

A look at pertinent patents for dispensers, point-of-sale systems and dispensing nozzles

1995: the patented truth

by Wolf H. Koch, Ph.D.

For 1995, I don't see any real technology show-stoppers. Most of the patents obtained represent continuous improvements of technology already implemented or previously protected. A number of them represent interesting changes and potential improvements to today's equipment.

The issuance of a patent does not mean the invention has been turned into a product. The roadblocks to commercialization are many. These roadblocks include the fact that certification and/or listing by the various safety, consumer and environmental agencies may take several years – especially for products that represent a new methodology for which test and certification procedures need to be developed.

A summary of 1995 inventions would be incomplete without a highlight of at least several of the major innovations.

Technical highlights

Patent: Manfred Köpl; et. al., assigned to *Tankanlagen Salskotten GmbH*, US 5 447 062.

Abstract: A fuel metering system that uses two inter-engaging screw spindles within a rotor housing.

Description: It represents a departure from the positive displacement meters which are generally in use. The patent claims reduced flow restrictions and simplified manufacturing. The flow restriction improvements result from a rectilinear flow path; a reduction in structural parts simplifies the manufacturing.

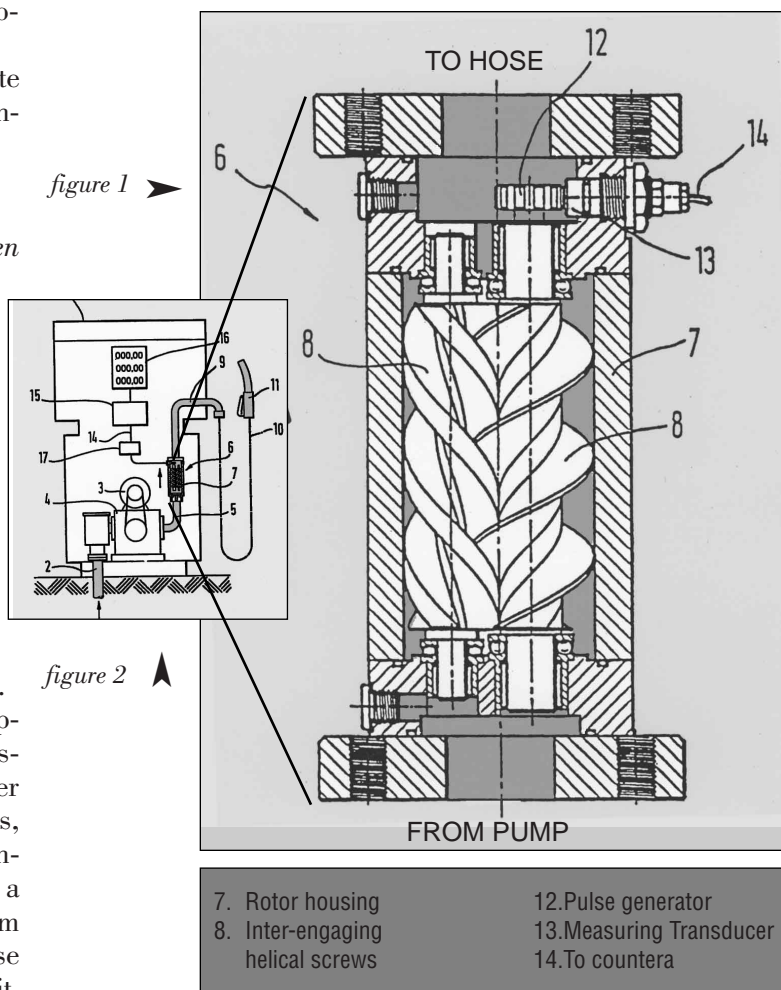
Background: Current gasoline meters are quite bulky. Reducing the meter size can lead to smaller dispensers, increasing visibility across the forecourt.

Design: *Figure 1* shows the meter integrated into a typical suction pump dispenser. (Use in submersible systems is, of course, possible.) Details of the actual meter are shown in *Figure 2*. Based on the patent drawings, miniaturization of the meter (compared to existing technology) should be feasible. The meter consists of a housing that contains at least two rotary helical worm spindles. When the spindles mate, an electrical pulse is generated and transmitted to a signal processing unit.

Patent: Seifoliah S. Nanaji; et. al., assigned to *Gilbarco, Inc.*, US 5 464 466.

Abstract: A fuel storage tank vent filter system using membrane technology.

Description: Gilbarco addressed concerns over potential fugitive emissions, resulting from a situation in which assisted vapor recovery systems pressurize underground tanks, with the use of a membrane for hydrocarbon vapor permeation. While membrane devices have been used to control emissions from gasoline tank farms, the specific application to prevent UST over-



pressurization is new. The membrane apparatus can be retrofitted to existing tank systems, and should provide an effective means of significantly reducing VOC vent emissions.

Background: The California Air Resources Board (CARB) has projected that there will be more service station fugitive emissions from the interaction of the current assisted Stage 2 systems and vehicles equipped with on-board refueling vapor recovery (ORVR) canisters. Membrane processors are one of several ways to eliminate these emissions.

Design: Figure 3 shows the membrane processor as part of the station vent system. Figure 4 displays details of the system. When underground tank pressure increases, a pump starts pulling excess vapors through the membrane. Air will diffuse, and hydrocarbons will be returned to the tank.

Patent: Charles H. Covert; et. al., assigned to *General Motors*' vehicle ORVR, US 5 462 100.

Abstract: ORVR vehicle vapor recovery system with differential pressure control valve.

Description: This patent illustrates a method of meeting vehicle on-board refueling vapor recovery (ORVR).

Background: The EPA has mandated ORVR systems for automobiles beginning with the 1997 model year.

Design: Figure 5 shows a typical vehicle tank system with two carbon canisters for vapor absorption. One larger canister would also do the job. As fuel is dispensed through the fill pipe, a liquid seal is established at the anti spit-back ball, which increases the internal tank pressure. The differential pressure valve opens, allowing vapors into the carbon canisters where they will be absorbed. When the car is being driven, the engine vacuum will purge the canisters. There is also an alternative configuration – a j-trap, in addition to the ball – to provide the liquid seal. CARB is currently testing a configuration that seals by reducing the diameter of the fill pipe. By sealing the fill pipe with the dispensed gasoline, refueling hydrocarbon vapors will remain in the vehicle; and the assisted State 2 vapor recovery systems will be returning air to the underground. This air will grow in volume as it saturates with hydrocarbons, causing the problem addressed by the Gilbarco membrane processor.

Patent: Joshua E. Rabinovich; unassigned, US 5 392 824 and US 5 435 356.

Abstract: Two *Rabinovich* patents, covering additional features of gasoline-driven vapor pumps integrated into a dispensing nozzle (supplementing Rabinovich's 1994 patent).

Description: If the nozzle design can overcome the regulatory and certification hurdles and be cost-effective, *Rabinovich's* inventions can greatly simplify the conversion of balance systems to assisted vapor recovery. The integration of vapor pump and nozzle is certainly innovative, and should lead to reduced installation costs. The patents claim a constant vacuum level at the fill pipe, resulting in improved efficiency for the vapor recovery process.

Design: Figure 6 shows the shape of the nozzle, and Figure 7 provides internal details. Compared to conventional vapor recovery nozzles, the area around the spout mount is enlarged. It

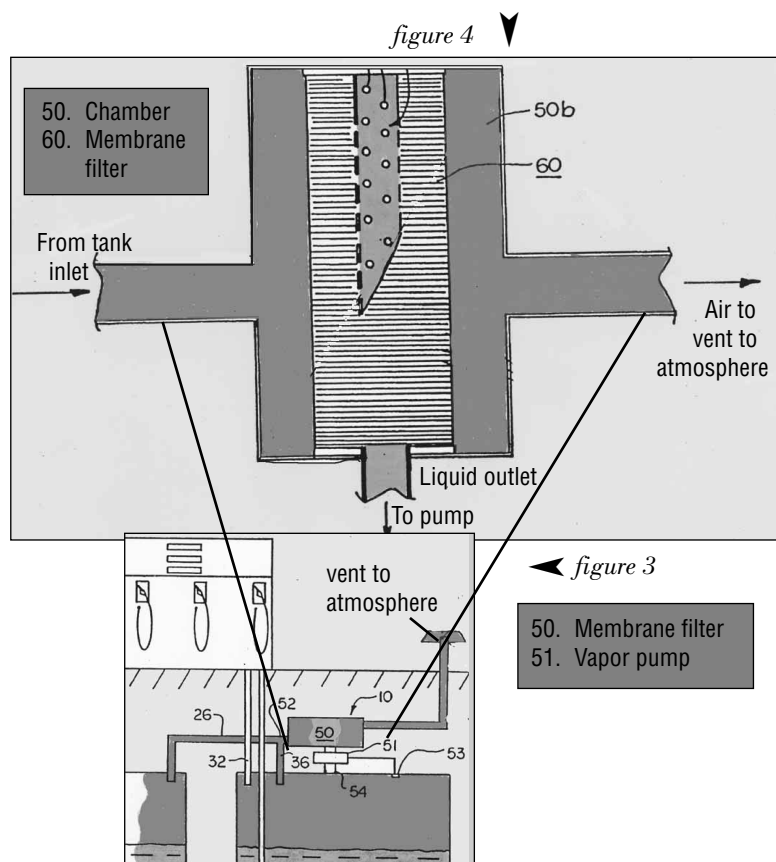
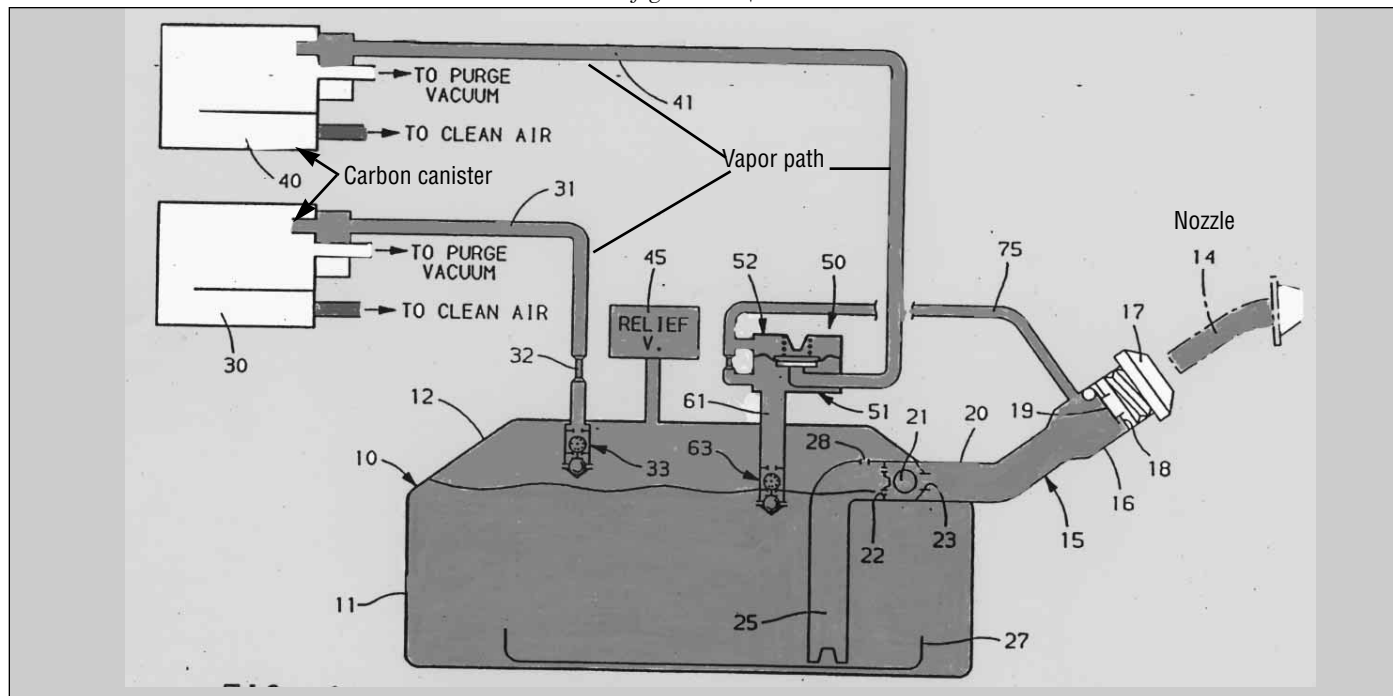


figure 5 ▼



houses the liquid-driven turbine motor that drives the vapor pump. Currently, it is costly to change balance systems to assist vapor recovery to allow for the use of bootless nozzles. Vapor pumps must be installed in the dispenser along with extensive repiping of the vapor passages. The *Rabinovich* nozzle has the potential to greatly simplify the task: only the dispensing nozzle needs changing.

Other relevant 1995 patents

- A patent was awarded for a novel hose retraction device intended to protect the dispensing hoses of the low profile, multiproduct dispensers used in Europe. (Gert Miller; et. al., assigned to *Scheidt & Bachmann GmbH*, EP 640 557)
- A patent was received for a manually activated vapor check valve located in the gasoline dispenser. The valve, near the nozzle boot, is closed by mechanical linkage when the nozzle is hung. (Paul D. Miller; et. al., assigned to *Gilbarco, Inc.*, US 5 452 750)
- Two independent patents were issued for devices intended to prevent the release of fuel during filter changing. One is a filter valve that closes as the filter is removed. The second is a dispenser collector pan to catch the released fuel and a drain

to aid in disposal. (Michael R. Lessley; et. al., US 5 390 701 and Peter L. Vlaskamp, US 5 429 274)

- Two patents were awarded covering the security encryption of customer information for the retail environment. (William S. Johnson; et. al., US 5 384 850 and US 5 448 638, both assigned to *Gilbarco, Inc.*)
- A system was patented for equipment that converts electronic customer and transactional information into bar-code information. (S. Yoshinaga, assigned to *Fujitsu, Ltd.*, EP 681 248)
- A system to control and recover vapors during transport loading operations was awarded a patent. (Alistair A. Tees; et. al., assigned to *Fina Technology, Inc.*, US 5 429 159)
- Two patents for Stage II vapor recovery systems were awarded, the first for a centralized vacuum assist system and controls, and the second for measuring the performance of vacuum assist pumps and adjusting their output. (H.C. Hartsell; et. al., US 5 417 256 and Edward A. Paynes; et. al., US 5 450 883, both assigned to *Gilbarco, Inc.*)
- Two patents were awarded to one inventor for devices for measuring the efficiency of Stage II va-



por systems. The first measures the volumetric efficiency at the nozzle/vehicle interface, and the second one measures the efficiency of the system installation. (Sylvain Janssen; et. al., US 5 437 183 and US 5 465 606, both assigned to *Schlumberger Industries*)

- Four patents were awarded to various inventors and assigned to *Emco Wheaton, Inc.* for vacuum assisted Stage II vapor recovery nozzles and enhancements.
- Two for multi-compartmented nozzle spouts (Chik-Kun Shik; et. al., US 5 450 884 and Kenneth W. Dotson; et. al., US 5 379 811)
- A magnetic device that controls the proportion of liquid delivered to vapor returned. (Walter H. Schneider; US 5 417 259)
- A new type of bootless vapor recovery nozzle (David J. Parrish; et. al, US 5 390 712)
- Patents were awarded to two inventors and assigned to OPW (*Dover Corporation*).
 - The first is for an improved balance system nozzle and sub-assemblies. (Donald L. Leininger; et. al, US 5 421 382)
 - The second is for a vacuum assist nozzle with an improved “slurpee” function. The slurpee function removes liquid from the vapor path using a vacuum created by the flow of fuel. (Robert L. Woods, et. al., US 5 435 357)

- A patent was awarded for a check valve, mounted at the Stage II delivery nozzle spout to prevent dripping of fuel when fuel is not flowing. (Alan J. Reep, US 5 377 729)
- A World Patent was issued for a locking dispensing nozzle for pressurized liquids such as LPG. Gorgas (Australia) PTY, Limited, WO 95/02554

This is the first of a two-part review of patents issued in 1995 for dispensers and components, point-of-sales systems, vapor recovery and dispensing nozzles. A future article will cover new technology in product tanks, secondary containment, leak detection and construction methods. *PE&T* will provide information on other new, relevant patents on an ongoing basis.

In his search of available data bases for U.S., European and world patents covering petroleum-equipment related topics, Dr. Koch has located a number of patents issued by individual countries; however, they have not been included in this article because of their availability and language problems. Should you find any omissions of U.S. patents, other than those issued in late December, please call or write PE&T headquarters. 1995 patents from late December will be included in future updates.

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.

Circle Reader Inquiry 35

figure 6 ▼

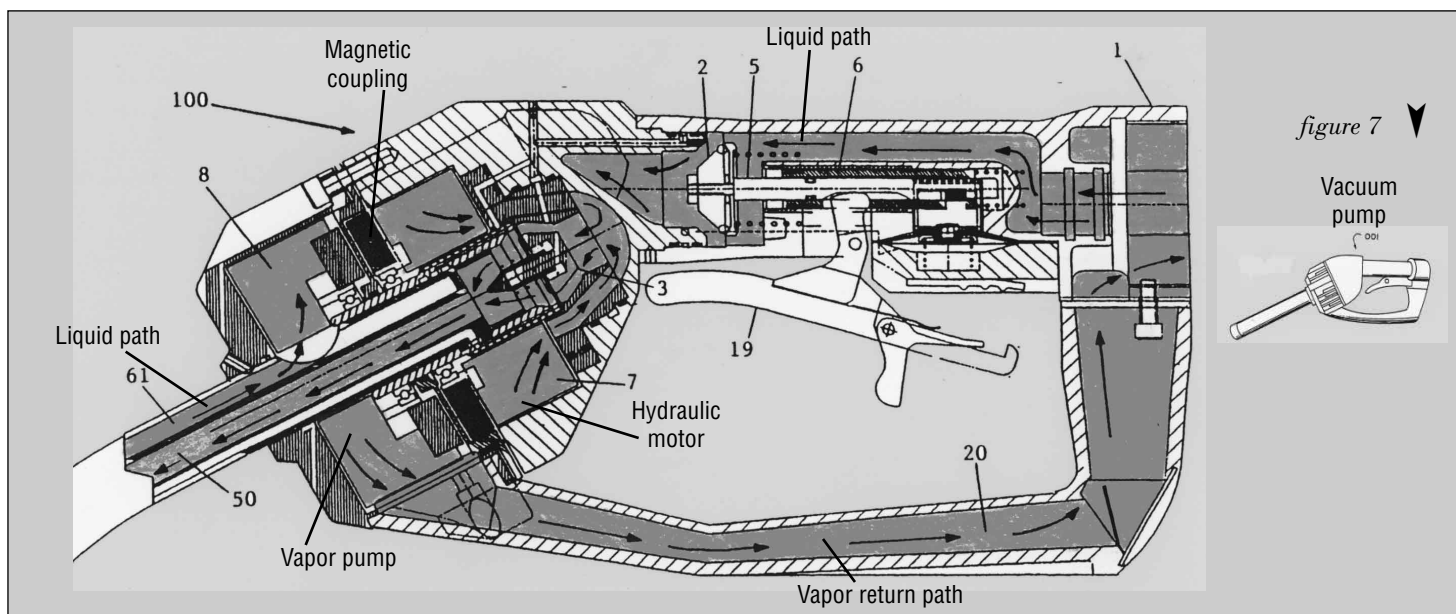


figure 7 ▼

Vacuum pump

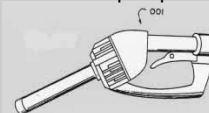


Table 1 — 1995 Patent Review

Dispensers & Components

EP 640 557	MILLER, GERT; et. al. SCHEIDT & BACHMANN GmbH	A novel retracting hose mount with all hoses in a multi-product dispenser mounted on a common counter-balanced retractor mechanism.
US 5 390 701	LESSLEY, MICHAEL R.; et. al, UNASSIGNED	Filter valve assembly for retail gasoline dispensers limiting product loss during filter change.
US 5 429 274	VLASKAMP, PETER L. UNASSIGNED	Dispenser collector pan with drain to prevent product spillage.
US 5 447 062	KÖPEL, MANFRED; et. al, TANKANLAGEN SALZKOTTEN GmbH	Fuel metering system uses 2 interengaging screw spindles within rotor housing.
US 5 452 750	MILLER, PAUL D.; et. al, GILBARCO, INC.	Manually activated vapor valve for gasoline dispensers.

Point-of-Sale Technology

US 5 384 850	JOHNSON, WILLIAM S.; et.al. GILBARCO, INC.	Security system for retail environments using PIN encryption.
US 5 448 638	JOHNSON, WILLIAM S.; et.al. GILBARCO, INC.	Security system for retail environments using PIN encryption.
EP 681 248	YOSHINAGA, S. FUJITSU LTD.	Equipment for converting customer and transaction information into bar-code information.

Vapor Recovery Technology

Stage 1

US 5 429 159	TEES ALISTAIR A.; et. al. FINA TECHNOLOGY, INC.	Stage 1 vapor recovery system for vehicle loading operation.
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Stage 2

US 5 417 256	HARTSELL, H. C.; et. al. GILBARCO, INC.	Centralized vacuum assist vapor recovery for fuel dispensing with controller and fuel and vapor flow sensors for operating valves.
EP 653 376	FINLAYSON, I. M. DRESSER INDUSTRIES	Fuel dispensing system monitoring vapor recovery and fuel vapor-to-air ratios.
US 5 437183	JANSSEN, SYLVAIN; et. al. SCHLUMBERGER INDUSTRIES	Method for measuring the volumetric efficiency of vapor recovery systems.
US 5 450 883	PAYNE, EDWARD A; et. al. GILBARCO, INC.	Method for testing for error conditions in a vapor recovery system.
US 5 464 466	NANAJI, SEIFOLLAH S.; et. al. GILBARCO, INC.	Fuel storage tank vent filter system using membrane technology.
US 5 465 606	JANSSEN, SYLVAIN; et. al. SCHLUMBERGER INDUSTRIES	System for measuring the efficiency of vapor recovery installations.
Vehicle ORVR		
US 5 462 100	COVERT, CHARLES H.; et.al. GENERAL MOTORS CORP.	ORVR vehicle vapor recovery system with differential pressure control valve.

Nozzles

WO 9 502 554	FRY, DAVID; et. al GOGAS (AUSTRALIA) PTY. LTD.	Fluid dispensing nozzle for liquid petroleum gas (LPG).
US 5 379 811	DOTSON, KENNETH W.;et. al. EMCO WHEATON, INC.	Vapor recovery dispensing nozzle.
US 5 390 712	PARRISH, DAVID J.; et. al. EMCO WHEATON, INC.	Fuel dispensing and vapor recovery nozzle.
US 5 392 824	RABINOVICH, JOSHUA E. UNASSIGNED	Vapor recovery nozzle with automatic shut-off system and integrated vapor pump.
US 5 435 356	RABINOVICH, JOSHUA E. UNASSIGNED	Vapor recovery nozzle with integrated vapor pump.
US 5 435 357	WOODS, ROBERT L.; et. al. DOVER CORP.	Vapor recover fuel nozzle systems providing an improved slurpee function.
US 5 417 259	SCHNEIDER, WALTER H. EMCO WHEATON, INC.	Fuel dispensing nozzle with vapor recovery controlled by proportioning valve.
US 5 421 382	LEININGER, DONALD L.; et. al. DOVER CORP.	Balance vapor recovery nozzles and sub-assemblies.
US 5 450 884	SHIK, CHIK-KUN; et. al. EMCO WHEATON, INC.	Multi-compartment spout for fuel dispensing nozzle.

Associated Equipment

US 5 377 729 UNASSIGNED	REEP, ALAN J.	Check valve for a nozzle, spouts to prevent spillage when fuel is not flowing.
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