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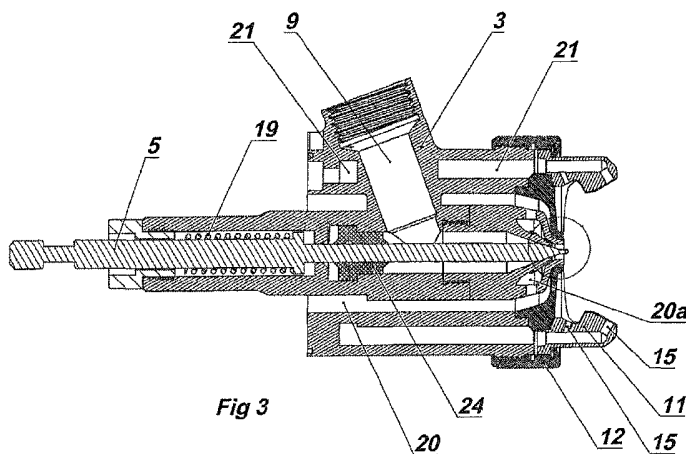
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(56) Documents Cited:
EP 1479447 A1 **EP 1340550 A2**
DE 019503495 A1 **DE 004302911 A1**
DE 004213826 A1 **US 6267302 B1**

(58) Field of Search:
INT CL **B05B**
Other: **EPODOC, WPI**

(54) Title of the Invention: **Atomising apparatus**
Abstract Title: **An air spray gun with a replaceable frontal module**

(57) A spray gun which atomises a liquid using a pressurised gas comprises a frontal portion associated with the outlet for the spray, the frontal portion being detachable and replaceable substantially as a modular unit (pictured). The spray gun is envisaged having a handle, flow passages for air 15, 20, 21 and flow passages for paint 9, and a valve arrangement utilising a needle 5 at the outlet. Preferably the entire outlet including the needle valve arrangement is removable. The separable tip ideally comprises a spring 19 biasing the needle 5. More preferably the connection for the liquid supply 9, whether a gravity-fed container or a pressurised hose connection, is integral with the detachable frontal portion of the spray gun. The removable head portion can be disposed of, or be replaced with an equivalent portion. This replaceable nozzle arrangement aims to prevent colour contamination.



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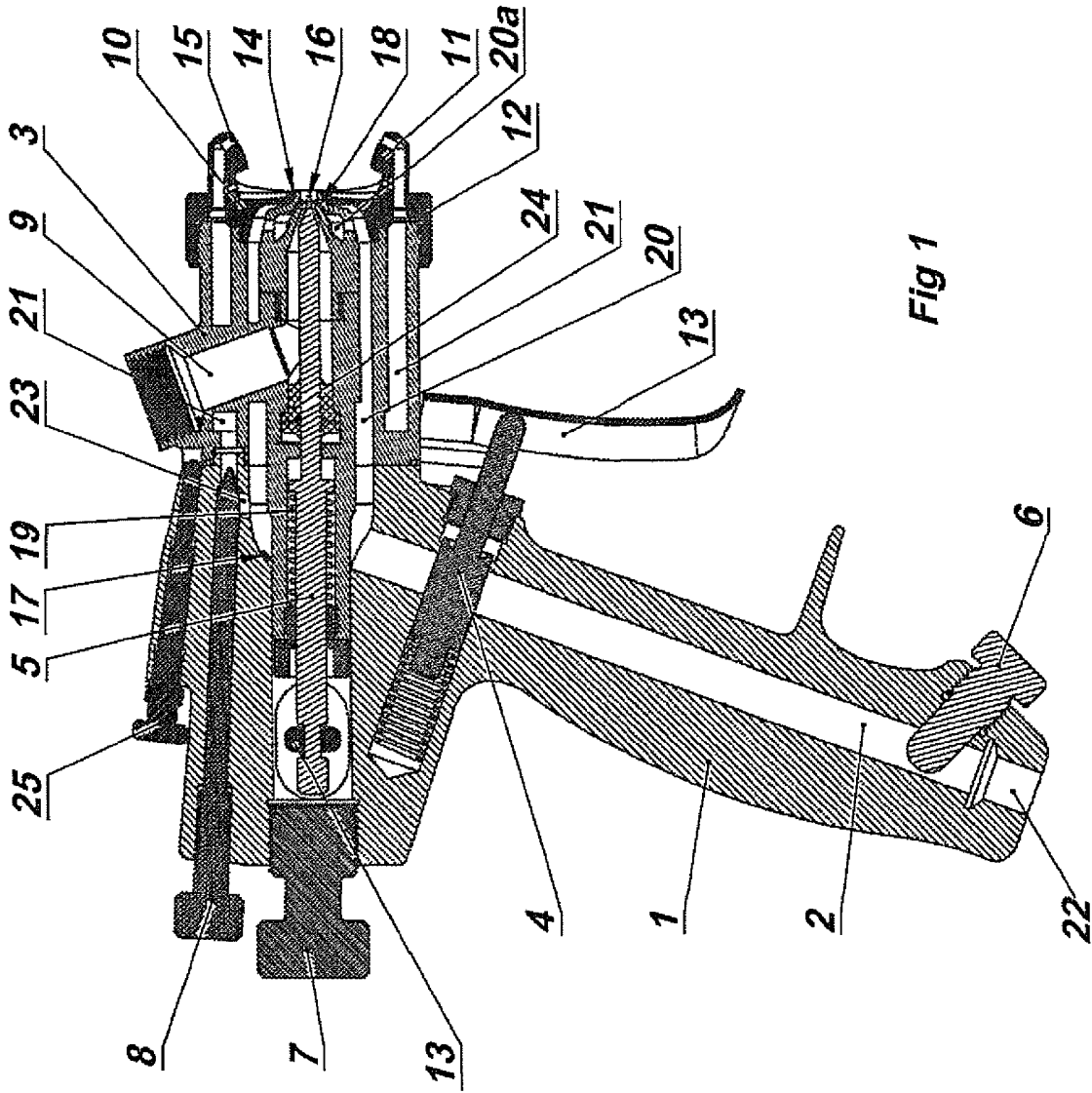
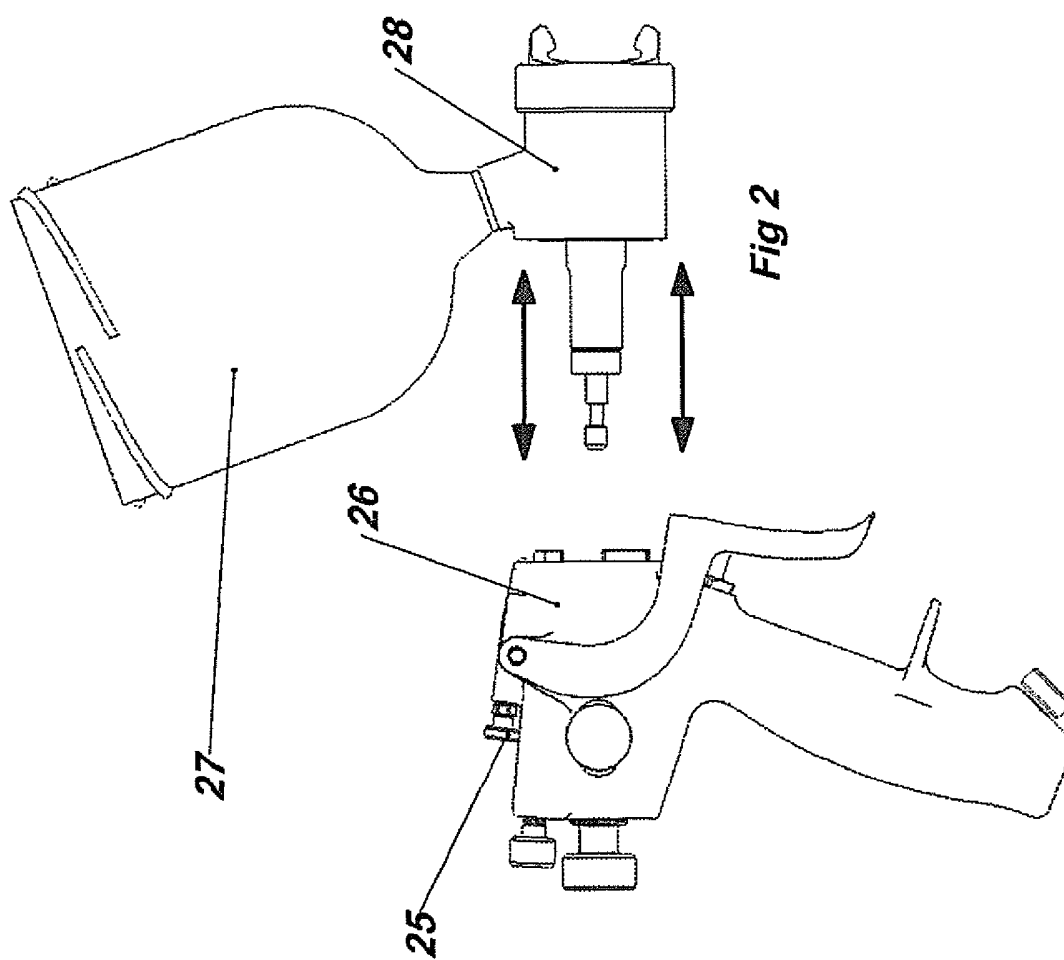


Fig 1



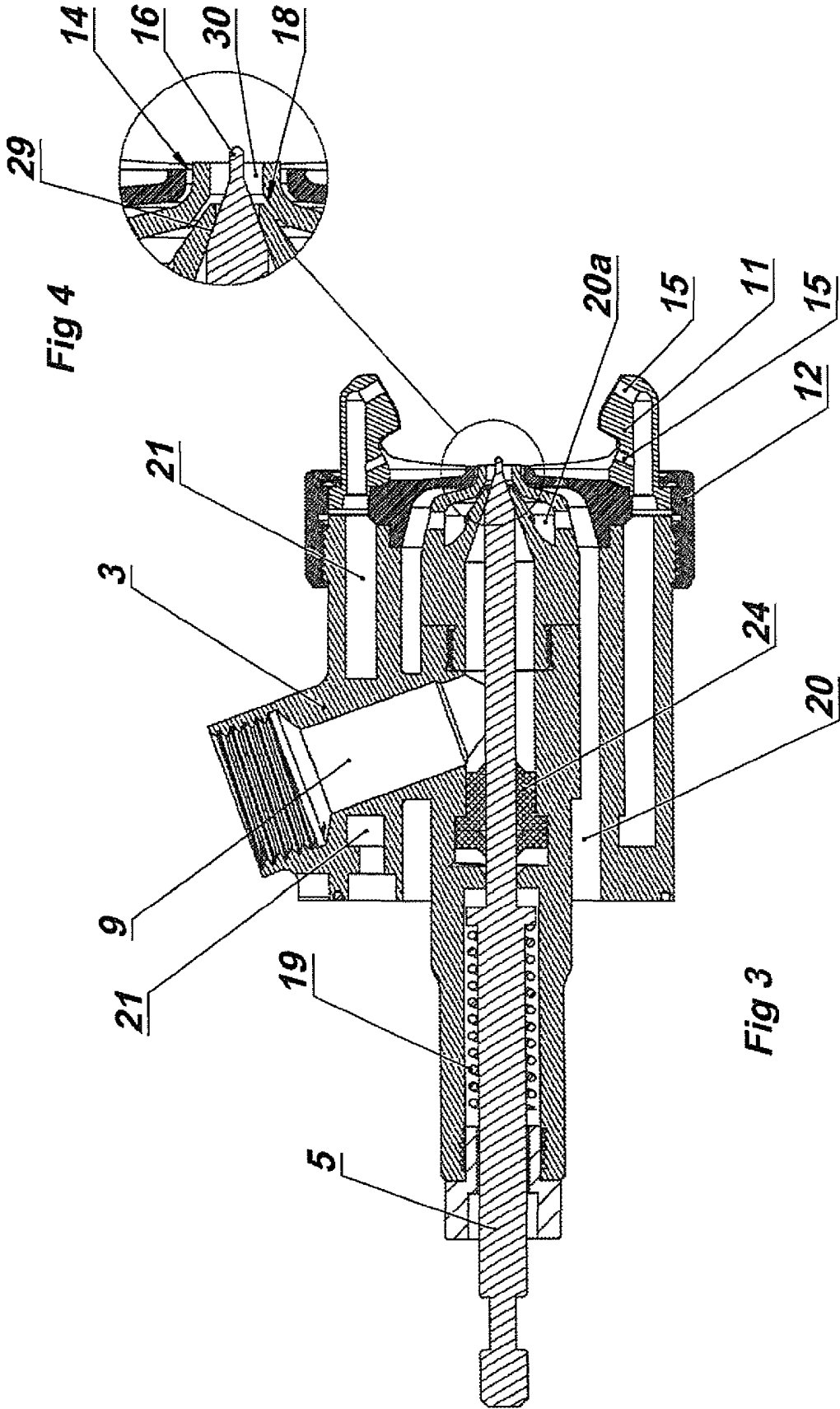


Fig 4

Fig 3

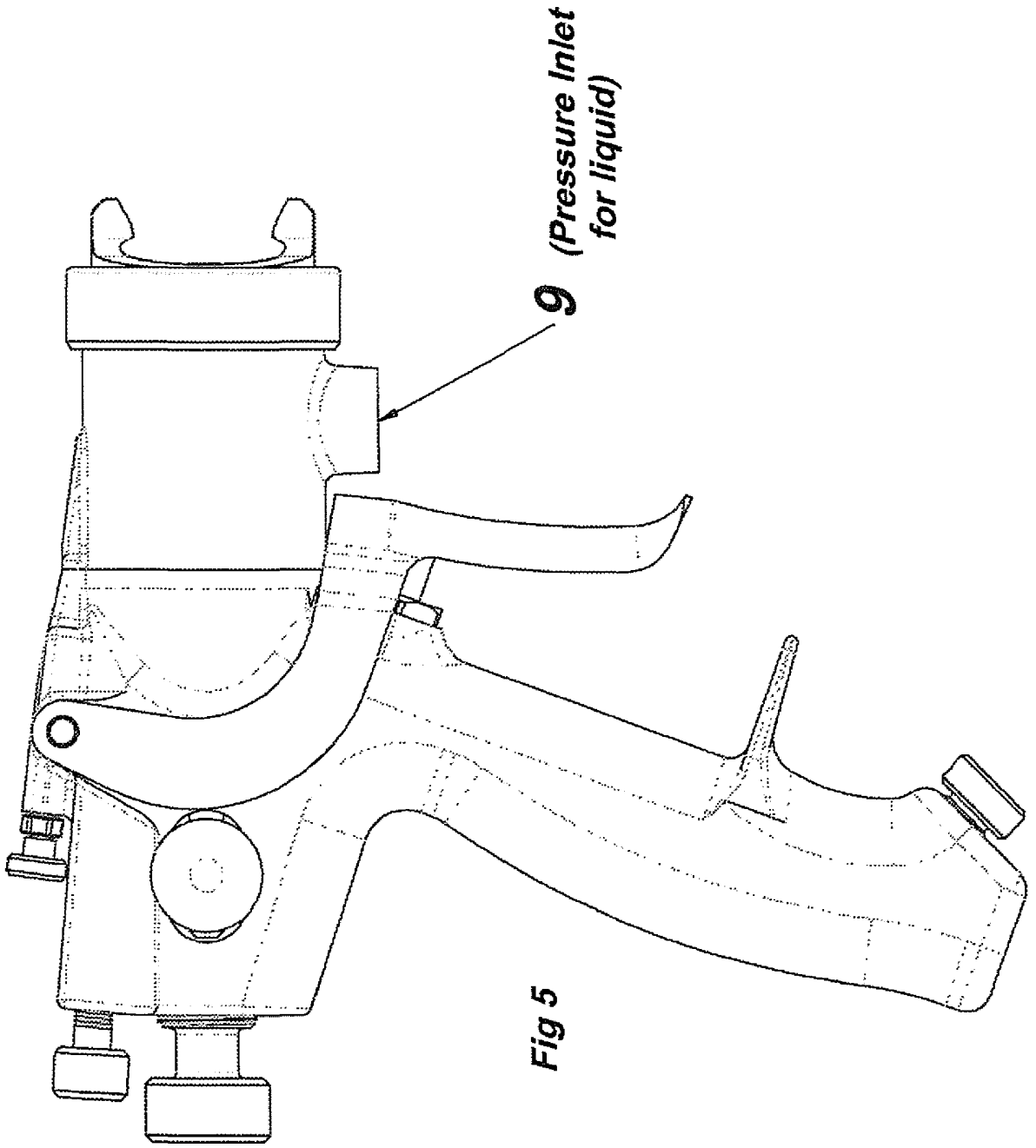


Fig 5

ATOMISING APPARATUS (Spray Gun)

This invention relates to an apparatus for atomizing liquids for the spraying of materials and in particular to an improved design which allows for easy changes between different liquids or types and colours of the same liquid.

Background of Invention

Various types of apparatus including those known as spray guns are used for the application of functional or decorative coatings onto components or products. The apparatus directs the liquid through channels usually by means of a pressure differential to a point where it is atomized by mixing with one or more jets of gas or pressurised gas.

When the operation is complete it is necessary for the components parts of the apparatus to be cleaned as the coating material if left will dry or harden and block the channels of the apparatus. This will prevent the apparatus from working and may result in it having to be thrown away.

The normal method of cleaning the apparatus requires the dismantling of some or all of the components and carrying out a lengthy cleaning process. This is time consuming and can result in damage to the more delicate components. The cleaning process also requires the use of solvents which are expensive and can be difficult to dispose of.

It is often the case that if multiple different types or colours of coatings are to be applied to the same component or product then it is necessary to clean the apparatus being used between each different coating. This is time consuming and for small areas can be costly and difficult to do efficiently. An alternative to repeatedly cleaning one piece of apparatus is to use multiple units however this can be difficult or impossible to do in the cases where the coating has a short shelf life or hardening time.

If the cleaning process is not carried out effectively it can result in subsequent uses of the apparatus being contaminated by particles from the previous use that are not fully cleaned out of the apparatus.

It is therefore the aim of the present invention to provide a means of providing a disposable or more easily cleaned components that can reduce or eliminate the need to clean the fluid areas of the apparatus and so improve the efficiency and flexibility of existing spray guns and similar apparatus.

Description of the Drawings

Fig 1 Shows a longitudinal cross section of a first embodiment of the atomising apparatus as a spray gun

Fig 2 Shows a side elevation of a first embodiment of the atomising apparatus as a spray gun with the replaceable element assembly separated from the main handle assembly.

Fig 3 Shows a longitudinal cross section of the replaceable element assembly of a first embodiment of the atomising apparatus as a spray gun

Fig 4 Shows a longitudinal cross section of a portion of the replaceable element assembly

Fig 5 Shows a side elevation of a second embodiment of the atomizing apparatus as a spray gun

ATOMISING APARATUS – DETAILED DESCRIPTION

In figure 1 is shown a first embodiment of the atomizing apparatus as a spray gun for atomizing liquid and depositing the atomized material as a functional or decorative coating on a variety of products and surfaces.

Fig 1 shows a handle 1 to which is assembled a number of components. Pressurised gas is introduced into the handle by way of a threaded fitting 22 and flows up a channel 2. The flow rate of the gas is controlled by way of an adjustable valve 6.

A manually operated valve 4 operated by way of a trigger 13 or similar actuating lever controls the flow of the gas into the gas conditioning chamber 20.

Apertures in the wall of the gas conditioning chamber 23 allow some of the gas to flow into a secondary chamber, the shaping chamber 21 via a control valve such as a needle valve 8.

Pressurised gas from the gas conditioning chamber 20 can pass freely along the chamber and exit to atmosphere via a peripheral orifice 14. Pressurised gas from the gas conditioning chamber can also enter the pre-atomising chamber 20a from where it can exit by way of a circular orifice 18 or a number of jets around the fluid orifice 24.

Pressurised gas after passing through the shaping control valve 8 enters the shaping chamber 21 from where it can pass through a number of multiple orifices 15 in the spray shaping element 11.

Fluid of the correct viscosity to allow flow is introduced into the fluid inlet 9 either by way of gravity from a container 27 (Fig 2) or injected under pressure (see Fig 5 for a second embodiment). The fluid is prevented from exiting the apparatus by the closure of a needle valve 5 which is held in place by a spring 19 or similar mechanism.

The needle can be withdrawn from the valve seat 29 (Fig 4) to allow the flow of the fluid. In the first embodiment the apparatus is a manual spray gun so the closing of the trigger 13 serves the function to allow the flow of the pressurized gas by opening valve 4 and then withdrawing the needle 5 from the needle valve 29 (Fig 4).

The needle is shaped to include a short parallel section 16 at its tip. This allows the use of needles with different diameters of this parallel section to be used with the same fluid tip 10. The resulting different orifice areas between the fluid orifice 30 (Fig 4) and the needle tip 16 allows for easy set up with different fluids or viscosities as only one component, the needle 5, may need to be changed.

The fluid on passing through the needle valve 29 at a quantity depending on the amount that the needle 5 is withdrawn (flow rate) then comes into contact with the pressurised gas initially exiting from the orifice or jets 18. The impact of the pressurised gas has the effect of an initial atomizing of the liquid. The volume and velocity of the atomized liquid is controlled by the pressure of the gas and the flow rate of the liquid.

The pressurized gas emanating from the circular orifice 14 increases the level of atomisation of the liquid and also forms a “curtain” of pressurised gas around the atomised liquid and gas cone. This circular curtain of pressurised gas reduces the ability of stray particles of atomized liquid from being distributed outside the main atomized cone of liquid and pressurized gas.

The result is that the quantity of atomized liquid that is deposited in the desired areas of the target surface is greater than is normally experienced. This increases the efficiency of the application of the liquid.

The atomized liquid and pressurized gas cone can be shaped by the impinging of multiple jets of pressurized gas from the shaping element **11**. Depending on the amount of pressurised gas that is allowed to enter the shaping element **11** by way of the control valve **8** the atomized fluid and pressurized gas cone can be compressed from each side to form a wider thinner fan of atomised liquid and pressurized gas.

A facility is provided in the main handle **1** of the apparatus to allow the monitoring of the pressure inside the pressurized gas conditioning chamber. By way of a vent **17** in the wall of the chamber to the upper exterior surface of the handle **1**, a pressure monitoring device can be attached to the handle **1**.

This allows the operator to monitor the actual pressure that is being used to atomise the fluid. The pressure monitoring device can be removed easily for cleaning and the vent can be shut with a suitable threaded fastening if it is not required.

On completion of the atomizing task it is necessary to clean the apparatus as the fluid may harden or thicken inside the chambers. Common atomisation equipment such as spray guns require partial or total dismantling and cleaning with suitable solvents sometimes under pressure to remove any liquid residue.

This normally has to be carried out within a short period of otherwise the fluid can go hard with the result that the apparatus is no longer serviceable.

As seen in Fig **2** the front replaceable element assembly **28** of the apparatus can be removed from the handle assembly **26**. This is achieved by unlocking the replaceable element assembly **28** by withdrawing the lock pin **25** on the top of the handle assembly **26** and unlocking the needle **5** from the trigger **13**.

The replaceable element assembly **28** can then be partially rotated or moved so that it unlocks from the handle assembly **26**. The complete replaceable element assembly **28** complete with the needle **5** and paint reservoir **27** (in the first embodiment) can then be removed.

The Needle valve is held closed by the action of the spring **19** or a similar device. This prevents the unused liquid from escaping from the container **27**. The container **27** can be removed and sealed for later use if necessary.

Once the container has been removed the replaceable element assembly can be cleaned using a small amount of solvents or cleaning systems such as ultrasonic cleaning which do not require very little or no environmentally unfriendly or expensive solvents.

The replaceable element assembly **28** can be manufactured from low cost mass produced materials. This allows the removal of the expensive items such as the Needle **5**, the fluid tip **10** the shaping element **11** and the retaining ring **12** for reuse as only the needle **5** and the fluid tip **10** come into contact with the fluid and are very easy to clean.

It can also be manufactured in different colours for different applications

It is possible to manufacture the fluid tip, the shaping element and the retaining collar from low cost materials as well, allowing the whole assembly **28** and **27** to be disposable after a few uses. The materials used for these components are likely to be recyclable.

Figures 3 and 4 show a detailed longitudinal cross section of the replaceable element assemble the items numbers of which are the same for the other figures.

Figure 5 shows a second embodiment of the apparatus as would be required for a liquid that is pressure fed into the apparatus instead of using a gravity container.

The first and second embodiments are for manual operation. Additional embodiments are available for automatic and robotic operation using mechanized, electronic, pneumatic and hydraulic actuators and controls.

ATOMISING APPARATUS (Spray Gun)

CLAIMS

1 An apparatus for spraying liquids by means of atomisation by a pressurized gas which uses a removable section which can be used once only or can be remotely cleaned. That apparatus comprising of:

- a reusable handle which includes a method of control of the pressurized gas supply.
 - a removable element assembly which provides channels for the pressurized gas and an inlet for the liquid to be atomized.
 - a means of locking and releasing the removable element assembly to the handle
 - a needle valve control for regulating the flow of the liquid which can be removed with the removable element assembly
 - a means of opening the needle valve when the removable element assembly is attached to the handle
 - a channel or channels in the handle that allow the attachment of a pressure measuring device on top of the unit.
 - a circular orifice or series of jets around the fluid nozzle angled to allow a directed jet of pressurized gas to impinging on the fluid exiting the fluid chamber
 - a fluid spray nozzle which forms part of the removable element but which can be removed
 - a needle valve the needle element of which includes parallel section at the end
 - a removable atomizing button that fits to the front of the replaceable element assembly
 - a gas jet component that directs multiple jets of pressurized gas to shape the atomized fluid flow.
 - a circular orifice that encapsulates the cone of atomized fluid as it leaves the nozzle
 - a valve on the handle for adjusting the flow and pressure of the shaping gas jets
- 2 The apparatus in claim 1 in which the pressurised gas exiting the orifice or jets around the fluid nozzle pre atomises the fluid before it exits the main atomizing button.
- 3 An apparatus according to claim 1 in which the removable assembly element can be removed and reattached to the handle and locked in place.
- 4 The apparatus in claim 3 in which the replaceable element assembly can be coloured in different colours for use with different materials or different nozzle and tip sizes.
- 5 The apparatus in claim 1 in which needle valve is held shut by a spring or similar device such that the fluid is not able to leak out of the replaceable element assembly when it is removed from the apparatus.
- 6 The apparatus in claim 1 in which the replaceable element assembly can be used as a disposable element which does not have to be cleaned

- 7 The apparatus of claim 4 which can be moulded and manufactured of recyclable materials.
- 8 The apparatus of claim 1 which allows the fluid shaping jet element to be rotated relative to the axis of the handle separately from the atomizing button and fluid nozzle.
- 9 The apparatus in claim 1 in which the needle of the needle valve has a parallel section which can be changed so that the aperture through which the
- 10 The apparatus in claim 2 in which the pressurised gas required is at a lower pressure than normal high pressure spray guns.
- 11 The apparatus in claim 2 in which the replaceable element assembly can be changed for different designs for ways of introducing the fluid such as gravity or pressure.



Application No: GB1019542.8

Examiner: Mr Nithi Nithiananthan

Claims searched: All

Date of search: 9 February 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	All	EP1479447 A1 (Walther); see figure 1 in particular showing an air spray gun with detachable heads (showing a gravity-fed arrangement and a hose-fed/pumped arrangement)
X	All	US6267302 B1 (Huffman); see figure 2 noting detachable section 20
X	All	EP1340550 A2 (Wagner); see figures 2-4
X	All	DE4213826 A1 (Walther); see figure 1
X	All	DE4302911 A1 (Minari); see abstract and figure 1
X	All	DE19503495 A1 (AMV); see figure 1 and read abstract

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

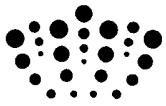
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B05B

The following online and other databases have been used in the preparation of this search report

EPODOC, WPI



International Classification:

Subclass	Subgroup	Valid From
B05B	0001/30	01/01/2006
B05B	0007/24	01/01/2006