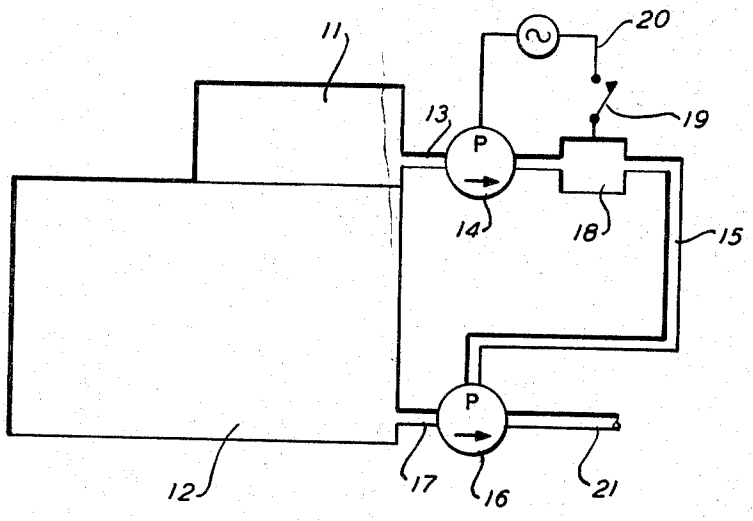
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ADDITIVE DELIVERY DEVICE

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ADDITIVE DELIVERY DEVICE

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Our invention relates to fuel oil additive systems generally and specifically to an additive delivery device adapted to periodically introduce metered quantities of a fuel oil additive into the truck pump from a fuel oil tank in response to hydraulic vacuum generated by the fuel oil delivery pump.

It is common practice to introduce various additives into combustible fuel oil before delivery to the consumer. These additives consist generally of cleansing solvents which remove sludge and other impurities from strainers and fuel oil nozzles, as well as high temperature combustion compounds which insure complete combustion of the fuel oil thereby eliminating soot. In addition, olfactory agents may also be introduced which tend to diminish the otherwise unpleasant odor of fuel oil. The precise identity of these individual additives vary from a fuel oil dealer to a fuel oil dealer, but are all well known in the trade.

Frequently, the additive is introduced into the large storage tank maintained by the fuel oil wholesaler. However, introduction of relatively large quantities of additives into extremely large quantities of fuel oil creates problems of even mixing. In addition, some of the additive may be rendered useless by addition to such large tanks where excessive amounts of pre-existing sludge may be found and, where the fuel is not used for a considerable period of time.

It is more advantageous to introduce the additive into the fuel oil either at the point of delivery or as close thereto as possible in precisely metered amounts, without adding the additive directly to the fuel oil tank.

Therefore, it is among the objects and advantages of our invention to provide an additive delivery device in which a fuel oil additive is introduced directly into the delivery stream of fuel oil emanating from a fuel oil storage or transportation tank.

Another object of our invention is to provide an additive delivery device in which an additive delivery pump connected to an additive tank injects an additive into the stream of fuel oil emanating from the fuel oil tank delivery pump in response to operation of the said fuel oil delivery pump.

Yet a further object of our invention is to provide an additive delivery device in which the additive delivery pump is intermittently energized by means of a vacuum switch in the conduit connecting the fuel oil delivery pump with the additive delivery pump.

Still another object of our invention is to provide an additive delivery device in which the flow of additive into the fuel oil delivery stream is continuously and precisely measured at all times.

A further object of our invention is to provide an additive delivery device which can be conveniently mounted on fuel oil delivery trucks as well as installed at fixed installations.

Still another object of our invention is to provide an additive delivery device in which the additive delivery pump may be energized by a power system separate and distinct from the power system energizing the fuel oil delivery pump.

These objects and advantages, as well as other objects and advantages may be achieved by our invention one embodiment of which is illustrated in the drawing in which:

The figure illustrates schematically our additive delivery device.

Referring to the drawings in detail, our additive delivery device comprises an additive storage tank **11** which may be fabricated of either metal or fiberglass. The additive storage tank **11** may be mounted on or in juxtaposition to a fuel oil storage tank **12**. In the case of a mobile truck, the additive tank **11** may be strapped directly to the main fuel oil storage tank or strapped to a frame member of the truck. In a fixed installation, the additive tank **11** may be attached to or placed generally in close proximity to the fuel storage tank **12**. A conduit **13** connects the additive storage tank **11** with an additive delivery pump **14**. The additive delivery pump **14** is connected through conduit **15** with the vacuum side of a fuel oil delivery pump **16**. The vacuum side of the fuel oil delivery pump **16** is also connected through conduit **17** to the fuel oil storage tank **12**.

A vacuum sensing switch **18** is positioned in conduit **15** between the additive delivery pump **14** and the fuel oil delivery pump **16**. The vacuum switch **18** is operatively connected to an electrical switch **19** located in the power circuit **20** to the additive delivery pump **14**. The fuel oil delivery pump **16** may be energized by a separate and distinct power circuit for, in the case of a fuel oil delivery truck, the pump **16** may be powered through a transmission by the engine of the truck.

In operation, the fuel oil delivery pump **16** may be energized to generate a vacuum in conduits **15** and **17**. Immediately, the vacuum switch **18** senses the vacuum in conduit **15** closing the electrical switch **19** in the power circuit **20** to the fuel oil additive pump **14**. The additive delivery pump **14** is thereby energized to deliver additive through conduit **15** to the fuel oil delivery pump **16** wherein it is infused in the stream of fuel oil passing from the fuel oil storage tank **12** through conduit **17**. The combination of fuel oil with additive infused therein passes through the discharge conduit **21** of pump **16** to the consumer.

The additive pump **14** carefully measures the amount of additive which passes through conduit **15** to be infused in the fuel oil stream **21**. Hence, the amount of additive delivered through conduit **15** is not necessarily directly proportional to the vacuum generated by pump **16**. This is extremely important since reduction valves would be necessary in conduit **15**; otherwise, excessively large quantities of additive would be drawn from the pump **14**, the vacuum in conduit **15** being of the same order of magnitude as the vacuum in line **17**. At the same time, pump **14** may be energized by a separate and distinct power system. This is very important on trucks where the fuel oil delivery pump **16** is driven by the engine of the truck. Obviously, it would be extremely difficult to extend this power train to pump **14**. Here, too, the operating speed of pump **14** should not necessarily bear a direct relationship to the operating speed of pump **16**.

The additive in tank **11** is mixed with the fuel oil from tank **12** immediately prior to discharge to the consumer **21**. Thus, the additive does not enter the storage tank **12** at any time and in the case of a fuel oil delivery truck, does not remain in a storage tank with the fuel oil at any time other than in the tank of the consumer.

While we have described our additive supply device with a vacuum switch **18**, it must be borne in mind that any means for detecting vacuum, flow or surge in conduit **15** could be substituted. When pump **16** is actuated, obviously, there is a surge of liquid in conduit **15** which surge itself could be employed to operatively close electrical switch **19**, thereby energizing pump **14**.

In any given installation, the delivery rate of the fuel oil pump **16** is substantially constant and, hence, the operating speed of the additive pump **14** need not be

variable. Moreover, although we have described the fuel oil additive pump **14** as being of the metering variety, other metering devices may be introduced to perform this function.

The foregoing description is merely intended to illustrate an embodiment of the invention. The component parts have been shown and described. They each may have substitutes which may perform a substantially similar function; such substitutes may be known as proper substitutes for the said components and may have actually been known or invented before the present invention; these substitutes are contemplated as being within the scope of the appended claims, although they are not specifically catalogued herein.

We claim:

1. An additive delivery device comprising:

(a) an additive tank;

(b) a fuel tank;

(c) an additive pump having an inlet and an outlet, the inlet communicating with the additive tank;

(d) a fuel pump having an inlet and an outlet, the inlet communicating with the fuel tank;

(e) a conduit connecting the outlet of the additive pump with the inlet of the fuel pump;

(f) a power source operatively connected to the additive pump the said power source being independent of both the operating pressure and speed of the fuel pump;

(g) means in the said conduit for detecting suction at the inlet of the fuel pump, said means being operatively connected to the power source for the additive pump whereby the additive pump is energized when the fuel pump generates suction at its inlet.

2. An additive delivery device comprising:

(a) the structure in accordance with claim **1**, wherein

(b) the additive pump and the fuel pump have different sources of power.

3. An additive delivery device comprising:

(a) the structure in accordance with claim **1**, in which

(b) the detection means are a vacuum operated electrical switch operatively connected to the power source of the additive pump.

4. An additive delivery device comprising:

(a) the structure in accordance with claim **1**, in which

(b) the detection means are a surge operated electrical switch operatively connected to the power source of the additive pump.

5. An additive delivery device comprising:

(a) the structure in accordance with claim **1**, in which,

(b) the additive delivery pump blocks the flow of additive from and against pressure from the additive tank until the said additive pump is energized.

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