



# 1996

Station Design

Hose Systems

Secondary  
Containment

Underground  
Systems

Terminal  
Operations

by Wolf H. Koch, Ph.D.

# Service Station Patents

Part 2

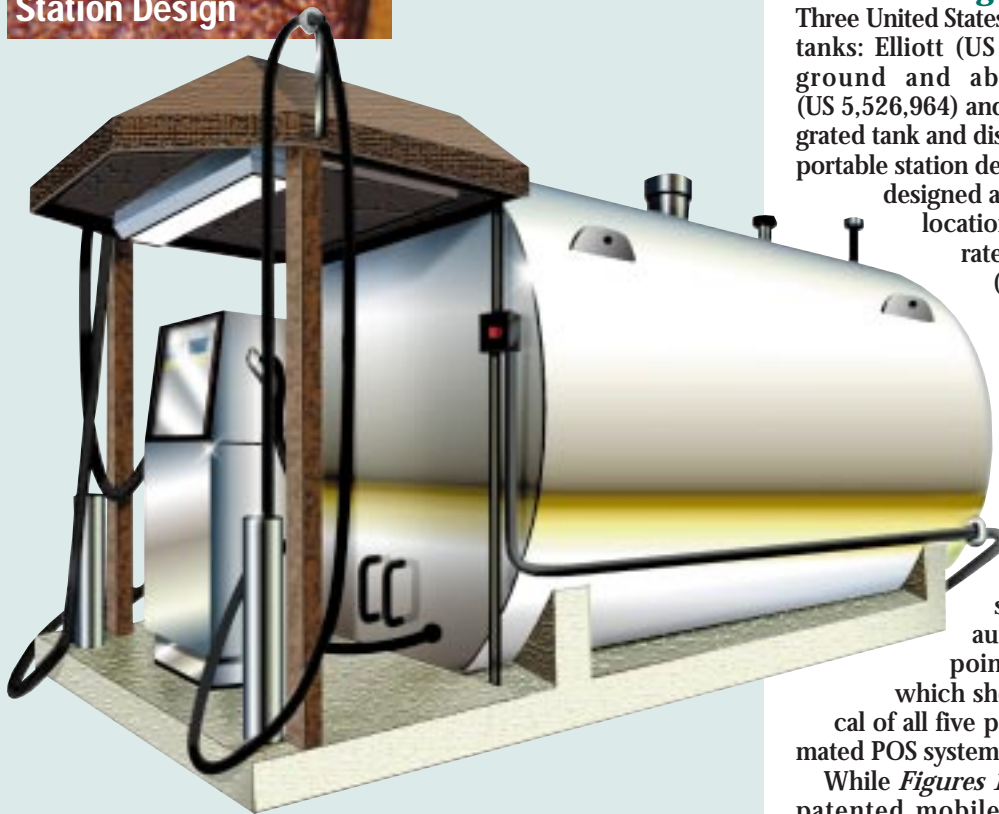
## Spirit of Innovation



**Editor's Note:** 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.

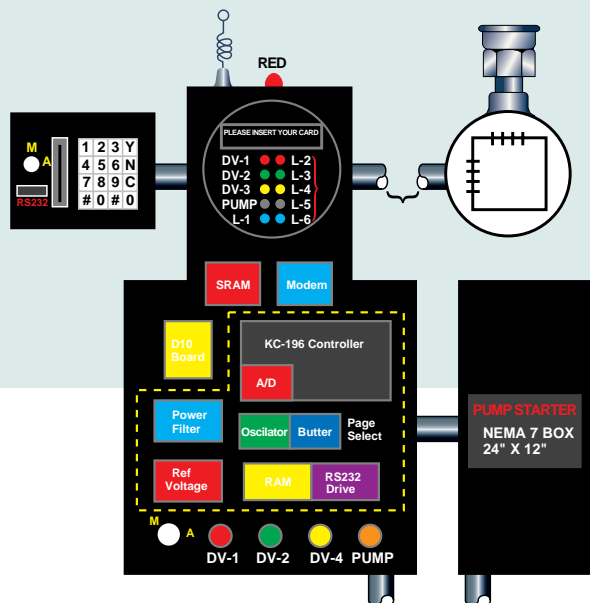
**M**ost 1996 patents reflect continued product improvement, with no technology "show stoppers." In the station design category, several companies have protected various aspects of mobile fueling stations. This is a new concept for the domestic market, but one that has been offered commercially by a number of West and East European vendors for several years.

## Station Design



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

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



## Station Design

Three United States patents illustrate designs for storage tanks: Elliott (US 5,495,695) shows 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.

## 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.

## 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.

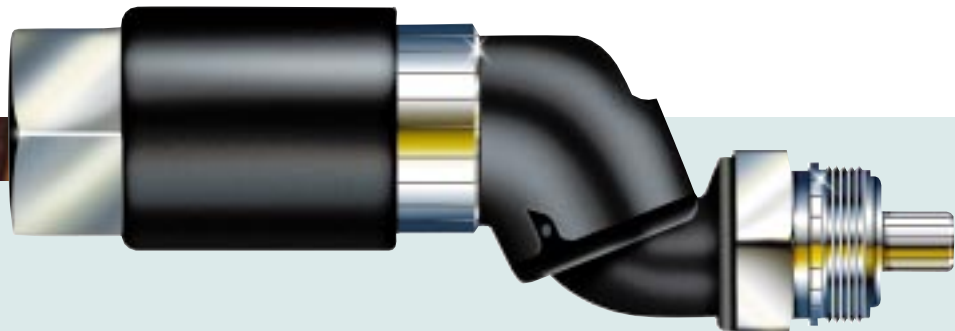
## Patent Overview

Table 1 (see pages 44 and 45) 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. ☐

**Wolf Koch** is President and founder of Technology Resources International, Inc. in Batavia, Illinois. He provides services in technology planning, product development and testing and litigation support. He is an expert in retail service station technology, product distribution and natural gas vehicles and associated fueling systems.

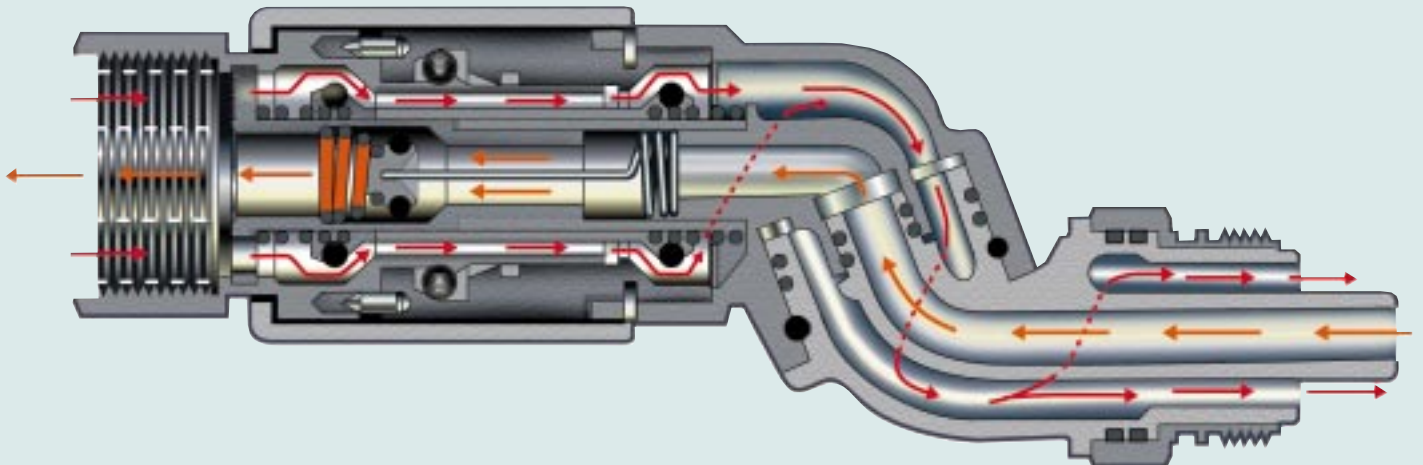
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## Hose Systems



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

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



## 1996 Patent Overview Table

### Station Design

US 5 495 695	Thomas Elliott Dalworth Concrete Products, Inc.	Vaulted underground storage tank
US 5 526 964	Bobby Moore, et. al. Unassigned	Fuel dispensing system, integrating underground tank and dispenser
US 5 562 162	R. Michael Webb U-Fuel, Inc.	Portable fueling facility
US 5 573 066	Greg Vaillancourt, et. al. Valcom Mechanical Limited	A remote fueling station designed for fueling of equipment in potentially hazardous locations
US 5 586 050 WO 9 605 561	Darby Makel, et. al. Aerojet General Corp.	Remotely controllable LNG field station management system
US 5 586 586	Manfred M. Fiech Unassigned	Unitized fuel storage system
WO 9 530 564	Gerd Weimann Rhein-Ruhr Maschinebau GmbH.	Modular filling station
WO 9 629 244	Mark Youden BP Australia Ltd.	Mobile refueling unit

### Hose Systems

EP 0 694 141	James W. Healy Healy Systems Inc.	Fuel dispensing hose breakaway assembly
US 5 456 784	Bobby J. Cogdill, et. al. Dayco Products, Inc.	Hose construction and manufacturing method
US 5 462 090	Jeffrey J. Winter, et. al. Dayco Products, Inc.	Flexible hose construction having an inner corrugated hose made of polymeric material
US 5 486 023	John D. Sanders, et. al. Dayco Products, Inc.	Hose construction and coupling
US 5 487 570	Samuel L. Wilson Dayco Products, Inc.	Hose assembly, coupling and parts
US 5 497 810	Jeffrey M. Berger, et. al. Dayco Products, Inc.	Hose assembly
US 5 513 681	John Sanders, et. al. Dayco Products, Inc.	Fuel dispensing hose assembly
US 5 529 085	Alton Richards, et. al. Richards Industries, Inc.	Breakaway hose coupling
US 5 564 471	Paul Wilder, et. al. Dover Corporation	Fuel hose breakaway unit
US 5 566 438	Rothel Bullock Unassigned	Tool for reconnecting a fuel hose safety break-away
US 5 570 719	Alton Richards, et. al. Richards Industries, Inc.	Breakaway hose coupling
US 5 573 283	Randall E. Sellers, et. al. Dayco Products, Inc.	Branched hose construction

### Secondary Containment

US 5 478 171	Joseph V. Tassone, et. al. Dayco Products, Inc.	System for conveying a fluid through an underground location
US 5 490 419	Michael Webb Total Containment, Inc.	Secondary containment system using flexible piping
US 5 494 374	Andrew Youngs, et. al. Unassigned	Secondary containment flexible underground piping system
US 5 529 098	Sergio Bravo Unassigned	Gasoline containment systems with leak-resistant fittings

## Underground Systems

US 5 553 971	Keith J. Osborne Intelpro Corporation	Double-containment underground piping system
US 5 558 464	Joseph V. Tassone Dayco Products, Inc.	System for conveying fluid through an underground location
US 5 567 083	Keith J. Osborne Intelpro Corporation	Double-containment underground piping system
US 5 580 186	Joseph V. Tassone Dayco Products, Inc.	System for conveying fluid through an underground location
EP 0 728 679	Erwin Bald Unassigned	Access shaft (sump) for an underground tank
EP 0 748 976	Jean-Claude Dupouy, et. al. Total Raffinage Dist.	Pipeline system for filling an underground fuel storage tank and for delivering fuel to a dispensing installation
US 5 490 544 WO 9 603 317	Russell Broline Marley Pump Co.	Method and apparatus for inhibiting air infiltration into fuel dispensing lines
US 5 496 469	Charles Scraggs Unassigned	Apparatus for reducing and separating emulsions and homogeneous components from contaminated water
US 5 498 331	Joseph Monteith Ontario Limited	Water - Hydrocarbon separator
US 5 505 826	Patrick Haglin, et. al. Unassigned	Hydrophilic anode corrosion control system
US 5 507 326	Gary R. Cadman, et. al. Scully Signal Company	Fluid overflow protection and product identification system
US 5 511 898	Martin C. Pettesch, et. al. Universal Valve Co., Inc.	Moveable manhole cover
US 5 513 680	Henry T. Hilliard, Jr., et. al. Unassigned	Portable apparatus and method for venting a storage vessel
US 5 518 024	Francis B. Weeks, et. al. Emco Wheaton Inc.	Overflow prevention device for storage tanks
US 5 544 974	Robin Berg, et. al. Xerxes Corporation	System for underground storage and delivery of liquid product, and recovery of leakage
US 5 550 532	Glen Marshall Shell Oil Co.	Method and device for containing fuel spills and leaks
US 5 557 965	Bradley T. Fiechtner Dover Corporation	Pipeline leak detector
US 5 564 464	David R. Pendleton, et. al. Dover Corporation	Storage tank shut-off valve
US 5 564 465	Martin Pettesch Universal Valve Co., Inc.	Fill restricting drop tube
US 5 577 895	Charles Franklin, et. al. FE Petro Inc.	Submerged pump unit having a variable length pipe assembly.
WO 9 636 832	Robert Roberts Emco Wheaton DTM. Inc.	Dry disconnect coupling including means for returning fluid residue to flow path

## Terminal Operations

US D 371 752	Frank V. Stemporzewski, Jr. Scully Signal Company	Warning indicator panel for fuel tankers
US 5 485 401	Gary Cadman Scully Signal Company	Method and apparatus for testing overflow protection devices
US 5 515 890	Robert C. Koeninger Dover Corporation	Control system for filling tanks with liquids
US 5 534 856	Gary R. Cadman Scully Signal Company	Tank truck identification and verification system
US 5 566 555	Paul Hewitt Unassigned	Vapor recovery system with refrigeration and regeneration