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(54) Explosive-screening apparatus and method.

(57) A baggage screening system for airports, in which the suspect baggage is placed in a blast-proof enclosure (1) and is subjected to influences which may trigger the explosion, or destroy the trigger mechanism, or detonate the explosion directly. The enclosure (1), has a vacuum pump (7) attached to simulate a high altitude and activate any altitude switches employed. In addition, a high power microwave source (13) is coupled into the enclosure to provide pulses of high intensity electromagnetic field. Any detonating circuits are coupled into this field and any semiconductor devices will be destroyed. Explosive devices are thus either disabled or detonated.

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Explosive-screening Apparatus and Method

This invention relates to apparatus and a method for screening objects, and in particular travellers' baggage, for explosive charges.

The protection of passengers and aircraft from attack by terrorist bombs is a problem of increasing concern. Current practice at airports is to use various types of equipment (eg using X-rays) to detect bombs in baggage so that 'infected' baggage can be prevented from entering aircraft and can be made safe or otherwise disposed of. These methods are not always successful and the ingenious terrorist is continually devising ways to make his devices undetectable. In addition, the possibility must be considered, of the terrorist devising a mechanism by which a bomb could be detonated by X-rays.

An object of the present invention is to provide an improved apparatus and method for screening baggage and other objects for explosives.

According to one aspect of the present invention, explosive screening apparatus comprises a blast-proof enclosure, access means for inserting an object to be screened into the enclosure, and means for subjecting the interior of the enclosure to conditions tending to destroy a triggering mechanism that may be present in conjunction with an explosive charge.

The means tending to destroy a triggering mechanism may comprise means for simulating a triggering condition, destruction of the triggering mechanism being effected by explosion of the explosive charge. The means for simulating a triggering condition may then comprise means for reducing the pressure within the enclosure to a value corresponding to a predetermined altitude in the atmosphere thereby tending to trigger any altitude sensitive triggering mechanism and detonate any associated explosive charge.

Alternatively, or in addition, the means tending to destroy a triggering mechanism may comprise means for subjecting the object to electromagnetic energy such as to disable a triggering mechanism without necessarily triggering it. There may be included a microwave source coupled through the wall of the blast-proof enclosure and adapted to emit high-power microwave pulses such as to be absorbed by and destroy any semiconductor electronic component within the object, or, alternatively, to detonate any explosive charge within the object.

According to another aspect of the invention, in a method of screening objects for explosive content, the object is subjected to triggering conditions within a blast-proof enclosure.

The method may include subjecting the object to high-power microwave energy coupled through the wall of the enclosure to destroy any triggering mechanism present in the object or to detonate any explosive charge in it.

One embodiment of screening apparatus in accordance with the invention and its method of operation will now be described, by way of example, with reference to the accompanying drawing showing, diagrammatically, a section through an enclosure containing a suspect suitcase.

The enclosure 1 is of very substantial construction eg reinforced concrete or armour plating or a combination of the two. A sliding blast door 3 can be moved aside to provide access to the interior of the enclosure through a port or hole 5 which is of suitable size for the insertion of suitcases etc. While the door 3 is shown as incorporated in the wall of the enclosure it might be incorporated in a conveyor arm on which the object/suitcase to be screened is presented to the enclosure, there being provision for locking the door to the enclosure.

The enclosure is sufficiently vacuum-tight as to be able to support a reduced pressure such as occurs in the atmosphere at an altitude of, say, 40,000 feet. A venting pipe 7 extends through the enclosure wall for this purpose to a vacuum pump 8. The pipe and pump are protected by a blast flap 9 mounted at the inner end of the pipe to prevent solid material entering it. The blast flap may be resiliently mounted so as to seal the pipe 7 when driven against it by blast pressure.

In the upper wall of the enclosure is a port 11 connected to a waveguide 13 which in turn is coupled to a magnetron 14. The port 11 is closed against explosion debris by a dielectric plug 15 which permits the transmission of microwave energy.

The whole of the interior surface of the enclosure is lined with copper sheet 16 to screen the environment from the high electromagnetic fields arising within the enclosure.

In operation, each piece of baggage is introduced into the enclosure, as indicated by the suitcase shown, and the blast door 3 closed. The vacuum pump is first operated and the pressure in the enclosure reduced to simulate atmospheric conditions at which an altitude trigger mechanism would operate. If such a trigger mechanism and its associated explosive charge is present it will detonate the charge so destroying, of course, the baggage and all contents of the enclosure. The enclosure itself is assumed strong enough to withstand the explosion.

If the pressure reduction stage produces no effect, normal air pressure is restored and the magnetron is operated in a series of high intensity

pulses, producing within the enclosure electromagnetic fields of several tens of kilovolts per metre. These fields will couple with any electrical detonating circuits that may be present, depositing sufficient energy in semiconductor devices to cause destructive damage so that the triggering mechanism will no longer fuction. The detonating circuit may be such that the microwave energy input does in fact trigger the detonation. The trigger mechanism is then 'disabled' but only by explosive destruction of course.

Electro-explosive detonators may be operated by a current pulse, initiated by a timer for example, passing through a detonator. Such a charge could also be triggered by a microwave pulse dissipated in the charge.

In the event that no explosion results from the above described treatments, the baggage is subjected to normal X-ray examination which will discover any bomb whose trigger mechanism has been disabled.

With apparatus as described above, it will of course be necessary to ensure that no electrical equipment, cameras, shavers, radios etc are left in baggage that is to be screened. The pressure reduction and microwave treatments will not, however, damage normal baggage contents.

In modifications of the above described equipment one or other (alone) of the pressure and electromagnetic treatments may be employed, where, for example, it is required or is economically preferable, to perform the tests independently.

While microwaves have been specified above as the chosen electromagnetic field it will be appreciated that other frequency ranges might be adequate, or even preferable, in particular circumstances, eg the higher radio frequencies and high power X-rays.

The blast-proof enclosure has been described as roughly vacuum-tight but in a modified construction, just as a blast flap is driven to seal the vacuum port so another, normally closed, port may be blasted open by an explosion to release the blast forces safely to atmosphere or other safe environment.

Claims

1. Explosive screening apparatus comprising a blast-proof enclosure (1), access means (3, 5) for inserting an object to be screened into said enclosure (1), and means (8, 14) for subjecting the interior of the enclosure (1) to conditions tending to destroy a triggering mechanism that may be present in conjunction with an explosive charge.

2. Apparatus according to Claim 1, wherein said means tending to destroy a triggering mechanism comprises means (8) for simulating a triggering condition, destruction of the triggering mechanism being effected by explosion of said explosive charge.

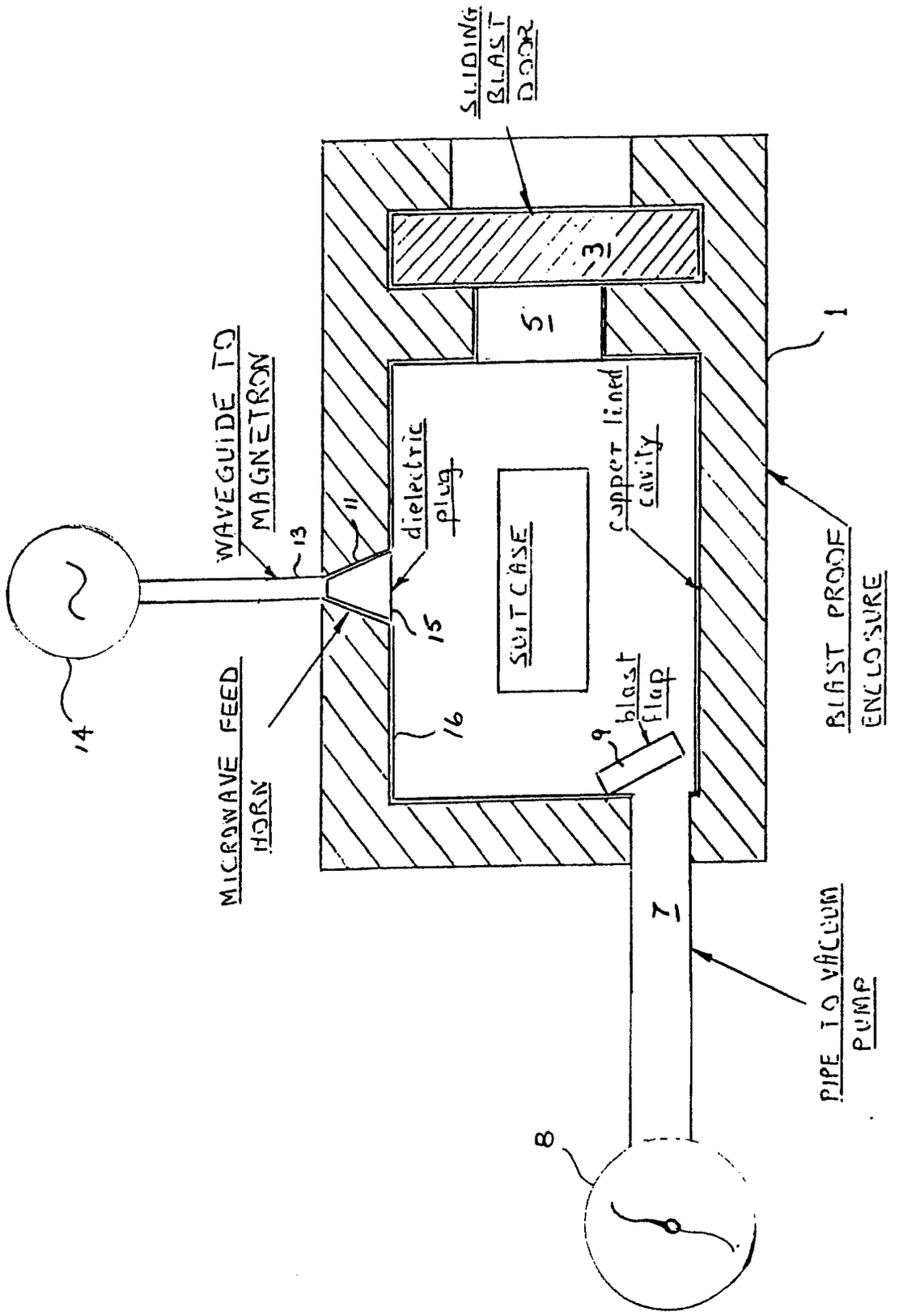
3. Apparatus according to Claim 2, wherein said means for simulating a triggering condition comprises means (8) for reducing the pressure within the enclosure to a value corresponding to a predetermined altitude in the atmosphere thereby tending to trigger any altitude sensitive triggering mechanism and detonate any associated explosive charge.

4. Apparatus according to any preceding claim, wherein said means tending to destroy a triggering mechanism comprises means (14) for subjecting said object to electromagnetic energy such as to disable a triggering mechanism without necessarily triggering it.

5. Apparatus according to Claim 4, including a microwave source (14) coupled through the wall (11) of said blast-proof enclosure (1) and adapted to emit high-power microwave pulses such as to be absorbed by and destroy any semiconductor electronic component within said object.

6. A method of screening objects for explosive content, wherein the object is subjected to triggering conditions within a blast-proof enclosure (1).

7. A method of screening objects for explosive content wherein the object is placed within a blast-proof enclosure (1) and is subjected to high-power microwave energy coupled through the wall (11) of the enclosure (1) to destroy any triggering mechanism present in said object or to detonate any explosive charge in said object.


SLIDING BLAST DOOR
3
5
1
WAVEGUIDE TO MAGNETRON
13
11
dielectric plug
copper lined cavity
SUITCASE
15
16
MICROWAVE FEED HORN
14
9
blast flap
BLAST PROOF ENCLOSURE
7
PIPE TO VACUUM PUMP
8

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EUROPEAN SEARCH REPORT

Application Number

EP 90 30 3942

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)
A	US-A-4 437 382 (YERUSHALMI) * Column 1, lines 5-52; column 3, last paragraph; figures 1-5 *	1	F 42 B 33/06
A	US-A-4 169 403 (HANSON)		
A	FR-A-1 542 733 (LOUSTAU)		
A	US-A-3 611 766 (KLEIN)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F 42 B
F 42 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	03-07-1990	RODOLAUSSE P.E.C.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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