United States Patent [19]

Haynes

[11] **3,725,895**

[45] **Apr. 3, 1973**

[54] STOLEN ARTICLE DETECTION

[76] Inventor: **Lawrence B. Haynes,** 1205 Kershaw Drive, Raleigh, N.C. 27609

[22] Filed: **July 13, 1972**

[21] Appl. No.: **271,437**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 98,990, Dec. 17, 1970, abandoned.

[52] **U.S. Cl.** .....**340/280,** 73/23, 340/237 R, 340/258 R

[51] **Int. Cl.** **G08b 13/00**

[58] **Field of Search** 340/280, 237, 258; 116/67, 116/83; 73/23, 23.1, 40.7

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Primary Examiner—John W. Caldwell
Assistant Examiner—Scott F. Partridge
Attorney—David H. Semmes

[57] **ABSTRACT**

A method and system for detecting stolen articles such as by shoplifting. Articles in a store and the like are sprayed with a non-toxic, humanly undetectable aerosol which is subject, being highly aromatic in nature, to detection by a sensing device. In removing the treated article a detection area or zone from the store must be passed and if unauthorized or unapproved removal of the article is attempted an indicator or alarm is activated by detection of the aerosol, resulting in apprehension of the article carrier. If the article is paid for or removal from the premises is otherwise authorized, then when passing through an authorizing area such as a checkout counter, the sensible odor can be neutralized or rendered passive or an additional neutralizing agent or means can be applied to the article, either method of which will serve to prevent activation of the detection device.

11 Claims, 6 Drawing Figures

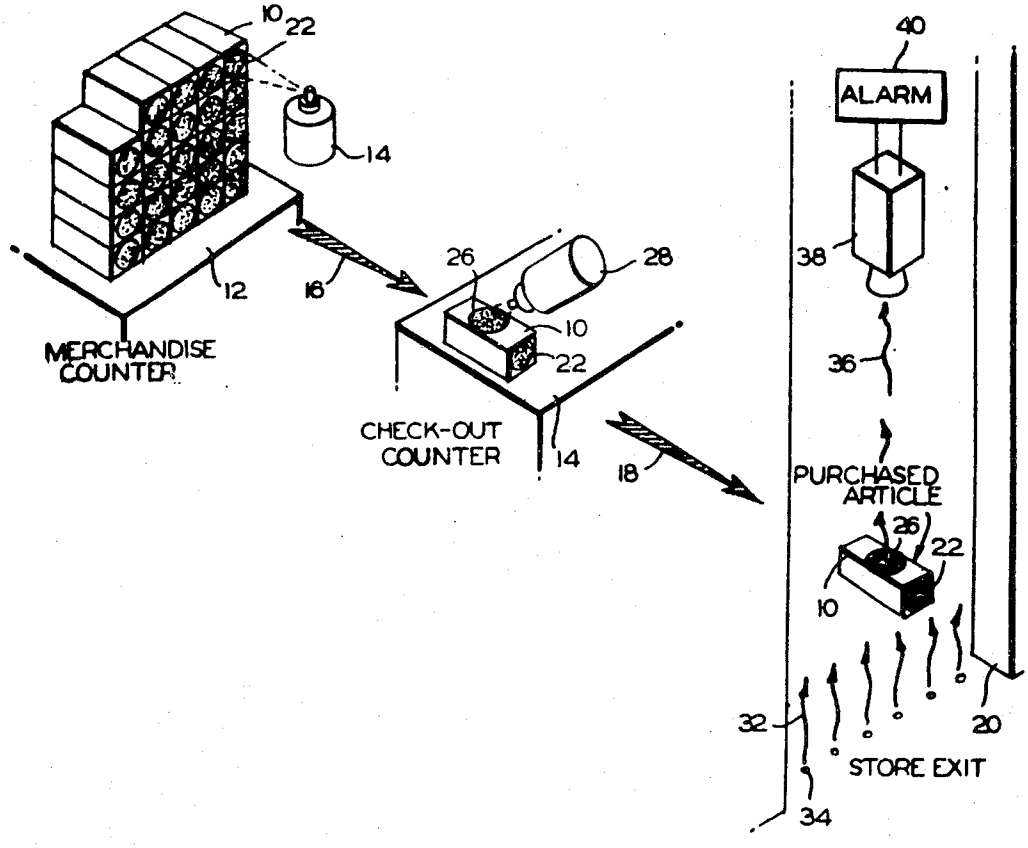


Fig 1.

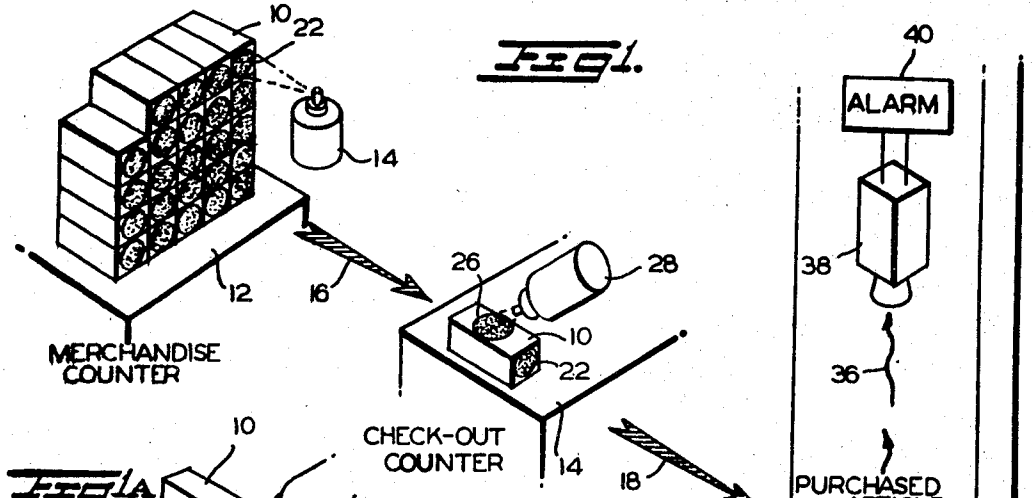


Fig 1A

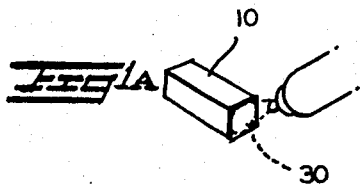
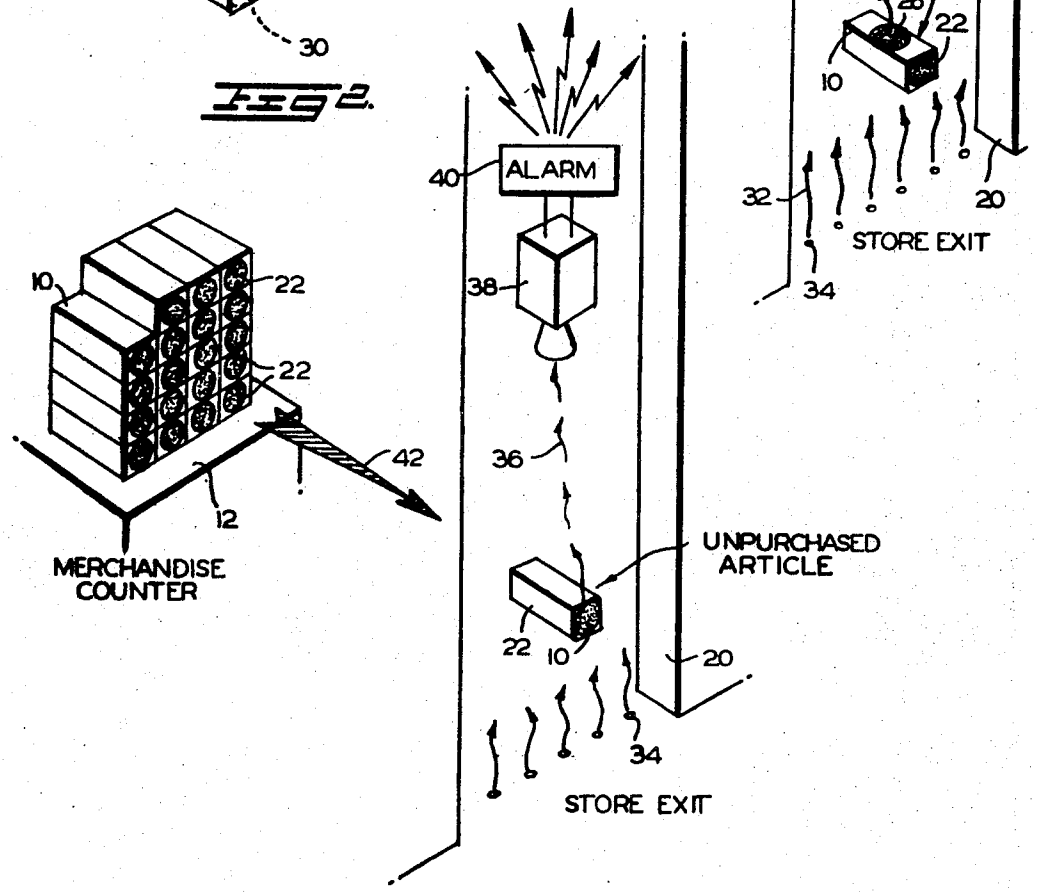


Fig 2.



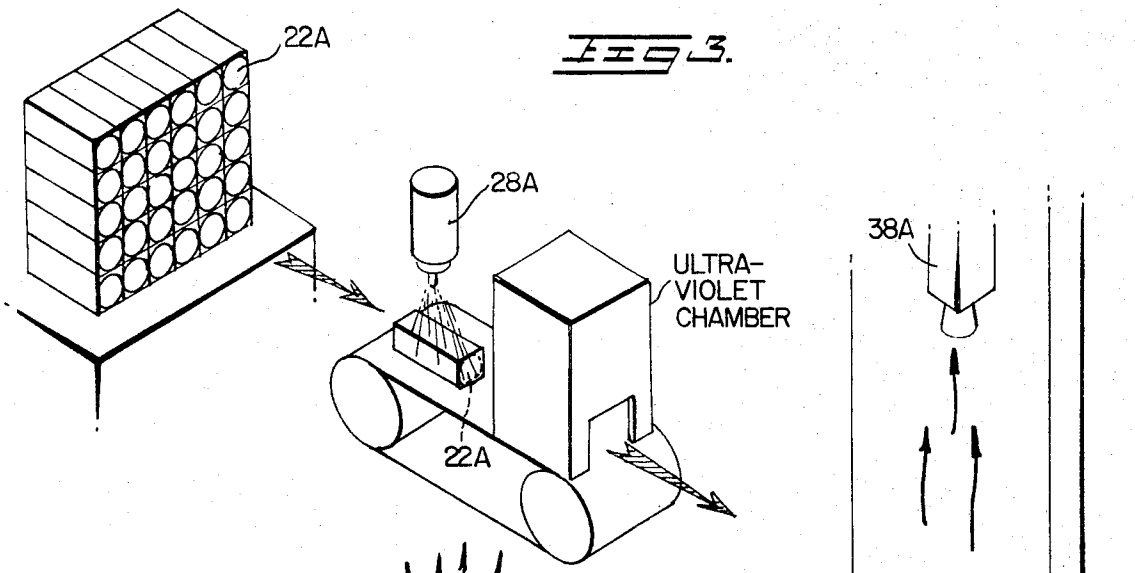


Fig 3.

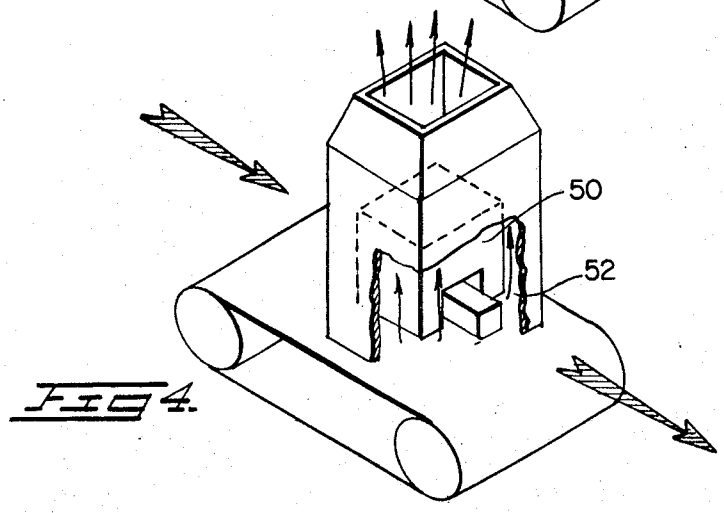


Fig 4.

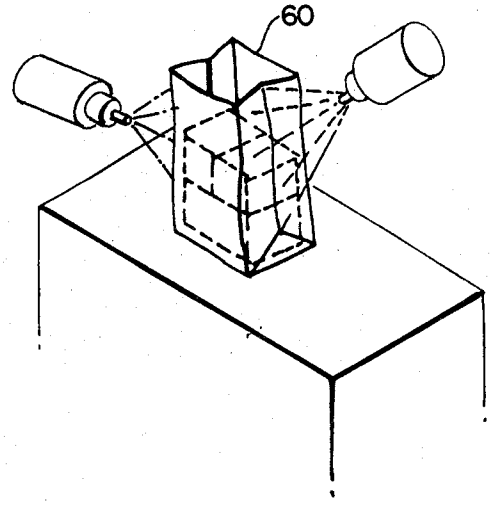


Fig 5.

STOLEN ARTICLE DETECTION

This application is a continuation-in-part of application Ser. No. 98,990, filed Dec. 17, 1970 and now abandoned.

BACKGROUND OF THE INVENTION

In both retail and wholesale merchandising there is an ever increasing financial loss being incurred due to unauthorized removal of articles or goods by stealing, shoplifting and the like. This monetary loss has reached such proportions that not only individual merchandisers are increasingly alarmed but also trade organizations and law enforcement officials are actively investigating the possibility of means or procedures to reduce and substantially eliminate the volume of loss.

Efforts to decrease inventory shortages or losses resulting from theft have included, as examples, installing closed-circuit television, hiring additional security forces, closing in separate departments with barricades and turnstile entrances, technologies from optics to sound utilizing magnetics, thermionics, electricity, etc. All such schemes and attempted solutions are extremely expensive and in many instances, such as surveillance personnel increases, have been ineffective.

There accordingly exists a great need for a detection method wherein potential larceny is deterred and at the same time legitimate sales or removal of goods can continue unaltered by the detection scheme utilized. The present invention teaches a method which is not only effective but of simplicity and is inexpensive.

SUMMARY OF THE INVENTION

The present invention provides method and system for detecting and/or preventing unauthorized removal of articles or goods from stores or the like which overcomes drawbacks existent in presently used systems and which is highly effective, simple in use and inexpensive.

In accomplishing this result, the present invention utilizes an olfactronic approach. The invention includes the application of odoriferous agents to the articles or goods and which are non-toxic and humanly undetectable aerosols. Electronic detection means are placed at store exits, for example, which are capable of detecting the odor on articles passing through the detection zone if removal from the premises is unauthorized such as articles which have not been paid for in the usual nature or course of business. Olfactronic as used herein is a coined term combining olfactory, which means "to smell," and electronic means of detecting smell. The method and system also includes means for indicating approval of removal of the article or goods from the premises such as by payment in a usual manner. This can include removal of the primary detection agent, application of a second or masking agent or application of a second agent of different characteristics from the first applied with the system requiring the composite agent application for removal approval.

The masking or nullifying is normally accomplished at a checkout or payment counter operated in the normal manner of conducting business.

Additional objects and advantages of the present invention will be more readily apparent from the following detailed description of embodiments thereof when taken together with the accompanying drawings in which:

FIG. 1 is a schematic view representing a method and system in accordance with the invention and depicting an authorized article removal;

FIG. 1A is a schematic view of a modified form of detection agent nullification;

FIG. 2 is a schematic representation of the method and system of the invention operating under conditions of unauthorized article removal; and

FIGS. 3, 4 and 5 represent specifically different modes of the invention.

The features and operation of the present invention are shown in the drawings and described hereinafter with reference to a widely used type of merchandising of goods but obviously is not to be limited thereto since the principles are of much more widespread application.

In many business establishments merchandise which is, for example, prepackaged in containers **10**, or the like, are stacked by store personnel on merchandise counters **12** for selection by purchasers who in the normal course of business take the packages or articles or merchandise to a checkout counter **14** where the goods are paid for. This operation of the customer is indicated by arrow **16**. Subsequent to payment, the customer, as indicated by arrow **18**, removes the article from the store or merchandising outlet through store exit **20**. In numerous instances, however, the customer, in a broad sense, intentionally by-passes the checkout counter and payment for the merchandise in various ways of conduct, and which broadly can be considered as shoplifting or illegal purloining of goods without any intention of payment. Such actions result in very substantial losses to the selling establishment. It is this type of operation that the present invention is designed to eliminate.

The method and system of the invention, in one embodiment, includes the steps of applying a non-toxic, humanly undetectable aerosol which, being highly aromatic in nature, is detectable by an appropriate electronic sensing device. An applied application of this aerosol is indicated by the spot **22** in FIG. 1 and is applied from an aerosol container **24** by appropriate personnel. The customer, in normal accepted practice then takes the so marked article to the checkout counter **14** where payment is made. At this point checkout personnel can, according to one embodiment of the invention, apply a second aerosol marking agent as indicated by spot **26** to the article from aerosol can **28**. This second applied agent, in the embodiment of FIG. 1 can consist of different characteristics from that of the first applied or, as shown in FIG. 1A can consist of a masking agent applied appropriately to and over the first spot **22** as indicated in broken lines at **30**. Subsequent to payment for the goods and appropriate marking by the checkout personnel, as shown in FIG. 1, the customer removes the articles from the store through exit **20**.

Appropriately situated at or in proximity to the store exit are detection means for unauthorized article removal detection. When utilizing an olfactronic technique in accordance with the invention, a directed air flow in the nature of a curtain or sheet indicated by arrows **32** is established through holes of openings **34** in the desired location through which the customer must pass such as the store exit. This flow of air can be very slight when highly aromatic substances are used and in

practice would be undetectable by persons passing therethrough. The air flow will pass over or about the purchased article **10**, even if carried in a shopping bag for example, and will entrain the olfactronic sensible material in the air stream as indicated by arrows **36** and pass to an appropriate detection device generally indicated at **38**. If appropriate procedure indicating authorization of removal has not been taken at the checkout counter, the detector device **38** will activate an alarm **40** of any appropriate type and the bearer of the article can be apprehended in the act of unauthorized removal of the goods. This functioning of the present invention is depicted in FIG. **2** where the article bearer has by-passed the checkout counter and passes directly, for example, from the merchandise counter to the store exit as indicated by arrow **42**.

If an article has been appropriately paid for and appropriately marked at the checkout counter, the alarm in the embodiment shown in FIG. **1** will not be activated since in the shown embodiment the use of two agents of different characteristics, one applied before display, and one applied at the time of purchase, can be sensed by the detector as indicating proper purchase of the article. If, however, the second application at **26** is omitted, as depicted in FIG. **2**, the detector will indicate unauthorized removal. Modifications of the principles of the invention can consist in use of one agent - remove agent at time of sale so that any agent detected upon leaving the building indicates that the article is stolen. Use of a second agent as a masking agent for the first agent, indicated at **30** in FIG. **1A**, applied to the article at the time of sale to indicate purchase can also be sensed by the detector to indicate an authorized and approved sale.

Many specifically different forms of agents and detectors can be used within the principles and teachings of the invention. The detectors, for example, can include a short analysis device such as is presently being used in bomb detectors. The prime device is a gas chromatograph equipped with an electron capture type detector, such as but not limited to a Beckman GC–4 gas chromatograph equipped with a model 134060 electron capture detector. Its working principle is Δ changes in electron capture = conductivity. The form of the electron device contemplated by the present invention is one that does not require reverse flashing of the analysis chamber by an innate gas. A continuous sampling chromatograph could also be used if the Δ time between sampling ingestion and definition is adequate.

The olfactronic or odoriferous agents can include a whole series of agents available from non-toxic Freon compounds. These agents are preferably encapsulated utilizing a microencapsulation technique and subject to "time release" after application to the article to be displayed for purchase (or pilferage). Other compounds based on unique, fairly rare in the market place of use, types of compounds can be used.

The actual detection techniques could utilize, as mentioned hereinbefore, one agent - remove agent at time of sale, so any agent detected leaving the building indicates that the article is stolen. The use of an agent as a marking agent, to be applied to the article at time of sale to indicate purchase is contemplated as also is the use of two agents of different characteristics, one applied before display, and one applied at the time of purchase. If only one agent appears at the detector location this is an indication that the article is stolen.

When utilizing a technique of adding a secondary agent at the point of sale it is contemplated to use "-sold" or "thank you" labels at the point of purchase or checkout counter, the label having been marked by a short life agent. A stamp applied to the article or a sales slip attached to the article could likewise be utilized.

Specific examples of some techniques which can be employed within the teachings of the invention are set forth hereinafter.

EXAMPLE 1

A semi-volatile, polymerizable material such as an unsaturated ester, for example methyl or ethyl linoleate or methyl or ethyl stearolate, is used at **22A** to mark all merchandies. At the check-out counter, see FIG. **3**, a dilute mist of a radical initiating agent, such as di-tert-butyl peroxide, is sprayed at **28A** on the merchandise before it passes through an intense, short wavelength ultraviolet light chamber which polymerized the unsaturated marking material. Merchandise so treated may be removed from the premises without incident. Without this treatment the presence of the volatile unsaturated marking material would be detected by a rapid, automatic sampling capillary gas chromatograph **38A** equipped with a flame ionization detector such as but not limited to a BGC–4 gas chromatograph with a model 102250 Hydrogen Flame Detector. The identity of the marking material being determined by its characteristic retention time. Improved sensitivity could be obtained by prior concentration of the unsaturated substance contained in large air sample by slow passage of the air sample through a highly purified high molecular weight saturated hydrocarbon oil, such as but not limited to an apiezon oil. The oil is then flash heated in the inlet of the gas chromatograph.

EXAMPLE 2

One of the several Freons is encapsulated in a semi-porous polymer matrix, such as a polyvinyl acetate, and used to mark all merchandise. At the check-out counter a different Freon, similarly encapsulated, is sprayed on all merchandise passing along the conveyor counter. The air door is monitored by a rapid gas sampling device which periodically sends an air sample such as an amount ranging from 10 μL – 10 ml, through a capillary gas chromatograph equipped with an electron capture detector, such as but not limited to a BGC–4 gas chromatograph equipped with model 134060 electron capture detector. From the characteristic retention times of the two Freons a null reading is given. If only one of the Freons is detected, indicating stolen merchandise, the alarm is activated.

EXAMPLE 3

A high molecular weight unsaturated ester, nitrile such as linoleyl nitrile, or other suitable unsaturated material of moderate volatility would be applied to all merchandise on the shelf. When checking-out all merchandise purchased would pass through an intense short wavelength ultra-violet light box on the check-out conveyor. This treatment would serve to polymerize

the unsaturated marking substance thus dramatically diminishing its volatility. Removal of such treated items from the store would not set off the alarm. However, untreated material would be detected by a high capacity, capillary column gas chromatograph equipped with a flame ionization detector which was connected to an automatic gas sampling device, such as might be assembled from a Beckman 102396 Gas sampling valve and a 102397 switching valve, sampling the air flow at or near the store exit.

EXAMPLE 4

A highly halogenated gaseous material such as one of the Freons is microencapsulated in a polymer matrix, such as polyvinyl acetate, in which state it has an appreciable leak rate sufficient to be easily detected by a gas sensing device (similar to an electron capture type chromatography detector) composed of two metal plates separated by a few mm. and charged with several hundred volts. One of the plates is coated with a B-emitting material (such as but not limited to tritium) sufficient to ionize a small fraction of the gas passing between the plates. The resulting small flow of current between the plates results in a steady "null" reading. When a highly halogenated material such as one of the Freons passes between the plates, the current drops off (disrupting the "null", i.e., sounding the alarm). In the invention proposed, articles to be purchased would pass along a conveyor at the check-out, see FIG. **4**, during which passage an ultra-sonic chamber **50**, such as one 250-watt chamber with a 20,000 – 30,000 HZ capacity, encased in a high air flow area **52** would burst the polymer encapsulating material, releasing the marking olfactory material. Passage of such material through the exit area would not set off the alarm. Any untreated item would be detected, however, even if concealed in a pocket or bag.

EXAMPLE 5

All merchandise to be legally removed from the store might be placed in a bag **60** that had been "perfumed" as it was pulled out of the bag storage bin. The odiferous agent might be a species such as α, α, α-tricholorotoluene which would be only slightly odorous and which would evaporate in about 30 minutes. Thus the previously described electron capture gas chromatograph sampling the "air door" would in this application be switched to read null when α, α, α-trichlorotoluene was detected but would sound an alarm when this marking substance did not accompany passage through the door.

"Neutralizing" by polymerization can be induced by short wavelength black light of but not limited to 2,537A for a period of up to 30 seconds.

In recapitulation, the invention utilizes detection of specific vapors or gases to prevent pilferage of material, products, or commercial or potentially commercial goods. The technique is selective in indicating authorized or unauthorized removal of goods or materials from a merchandising establishment and defies detection by individuals. The technique utilized is unique and eliminates disadvantages of previously developed systems for prevention of pilferage. The material utilized preferably has a prolonged capability of release of a gas and/or vapor. The gas or vapor is foreign to the environment in which its utilization is contemplated and is not detectable by the normal human olfactory system either by concentration of the material utilized or by the nature of its vapor or gas. The material or its vapor or gas is not irritating or toxic to humans. It will not damage any material on which it is applied, is invisible to an unaided human eye and exhibits no distinctive tactile qualities. If desired, an identification material, such as a radiolucent dye identifiable under ultraviolet light, can be added to the odoriferous material to facilitate identification of the treated area by deactivating personnel.

The sensor device and the gas or vapor collection means can vary and can be specific to record only certain materials and/or a combination thereof. In like manner the specific detection means or device utilized can vary within the skill of knowledge in electronic sensing or detection.

Obviously changes in details can be effected within the spirit and scope of the invention as defined in and limited solely by the appended claims.

I claim:

1. A method of detecting attempted unauthorized removal of articles from premises of an establishment including the steps of:
   A. applying an olfactronic sensible material to the articles;
   B. establishing an olfactronic detection zone requiring passage therethrough of the so marked articles for removal from the premises;
   C. discriminately detecting existent olfactronic emissions from the so marked articles during passage through the detection zone; and
   D. selectively activating indicating means by the presence or absence of selected detected olfactronic emissions to indicate attempted unauthorized removal of articles from the premises.

2. A method as claimed in claim **1** wherein said olfactronic material consists of odoriferous materials normally humanly undetectable and in the nature of nontoxic Freon compounds.

3. A method as claimed in claim **2** including encapsulating the olfactronic material utilizing a microencapsulation technique adapted for time release subsequent to application to the articles.

4. A method as claimed in claim **1** including the step of neutralizing the olfactronic sensible material applied to the articles to indicate authorized removal thereof from the premises.

5. A method as claimed in claim **4**, wherein an agent - remove agent is applied to the article at the time of authorized removal whereby any agent detected leaving the building indicates unauthorized article removal attempt.

6. A method as claimed in claim **4** including applying a masking agent to the first applied olfactronic sensible material for indicating authorization of article removal.

7. A method as claimed in claim **1** including applying two agents having olfactronic sensible capabilities wherein one is applied to articles as normally stored on the premises and a second is applied at a time of article removal authorization whereby if only a single agent appears on an article at the detection zone an indication of attempted unauthorized removal results.

8. A method as claimed in claim 5 including removing the agent by application of ultraviolet light.

9. A method as claimed in claim 5 wherein the detection agent is encapsulated and subsequently removing the agent by means of adhesives, magnetics or by bursting with ultrasonic vibrations.

10. A method as claimed in claim 7 wherein the secondarily applied agent can consist of a label marked by a short life agent, a stamp or a sales slip attached to the article.

11. A method as claimed in claim 1 wherein detection of the olfactronic emissions is accomplished by an electron capture type of gas chromatograph.

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