

Aug. 26, 1969

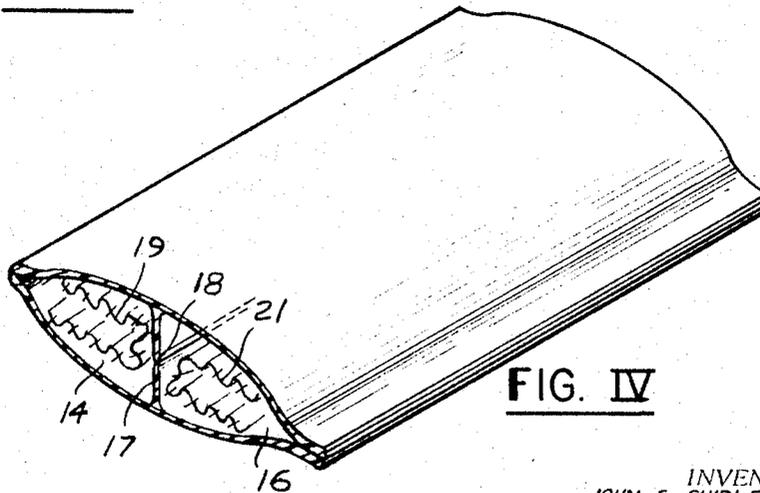
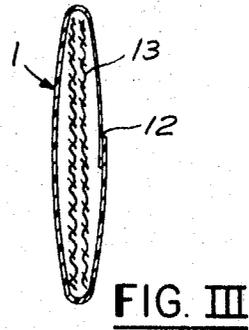
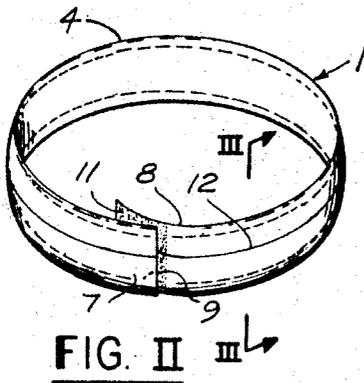
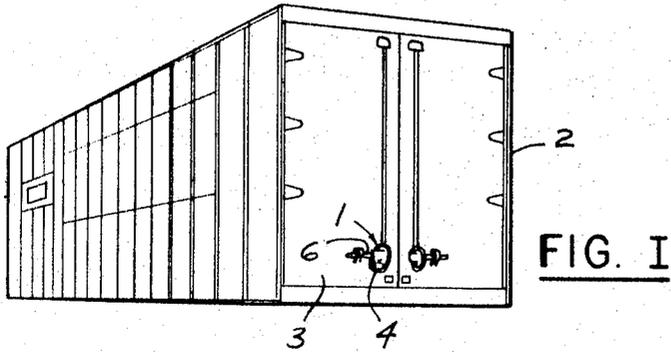
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3,463,532

SECURITY SEAL

Filed Feb. 14, 1968

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

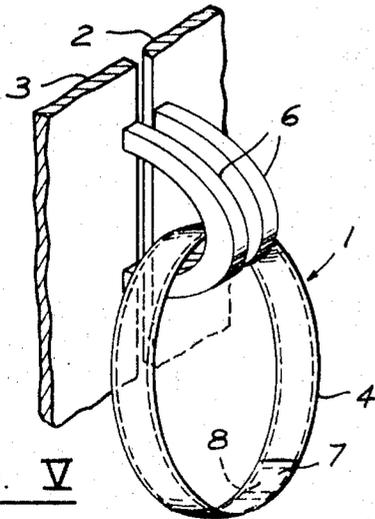


FIG. V

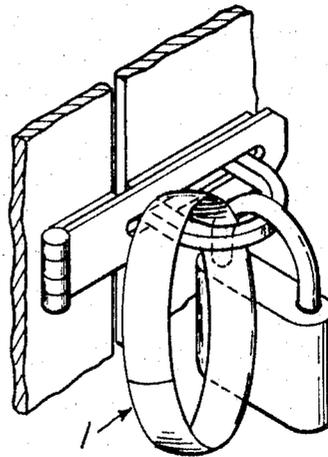


FIG. VI

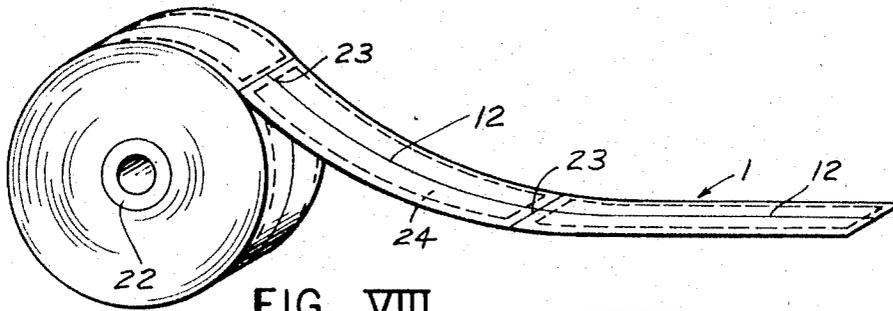


FIG. VIII

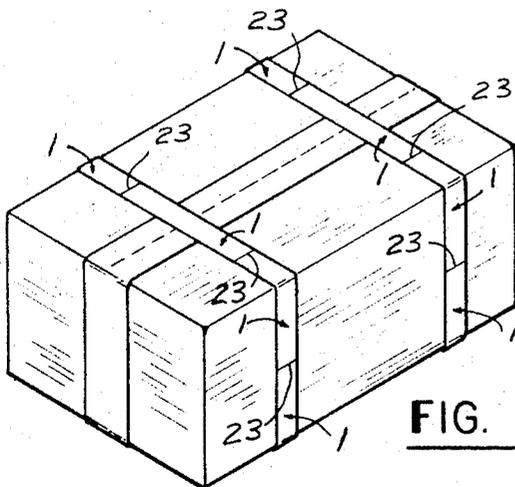


FIG. IX

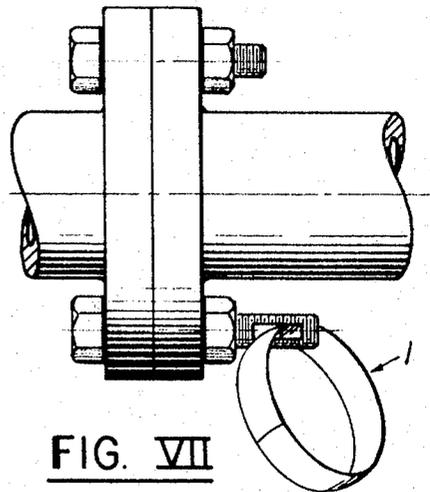


FIG. VII

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SECURITY SEAL

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Continuation-in-part of application Ser. No. 655,607

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No. 705,530

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U.S. Cl. 292—307

8 Claims

ABSTRACT OF THE DISCLOSURE

A security seal is taught for use with cartons, shipping
containers and openings. Such a seal is generally connectable
across an opening. The seal may be attached by adhesive to the
article to be sealed or else ends of the seal may be joined
together. The inventors teach an apparatus by which tampering
with the seal and/or an opening can be detected easily. According
to one embodiment the seal is furnished with a reservoir containing
a suitable dye selected to change color vividly on exposure
to air. The seal is constructed so that a seam (in contact
with the reservoir) is arranged to rupture before the seal is
broken, thereby exposing the dye to air. Because of the color
change that results, one is alerted to the broken seal. An
alternate embodiment of this seal contemplates two reservoirs
separated from each other by a diaphragm. Each of the
reservoirs contains one of a pair of suitable chemicals which
react together to produce a vivid color change. In this second
embodiment the seal is so constructed that the diaphragm is
arranged to rupture before the seal is broken. It is also
contemplated to use seals of either embodiment in tape form
with adhesive on one side so that it may be used to wrap
cartons or span openings.

Cross reference

This application is a continuation in part of United States
application 655,607 filed July 24, 1967.

Background

Merchandise and valuables are often stored or shipped
in cartons, containers, and the like with locks provided
for security. But locks can be picked or opened by thieves,
so seals are furnished to indicate when a carton, container,
door or the like has been opened. These seals may be attached
by adhesive to the article to be sealed or they may be
connectable between a door and a container (by way of
example for a shipping container about a latching mechanism
and its fastening, or in a hasp arrangement about the staple
and over the strap).

In transporting freight, responsibility for cargo losses
due to pilferage or the like, is frequently fixed by a
determination of whether or not a seal has or has not been
broken. However it is not difficult to undo conventional
seals, pilfer goods from containers and then reconnect the
broken seals. Cargoes are especially vulnerable when they
are left unattended for long periods of time. At destinations
conventional seals are normally broken with crude instruments.
Not much force is necessary to break these seals and seal
breaking frequently degenerates into a lax, routine effort.
In breaking a large number of seals, transportation employees
easily may fail to discern a seal that has been broken.
Thus, shippers can lose valuable merchandise with doubtful
recourse against carriers. But worse than this, indifference,
or carelessness on the part of the carriers' employees enures
to the carriers' benefit.

Summary

The inventors have cured this paradox by a novel and
practical approach to security seals. They furnish a seal
with a reservoir containing a suitable dye selected to
change color vividly on exposure to air. The seal according
to this embodiment is constructed so that a seam (in
contact with the reservoir) is arranged to rupture before
the seal is broken, thereby exposing the dye to air. The
same result will be obtained if the seal is cut or torn.
Because of the color change that thus results, one is
alerted to the broken seal. One alternate embodiment of
this seal contemplates two reservoirs separated from each
other by a diaphragm. Each of the reservoirs contains one
of a pair of suitable chemicals which react to produce a
vivid color change. In this second embodiment the seal
is so constructed that the diaphragm ruptures before the
seal is broken. As in the aforementioned embodiment,
cutting or tearing of the seal will cause the two chemicals
to combine for reaction one with the other.

In still other embodiments paralleling those set forth
above, seals may take the form of tape with adhesive
on one side so that it may be connected for intimate
adherence across a joint of a carton, drawer, door or the
like or alternately it may be wrapped about a carton.
When the carton, drawer, door or the like is opened, the
seal must be broken thus producing either a color change
reaction by virtue of a dye being exposed to air or else
by interaction of two chemicals resulting from rupture
of a weak diaphragm.

It is further contemplated that a slowly progressing
color change may be employed so that the length of time
since a seal has been broken can be ascertained.

Drawing

The foregoing and other advantages will appear more
fully from the accompanying drawing wherein:

FIGURE I is a schematic illustration of a shipping
container having a door and including a seal according to
this invention connected between the container and its
door.

FIGURE II is a perspective view of a seal according
to one embodiment of this invention.

FIGURE III is a sectional view taken along line III—
III of FIGURE II.

FIGURE IV is a perspective view in section illustrating
a second embodiment of this invention.

FIGURE V shows a seal according to the first embodi-
ment and connected across an opening and engaging
handles on both sides thereof.

FIGURE VI depicts a seal according to the first embodi-
ment and engaged between the strap and staple of a hasp.

FIGURE VII shows a seal according to the first embodi-
ment and applied to a flanged pipe coupling.

FIGURE VIII illustrates a roll of seals according to this
invention.

FIGURE IX reveals a seal in tape form applied across
a joint of a carton.

Description of embodiments

As seen in FIGURE I seal 1 is used with shipping
container 2 having a port and movable door 3 all opera-
tively associated in their conventional relationship. Seal 1
includes elongated band 4 which encircles handles 6 for
connection between door 3 and container 2.

Band 4 is preferably made of polypropylene, a poly-
ester or some other suitable plastic material. Polypro-
pylene or a polyester are preferred because of their rela-
tive impermeability to oxygen. A polyester (such as that
sold commercially under the name "Mylar") holds up

well under temperature and other weather extremes and is otherwise well suited to the service here contemplated. A suitable polypropylene is marketed under the name "Clysar."

Band ends 7 and 8 (as shown in FIGURE II) are connected to each other by contact adhesion employing pressure-sensitive adhesive surfaces 9 and 11. Before a seal is to be installed, a releasable paper (not shown) may cover one or both of the adhesive surfaces 9 and 11. After removal of the releasable paper, the adhesive surfaces 9 and 11 are pressed one against the other to produce a tenacious and lasting bond therebetween. Messages; such as seal number, name of shipper or consignee, patent number or the like; may be printed on bands 4.

A weakened seam is furnished in band 4 by heat sealing lap joint 12. The adhesion of surfaces 9 to 11 is to be of a magnitude that insures the rupture of lap joint 12 before surfaces 9 and 11 separate. Thus by design, the rupture of lap joint 12 precedes breakage of seal 1.

In the embodiment shown in FIGURES II, III, V, VI, VII, VIII and IX, an oxidation reaction is generally relied upon to produce a vivid color change on the rupture of lap joint 12. Methylene blue can first be reduced to methylene white by reaction with an alkaline solution of sugar. Gauze 13 is impregnated with the methylene white so that on rupture of joint 12, the methylene white is exposed to oxygen of the air and it turns blue. Another suitable dye for use in this application would be sodium pyrogallate, prepared from pyrogallol and an alkaline solution such as sodium carbonate. When exposed to oxygen, the sodium pyrogallate turns dark brown to black in color and stays that way. Other dyes which are susceptible to vivid color change when exposed to oxygen include resazurin and indigo carmine. It is also contemplated that slow acting dyes may be employed so that the length of time from the breaking of a seal may be ascertained.

As shown in FIGURE IV, an alternate embodiment of this seal has two reservoirs 14 and 16, separated each from the other by diaphragm 17. In this embodiment the chemicals in reservoirs 14 and 16 are organized to react with each other on the rupture of diaphragm 17 along weakened seam 18. As in the embodiment of FIGURES II and III, weakened seam 18 is arranged to rupture before the seal is broken.

Suitable chemicals to produce a vivid color change in the embodiment of FIGURE IV are potassium ferrocyanide impregnated in gauze 19 disposed in reservoir 14 and ferric alum impregnated in gauze 21 disposed in reservoir 16. When diaphragm 17 is ruptured, these chemicals react to change from colorless to deep blue. A thiocyanate reacting with ferric alum would produce a bright red color. This reaction does not depend upon oxygen from the air. Here again a slow acting dye is also foreseen.

When a shipment arrives at its destination with seal 1 intact, the seal is easily removed by cutting or tearing apart adhesive surfaces 9 and 11. The ensuing color change is then of no consequence.

As seen from FIGURES V, VI and VII, seal 1 can be applied in various manners to closures. It is felt that FIGURES V and VI should be clear. The application in FIGURE VII assures that a flanged pipe coupling has not been opened.

FIGURES VIII and IX relates to seals according to this invention in tape form with adhesive on one side only. The tape may be severed from roll 22 at joints 23 between adjacent dye reservoirs 24.

It will be understood by those familiar with security and/or containerized shipping that wide deviations may be made from the shown embodiment without departing from the main theme of invention.

What is claimed is:

1. A security seal for detecting motion between two members and comprising

an elongated hollow band connectable by adhesion across the two members, the band provided interiorly thereof with a diaphragm arranged to separate two chemicals which are selected to be capable of reacting each with the other when mixed to produce a vivid color change, the diaphragm provided with a weakened seam portion so that the diaphragm will rupture before the band.

2. A security seal for detecting motion between two members and comprising

an elongated hollow band connectable by adhesion across the two members, the band provided interiorly thereof with a reservoir containing a suitable dye selected to change color vividly on exposure to air,

the band provided with a weakened seam in contact with the reservoir which ruptures before the seal is torn thereby exposing the dye to air.

3. The security seal of claim 2 with retaining means in the reservoir to retain dye therein.

4. A security seal for detecting motion between two members and comprising

an elongated hollow band connectable by adhesion across the two members,

the band provided interiorly thereof with two reservoirs separated from each other by a diaphragm, each of the reservoirs containing a suitable chemical which reacts with the other when mixed to produce a vivid color change,

the diaphragm provided with a weakened seam portion so that the diaphragm will rupture before the seal is torn whereby the chemicals react when they are mixed.

5. A seal for use with a shipping container which is provided with an access port and a moveable door operatively associated therewith, the seal comprising

an elongated hollow band connectable between the door and the container,

means for connecting the ends of the band each to the other,

the band provided with a diaphragm arranged to separate two chemicals which react when mixed to produce a vivid color change,

the diaphragm provided with a weakened seam portion so that the membrane will rupture before the seal is torn.

6. A seal for use with a shipping container which is provided with an access port and a moveable door operatively associated therewith, the seal comprising

an elongated hollow band connectable between the door and the container,

means for connecting the ends of the band each to the other,

the band provided interiorly thereof with a reservoir containing a suitable dye selected to change color vividly on exposure to air,

the band constructed to include a weakened seam in contact with the reservoir which ruptures before the seal is torn thereby exposing the dye to air.

7. The seal of claim 6 with retaining means in the reservoir to retain the dye therein.

8. A seal for use with a shipping container which is provided with an access port and a moveable door operatively associated therewith, the seal comprising

an elongated hollow band connectable between the door and the container,

means for connecting the ends of the band each to the other,

the band provided with two reservoirs separated from each other by a diaphragm,

each of the reservoirs containing a suitable chemical which reacts with the other when mixed to produce a vivid color change,

the diaphragm provided with a weakened seam portion

5

so that the diaphragm will rupture before the seal is torn whereby the chemicals react when mixed.

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U.S. Cl. X.R.

116—114