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(54) **System that insures tamper resistance.**

(57) This is an electronic system which would detect when secured material has been unsecured. The system can comprises : a power source 20 connected to an audio/visual processor 26 ; an indicator[s] 20,22 also connected to the audio/visual processor ; a vacuum sensing system 32 also connected to the audio/visual processor ; and a memory device which would trigger only once after the device has been armed, whereby the system would be armed after a vacuum has been formed and the stress sensing system would detect a leak in the vacuum.

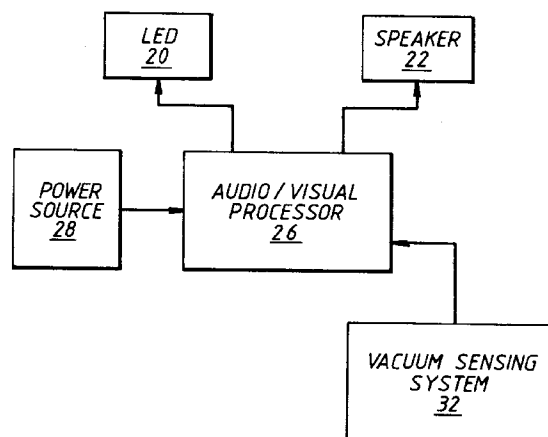


Fig. 2

FIELD OF THE INVENTION

This invention generally relates to insuring tamper resistance in secured materials.

BACKGROUND OF THE INVENTION

Without limiting the scope of the invention, its background is described in connection with insuring tamper resistance after a product has been secured.

Tamper resistant products are becoming increasingly more important to society. With the associated dangers of unauthorized tampering of secured materials, the issue of a tamper resistance system is very important.

Because of the inherent risks associated with medical products that have been tampered with, there has been great strides to insure tamper resistance of the packages. The current technology places a seal around the usual opening of the package, and if the seal is broken when the consumer gets the product, the product has supposedly been tampered with.

The seal solution does not address the possibility of the injection of a foreign substance through the sides of the package. For example, if the product was a bottle of aspirin, cold tablets, cough syrup, etc., then a needle with a foreign substance could be injected into the side of the bottle, and the seal would never be broken. Since the hole in the side of the bottle would be small (and probably not easily detected), and the seal on the opening of the bottle would be intact, the consumer would assume the bottle has not been tampered with. A needle puncture in the seal over the opening would also be virtually undetectable.

The issue of tamper resistance is not exclusive to medical products. Many more products exist where security or tamper resistance is necessary. Another example of an area that might require security or tamper resistance is the delivery of mail or other material. The delivery of secured materials from one place to another may require some tamper detection. Another area that might require some type of tamper resistance, is software. With the mass destruction that software viruses can perform, the issue of software integrity is growing at a very rapid rate.

Accordingly, improvements which overcome any or all of the problems are presently desirable.

SUMMARY OF THE INVENTION

It is herein recognized that a need exists for a system that would indicate when an object has been tampered with. The present invention is directed towards meeting those needs.

Generally, and in one form of the invention, a microchip or similar device would control access to the secured material. The sensor or triggering device

would be, for example, vacuum controlled. The sensor would be triggered only one time, for example, when the vacuum is first disturbed (e.g. by tampering or by being opened by the consumer). If a needle entered the material through any area, the vacuum would be lost, which would trigger the device. If the vacuum is lost, the device would be triggered. The device preferably has an audio, as well as a visual signal in order to accommodate both the visually and hearing impaired. The signal would indicate when the material is being opened (or tampered with) for the first time. The first person who opens or tampers with the material will see and hear the signal. A battery turns on the indicators as soon as the device is triggered and the indicators continue to indicate until the battery is virtually discharged. If a consumer or other authorized personnel receive and open the material, they should see and hear the indicators. If the indicators do not turn on, then the material can be assumed to be tampered with, and should be returned to the manufacturer.

An advantage of the invention is the lives it will save in protecting the consumer from medical products that have been tampered with. The invention could also be helpful to alert authorized personnel when the security of the material has been breached.

This is an electronic system which would detect when secured material has been unsecured. The system generally comprises: a power source connected to an audio/visual processor; an indicator also connected to the audio/visual processor; a vacuum sensing system also connected to the audio/visual processor; and a memory device which would trigger only once after the device has been armed, whereby the electronic system would be armed after a vacuum has been formed and the stress sensing system would detect the first leak in the vacuum.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and further aspects of the invention are illustrated in the accompanying drawings wherein like elements are denoted by like reference designators and in which:

FIG. 1 is a diagram of one embodiment of the tamper indicating system;

FIG. 2 is a block diagram of another embodiment of the tamper indicating system;

FIG. 3 is a diagram of the tamper indicating system implemented in a medical bottle;

FIG. 4 is a cross-section of the tamper indicating system implemented in a package of capsules;

FIG. 5 is a cross-section of the tamper indicating system implemented within an envelope; and a frontal view of the same tamper indicating system.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Fig. 1. shows one embodiment of the tamper indicating system. The spring is attached to the upper portion 12 of a switch in the circuit. When the system 10 has a vacuum, the switch 12-13 is open. Once the vacuum is released, the spring 11 pushes the upper portion 12 of the switch against the lower portion 13 of the switch. When the switch is closed, it completes the circuit and the LED 14 gets power from the battery source 15.

Another embodiment is depicted in FIG. 2. A power source 28, (which could be a battery or low leakage, long storage capacitor, for example) is connected to an audio/visual processor 26 (as used herein the term "audio/visual" means audio and/or visual). A LED 20 is also connected to the audio/visual processor 26. The LED 20 would permanently change color when used (it could be blue if the vacuum is intact, and turn red when the vacuum is broken). A speaker 22 would also be connected to the audio/visual processor 26. The speaker 22 could be piezo-electric horn and serve as the audio indicator. The system also has a stress sensing system 32, which could have a piezo-electric sensor so that applying vacuum through a port causes stress or movement on a sensor sending a spike to a detector. When the detector gets a spike, it would then send out a pulse to the audio/visual processor. In addition, the audio/visual processor is not necessary and could be combined with the vacuum sensing system.

Placing the system under vacuum would flip or arm the circuit. Releasing vacuum from device would flop device and send a trigger pulse to audio/visual processor 26, triggering device and setting off alarm (flashing of LED and pulsed audio through speaker).

The trigger pulse from the flip-flop would arm the audio/visual processor 26 enabling it to be locked on to operate until the battery is completely drained. An additional event counter here could also insure that the processor operates only one time.

The system would not be armed or enabled until the unit is placed under vacuum. Once armed, then removing vacuum would trigger or fire the device and set off indicators. Indicators would operate until battery is completely exhausted. Optionally, a circuit could also be included to insure that indicators could fire only once (in the event that the vacuum is released and re-applied before battery is drained).

FIGS. 3-5 are examples on how the system could be implemented. These figures do not limit the invention, but are only offered as examples.

In FIG. 3, a medicine bottle 44 is shown with the invention 40 on the foil seal 42. The invention 44 is shown on the seal at the mouth of the bottle. If the foil seal 42 is lifted or a needle was inserted into the bottle, the vacuum would be released and trigger the in-

vention 40.

In FIG. 4, a capsules are shown encased within a package. Each capsule has a bubble 48 that would be pressurized to form a vacuum and trigger the invention 46. Alternately, instead of having the invention on each capsule, the entire package of capsules could be encased within another package that would have the invention setup on it.

In FIG. 5, a cross-section of an envelope is shown. The envelope 52 is shown to be closed. The invention could be mounted on a soft rubbery adhesive tape 58. Each section of tape would have a device mounted under the bubble with a vacuum already applied. the tape could then be applied to the envelope or package with the bubble placed directly over the lip or fold of the package. Opening the envelope or package would tear the bubble, releasing the vacuum and triggering the device. The tape material would have to be extremely tacky so that once applied, it could not be removed without tearing. The tape would also have to be soft enough (like bubble wrap) so that when put under stress would tear and not peel. While this invention has been described with reference to illustrative embodiments, this description is not intended to be construed in a limiting sense.

Various modifications and combinations of the illustrative embodiments, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to the description. It is therefore intended that the appended claims encompass any such modifications or embodiments.

Claims

1. A tamper indicating system comprising:
 - a) a power source connected to an audio/visual processor;
 - b) an indicator also connected to said audio/visual processor;
 - c) a triggable sensing system also connected to said audio/visual processor; and arranged such that said indicator is activated on only the first triggering of said sensing system.
2. A tamper indicating system as claimed in claim 1 and wherein said sensing system is a vacuum sensing system whereby said system would be armed after a vacuum has been formed and would detect a leak in said vacuum and thus trigger only once after the device has been armed.
3. The system of claim 1 or claim 2, wherein said power source is a battery or a storage capacitor.
4. The system of claim 1, claim 2 or claim 3 wherein said power source is drained by powering the in-

indicator after the triggering of the electronic system.

5. The system of any preceding claim, wherein said indicator comprises a LED. 5

6. The system of claim 5, wherein said LED would permanently change color when used.

7. The system of any of claims 1 to 6, wherein said indicator comprises a speaker. 10

8. The system of claim 7, wherein said speaker is a piezo-electric horn which serves as an audio indicator. 15

9. The system of any preceding claim, wherein the sensing system includes a stress sensor.

10. The system of claim 9, wherein said stress sensor is a piezo-electric sensor. 20

11. The system of any preceding claim including a memory. 25

12. The structure of claim 11, wherein said memory device is a flip-flop device.

13. The structure of any preceding claim, wherein an event counter is connected to said audio/visual processor to insure that the processor operates only one time. 30

14. A method of detecting tampering with a secured material comprising: 35
 - a) applying a vacuum to a chamber and arming an audio/visual processor by said applying of said vacuum;
 - b) sensing a disturbance in said vacuum;
 - c) turning on an indicator connected to said audio/visual processor after sensing a change in pressure by said vacuum sensing system; and 40
 - d) draining a power source connected to said indicator on the first disturbance of said vacuum. 45

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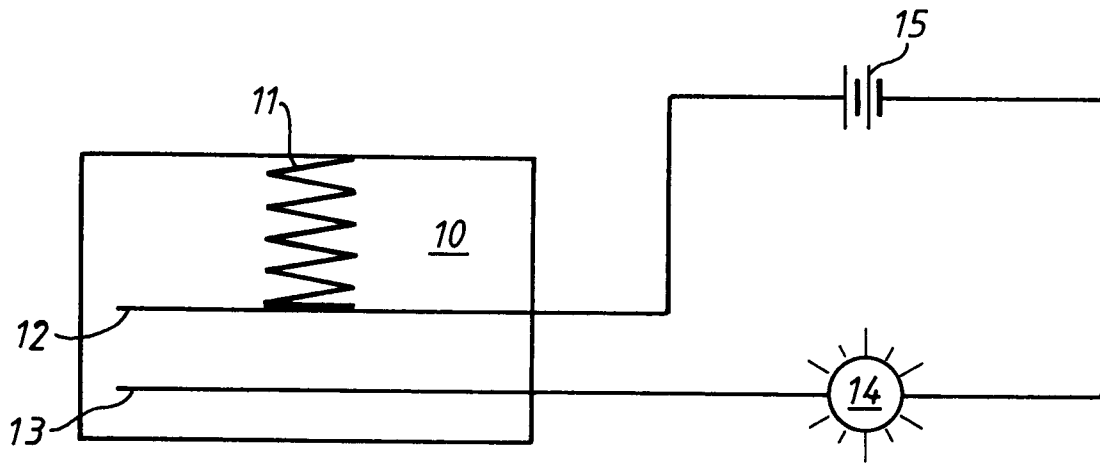


Fig. 1

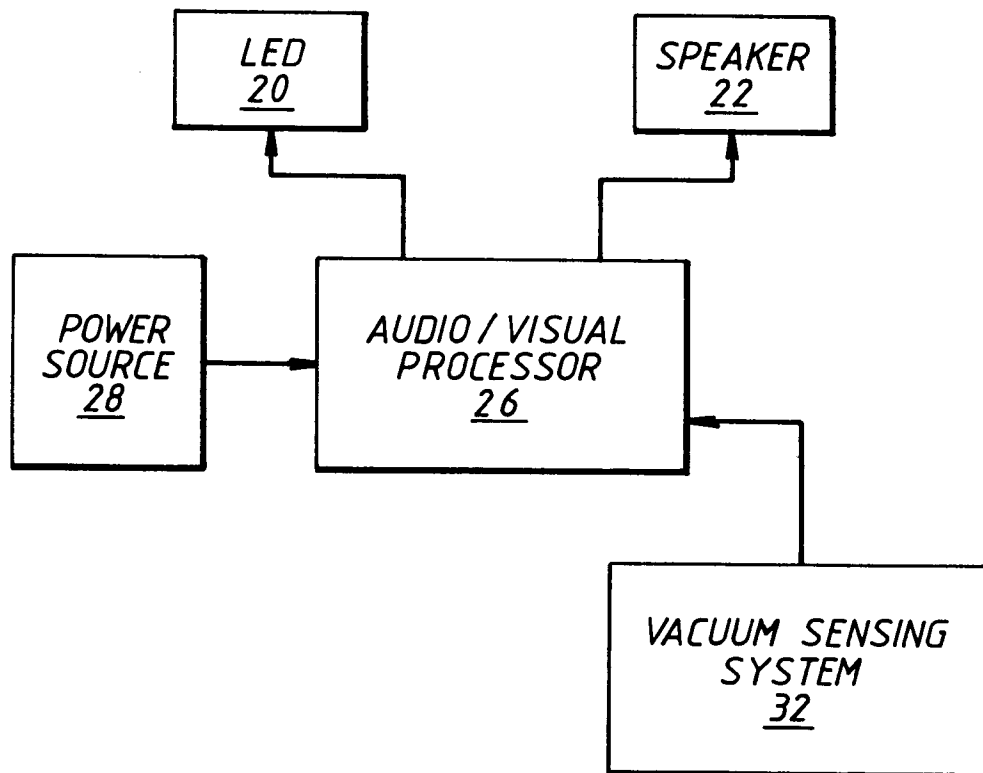


Fig. 2

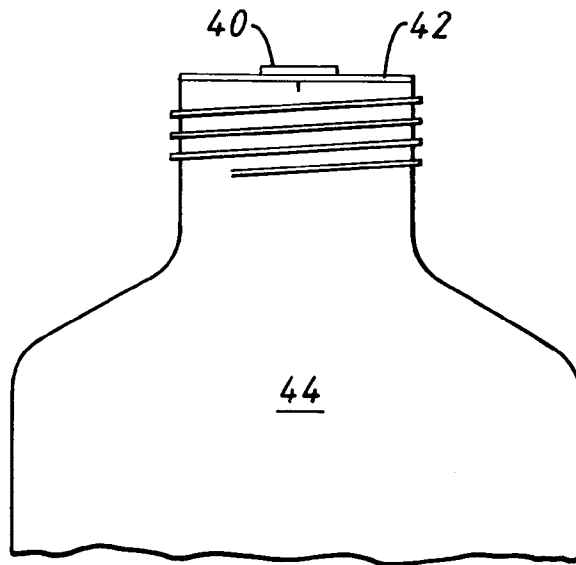


Fig. 3

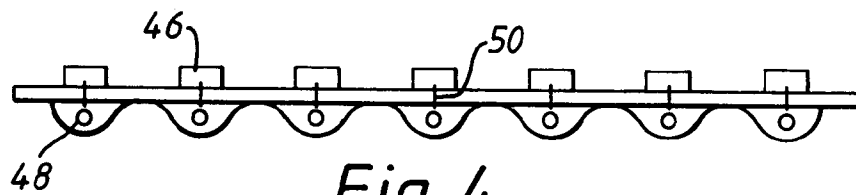


Fig. 4

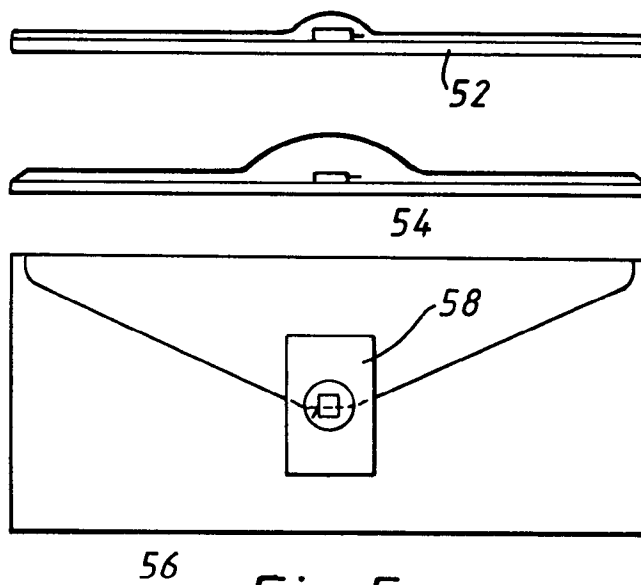


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 4022

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 269 317 (AMERICAN HOME PRODUCTS CORP.) * column 3, line 14 - column 5, line 55 * * column 14, line 25 - line 48; figures 1-8 *	1-6, 14	B65D55/02
X A	US-A-4 845 470 (N. BOLDT) * column 1, line 35 - column 3, line 46; figures 1-4 *	1 3, 4, 7, 8, 11, 12, 14	
A	EP-A-0 233 077 (INSTANCE D. J.) * page 2, column 19 - page 8, line 20; figures 1-3 *	1, 3-5, 7, 14	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			B65D G08B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 13 September 1994	Examiner Sgura, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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