



(12) PATENT ABRIDGMENT (11) Document No. AU-B-29827/95
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 684654

- (54) Title
PEST CONTROL DEVICE
- International Patent Classification(s)
(51)^s **A01M 001/20 A01M 001/02**
- (21) Application No. : **29827/95** (22) Application Date : **07.07.95**
- (87) PCT Publication Number : **WO96/02134**
- (30) Priority Data
- (31) Number (32) Date (33) Country
9414451 18.07.94 GB UNITED KINGDOM
- (43) Publication Date : **16.02.96**
- (44) Publication Date of Accepted Application : **18.12.97**
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- (56) Prior Art Documents
US 4970822
US 4709504
EP 297214
- (57) Claim

1. A device for the control of crawling pests, said device comprising a tunnel into which a crawling pest may enter, the interior surface of the tunnel ceiling, or a portion thereof, is treated with a suitable pest control agent, characterised in that the gap between floor and ceiling in the treated area decreases in the direction of crawl; such that a pest entering the device may encounter said decreasing gap and receive upon contact with the treated surface a dose of the agent topically on its upper parts.
2. A device according to claim 1 in which the floor of the tunnel is flat.
3. A device according to claim 1 or claim 2 in which at least a small floor-to-ceiling gap is maintained over all or substantially all of the treated area.
4. A device according to any of claims 1 to 3 suitable for crawling insect control in which the gap decreases from about 10mm to about 2mm.

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5. A device according to any^{one}_^ of claims 1 to 4 in which the ceiling is convex.
6. A device according to any^{one}_^ of claims 1 to 5 in which the ceiling is deformable or movable upon contact with the target pest.
7. A device according to claim 6 in which a compressible padding material is located between the interior and exterior surfaces of the ceiling adjacent to the movable/deformable surface.
8. A device according to claim 6 in which the treated portion is a light, deformable, movable structure that is suspended from the ceiling, and is not in contact with the floor of the device.
9. A device according to any^{one}_^ of claims 1 to 8 which, in order to limit user exposure to the pest control agent further comprises, at both ends of the tunnel, a portion of the interior surface of the ceiling which is not treated with the pest control agent.



I.

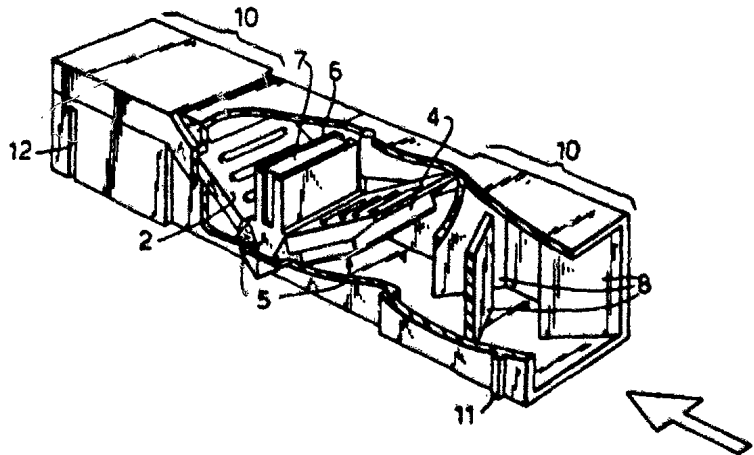
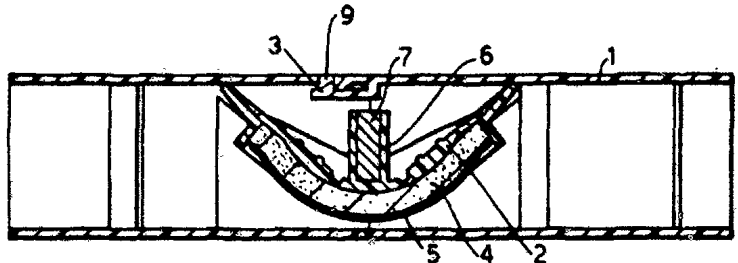
I)

<p>(51) International Patent Classification ⁶ : A01M 1/20, 1/02</p>	<p>A1</p>	<p>(11) International Publication Number: WO 96/02134 (43) International Publication Date: 1 February 1996 (01.02.96)</p>
<p>(21) International Application Number: PCT/EP95/02701 (22) International Filing Date: 7 July 1995 (07.07.95) (30) Priority Data: 9414451.6 18 July 1994 (18.07.94) GB (71) Applicant (for all designated States except US): AGREVO ENVIRONMENTAL HEALTH LIMITED [GB/GB], Hauxton, Cambridge CB2 5HU (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): ADAMS, Andrew, John [GB/GB]; McIntyre House, High Street, Berkhamsted, Herts HP4 2DY (GB). (74) Agent: WELLS, Norman, David; AgEvo UK Limited, Patent Dept., Chesterford Park, Saffron Walden, Essex CB10 1XL (GB).</p>	<p>(81) Designated States: AM, AU, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, JP, KE, KR, KZ, LK, LT, LV, MX, NO, NZ, PL, RO, RU, SD, SI, SK, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG).</p> <p>Published With international search report.</p> <p>684654</p>	

(54) Title: PEST CONTROL DEVICE

(57) Abstract

A device for controlling crawling pests comprising a tunnel in which the ceiling is treated with a pest control agent and the gap between floor and ceiling in the treated area decreases from at least one edge of the treated area. A pest entering the device receives a topical dose of the pesticide control agent on its upper parts.



PEST CONTROL DEVICE

The present invention relates to the control of crawling pests, eg crawling insects, arachnids, wood lice, millipedes and centipedes, but especially cockroaches.

5 More particularly the invention is concerned with a localised placement device for the control of such pests.

PRIOR ART

Crawling pests have conventionally been controlled by applying a pest control agent to an area, usually by
10 spraying, so that when the target pest crawls over that area it acquires a lethal dose of the agent. However, in this method, humans and non-target creatures can contact the pest control agent, and contamination of foodstuffs or surfaces may occur which could be harmful. Furthermore,
15 the target pest may not stay on a treated area long enough in order to acquire a lethal dose, and this may result in the development of repellency, or resistance, to the agent concerned.

US patent 4970822 describes a contact poison
20 delivery system for cockroaches comprising a tunnel structure having two vertical walls and two horizontal walls defining a poison containment area. An insecticide is applied to the internal horizontal surfaces so that a cockroach walking through the tunnel and contacting those
25 surfaces receives a dose of insecticide. However, the embodiments described are suitable only for the control of cockroaches of a particular size, and we have found that the construction of the device does not allow the insecticide to be transferred even to an insect of
30 appropriate size in a particularly efficient manner. In addition, insecticide is transferred to the legs and feet of the cockroach, and some of this will naturally be deposited on any surface or foodstuffs that it subsequently crosses, resulting in undesirable further
35 contamination. Such contamination is likely to be at sub-lethal levels and, if encountered by other pests,

might contribute to the development of resistance. In the region of the device, it could also act to repel further pests from entering the device.

EP 0281744 describes an insect trap for capturing and killing within it, triatomids such as *Rhodnius prolixus* the principal assassin bug responsible for the transmission of Chagas' disease. This trap has triangular-shaped chambers, the shape of which appeals to the assassin bugs by allowing them to nestle the posterior portions of their bodies into the corners. This invention, however, describes a trap within which the insect is poisoned and dies. It will be appreciated that the traps will fill up and will require periodic emptying or replacement. Further, it will be appreciated that this trap is designed for the purpose of controlling a single species of pest, and has been designed on the basis of the assassin bug's unique behaviour, which is unlike that of most crawling insects.

DESCRIPTION

The present invention provides a device for the control of crawling pests, particularly insects, and especially cockroaches, which reduces or overcomes some of the disadvantages of the prior art.

According to the present invention there is provided a device for the control of crawling pests, said device comprising a tunnel into which a crawling pest may enter, the interior surface of the tunnel ceiling, or a portion thereof, is treated with a suitable pest control agent, characterised in that the gap between floor and ceiling in the treated area decreases in the direction of crawl; such that a pest entering the device may encounter said decreasing gap and receive upon contact with the treated surface a dose of the agent topically on its upper parts.

Where the target pest is an insect, the dose is received topically on its antennae, dorsal surfaces of the thorax, abdomen or head.



The floor of the tunnel is preferably formed from thin layer of a material that does not represent a significant barrier for the pests to cross and enter the device.

- 5 The floor of the tunnel is preferably flat, in which case the treated area of the ceiling desirably slopes from opposite edges towards the floor in the direction of the interior of the device to provide the reduction in the floor-to-ceiling gap. For the control of most crawling
- 10 insects, especially cockroaches, the floor-to-ceiling gap preferably decreases from about 10mm to about 2mm, desirably towards the interior of the device. This could alternatively be achieved by means of a flat ceiling and a sloping floor,



but this presents a change in environment that is detectable by and may therefore deter the target pests. When a sloping ceiling is used, the change in environment is only detected once the ceiling has been contacted, ie
5 once the dose of the pest control agent has been transferred.

In comparison with a device in which the floor and ceiling are parallel, the reducing floor-to-ceiling gap enables a far wider range of sizes of crawling pest to be
10 accommodated and controlled. In addition, it exploits the inherent investigative nature of certain pests, especially cockroaches, which have a propensity to explore small gaps and crevices. To encourage such behaviour, and thus
15 increase the contact between the pest and the treated area, at least a small floor-to-ceiling gap is preferably maintained over all or substantially all of the treated area.

A path may be provided for the pest to enter the device at one end and exit at the other, having contacted
20 the treated portion, but this is not essential. Such a path may be imposed on the pest by means of one-way devices at suitable points, particularly one-way entrance and exit doors.

The device of the present invention is not a
25 harbourage or trap, and individual pests generally remain in it for a very short time, typically less than 5 seconds, leaving to die remote from the device once contact with the pest control agent has occurred. In this way the pest control agent may with further advantage be
30 transferred back to the pests' natural harbourage or to other pests. Although there may be a consequential transfer of the pest control agent to the environment, this will generally be less than that from known devices in which application is made to the feet or legs.

35 The tunnel entrance is preferably rectangular in cross-section.

The ceiling is preferably convex. It is also preferably deformable or movable on contact by the target pest, thereby improving or prolonging the contact between the pest and the pest control agent. To this end, a compressible padding material may be located between the interior and exterior surfaces of the ceiling adjacent to the movable/deformable surface. Alternatively, the compressible padding may be replaced by a supporting structure that gives some flexibility to the treated portion of the ceiling. In another embodiment, the treated portion may be a light, deformable, movable structure that is suspended from the ceiling, and is not in contact with the floor of the device.

In a further form of construction, contact with the ceiling, or a structure suspended from it, by the target pest may be made to act as a trigger for a second mechanism to dose the insect.

The treated interior ceiling of the device is desirably removable to enable it to be replenished with pest control agent or replaced.

User exposure to the pest control agent may be limited by the device further comprising, at both ends of the tunnel, a portion of the interior surface of the ceiling which is not treated with the agent. Alternatively, the device may be provided with suitable baffles at each entrance, which should not of course significantly obstruct the target pests from entering the device.

The construction of the device is preferably such that two or more may be linked to form a modular structure.

The device may also beneficially incorporate features attractive to the target pest, for example a dark interior, which has the added advantage of allowing photolabile compounds to be employed which may be of enhanced activity. In addition, the device may of course

contain pheromones or foodstuffs.

The pest control agent is preferably applied to the tunnel ceiling in a 1-500 μ m thick film of a suitable formulation. The formulation itself is desirably such
5 that it adheres to the tunnel ceiling without soaking into, migrating on, or dripping from it, does not flow at rest, is physically and chemically stable for several months under the conditions of use, and becomes flowable under small shear stress so as to be readily and
10 consistently transferred to the upper surface of the pest whilst rapidly regaining its original structure and viscosity under no-shear conditions. The amount of formulation transferred in the contact is preferably adequate to provide a lethal dose on single contact, but
15 small enough that sufficient remains to ensure the device continues to be effective against further pests. In addition, the formulation should not be repellent to the target pests.

Formulations which may exhibit these properties are
20 typically greases, pastes, gels or creams, and will most frequently comprise one or more pest control agents, optionally a synergist, a gelling/structuring agent, and one or more thickeners, stabilisers, solvents and cosolvents.

The pest control agent may for example be an
25 insecticide, sterilising agent, growth regulator, juvenile hormone analogue or behaviour modifier. Particularly preferred are the synthetic pyrethroid insecticides, eg acrinathrin, allethrin (such as D-allethrin), benfluthrin,
30 bifenthrin, bioallethrin, S-bioallethrin, esbiothrin, esbiol, bioresmethrin, cycloprothrin, cyfluthrin, beta-cyfluthrin, cyhalothrin, lambda-cyhalothrin, cypermethrin, alpha-cypermethrin, beta-cypermethrin, cyphenothrin, deltamethrin, empenthrin, esfenvalerate,
35 fenpropathrin, fenvalerate, flucythrinate, tau-fluvalinate, kadethrin, permethrin, phenothrin,

prallethrin, imiprothrin, resmethrin, tefluthrin, tetramethrin or tralomethrin. Among these compounds deltamethrin is especially useful.

5 The activity of the insecticide may be enhanced by the addition of a synergist or potentiator, for example one of the oxidase inhibitor class of synergists such as piperonyl butoxide or propyl 2-propynylphenyl phosphonate.

10 The gelling/structuring agent can be a bentonite, a modified clay or silica, such as BARAGEL 3000 from Redland Minerals Ltd, zinc stearate or any mixture of a salt and a surfactant able to produce a gel.

15 The viscosity of the formulation, under no-shear conditions, is preferably greater than or equal to 15,000 mPa secs at a temperature between 10 and 35°C. On contact with a pest, the formulations should preferably shear to a viscosity of no less than about 1000 mPa sec.

20 The thickener, an ingredient able to increase the viscosity of the product, typically consists of a hydrocarbon wax with more than 18 carbons length and soluble in the vehicle ie the liquid phase made by the solvents and co-solvents; an example of such an ingredient is LUNACERA MW from Industrial Waxes Limited.

25 The solvent or vehicle preferably has a boiling range greater than 280°C at atmospheric pressure, eg a mineral white oil such as ONDINA 15, a heavy hydrocarbon solvent such as BVA XK3, a vegetable oil, hydrogenated or methylated or not modified, MIGLYOL oils like 812N. Solvents or vehicle without odour and repellent effect are preferable.

30 Co-solvents can be used to help solubilization of the active ingredient and can be, for example, selected from ketones, glycol ethers, glycol esters.

35 Stabilizers when necessary are selected from anti-oxidants such as BHT, BHA, propyl-gallate, acidifying agent like citric acid, acetic acid or salts from the dodecylbenzene sulfonic acid.

Preferred formulations for use in the device of the present invention comprise:

		% w/w
	Active ingredient (insecticide)	0.01 - 80
	Gelling/structuring agent	0.00 - 30
5	Thickener	0.00 - 30
	Stabilizers	0.00 - 10
	Solvents	10.00 - 80

Where the active ingredient is deltamethrin, its content in the formulation is preferably from 0.01 to 30% w/w preferably 1 to 10%, and more particularly 2 to 7% w/w.

A specific preferred formulation may be prepared from the following ingredients:

		% w/w
15	Deltamethrin	5
	MIGLYOL 812 N	63.9
	Citric acid	0.1
	Calcium Phenylsulfonate	1
	LUNACERA MW	20
20	BARAGEL 3000	10

by solubilizing the deltamethrin in the MIGLYOL 812 N with the LUNACERA MW, citric acid and calcium dodecylbenzene sulfonate by stirring at a temperature of 70°C, then dispersing the BARAGEL 3000 using a high shear mixer to obtain a gel having a viscosity around 15,000 mPas at 20°C and over 500 mPas at 50°C.

The present invention also provides a method for the control of crawling pests, particularly insects, in a specified area by placing one or more of the localised placement devices of the present invention in the infested area, for example domestic house kitchens, restaurant kitchens or food preparation areas.

EXAMPLES

In a non-limiting manner, preferred embodiments of the device of the present invention will now be described with reference to the accompanying drawings in which:

Figure 1a is a cross-sectional side view of a preferred device according to the present invention.

Figure 1b is a diagrammatic partly cut-away perspective view of the device of Figure 1a.

5 Figure 2a, 2b and 2c illustrate perspective views of the device of Figures 1a and 1b in use in various orientations.

10 Figure 3 illustrates schematically the procedure for the insertion and removal of the refill portion of the device of Figures 1a and 1b.

Figure 4 is a diagrammatic perspective view of a simple localised treatment device according to the invention.

15 Figure 5 is a schematic view of the structure of the interior ceiling of the device of Figure 4.

Figure 6 is a diagrammatic perspective view of a simple localized treatment device according to the invention.

20 In Figures 1a and 1b a plastic casing (1) forms the walls, roof and base of the device. In use, the device contains within it a refill body (2) formed of plastics material eg polypropylene, this refill body being removable to enable its replacement. Locking means (3) engage the two portions of the casing on closure. A
25 simple key pushed into the openings (9) enables the device to be opened. The refill body comprises a deformable substrate (4) of a foam material, which forms the ceiling section of the interior of the device and provides the necessary reduction in the floor-to-ceiling distance. The
30 foam material may also be covered with a thin layer of plastics material e.g. polypropylene. The surface of the substrate (4) is coated with an insecticidal paste (5). In alternative embodiments, the refill body merely
35 comprises a solid curved structure of plastics material, preferably polypropylene, and the surface is coated with the insect control agent. In the embodiment shown, the

refill body also has a region (6) adapted to receive a tablet (7) of attractant to the target insect. The entrance/exit regions of the device incorporate baffles (8) which form maze sections (10). Such sections minimise user accessibility to the treated refill body while providing a minimal barrier to movement of the insect into the device. Ganging fixings (11) and (12) are shown on the external side walls of the device.

In use, the target insect enters the device in the direction of the arrow shown in Figure 1b. The sloping ceiling allows for contact by different development stages of the target insect and also permits the insects to progress further into the device until contact with the ceiling and resultant transfer of the insecticide occurs. The smallest development stages of the target insect and also some adults may be able to pass through the device, contacting the treated portion where the floor-to-ceiling distance is at its minimum.

In Figures 2a and 2b the positioning of a device of Figures 1a and 1b is illustrated, in a horizontal position and a vertical position respectively. The device is held in the vertical orientation by means of adhesive pads. These are also preferably used for a horizontal positioning to prevent the device from being inadvertently moved. Figure 2c illustrates the use of several devices fixed together by means of male and female fixings (11) and (12) respectively, thus increasing the overall catchment area.

Figure 3 illustrates the simple procedure for loading the refill body into the device and also for unloading the refill body.

In Figure 4 typical dimensions of the device for the control of the German cockroach (*Blattella germanica*) are: $a=10.5$ cm, $b=5$ cm, $h=0.8$ cm, $a_1=12$ cm, $b_1=6$ cm but these dimensions may vary with the species and behaviour of the target pest. A solid plastic casing (1) forms the walls

and the roof of the device, which is fixed on a cardboard base (13). The interior ceiling (14) has a convex interior surface (15) such that the height between it and the cardboard base is about 0.7 centimeter at the entrance and the exit of the device (c), and about 0.2-0.3 centimeter at the centre inside the device (d).

In Figure 5 the interior ceiling (14) consists of a convex aluminium foil (16), where the exterior surface is the interior surface of the ceiling (15), which foil covers a cotton wool pad (17) located between (16) and a plastic backing (18). Structure (14) is fixed to the interior surface of the roof of the device.

In Figure 6 the interior ceiling (15) consists of aluminium foil the convex shape of which is provided by fixing the foil over dental rolls (19) fixed on a cardboard base (20), to provide a specific minimum floor-to-ceiling distance within the tunnel. The ceiling is, however, unsupported between the edge of the roof and the lowest point. Figure 6 also shows the treated surface (5). The dimensions of this device used for controlling *Blattella germanica*, are preferably of the order: $i=1.7$ cm, $j=k=10$ cm, $m \geq 0.2$ cm.

Activity Example

In laboratory tests, a single device according to the invention containing 0.3g of a 5% w/w deltamethrin paste caused 100% kill of adult *Blattella germanica*, *Blatta orientalis* and *Periplaneta americana* cockroaches, from the susceptible laboratory strains, in a 1.1 x 1.1 m arena that contained harbourage, food and water. Under identical conditions, using a strain of *Blattella germanica* which was 20 times more resistant to deltamethrin, 94% males and 50% females were killed overnight. In three dimensional (2.5 x 2.5 x 2 m) arenas, with food, water and harbourage, two devices caused a 50% reduction (100% males, 70% females and 30% nymphs) of a mixed age population of the susceptible *Blattella*

germanica strain within 72 hours.

In field trials at two locations in an infested kitchen area, localised placement devices of the present invention, containing 0.3 g of a 5% w/w deltamethrin paste
5 formulation reduced the *Blattella germanica* population by 60-95% after one week. The cockroach population was more than 20 times more resistant to deltamethrin than the laboratory strain.

CLAIMS:

1. A device for the control of crawling pests, said device comprising a tunnel into which a crawling pest may enter, the interior surface of the tunnel ceiling, or a portion thereof, is treated with a suitable pest control agent, characterised in that the gap between floor and ceiling in the treated area decreases in the direction of crawl; such that a pest entering the device may encounter said decreasing gap and receive upon contact with the treated surface a dose of the agent topically on its upper parts.
2. A device according to claim 1 in which the floor of the tunnel is flat.
3. A device according to claim 1 or claim 2 in which at least a small floor-to-ceiling gap is maintained over all or substantially all of the treated area.
4. A device according to any of claims 1 to 3 suitable for crawling insect control in which the gap decreases from about 10mm to about 2mm.
5. A device according to any ^{one} of claims 1 to 4 in which the ceiling is convex.
6. A device according to any ^{one} of claims 1 to 5 in which the ceiling is deformable or movable upon contact with the target pest.
7. A device according to claim 6 in which a compressible padding material is located between the interior and exterior surfaces of the ceiling adjacent to the movable/deformable surface.
8. A device according to claim 6 in which the treated portion is a light, deformable, movable structure that is suspended from the ceiling, and is not in contact with the floor of the device.
9. A device according to any ^{one} of claims 1 to 8 which, in order to limit user exposure to the pest control agent further comprises, at both ends of the tunnel, a portion of the interior surface of the ceiling which is not treated with the pest control agent.



10. A device according to any one of claims 1 to 9 which, in order to limit user exposure to the pest control agent, further comprises to limit user baffles at each entrance which do not obstruct target pests entering the device.

5 11. A device for the control of crawling pests substantially as hereinbefore described with reference to the accompanying drawings.

10

DATED this 15th day of September, 1997

15 AgrEvo Environmental Health Limited

By its Patent Attorneys

DAVIES COLLISON CAVE

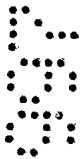
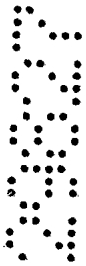


Fig.1a.

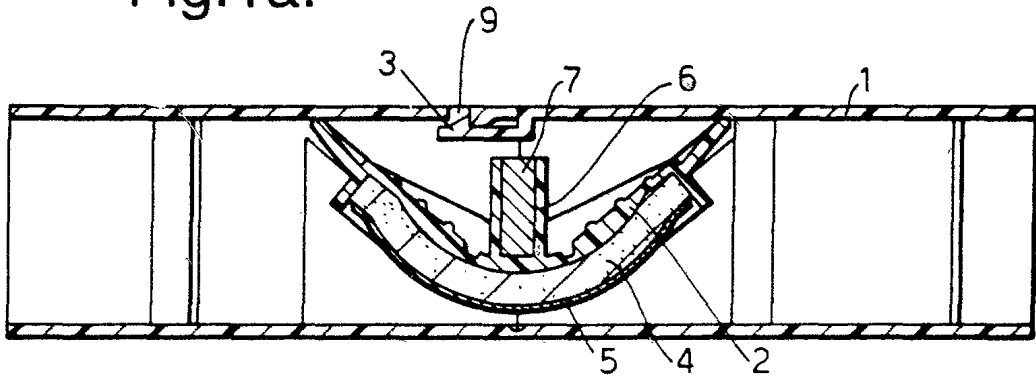


Fig.1b.

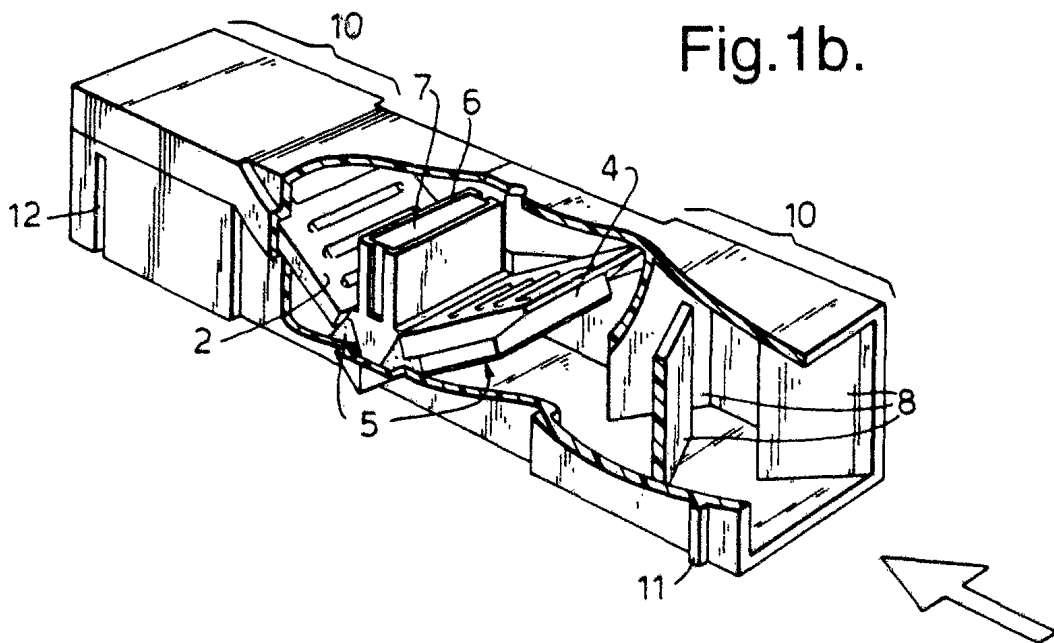
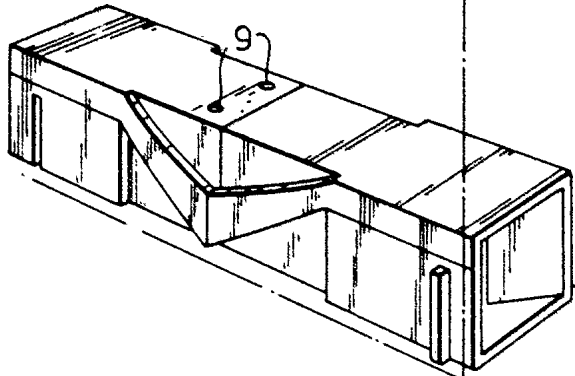


Fig.2a.



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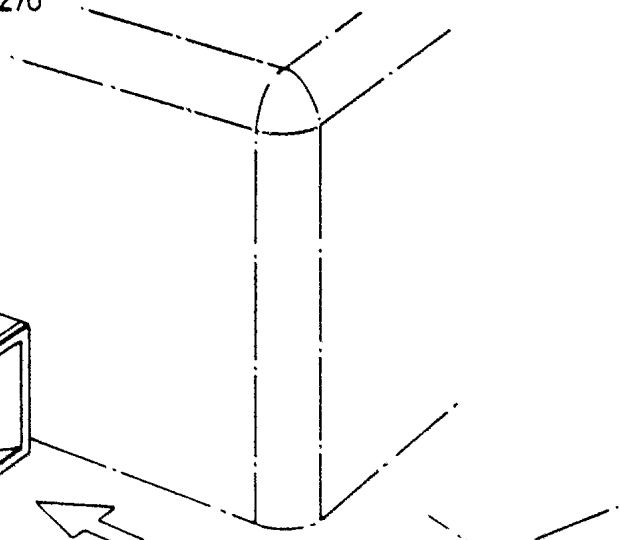


Fig.2b.

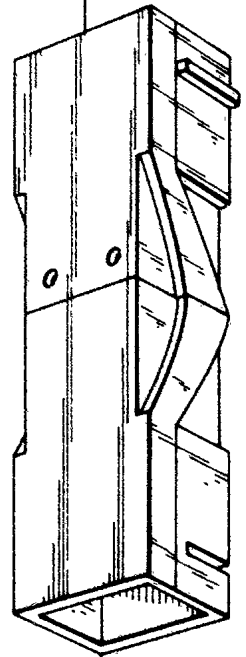


Fig.2c.

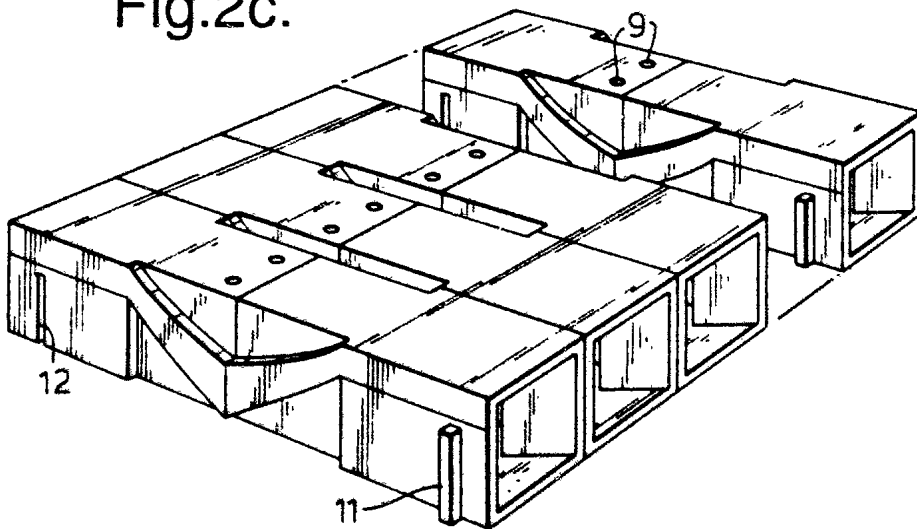
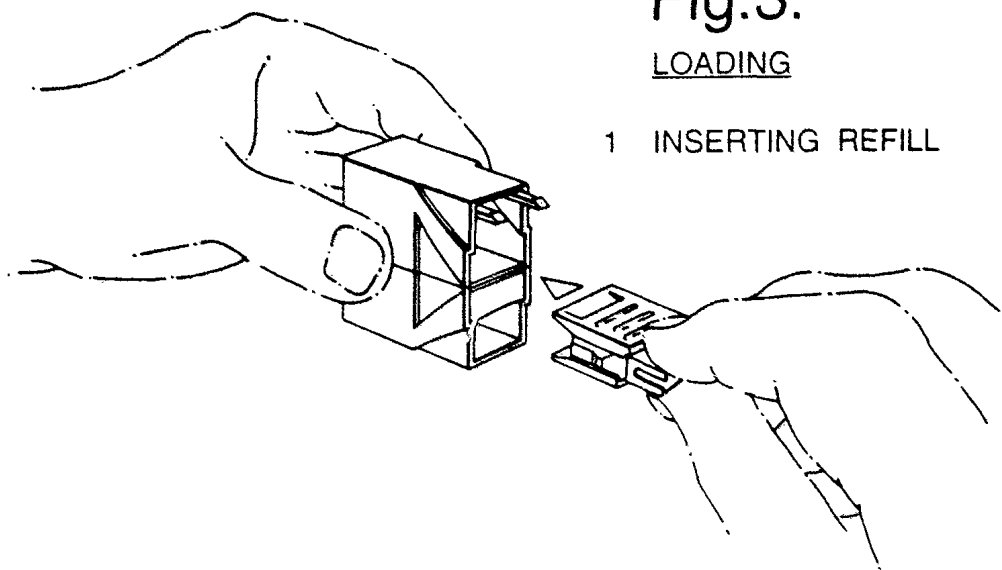


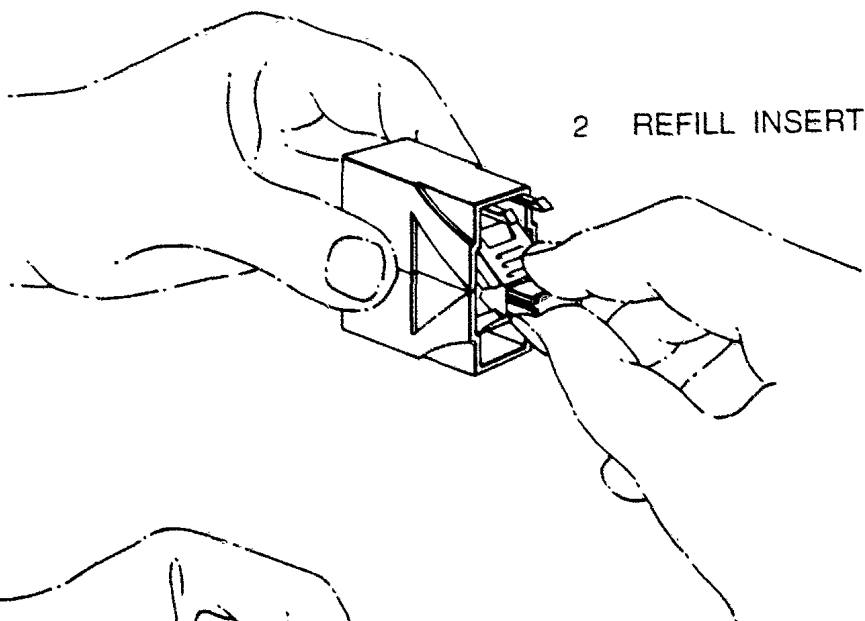
Fig.3.

LOADING

1 INSERTING REFILL



2 REFILL INSERTING



3 CLOSING HOUSING

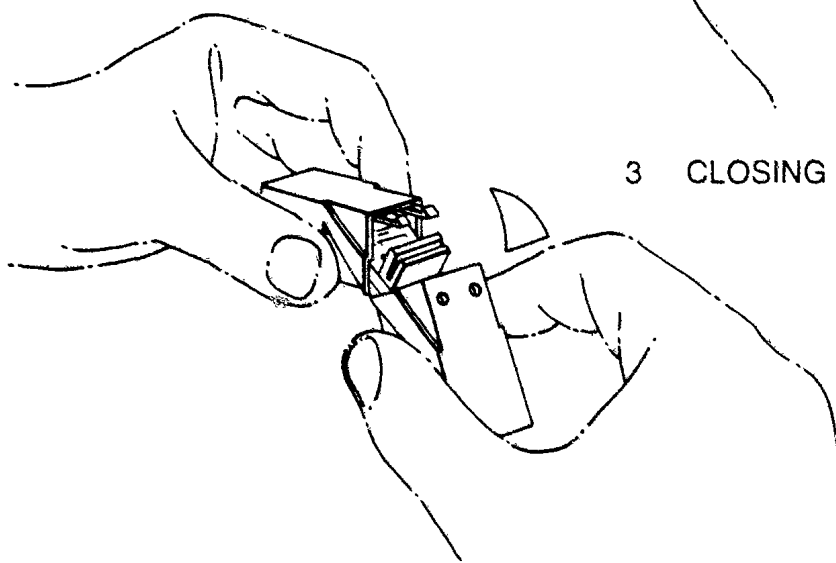


Fig.3.

UNLOADING

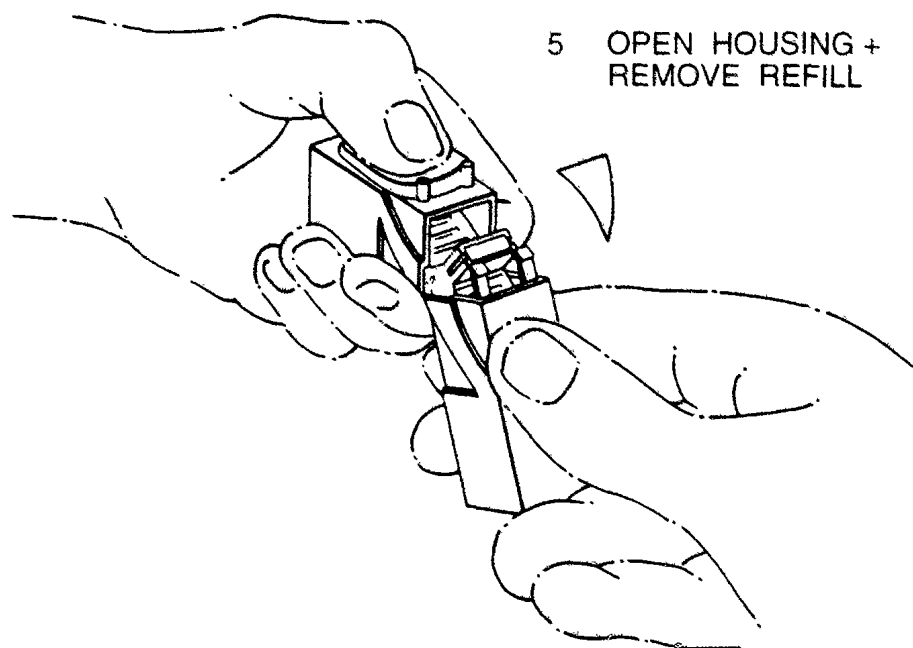
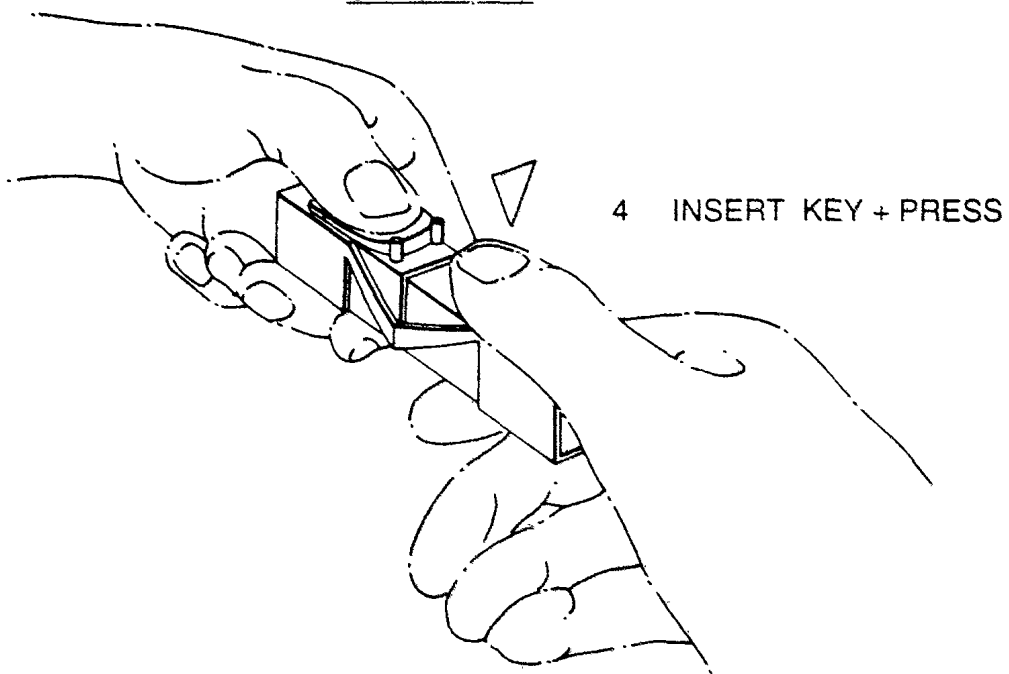


Fig.4.

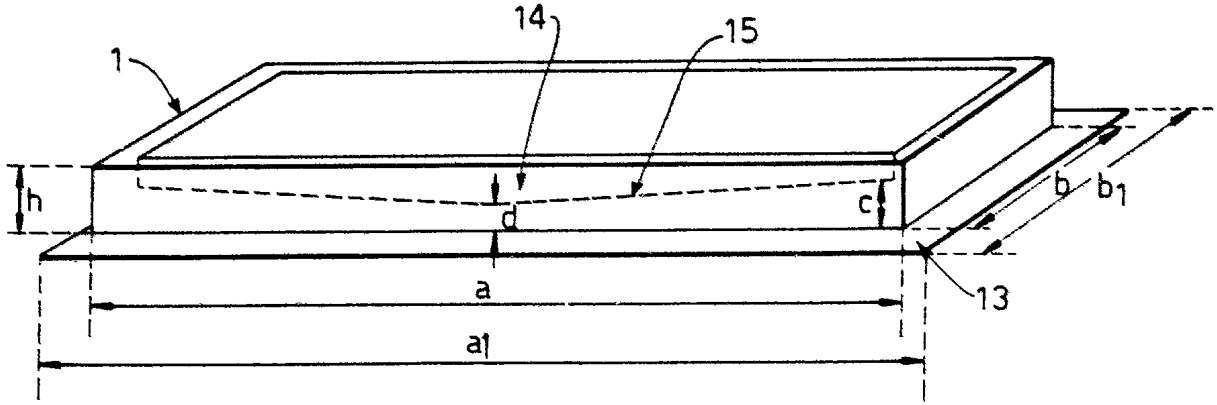


Fig.6.

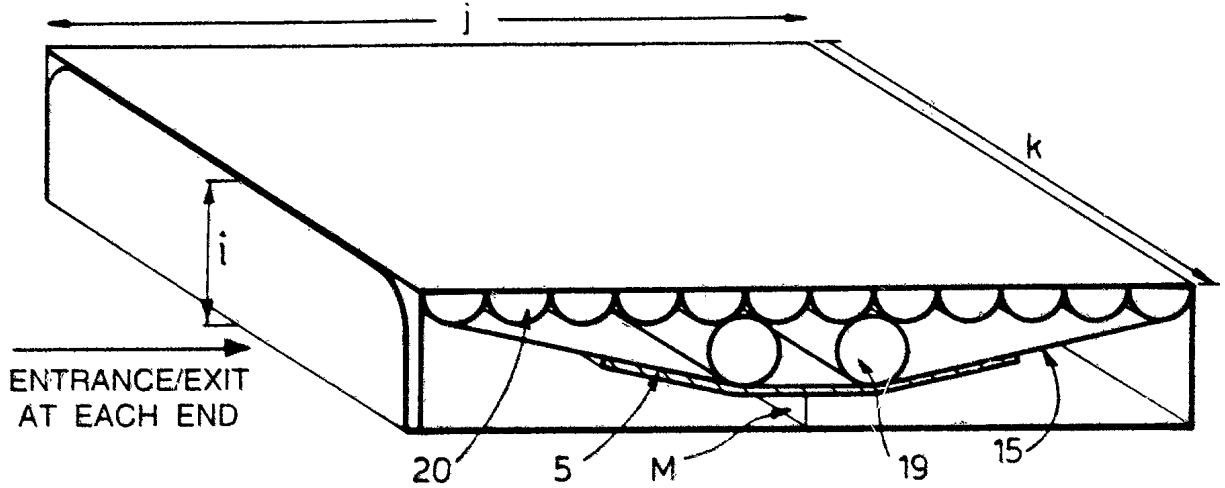
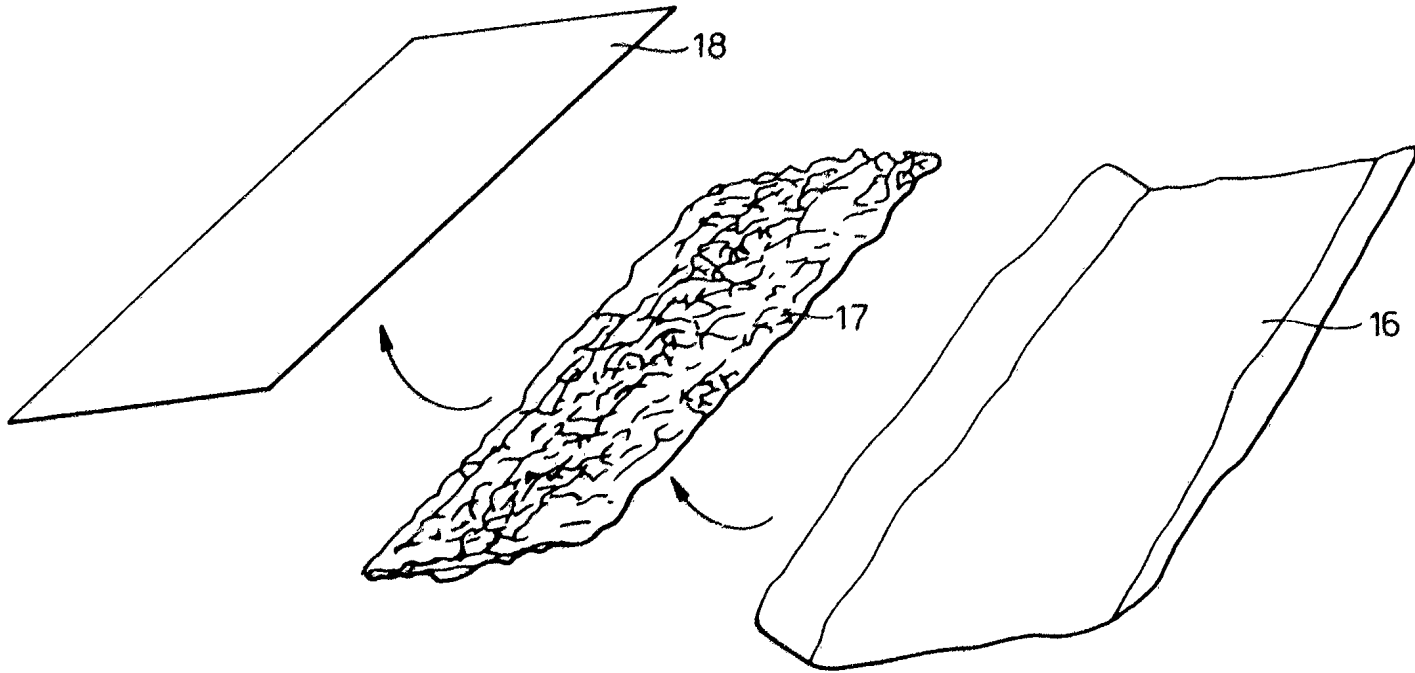


Fig.5.



INTERNATIONAL SEARCH REPORT

Intern. Appl. Application No.

PCT/EP 95/02701

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 6 A01M1/20 A01M1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 IPC 6 A01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US,A,4 970 822 (SHERMAN) 20 November 1990 cited in the application	1,2
A	see column 4, line 31 - column 5, line 61 see claims; figures	9
Y	EP,A,0 281 744 (THE RESEARCH FONDATION OF STATE UNIVERSITY OF NEW YORK) 14 September 1988 see column 3, line 32 - column 6, line 14 see claims; figures	1,2
A	WO,A,92 22200 (ICI AMERICAS INC.) 23 December 1992 see page 2, paragraph 3 see page 9, paragraph 3 - page 10, paragraph 1 see claims; figures	1,10
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Further documents are listed in the continuation of box C.

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Date of the actual completion of the international search

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20 September 1995

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 95/02701

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP,A,0 297 214 (S.C.JOHNSON & SON, INC.) 4 January 1989 see column 4, line 58 - column 7, line 12 see claims; figures -----	1,7
A	US,A,4 709 504 (ANDRIC) 1 December 1987 Abstract. see claims; figures -----	1,10

INTERNATIONAL SEARCH REPORT

information on patent family members

Intern. Application No.
PCT/EP 95/02701

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		DE-A- 3878948	15-04-93
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		US-A- 5042194	27-08-91
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US-A-4709504	01-12-87	NONE	
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