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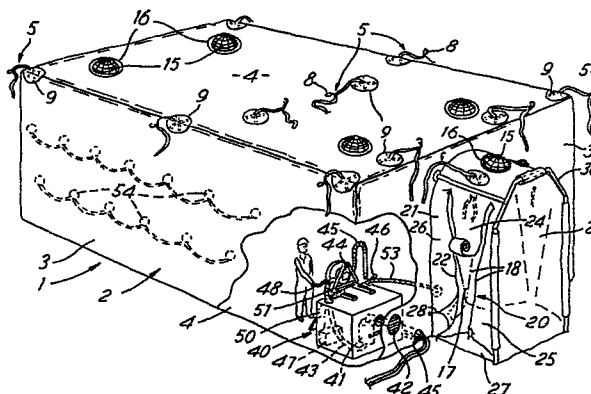
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54 Collapsible anti contamination shelter.

57 A collapsible anti contamination shelter (1) comprises a totally enclosable flexible airtight structure (3, 4) having means (5) for maintaining it in an erected state and provided with an air conditioning system (40).



Collapsible Anti Contamination Shelter

This invention relates to a collapsible anti contamination shelter particularly for protection  
5 against nuclear, biological and chemical substances.

In the event of a nuclear attack, which may be accompanied by the use of chemical or biological  
10 weapons, any buildings within the blast area will be destroyed and gamma radiation and heat in the surrounding area will cause widespread casualties. Protection against these primary effects can only be achieved with the use of expensive blast and radiation proof shelters, preferably located underground.

15 However, outside the area of primary attack, radioactive fallout and chemicals and biological contamination will claim many more victims unless some protection can be devised.

20 Problems also arise in the provision of shelters against such contamination in that they are very expensive, and require extensive work to construct them. Also such shelters are permanent and therefore take up  
25 considerable room even when not required.

The present invention seeks to provide a collapsible anti contamination shelter.

30 According to the invention there is provided a collapsible anti contamination shelter comprising a totally enclosable air tight flexible structure, means for maintaining the structure in an erected state and an airconditioning system for the structure.

Preferable the airconditioning system includes a filter unit through which all the air entering the shelter passes for decontamination. A hand operated, foot operated and/or electrically operated pump may be provided for sucking air through the filter unit.

The shelter may, when erected, be of generally rectangular shape and may be provided with attachment means in its upper part for attachment to supporting means such as the walls and/or ceiling of a room.

An airlock may be provided to allow entry to and exit from the shelter.

The invention will now be described in greater detail, by way of example, with reference to the drawings, in which:

Figure 1, is a perspective view, partly broken away, of an anti contamination shelter in accordance with the invention;

Figure 2, is a detail of the shelter according to Figure 1 showing a variation in the form of closure of an airlock opening;

Figure 3, is a detail of the shelter according to Figure 1 showing, in greater detail, the attachment arrangements for the shelter; and

Figure 4, is a detail showing a construction of shelter enabling parts of the shelter not being used to be stored away.

The shelter 1 shown in the drawings is intended for use

inside a building so as to be supported by the building with a minimum of modification.

5 As shown, the shelter comprises an airtight cuboid having, for access, an airlock 2 at one end. The walls 3 and roof 4 are suitably made of translucent polyurethane film, welded by radio frequency welding or adhered with suitable adhesives and may be reinforced as required. The floor 5, which is sealed hermetically  
10 to the walls is made from a tougher form of the same material so as to take up the necessary wear which will take place in use. To this end, additional reinforcement may be added.

15 The structure of the shelter is supportable in eight places by fixings 5, shown in greater detail in figure 3. In order to support the shelter, the room in which it is to be placed must be suitably prepared beforehand. However, with the shelter shown, only a  
20 minimum of alteration to the room may be necessary. The basic requirement is for hooks or screw eyes 6 to be located in the walls or ceilings to receive attachments 8 to be described in more detail hereafter. To this end, it may be necessary to provide reinforcing  
25 structures, particularly for hooks situated in the ceiling. In a specific example, the reinforcements may take the form of wooden joists e.g. 10cm x 10cm in cross section, which can be fitted above or beneath existing joists, preferably at right angles thereto.  
30 However, where the existing joists are of sufficient strength, the hooks may be attached directly to the existing joists. As far as the walls are concerned, if these are of brick then all that may be required is for the hooks to be fitted to wall plugs or the like  
35 located in the brickwork. In order to avoid, as much

as possible, upsetting the look of the room, the fixing points may be in the form of threaded sockets, only the openings of which are visible, the hooks being in the form of eye bolts which are screwed into the sockets at the time of erection of the shelter.

The attachments 8 on the shelter itself are in the form of strengthening patches 9 to which a strap 10 is attached, the strap having at its free end a snap hook 11 which can be snapped quickly onto the eye 6 when erecting the shelter. In order to enable the shelter to be used in rooms of different heights, the strap 10 is preferably adjustable, for example, using a second strap 12 carrying a buckle arrangement 14 to which the first strap is buckled as shown in Figure 3.

In order to increase the universality of the shelter, a number of differently placed attachments 8 may be provided, not all of which would be used in any one location.

By the use of such a location of the attachments, a shelter which, when fully erected, would be larger than the room in which it is situated can be used by leaving portions of the shelter un-erected and folded, as will be hereafter described.

Also in the upper part of the shelter, pressure relief valves 15 are provided which are so set as to ensure that a pressure in excess of atmospheric can be maintained in the shelter. In this way, should a small leak be accidentally found, all air flow would be from the shelter outwards so that no contaminated air could be admitted. Suitably the pressure relief valves 15 are protected by wire cages 16.

The interior of the shelter has provided in it a single opening 17 in the form of closable flaps. These flaps are preferably secured in an airtight condition when closed by means of the sliding clasp fasteners 18.

5 This single opening 17 opens into the airlock 2 situated at one end of the shelter, egress from the airlock to the outside being through a second flap closure 20 on one side face 21 of the airlock. This second closure 20 is also suitably closed by sliding  
10 clasp fasteners 22.

In Figure 1, the airlock flap closure 20 comprises four parts 24 to 27 which are all "zipped" together in the closed condition. When open, the centre flap 24 is  
15 rolled up, the side flaps 25 and 26 are secured at the sides by ties 28 and the lower flap 27 lies flat on the floor.

In the alternative shown in Figure 2, two flaps 30, 31  
20 are provided in the manner of a tent opening, each flap having a centre fastening 33 (to the other flap) and floor fastenings 34.

The airlock suitably has its own frame 36 formed of  
25 metal structures which pass through sleeves 38 formed in the airlock material. For universality, the airlock openings may be provided in both sides instead of only one as shown. In addition to the frame, the airlock may have attachment straps 5 and its own  
30 pressure relief valve 15.

In the interior of the shelter is situated an air conditioning apparatus 46 comprising a filter unit 41 with an inlet opening 42 in the shelter wall and an  
35 outlet 43 to a pump 44. This pump 44 sucks air through

the filter 41 and passes it to an outflow pipe 45 to provide cleaned air to the interior of the shelter at 46. To ensure a suitable level of filtering, a three stage filter is employed as the filter unit 41.

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The pump 44 is a dual operation pump and is provided for both power and manual operation. To this end the pump 44 is provided with an electric motor (not shown) driven by a long life battery 47 and an operating handle 48 for hand operation. The filter unit is preferably housed in a box structure 50, which is collapsible to allow it to pass through the airlock and the pump 44 is then mounted on a framework 51 attached to the top of the box 50.

15

The outlet from the pump 44 is branched to provide clean air along a duct 53 and this supply may be controlled by a valve (not shown) allowing the air to the airlock to be cut off.

20

The shelter is also equipped with looplines 54 along the walls for storage purposes and a special input socket 45 to enable a mains supply to be fed to the shelter (e.g. for operating the pump, electric motor and lights) if the mains supply is operating or during erection.

25

When the shelter is to be used in a room which is smaller than that for which it is basically designed, certain parts of the shelter may be left un-erected and the unused parts can be folded and covered by a cover flap 55 as can be seen in figure 4. Thus in its fully erect form, the shelter is carried by the four corner attachments, together possibly with the two outer central attachments. For a reduced length, the two

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corner attachments at the airlock end and the outer central attachment are used. For a narrower and shorter shelter, the inner central attachments and the inner end attachments adjacent to the airlock are used.

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It will of course be appreciated that the shelter, once erected can be to a large extent self supporting if there is a sufficient pressure differential between the interior and exterior. However, for efficient operation to cope with leaks etc the air pressure inside need only be slightly higher than atmosphere.

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The above described embodiment includes all the necessary built in features. However, it will be understood that with the shelter there will need to be a considerable amount of portable equipment which will be placed inside the shelter once erected, to make the shelter habitable. Such equipment will include bedding, food storage, first aid kit, contamination testing equipment and lighting and toilet facilities.

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Although one particular form of shelter has been described, it will be appreciated that the shelter can take many forms. For example, a rudimentary shelter could do without an airlock, but such a shelter would not be usable again once the door flaps had been opened to let people out.

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With the airlock, it is desirable to provide some means of decontamination so that a person who has had to go out for some reason can return without contaminating the interior of the shelter. To this end, anti contamination suits could be kept in the airlock and the airlock could be provided with dousing equipment provided that provision for removal of the waste water

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is made beforehand.

5 An inlet for mains water to the shelter could be provided, should it turn out that the mains water was not contaminated. Provision for remote testing of the outside atmosphere could be included so that air could be tested without having to be introduced into the shelter. The same would apply to water.

10 Various modifications could be made to the above described embodiment. For example, other materials may be used. For the wall and roof any of the following materials could be used:-

15 Films of polyurethane, butyl, polyvinyl chloride, PVDC, polythene and some synthetic rubber and flame retardant materials. Base cloths coated with the above materials could also be used. This list is by no means exhaustive.

20 For the floor, a number of the materials used for the walls and ceiling could also be used, either a tougher form of the material being used or the material being reinforced or otherwise toughened.

25 It is, of course, desirable to use transparent or translucent materials for the walls and ceiling so that daylight will be admitted. However, if opaque materials are used, it is preferred that provision be  
30 made for windows rather than there having to be permanent light in the shelter, both for economic and psychological reasons.

Any form of airtight fastening could be used instead of  
35 or in combination with the sliding clasp fasteners for

the entry openings. For example, velcro or like adherent fastenings could be used. The airtightness could be achieved by seals which were separate from the actual fastenings.

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The support attachments could take other forms, for example using chains, adjustment, if desired, being carried out by a similar system to the strap arrangement, replacing the buckle by a snap hook which could engage any of the links of the chain.

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Where the structure of the building does not permit support of the shelter, the whole shelter could be equipped with a de-mountable frame, for example similar to the frame provided for the airlock.

15

The filter system can be elaborated by the provision of a blast valve to protect the filters from over-pressure and a visual airflow indicator so that the operator of the pump can see readily that sufficient airflow is achieved. Means are provided to allow changing of the filter units if they should become clogged.

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Pedal operation of the pump could be used instead of the hand arrangements and a hand or foot operated electric generator could be provided. If an exterior generator is available, this could have remote control operation and feed electricity into the shelter through the mains connection.

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Additional means for exhausting air from the shelter could be provided for use in the event that the ceiling valves become blocked.

35 A carbon dioxide sensor could be incorporated in the

installation to warn the occupants of the shelter to restart pumping of air and thus avoid the possibility of suffocation when the pump is not being activated all the time.

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While normally filtering of the air would be sufficient for all contaminants likely to be found, a self contained air supply could be provided with a regenerating recycling system.

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While the above described shelter has been designed for lining an existing room, it would be possible to use such a shelter without the necessity of having a surrounding structure, where such a structure is not available, provided that sufficient toughness of the materials used is allowed for. The shelter could also be used with an exterior metal framework such as a cage arrangement which could be assembled at any desired location.

15

claims

1. A collapsible anti contamination shelter comprising a totally enclosable airtight flexible structure (1) means (5) for maintaining the structure in an erected state and an airconditioning system (46) for the structure.
2. A shelter as claimed in claim 1, wherein the air conditioning system (46) includes a filter unit (41) through which all the air entering the shelter (1) passes for decontamination.
3. A shelter as claimed in claim 2, wherein the filter unit (41) comprises a three stage filter unit.
4. A shelter as claimed in claim 1, 2 or 3 wherein a mechanical pump (44) is provided for sucking air from outside through the filter unit, (41) the pump (44) having operating means (48) operable directly by personnel within the shelter.
5. A shelter as claimed in claim 4, wherein the pump (44) is provided with means (48) for driving it by hand.
6. A shelter as claimed in claim 4 or 5 wherein the pump (44) is provided with means for driving it by foot.
7. A shelter as claimed in claim 4, 5 or 6, wherein the pump (44) is provided with an electric motor for alternative operation to manual operation.

8. A shelter as claimed in any one of claims 1 to 7, wherein the shelter structure (1) is of generally rectangular shape when erected and is provided with attachment means (5) in its upper parts for attaching  
5 the structure (1) to supporting means.

9. A shelter as claimed in claim 8, wherein the attachment means (31) comprise straps (10) connectable to hooks (6) provided on the supporting means.

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10. A shelter as claimed in claims 8 or 9, wherein the shelter structure (1) has a closable opening (17) in one face.

15 11. A shelter as claimed in claim 10, wherein an airlock (2) is provided into which the closable opening (17) opens, the airlock being provided with at least one closable opening (20), opening to the outside of the shelter.

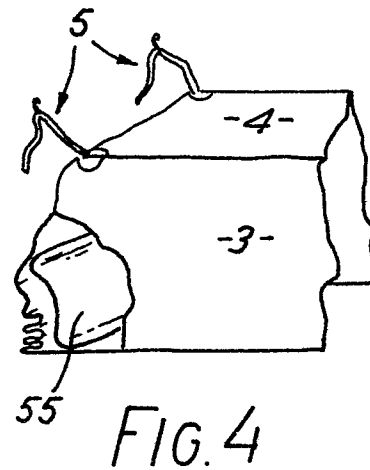
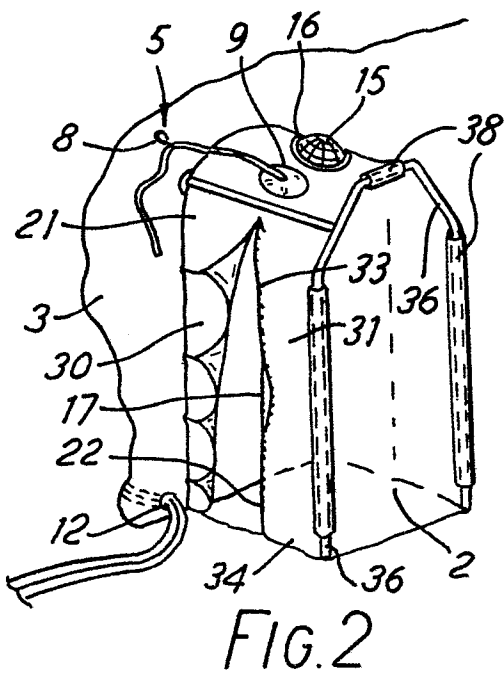
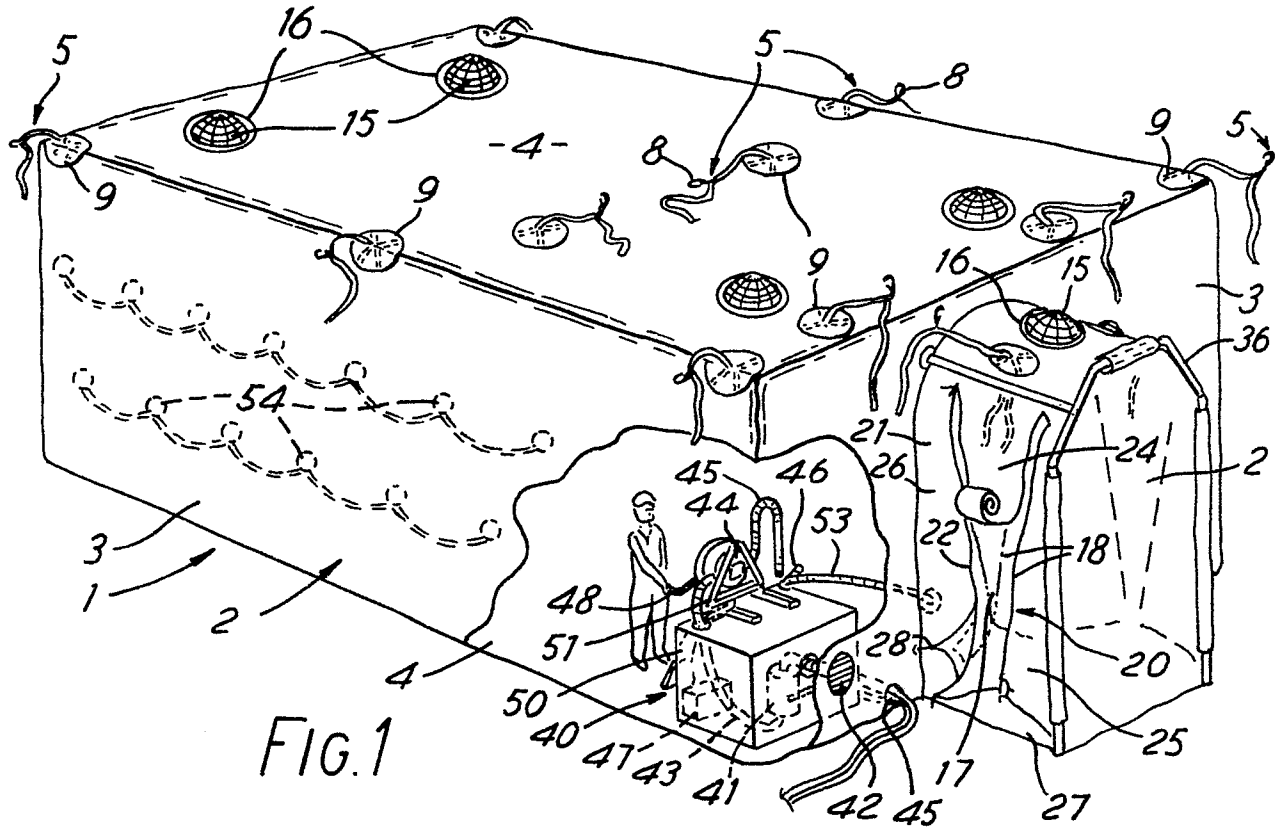
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12. A shelter as claimed in claim 11, wherein the airlock (2) is provided with its own supporting frame (36,38).

25 13. A shelter as claimed in claim 10, 11 or 12 wherein the opening(s) (17,20) comprise flap members (24 to 27, 30,31) secured in the closed position by airtight sliding clasp fasteners (22,33,34).

30 14. A shelter as claimed in any one of claims 1 to 14 wherein the shelter (1) is provided with pressure relief valves (15) designed to enable pre-determined excess pressure to be maintained within the shelter.

15. A shelter as claimed in claim 14, wherein the pressure relief valves (15) are provided with cages (16) for protection thereof.



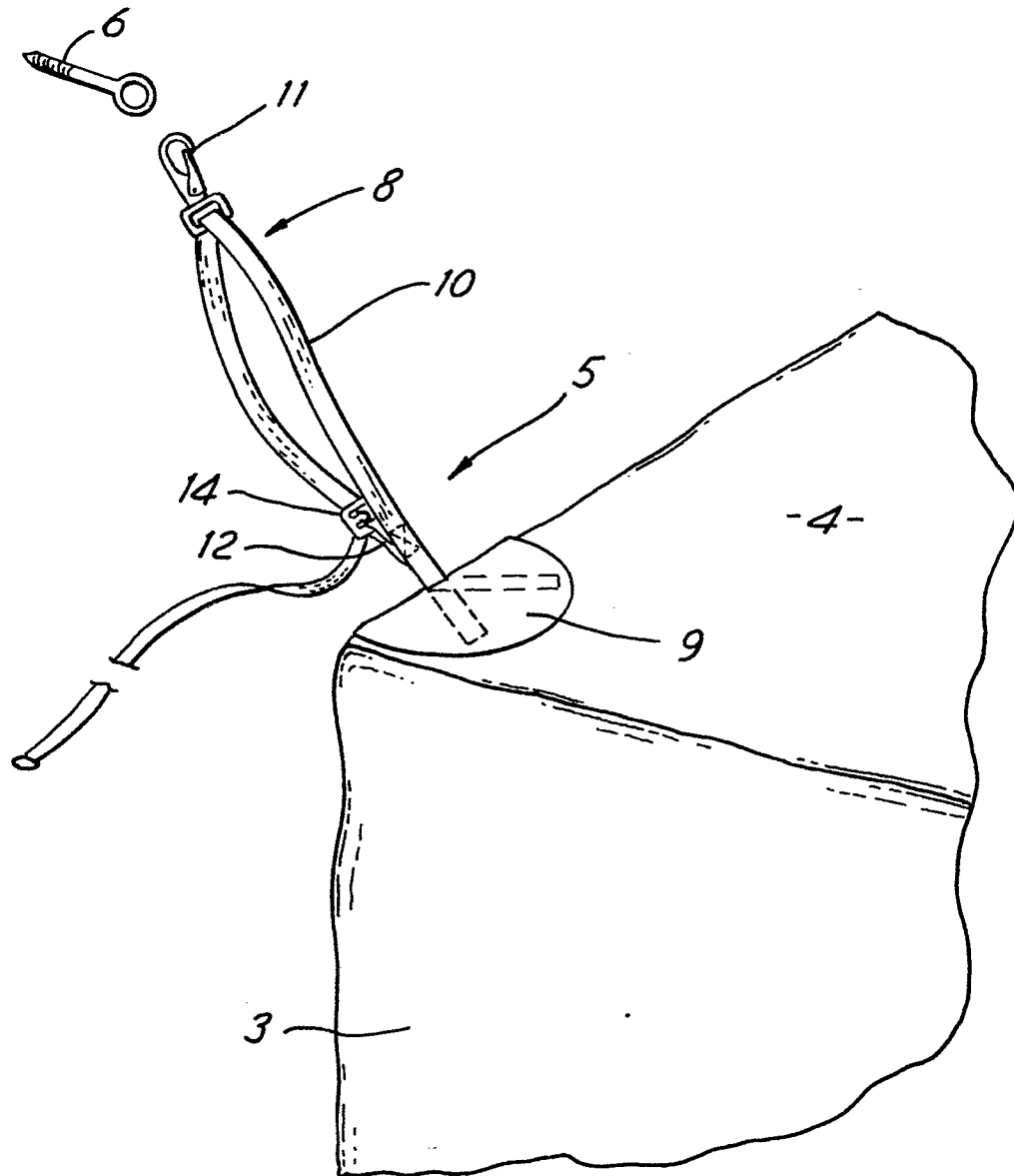


FIG. 3





European Patent  
Office

# EUROPEAN SEARCH REPORT

0075483

Application number

EP 82 30 4968

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. <sup>3</sup> )
X	<p>FR-A-1 566 305 (FERRARI)</p> <p>---</p> <p>*The whole document*</p>	1, 2, 4, 10, 11, 12, 14	G 21 F 7/00
X	<p>FR-A-1 309 320 (BESSONNEAU)</p> <p>---</p> <p>*Abstract; figures*</p>	1	
X	<p>US-A-3 335 529 (GEDNEY)</p> <p>---</p> <p>*Column 2, lines 50-72; figure 1*</p>	1, 4, 8, 10, 13, 14	
A	<p>US-A-3 918 221 (BENJAMIN)</p> <p>---</p> <p>*Abstract; figure 1*</p>	14	
A	<p>US-A-3 353 309 (KWAKE)</p> <p>---</p> <p>*Column 5, lines 66-70; figures 1, 7*</p>	9	<p>TECHNICAL FIELDS SEARCHED (Int. Cl. <sup>3</sup>)</p> <p>G 21 F 3/00</p> <p>G 21 F 7/00</p> <p>E 04 H 15/00</p>
A	<p>US-A-2 649 101 (SUITS)</p> <p>---</p> <p>*Figures*</p> <p>-----</p>	1, 4	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 23-12-1982	Examiner KAVCIC D.
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone</p> <p>Y : particularly relevant if combined with another document of the same category</p> <p>A : technological background</p> <p>O : non-written disclosure</p> <p>P : intermediate document</p> <p>T : theory or principle underlying the invention</p> <p>E : earlier patent document, but published on, or after the filing date</p> <p>D : document cited in the application</p> <p>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p>			