

Service Station Patents Part 2

Wolf H. Koch, Ph.D. examines recent patents for mobile fueling stations, POS systems, flexible piping, vapor recovery systems, and 18 UST systems—to name a few.

Spirit of Innovation

Part I of this year's two-part series on service station patents listed 69 patents on aboveground systems (March/April issue). The following article covers underground systems and several remaining aboveground topics. It includes more than 50 patents.



improvement, with no technology “show stoppers.” In the station design category, several companies have protected various aspects of mobile fueling stations. This is a new concept for the domestic market, but one that has been offered commercially by a number of West and East European vendors for several years.

Station Design

Four patents illustrate designs for storage tanks: Elliott (US 5,495,695) and Brodie (US 5,400,924) show vaulted underground and aboveground tanks; and Moore (US 5,526,964) and Fiech (US 5,586,586) describe integrated tank and dispenser modules. Five patents cover portable station design. Villancourt (US 5,573,066) has designed a remote filling station for hazardous locations, such as mines, which incorporate the necessary safety devices. Webb (US 5,562,162) and Weimann (WO 9 530 564) have patented portable facilities for remote fleet fueling sites, while Yonder (WO 9 629 244) has taken the concept one step further and designed a mobile fueling trailer.

Although the portable station design by Makel (US 5,586,050 and WO 9 605 050) is shown as an LNG station, the design incorporates a secure communications link for sales authorization through an automated point-of-sales (POS) system. **Figure 1**, which shows one of the five designs, is typical of all five patents. **Figure 2** illustrates the automated POS system described by Makel.

While Figures 1 and 2 show typical features of the patented mobile fueling facilities, one needs to remember that their emphasis is on fleet fueling at remote locations. On the other hand, European offerings in this area, which have focused on designs for retail, are aesthetically pleasing and provide additional customer amenities.

Figure 1: (US 5,562,162) Typical Portable Fueling Facility. 



Figure 2: (US 5,586,050) Portable Station Control Panel.

Hose Systems

This category includes patents on hose construction, couplings, breakaways and swivels as well as one patent describing a special tool for reconnecting breakaways (US 5,566,438). Seven of the 12 patents cover Dayco products. While one does not associate this category with sophisticated engineering designs, it should be noted, the coaxial fittings for vapor recovery systems have a high degree of complexity. For example, **Figure 3** shows a Richards (US 5,570,719) breakaway swivel to be used between vapor recovery nozzles and hoses. **Figure 4** illustrates the complexity of design needed to do vapor and liquid shutoff during breakaway, combined with swivel capability during normal operations.



Figure 3: (US 5,570,719) Typical Swivel Breakaway.



Figure 4: (US 5,570,719) Swivel Breakaway Detail.

Secondary Containment

Seven of the eight patents in this category feature flexible piping systems, while the last patent describes leak-resistant plastic fittings. Our 1995 patent review (July/August 1996 issue) featured double-wall rigid and flexible piping. While 1996 patents highlight unique features in materials and methods of construction, the products they describe are not revolutionary—but they do provide additional choices to the user.

Underground Tank Systems

The 18 patents in this grouping represent a wide variety of topics, including submersible pumps with variable length pipes and corrosion control via anodes. Several patents describe overfill spill protection, overfill protection testing, fill tube flow restrictors and shutoff valves. Hydrocarbon/water separators are featured in two patents. Miscellaneous technologies include venting tanks with purge gas and preventing air infiltration into product lines. The latter is covered by two Marley Pump patents (US 5,490,544 and WO 9 603 317).

Product lines are generally protected from overpressurization due to thermal expansion of product by a relief valve. However, when product cools at night, especially during system-dormant periods, product shrinkage and air infiltration may occur. During subsequent operations, air in the product line may simulate an apparent leak; this may result in a shutdown during the line leak test. This problem is circumvented by maintaining a small product reservoir with a siphon to make up volume shrinkage in the product line.

Terminal Operations

Terminal operations center around tanker trucks and Stage I operations. A terminal refrigeration vapor recovery system is described in one patent. Overfill protection systems for tank trucks are shown in two patents—one of them is similar to a system for underground tanks. Together with a tank truck identification and verification system, and a design patent for a tank truck warning panel, these four Scully Signal Company patents (US 5,485,401; 5,507,326; 5,534,856 and D 371,752) describe a fully integrated approach to product loading and delivery.

Patent Overview

Table 1 (see below) completes the list of 1996 service station patents. Accolades go to Dayco Products for achieving ten patents. OPW (Dover) and Scully Signal each received four patents. Where inventions received European or World patents in addition to a US patent, the US patent is shown first.

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