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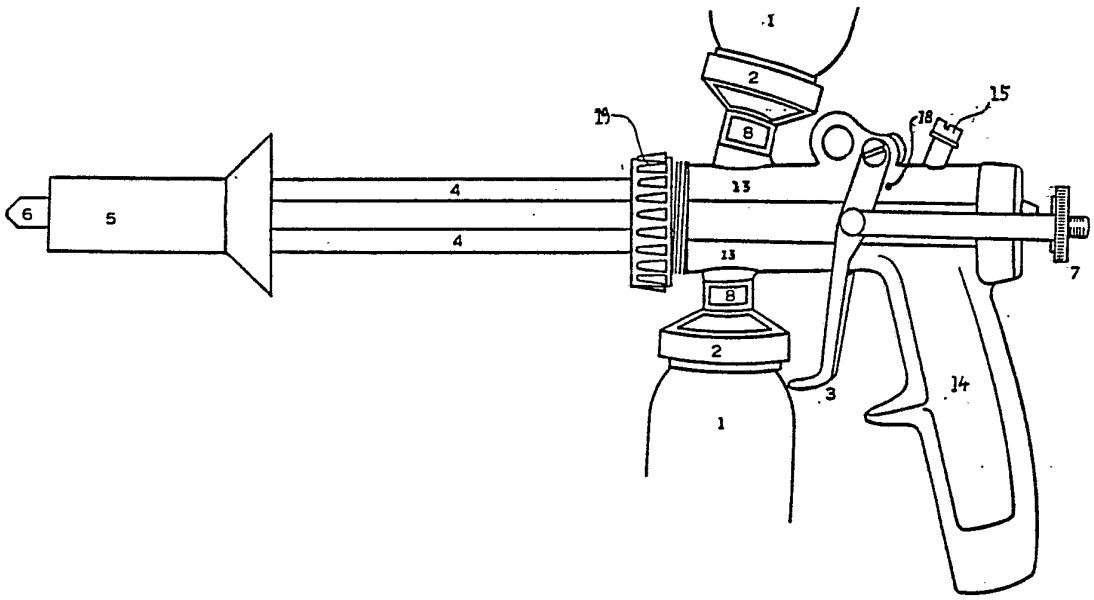
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(54) Title: AEROSOL MIXING AND APPLICATION GUN



(57) Abstract

A portable gun, a method for using such a gun for dispensing one or more flowable substances contained in replaceable aerosol containers (1). The containers being fixed to the gun frame (18) by an adapter (2). The adapter may be in the form of a universal mount. Other features include a static mixer (5), trigger actuation (3) with locking means (7).

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AEROSOL MIXING AND APPLICATION GUN

BACKGROUND OF THE INVENTION

1. Field of the Invention -

This invention relates to a portable gun which enables one-component or multi-component flowable substances to be dispensed. The flowable substances are accomodated in one or more aerosol containers.

2. Statement of Related Art -

Existing systems for dispensing flowable substances involve complications both in manufacture and in practical application.

One of the commercially available systems comprises a plastic device provided with a handle. The two components are forced out by pulling the trigger and are then thoroughly mixed by means of a "static mixer". This system cannot be reused when the containers accom-

modating components A and B are empty. In addition, it is often difficult and unsafe to use.

Other systems are based on the principle of a two-component gun. Components A and B are delivered by means of a metering pump. The products pass through tubes into the body of the gun and are mixed in its interior. The use of systems of this type necessitates thorough cleaning with various solvents.

SUMMARY OF THE INVENTION

This invention affords a gun for dispensing one or more flowable substances. Because these flowable substances are stored in aerosol containers and feed directly into the gun, the substances may readily be replaced as needed or changed as desired. The gun itself is a triggered device which contains a static mixing chamber where the flowable substances may be mixed before dispensing, and an outlet adapted to the particular application for which the flowable substances are intended. The aerosol pressure feeds the flowable substance into a receiving chamber of the gun, and pulling of the trigger and/or the aerosol pressure forces the one or more flowable substances through a static mixing chamber and then through the outlet. The flowable substance may be a liquid, a gas, or a solid which is in a flowable form. In a further embodiment, a universal mounting device is provided for each aerosol container, by which means it is removably connected to the gun.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side exterior view of a gun according to this invention, with aerosol containers connected at the top and bottom.

Figure 2 is a side exterior projection of a universal mounting device according to this invention, suitable for removeably connecting aerosol containers to the inventive gun.

DETAILED DESCRIPTION OF THE INVENTION

The inventive device has the advantages of finely adjustable metering of the dispensed product, simplicity of design, satisfactory protection of the dispensed substance from ambient conditions prior to dispensing, and simplicity of cleaning.

It can be used in many different fields of industry, but is particularly adapted to the mixing and dispensing of two or more component flowable substances of a chemical nature, for example polyurethane liquids and foams, epoxy resins, polyesters, silicones, metal- or wood-filled resins including epoxies, methyl methacrylates, and the like. Limitations on the substances to be dispensed are determined primarily by the materials of which the gun is constructed, and the hermetic tolerances of the gun. Thus, if the gun is sufficiently hermetic, it can be used to mix and dispense gases or gaseous suspensions of solids or liquids. Similarly, liquids, solutions, oil-in-water, or water-in-oil suspensions, colloidal suspensions, creams, and the like, may be dispensed. Solids may be dispensed where they are in flowable form, such as silica or talc powders, either alone or in admixture with gaseous or liquid carriers. Generally, any substance that can be packaged in an aerosol container can be used in the inventive device.

Thus, the gun can be used with one or more (preferably two) aerosol containers with the same or different contents. Where the same contents are

dispensed from all aerosol containers, the gun device multiplies the effective life of a single container, and permits easy and rapid replacement of one or more aerosol containers at a time. Where different aerosol contents are used, the gun device permits efficient mixing of the ingredients just prior to application, metering of the dispensing, convenient application of the mixture to a work piece, and easy and rapid changing of the flowable substances to be mixed by changing one or more of the aerosol containers. Replacement of used containers is also facilitated.

Cleaning of the gun can be effected quickly and easily by the insertion of a pressurized neutral or inert gas or liquid through the aerosol inlets. The pressure can be afforded by a suitable gas or liquid pump, or by an aerosol container with inert or neutral contents. Thus, the gun can be cleaned periodically during use, or when changing aerosol components, without taking it apart.

In Figure 1, the two aerosol containers (1) are shown projecting upward and downward from the gun frame (18). Although this is a preferred embodiment, one or more containers may be inserted into inlets at any point around the frame, provided that the aerosol container masses are reasonably balanced or compensated. Each aerosol container (1) is removably connected to the gun frame (18) by an adapter (2), which, with the aerosol nozzle, may form a male-female threaded coupling, bayonet coupling, friction-fit coupling, or the like. The adapter may also be in the form of a universal mount as shown in Figure 2, which will be discussed below. The adapter also opens the valve of the aerosol container, in a conventional manner.

The contents of each aerosol container (1) flows

through a one-way (i.e. non-return) valve (8) into a separate receiving chamber (13), which is flowingly connected at one end to a conduit (4). Each conduit (4) is flowingly connected to a single, optionally removeable, static mixer (5), where two or more different flowable substances may be mixed. The design of the static mixer (5) is conventional, and may vary depending upon the nature of the flowable substances and the degree to which they are to be mixed. Generally, the mixing itself is achieved by the size, shape, and placement of baffles within the mixer (5); preferably there are no moving parts. The static mixer (5) is flowingly connected to an optionally removeable outlet (6) which may be a nozzle of any configuration or a rigid or flexible extension conduit ending in such a nozzle. The end of each receiving chamber (13) opposite the conduit (4) may be biased by a moveable baffle of conventional design (not shown) which is in turn biased by an actuating means such as a trigger (3). In a preferred and alternate embodiment, the end of the receiving chamber (13) opposite the conduit (4) is fixed, and the trigger (3) acts to withdraw a reciprocating needle valve (not shown) located in the receiving chamber (13) at the point where the receiving chamber (13) meets the conduit (4). The needle may be of such a length that it reaches to the top of the conduit (4) and closes it in this area. The flowable substance is then propelled through each conduit (4) by the pressure of the connected aerosol container (1). All of these mechanisms are individually conventional. Locking means may be attached to the trigger (3) and biased against the back of the gun, so that the trigger (3) may be pulled back against the gun handle (14) when the gun is not in use, thus preventing accidental discharge. The locking means (7) is preferably in a wishbone shape with the parallel ends pivotally

attached to the trigger (3) and a locking screw attached to the other end. An adjusting screw (15) may be present to adjust the degree to which the trigger (3) can be compressed while the gun is in use, thus regulating the flow of discharge through the nozzle. The frame (18) and other parts of the gun can each be constructed of metal, plastic, or a composite. It is preferred that the static mixer (5) and outlet (6) be constructed of a suitable plastic or composite since they may be removed individually or as a unit and discarded after each use. Also the conduits (4) may be removed in case by removing them at coupling (19) which may be a screw, bayonet, friction, or other type of joint. This will reduce the problem of minor amounts of container contents remaining within the gun mechanism. The conduits (4) and static mixer (5) may be of any configurations including cylindrical, plano-parallel, prismatic, and the like. The static mixer (5) may also be a regular prism, cube, or sphere.

The universal mounting device shown in Figure 2 is a preferred embodiment of this invention, especially when combined with the gun of Figure 1. It permits aerosol containers of virtually any size or configuration to be used in connection with the inventive gun. The universal mount comprises a preferably planar support base (17) from which generally perpendicularly extend two diametrically outwardly bowed parallel prongs (16). Slideably mounted on both prongs (16) is an aerosol container guide (10) which may be locked at any points along the prongs (16) by means of at least one rack and set-screw system (11), preferably one such system (11) for each prong (16). A snap closure (12) is attached to the guide (10) so that when an aerosol container (1) is placed within the device, the closure

(12) may be biased against the bottom end of the container (1) so as to hold it in place. Since the bottom of an aerosol container is generally concave, the snap closure (12) should have an inverse V-shaped flange to secure the container from moving. Where the container bottom is flat, the guide (10) may be a semi-circle, and the closure (12) should bias against the bottom of the container. Where the container bottom is flat and the guide (10) may be comprised of opposed semi-circles, and the closure (12) may bias against the side and/or the bottom of the container (1). The aerosol container's discharge end may be fitted into an optional mounting adapter (9) which is attached to the support base (17). The mounting adapter (9) serves the same function as adapter (2) described previously, and may be of the same type.

The universal mounting device or components thereof, as well as any other metal parts of the gun, especially including metal adapters (2), (9), may be covered with a protective plastic film such as a nylon or polytetrafluoroethylene.

The inventive device is simple to use. The conduits, static mixer, and outlet, if not already connected, are attached to the front of the gun. One or more aerosol containers are attached to the adapters and/or the universal mount and flowingly connected to the gun. The locking means is adjusted so as to release the trigger to the desired degree.

Then, simply by pulling the trigger, the one or more aerosol containers discharge their flowable substance into the gun, which flows from the receiving chamber through the conduits to the static mixer where multiple flowable subtances are mixed and then the flowable substance exits through the outlet. The gun

may then be used in a manner similar to a glue gun or caulking gun, for dispensing virtually any type of flowable chemical system including sealants, caulks, insulators, bonding agents, glues, fillers, paints, and the like. With a suitable nozzle and heat-resistant materials, the gun could even be used to discharge gaseous mixtures such as oxygen and acetylene for use in spot welding. Foams such as polyurethane can also be generated and spot applied for packaging, insulating, and fitting construction materials such as door casings and window frames.

Where multiple component systems are to be mixed, the proportions of each component may be adjusted by various means including varying the pressure of the respective aerosol containers and/or varying the size or nature of the adapter used in connecion with each aerosol container.

It may be noted that the gun of this invention could conceivably operate with pressurized tanks of flowable substances or with pumps or other pressure generations. However, this would defeat the important advantage of a self-contained portable gun, which can be used in the manner of a small hand tool in that it is easily transportable and can be used in small or difficult to access work areas.

CLAIMS

1. A portable gun for applying at least one flowable substance comprising at least one means for receiving a flowable substance from an aerosol container, operatively connected means for mixing two or more flowable substances received from said receiving means, and operatively connected means for discharging a flowable substance or a mixture of flowable substances received from said mixing means.

2. The gun of claim 1 comprising: a frame; at least one means fixed to said frame for receiving a flowable substance from an aerosol container; a separate receiving chamber within said frame flowingly connected to each said receiving means; actuator means for causing the flow of flowable substance, operatively connected to each said receiving chamber; a conduit adapted to receive the flowable substance, flowingly connected to each said receiving chamber at one end; a single static mixer adapted to mix multiple streams of flowable substance, flowingly connected to all said conduits at their remaining ends; and a single outlet from said static mixer adapted to discharge a flowable substance or a mixture of flowable substances.

3. The gun of claims 1 or 2 comprising two or more means for receiving a flowable substance from an aerosol container.

4. The gun of claims 1, 2, or 3 wherein each said

receiving means comprises an adapter which, with the nozzle of an aerosol container, forms a male-female thread coupling, a bayonet coupling, a friction-fit coupling, or the like.

5. The gun of claims 1, 2, 3, or 4 wherein each said receiving means is provided with a one-way hermetic valve entering into its associated receiving chamber.

6. The gun of claims 2, 3, 4, or 5 wherein each said conduit is cylindrical, planoparallel, or prismatic in shape.

7. The gun of claims 2, 3, 4, 5, or 6 wherein each said conduit is hermetically sealed by a reciprocating needle valve operatively connected to said actuator means.

8. The gun of claims 2, 3, 4, 5, 6, or 7 wherein said actuator means is a trigger pivotally connected to said frame.

9. The gun of claim 8 wherein said trigger is connected to a locking device for preventing its motion.

10. The gun of any one of claims 2 to 9 wherein said mixing means discharges through a flowingly connected outlet comprising a nozzle, or a rigid or flexible extension conduit ending in a nozzle.

11. The gun of any one of claims 1 to 10 wherein said

mixing means and/or said at least one conduit are removeably connected by coupling means.

12. The gun of claim 11 wherein said mixing means and said at least one conduit are simultaneously removeably connected by coupling means located at the point where said at least one conduit is removeably connected to said frame.

13. The gun of any one of claims 1 to 12 wherein each said means for receiving a flowable substance from an aerosol container comprises a removable universal mount capable of temporary or permanent affixation to said aerosol container.

14. The gun of claim 13 wherein said universal mount comprises a support base, two diametrically outwardly bowed parallel prongs extending outward generally perpendicularly from said base, a container guide slidably mounted on both said prongs, means for locking said guide at a point along said prongs, snap closure means for immoveably holding an aerosol container connected to said guide, and a mounting adapter attached to said support base for receiving the outlet end of said aerosol container, adapted to fasten said universal mount to said gun.

15. A method for employing the gun of any one of claims 1 to 14 comprising operatively connecting to said gun at least one aerosol container containing a flowable substance, placing the outlet of said gun in close proximity to the desired point of application of said flowable substance, and actuating the discharging means of said gun.

16. The method of claim 15 further comprising using at least two aerosol containers containing at least two diffrent flowable substances, which interact with each other physically or chemically when passing through said mixing means.

17. The method of claim 15 or 16 further comprising replacing one or more of said aerosol containers when its contents are exhausted and/or when it is desired to change the composition of said flowable substance discharged from said outlet.

18. The method of claim 15, 16, 17 further comprising replacing at least one conduit and/or the static mixer of said gun by employing said coupling means, upon exhaustion or changing of at least one said aerosol container.

19. The method of claim 15, 16, 17, or 18 further comprising cleaning the interior of said gun by attaching at least one aerosol container containing an inert or neutral substance and operating said gun until said inert or neutral substance passes through the outlet of said gun.

20. The method of claim 15, 16, 17, 18, or 19 wherein said flowable substance is a one-component, or statically mixed multi-component: polyurethane; polyurethane foam; epoxy resin; metal- or wood-particle-, filled resin; silicone; methyl methacrylate; polyester; or the like.

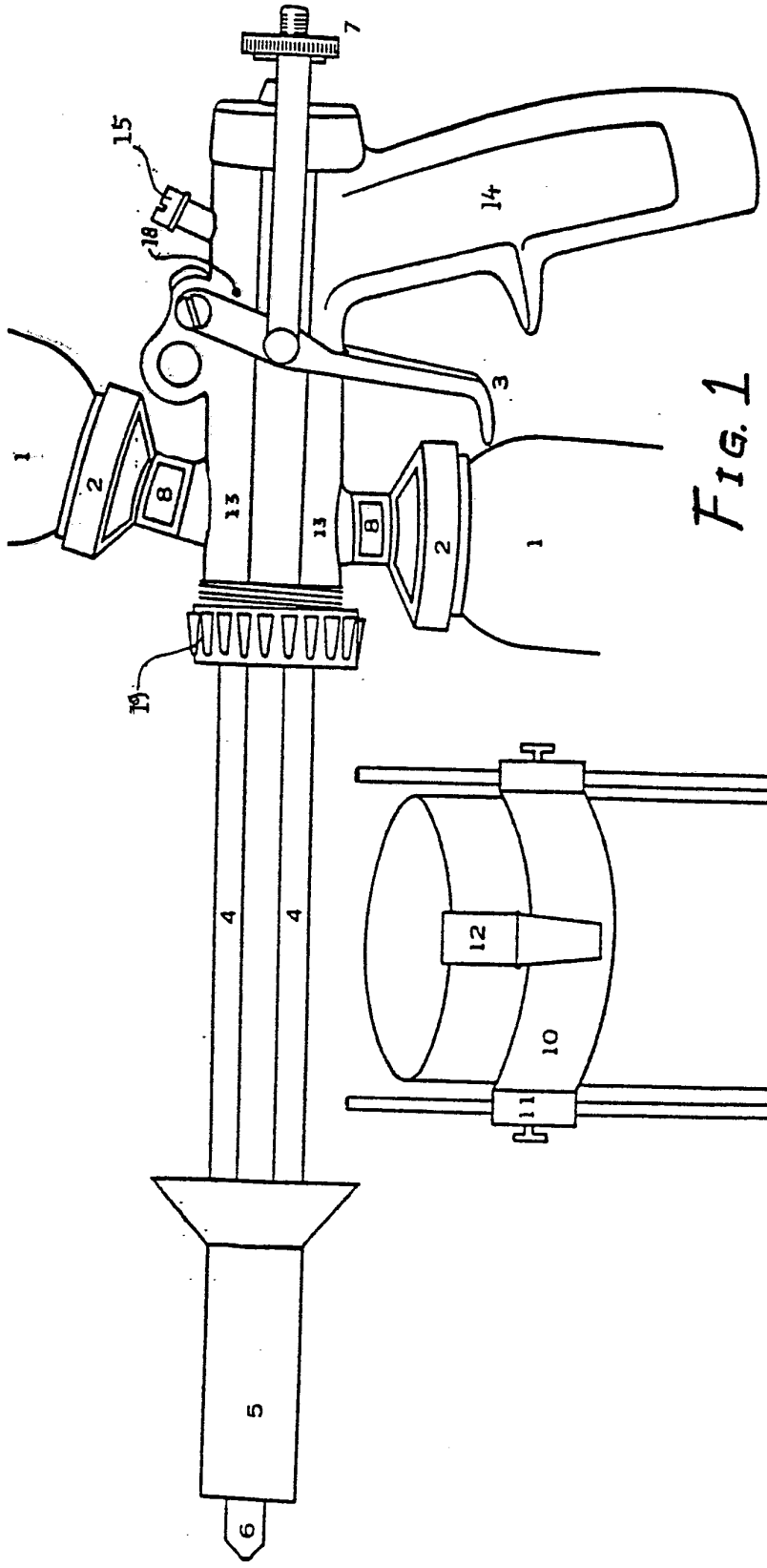


FIG. 1

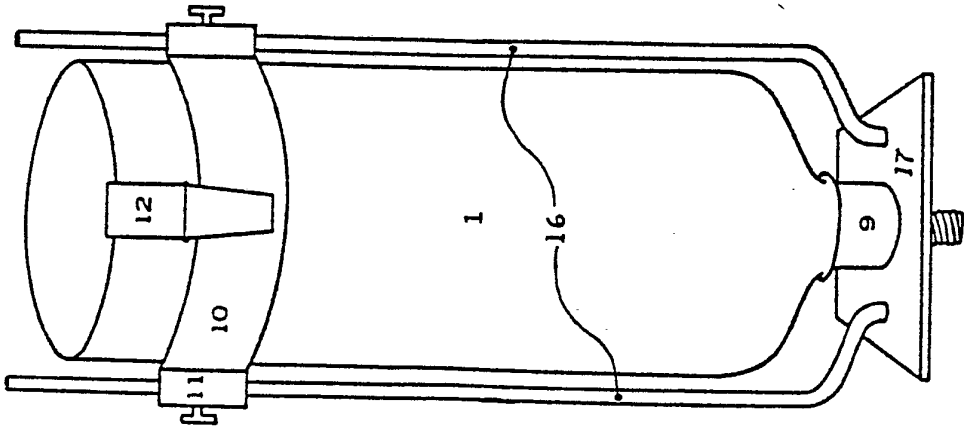


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 86/00514

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: B 65 D 83/14; B 05 B 7/24

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	B 05 B B 65 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
X	US, A, 3303970 (BRESLAU) 14 February 1967 see column 2, line 51 - column 6, line 35; figures 1-19	1,3-5,11, 12,15-20
X	US, A, 3559890 (BROOKS) 2 February 1971 see column 1, line 71 - column 5, line 26; figures 1-9	1-4,6,8, 10-12, 15-20
X Y	US, A, 3575319 (SAFIANOFF) 20 April 1971 see column 4, line 12 - column 7, line 3; figures 1-5	1-4,6,8, 10-12, 15-20 4,7-9,13, 14
Y	US, A, 4453650 (WITTE et al.) 12 June 1984 see column 3, lines 52-53; figures 1-8	7-9
Y	CH, A, 302650 (VEIT) 3 January 1955 see claims 1-11; figures 1,2	4,7,13
Y	US, A, 3764044 (PAJAK) 9 October 1973	

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* Special categories of cited documents: [10]

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
17th December 1986	28 JAN 1987
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	M. VAN MOL

International Application No. PCT/EP 86/00514

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
	see column 2, line 7 - column 3, line 14; figures 1-6	13,14

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/EP 86/00514 (SA 14727)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 13/01/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3303970		None	
US-A- 3559890	02/02/71	None	
US-A- 3575319	20/04/71	None	
US-A- 4453650	12/06/84	None	
CH-A- 302650		None	
US-A- 3764044	09/10/73	None	