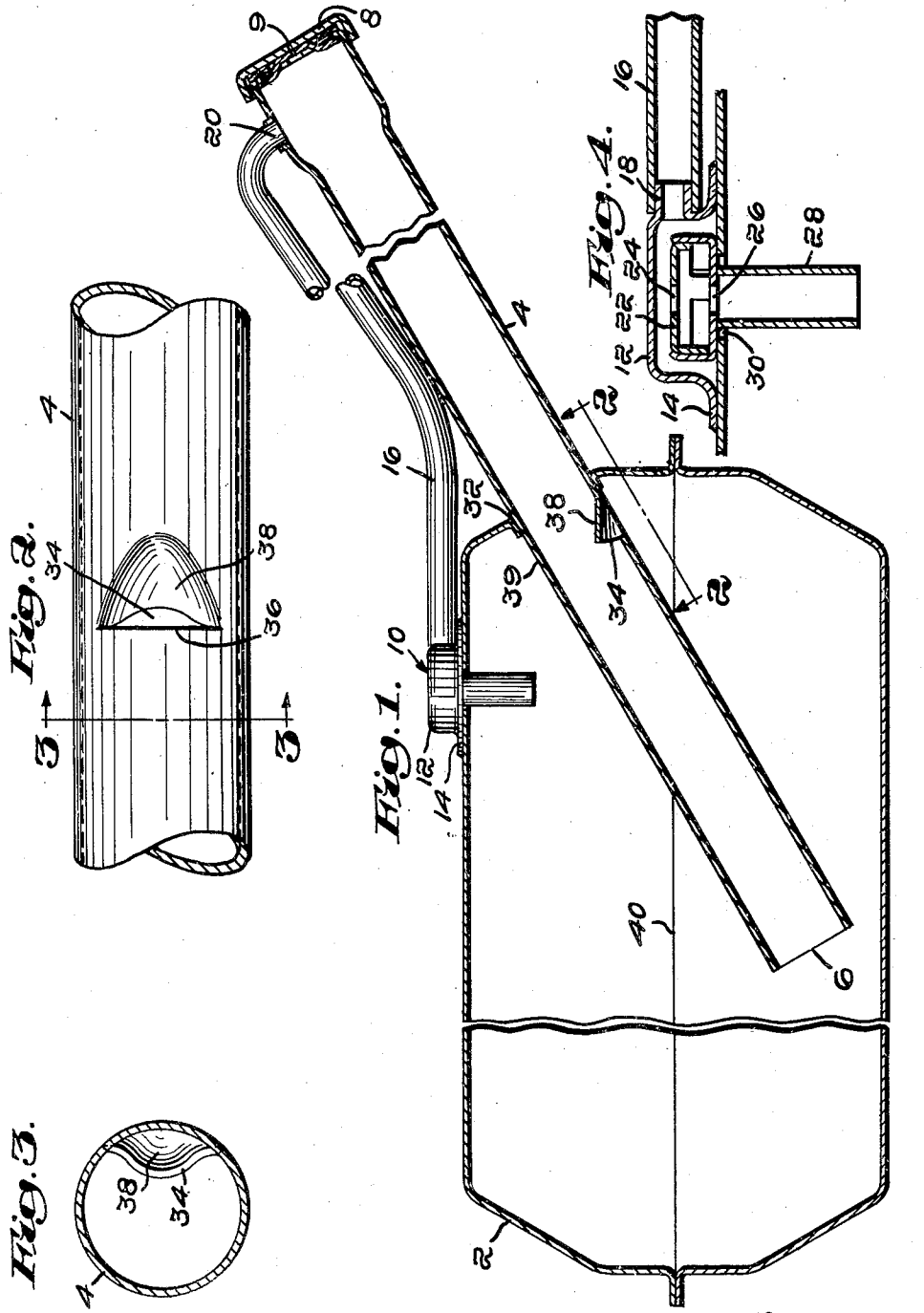
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TANK WITH BREATHER OPENING IN FILL PIPE

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TANK WITH BREATHER OPENING IN FILL PIPE

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This invention relates to fuel tanks that have incorporated therein gas-operated signaling means for indicating when the rising liquid level has reached a predetermined point. The invention is particularly concerned with gasoline tanks on automobiles, but may be used with equal effectiveness in any situation where the tank is subject to movement to cause surging of the liquid therein.

Audible signaling devices of the type used in connection with the present invention are shown, for example, in the reissue patent to Mathey, No. 22,391. A modification of this type of construction is also shown in the patent to Scully et al., No. 2,323,156. In general, it may be said that the invention is devised for use with a gasoline tank in which a gas-operated signaling device is positioned within and close to the top of the tank or has a portion extending through the top into the tank and in which the vent pipe leading from the signaling device terminates at a point within the fill pipe, forming a closed system when the cap closes the fill pipe, and in which means is provided to cause gas displaced by entering liquid to flow through the signaling device on its way to the atmosphere.

In installations of this sort, where the fill pipe is of the so-called deep fill type, that is, where the inner end of the fill pipe extends to a position below the liquid level so that displaced gas cannot escape through the fill pipe and the undesirable splashing that would otherwise occur is eliminated, an objectionable feature has been noticed.

Let us assume that the tank is half full, with the automobile in normal operation. The usual cap will close the upper end of the fill pipe so that there is no free flow of gas into the tank from the atmosphere. As the vehicle moves, the liquid will surge about in the tank, and the liquid level within the fill pipe will vary substantially as the liquid in the body of the tank surges from one side to the other. The result of this liquid movement is that there is a constant back and forth movement of gas through the whistle; that is, as the liquid rises in the fill pipe, the pressure on the vent pipe side of the whistle increases, while the pressure on the gas in the tank drops. Thus there is a quick movement of air from the fill pipe down through the vent pipe, through the whistle, and into the tank. This causes a short but distinctly audible sound. Conversely, as the liquid surges in the opposite direction so that the level in the fill pipe drops, then there is a quick short surge of air upwardly

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through the whistle through the vent pipe and into the filler neck, again causing an audible sound. The net result of this circumstance is that in a moving automobile having a signaling system of this nature there will be produced a succession of short audible sounds that have no relation to the liquid level.

When the gasoline tank is located in proximity to the driver or passengers, this steady sounding of the whistle is objectionable, and therefore it is an object of the present invention to overcome this situation without otherwise impairing or interfering with the normal operation of the signal during filling.

The invention will be more fully described hereinafter with the aid of the accompanying drawings, in which

Fig. 1 is a vertical sectional view of a tank, a fill pipe, and a signaling device, with the latter being in elevation. The several elements are broken away in part.

Fig. 2 is a view of a section of the fill pipe apart from the tank, viewed from its under side along the line 2—2 of Fig. 1.

Fig. 3 is a sectional view of the fill pipe along the line 3—3 of Fig. 2.

Fig. 4 is a vertical sectional view of the signaling means and a short section of the vent pipe extending therefrom.

Referring to Fig. 1, there is shown a typical gasoline tank 2 having a fill pipe 4, the lower end of which extends to a position close to the bottom of the tank to provide a typical deep fill installation. The upper end of the fill pipe, except during filling, is normally closed by a cap 8. This cap has the usual small vent 9 therethrough so that no negative pressure condition can develop in the tank as the gasoline is consumed. However, the opening through the cap is so small that gas cannot flow in or out freely enough to offset at once any quick pressure changes that may develop in the fill pipe.

Positioned on the top of the tank at any convenient place is the signaling means 10. This consists of a housing 12 having a horizontal flange 14 which is secured to the tank top in any convenient air- and liquid-tight manner. A vent pipe 16 connected by a short nipple 18 extending from one side of the housing leads into the fill pipe near the upper end of the latter at position 20.

Contained within the housing 12 is a typical whistle assembly consisting of a button type whistle 22 having upper and lower centrally aligned apertures 24 and 26. From the lower

side of the whistle depends an intrusion tube 28 passing through a hole 30 in the top of the tank. Hole 30 is somewhat larger than intrusion tube 28 so that in the event of a pressure developing in the tank which might drive whistle 22 upwardly from its seat, part of the gas may be bypassed through opening 30 to the vent pipe 16.

At the point where fill pipe 4 passes through and is in engagement with the tank as at 32, a rigid air- and water-tight connection is effected. This may be by soldering, welding or in any other convenient manner. Immediately below the point of connection and within the tank, an opening 34 is provided through the wall of vent pipe 4. The nature of this opening is clearly shown in Figs. 1, 2 and 3. In practice it can be easily made by sawing a limited transverse slot 36 through the fill pipe wall and then forcing the wall inwardly to form a reversely curved interior blister 38, with the open side in the direction of the lower end of the pipe. The opening so formed will hereinafter be referred to as the breather slot. While it is shown positioned on the under side of the fill pipe 4, it is to be understood that it may be located any place about the tube's circumference.

The object of the breather slot is to eliminate any change in pressure in the upper part of the fill pipe 4 so long as the level of the liquid is below the breather slot. Thus, while still obtaining the advantages of the deep fill, nevertheless the objectionable back and forth passage of air through the whistle due to surging of liquid in the tank is eliminated, provided the liquid level is below the breather slot. It has been found the the objectionable whistling occurs almost entirely when the tank is less than half full. This is due to the fact that the liquid in a partially filled tank will surge more than in a full tank. Consequently, the low level liquid will run further up the fill pipe on each surge. As the tank becomes more nearly full, surging is reduced, and there is less movement of air through the whistle and hence less sound.

In any event, the breather slot 34 as disclosed is located high enough to eliminate the objectionable characteristic. By placing the breather slot on the top side of the tube at 39 where it would be substantially on a level with the lower end of intrusion tube 28, then the level may be raised correspondingly before the breather slot is sealed.

The operation of the invention is as follows: The filler cap 8 is removed, and liquid is fed into the tank in the usual manner. The blister 38 somewhat restricts the cross-sectional area of fill pipe 4 so that the liquid flowing thereover acts as a seal to prevent any escape of displaced gas through the breather slot. Since the submerged part of the fill pipe is also effectively sealed by liquid, all displaced gas must flow through the signaling unit 10 and vent pipe 16 to the upper end of the fill pipe, and thence to the atmosphere.

In normal filling, the liquid supply would be cut off when the level has reached a point a little above the lower end of intrusion tube 28. Thereafter, in operation of the vehicle, the fuel will be consumed and the liquid level will drop below the intrusion tube, while still remaining above breather slot 34. During this period surging of the liquid will cause slight movement of air back and forth through the whistle but not in sufficient amounts to cause objectionable sounding. Finally, however, the liquid is consumed to such an

extent that it falls below the blister 38 to open the breather slot 34. By this time, surging has almost reached a point where objectionable sounds would be produced were it not for breather slot 34.

Let us assume, for example, that the liquid level is at the midpoint 40 of the tank and the liquid quiet. The pressure on both sides of the whistle will, of course, be equal, and this is true regardless of the particular level. The pressure in vent pipe 16, connected to the tank by the fill pipe and breather slot on one side and the whistle on the other side, is the same as the tank pressure. If the liquid then surges so that the level rises in the fill pipe but does not reach the breather slot, the tank and fill pipe pressures will immediately come into balance through movement of gas through the breather slot plus an inaudible slight movement through the whistle.

Conversely, as the liquid surges in the opposite direction and the level in the fill pipe falls, any change in pressure between the tank and vent pipe 16 is again adjusted by gas flow through the breather slot sufficient to prevent sounding of the whistle. In this way, all sound which would otherwise be caused by surging of the liquid is substantially eliminated.

It should also be noted that the form of the blister 38 not only prevents the escape of gas therethrough during filling, since the liquid passing thereover acts as a seal, but also substantially eliminates any entrance of gasoline to the tank through breather slot 34. In this way, in spite of the breather slot, all the benefits of the deep fill are retained. It will be understood, of course, that there may be some slight dripping of liquid into the tank from breather slot 34 during filling, but such amounts will be negligible and cannot be considered as interfering in any way with the deep fill principle.

While the invention has been shown and described by reference to a preferred form of the invention, it is to be understood that it is not to be limited thereby but only by the appended claims.

I claim:

1. The combination of a tank, a fill pipe having a deep fill extension within said tank, a gas-operated audible signaling device having its gas receiving end positioned within and near the top of said tank and operable to give a distinctive sound during the filling of said tank as displaced gas flows through said device as the liquid level rises, said device operable to cause cessation of said distinctive sound to give an indication when the liquid has risen to a predetermined level, a vent pipe leading from said signaling device to a point in said fill pipe higher than the top of said tank, and a breather opening through said fill pipe at a point within and a substantial distance above the bottom of said tank, whereby, as liquid whose level is below the level of said opening surges in said tank, pressure in said tank and said vent pipe will differ an amount insufficient to cause normal sound producing movement of gas through said signaling device.

2. The combination set forth in claim 1, in which said breather opening is located in said fill pipe at a point above the half-filled level.

3. The combination set forth in claim 1, in which said breather opening faces in the direc-

tion of flow of entering liquid, whereby entering liquid will flow past said opening to enter said tank through said deep fill extension.

4. The combination set forth in claim 1, in which said breather opening is shielded from entering liquid by a member extending inwardly of said pipe, which member causes entering liquid to flow over and past said breather opening to prevent the escape of displaced gas through said opening during filling.

5. The combination set forth in claim 1, and means for substantially preventing the flow of entering liquid into said tank through said opening.

6. The combination set forth in claim 1, in which said pipe has been cut transversely, and that portion of the pipe on the outer side of said cut has been bent inwardly of said pipe, said opening bounded in part by the distorted edge of said cut.

7. The combination of a tank, fill pipe having a deep fill extension within said tank, a

gas operated audible signaling device positioned adjacent to the top of said tank and operable to give a distinctive sound during the filling of said tank as displaced gas flows through said device as the liquid level rises, said device comprising means for controlling the operation of said device to indicate through the auditory senses when the liquid has risen to a predetermined level, a vent pipe leading from said signaling device to a point in said fill pipe higher than the top of said tank, and a breather opening through said fill pipe at a point within and a substantial distance above the bottom of said tank whereby, as liquid whose level is below the level of said opening surges in said tank, pressure in said tank and said vent pipe will differ an amount insufficient to cause normal sound producing movement of gas through said signaling device.

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No references cited.