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(54) **Improvements in or relating to the treatment of surfaces.**

(57) With reference to Figure 1, apparatus 1 for treating a surface, in this example the painted surface 2 of an aircraft fuselage 10, comprises an upright disposed canopy 3 for placing (as shown) in close proximity to the surface 2. The canopy 3 defines an aperture 4 allowing access to the surface 2 of a pressurised mixture of abrasive material and fluid, and is provided with a flexible duct 5 for subsequently collecting the mixture after use.

The abrasive media comprises particles of plastics or natural material, which are only mildly abrasive, whereby only paint is removed from the surface 2, leaving the anodised layer of the surface undamaged.

The abrasive mixture is supplied by a hand-held blast gun 6, which is preferably of the form disclosed by UK Patent No. 2,065,514. The gun 6 is provided with an internal mixing chamber whereby separate flows of the abrasive particles and water are introduced via supply ducts 7, 8 of flexible construction, before being discharged on to the surface 2 by way of a nozzle. The abrasive mixture can also be fed to a blast nozzle by way of an air-fed injector connected to a pressurised container.

The canopy 3, which is of box-like form, is provided with flexible seal 15 held in place by suckers 16.

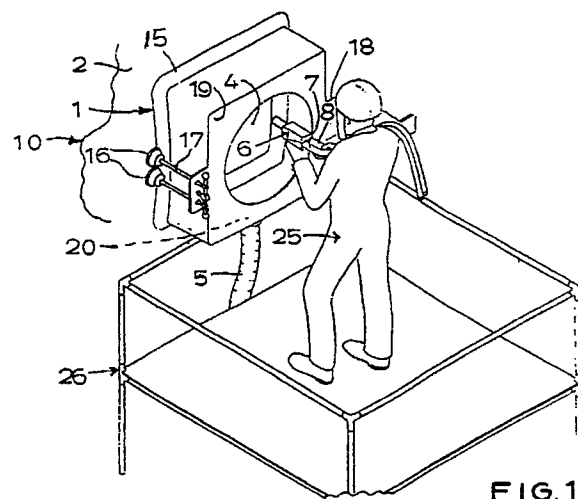


FIG. 1

IMPROVEMENTS IN OR RELATING TO THE TREATMENT OF SURFACES

BACKGROUND TO THE INVENTION

This invention relates to the treatment of surfaces and provides a method of, and apparatus for, the treatment of surfaces, particularly metallic surfaces.

A problem exists in removing paint from aircraft (and aircraft component) surfaces without damage to substrates, such as anodised or plated layers.

At present the principal method of paint stripping aircraft involves the use of toxic chemicals, which introduce problems of health and corrosion.

SUMMARIES OF THE INVENTION

According to one aspect of the present invention, a method of treating a surface comprises placing a canopy in close proximity to the surface, the canopy defining an aperture allowing access to the surface, directing a pressurised mixture of abrasive material and fluid on to the surface by way of said aperture, and subsequently collecting at least part of the mixture after use by way of the canopy.

According to another aspect of the present invention, apparatus for treating a surface comprises a canopy for placing in close proximity to the surface, the canopy defining an aperture allowing access to the surface of a pressurised mixture of abrasive material and fluid, and provided with a means for subsequently collecting at least part of the mixture after use by way of the canopy.

The collected matter is preferably re-used, and preferably comprises mildly abrasive particles of plastics material. The canopy is preferably provided with means enabling the canopy to be placed in sealing relationship with the surface.

BRIEF DESCRIPTION OF THE DRAWINGS

The various aspects of the invention will now be described, by way of example only, with reference to the accompanying drawings, all in perspective, wherein:-

Figure 1 illustrates one operator using apparatus according to the invention, on the surface of an aircraft fuselage,

Figure 2 illustrates several operators, each using apparatus according to the invention, on said fuselage,

Figure 3 illustrates a mobile sump unit,

Figure 4 illustrates a mobile generation and reclamation unit,

Figure 5 illustrates a mobile overspray pick-up unit,

Figure 6 illustrates a modified canopy, and Figure 7 illustrates, diagrammatically, part of the equipment carried by the unit 30 of Figure 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Figure 1, apparatus 1 for treating the painted surface 2 of an aircraft fuselage 10 comprises an upright disposed canopy 3 for placing (as shown) in close proximity to the surface 2. The canopy 3 defines an aperture 4 allowing access to the surface of a pressurised mixture of abrasive material and fluid, and is provided with flexible duct means 5 for subsequently collecting the mixture after use.

The abrasive media comprises particles of plastics or natural material, which are only mildly abrasive, whereby only paint is removed from the surface 2, leaving the anodised layer of the surface undamaged.

The abrasive mixture is supplied by a hand-held blast gun 6, which is preferably of the form disclosed by UK Patent No. 2,065,514 (Vapormatt Limited). The gun 6 is provided with an internal mixing chamber whereby separate flows of the abrasive particles and water are introduced via supply ducts 7, 8 of flexible construction, before being discharged on to the surface 2 by way of a nozzle. The abrasive mixture can also be fed to a blast nozzle by way of an air-fed injector connected to a pressurised container.

The canopy 3, which is of rubberised material, is of box-like form and is provided with a peripheral seal 15 of flexible construction, enabling the canopy to be placed in close relationship with the surface 2. The good sealing (releasable) relationship between the surface 2 and the canopy 3 is maintained by suction means comprising manually-adjustable suckers 16 carried by screw-threaded rods 17 supported by oppositely-disposed flanges 18 on the face 19 of the canopy 3 remote from the seal 15. The flexible seal 15 accommodates the curved fuselage surface 2 when pressed against the surface by the suckers 16.

The aperture 4 is of circular form and is cut in the face 19. That part of the canopy 3 below the aperture 4 forms a collecting space 20 for the used mixture of abrasive particles and water.

When the operator 25 has completed treatment

of that area of the surface 2 which is bounded by the seal 15, he moves the canopy to another area, after first releasing and subsequently re-engaging, the suckers 16.

A height-adjustable stand 26 is provided for the operator 25. As shown in Figure 2, several operators 25, each with a stand 26, may be employed.

The used mixture flows from the space 20 to a mobile process generation and reclamation unit 30 (Figure 4), by way of the flexible duct 5. The unit 30 comprises a plurality of blast generators 31, a storage space 32 for suction and blast hoses, a media storage area 33, media reclamation equipment 34, with centrifugal separators 37, a vacuum unit 35 and an air compressor unit 36.

The blast generators 31 each comprise a pressure vessel wherein a mixture of abrasive particles and water (to aid particle flow) is propelled therefrom to a discharge nozzle by air at a pressure of between 1.0 and 10.0 bar.

The media reclamation equipment 34 is used to separate abrasive particles and water supplied by way of the flexible duct 5 (Figure 1) and vacuum unit 36. With reference to Figure 7, the equipment 34 includes a non-magnetic sieve 65 to remove stones, paper etc, a magnetic sieve 66 for removal of metal particles, the centrifugal separators 37, an agitated settling tank 67 to remove fine particles of paint, skimmed off the top layer of water, and a centrifuge 68 to separate more dense particles. The cleaned abrasive particles are stored in the area 33 before re-circulation via the blast generators 31.

With reference to Figure 3, most of the results of overspray, ie most of the abrasive particle/water mixture not collected in the lower part of the canopy 3, falls into one or more mobile sump units 40, placed strategically below.

A sump unit 40 comprises a box-like collector 41 which houses a scraping conveyor 46 comprising a plurality of laterally-disposed, interconnected beams 47 which carry rubber flaps 48. The collector 41 is covered by a safety structure comprising grids 44 extending over the whole of the collector 41 which grids also provide a work platform. The conveyor 46 uses the rubber flaps 48 to scrape the abrasive particles along the bottom of the collector 41 and towards a collection point adjacent flexible duct 45. The material is then removed by suction applied to the duct 45, by way of unit 36, to the reclamation equipment 34 for subsequent re-use. The conveyor 41 operates with an oscillating movement, oscillation being applied by an oscillator 49 having an actuating rod 58 connected to the conveyor 46.

Use of the invention provides a number of advantages, including:-

1. Establishment of a water cushion or buffer

between the surface 2 and the abrasive particles.

2. Simultaneous washing of the surface.

3. Carriage (if required) of specialised chemicals by the water, for example - de-greasing chemicals.

4. Environmentally safe. No toxic chemicals used or dust created.

5. Automatic cleaning and re-use of the surface treatment media.

6. Provision of a mobile system for surface treatment, avoiding need for a dedicated area.

7. The system can be used outside hangers and similar structures, without need for cover.

8. The system is safe. Static or explosion hazards are avoided.

Figure 6 illustrates a modified canopy 50 of elongate, rectangular form, defining an elongate access aperture 51. The canopy 50 is provided with a peripheral seal 52 of hollow form, the interior of which is connected to suction means in the form of the vacuum unit 36 (Figure 4) by a manifold 53 and a control valve (not shown). The seal 52 is brought into operation automatically when the vacuum unit 36 is running. The control valve breaks the vacuum when it is decided to change the position of the canopy 50 without taking the vacuum unit 36 out of operation. A water rinse gun 54 with a supply hose 55 is provided for rinsing the cleaned surface.

A wider surface treatment band can be provided (which is particularly advantageous with the canopy 50 of Figure 6) by stacking several guns 6 side by side.

The shape of a canopy may vary according to requirements. For example, with reference to Figure 2, as the curved surfaces of wings 11 and engine cowlings 12 differ from the fuselage 10 of the aircraft 13, special canopies for such surfaces are best provided. The shape of the apertures such as 4 and 51 can also vary, according to requirements.

A canopy can be used in a horizontal position, above or below the fuselage surface 2.

An alternative to a blast generator 31 comprises a tank wherein abrasive particles and water are agitated, by water jets or mechanical means and the mixture then pumped to the blast gun wherein it is accelerated by compressed air. Two hoses are employed by this method.

With reference to Figure 5, overspray material not collected by the unit 40 of Figure 3, can be picked up by a mobile vehicle 60 which carries a vacuum collection unit 61. The overspray material is picked up by a vacuum nozzle 62 disposed at the front of the vehicle 60.

Claims

1. A method of treating a surface characterised in that (CIT) the method comprises placing a canopy (3) in close proximity to the surface (2), the canopy defining an aperture (4) allowing access to the surface, directing (6) a pressurised mixture of abrasive material (7) and fluid (8) on to the surface (2) by way of said aperture (4), and subsequently collecting (5) at least part of the mixture after use by way of the canopy. 5 10

2. The method claimed in claim 1, CIT the fluid is water.

3. The method claimed in claim 1 or 2, CIT the abrasive material is plastics material.

4. The method claimed in claim 1, 2 or 3, CIT the collected mixture is separated out (34) for subsequent re-use. 15

5. The method claimed in any one of claims 1 to 4, CIT the canopy (3) is provided with a peripheral seal (15) of flexible construction. 20

6. The method claimed in any one of claims 1 to 5, CIT the canopy (50) defines an aperture (51) of elongate form.

7. The method claimed in any one of claims 1 to 6, CIT mixture not collected by way of the canopy is picked up by a mobile vehicle (60) which carries vacuum collection means (61). 25

8. A surface treated according to the method claimed in any one of claims 1 to 7.

9. Apparatus for treating a surface, CIT the apparatus (1) comprises a canopy (3) for placing in close proximity to the surface (2), the canopy defining an aperture (4) allowing access to the surface of a pressurised mixture of abrasive material (7) and fluid (8), and provided with a means (5) for subsequently collecting at least part of the mixture after use by way of the canopy. 30 35

10. Apparatus as claimed in claim 9, CIT the canopy (3) is of box-like form and is provided with a peripheral seal (15) of flexible construction. 40

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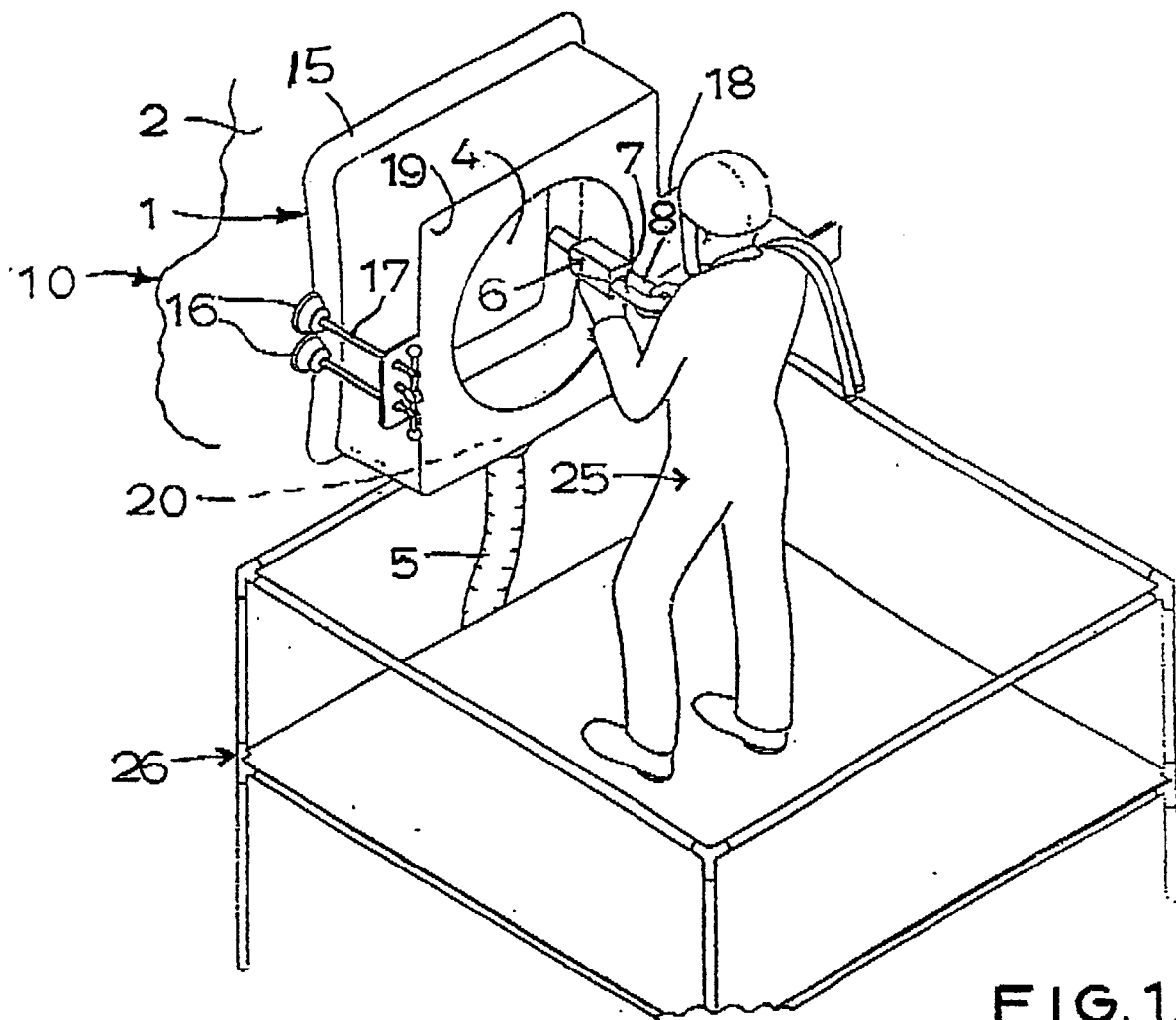


FIG. 1.

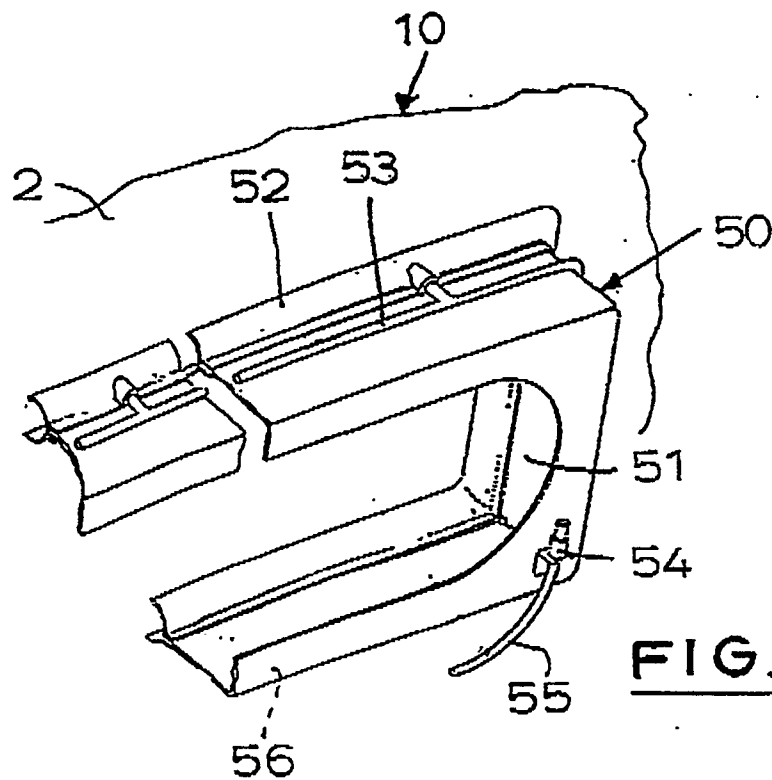


FIG. 6.

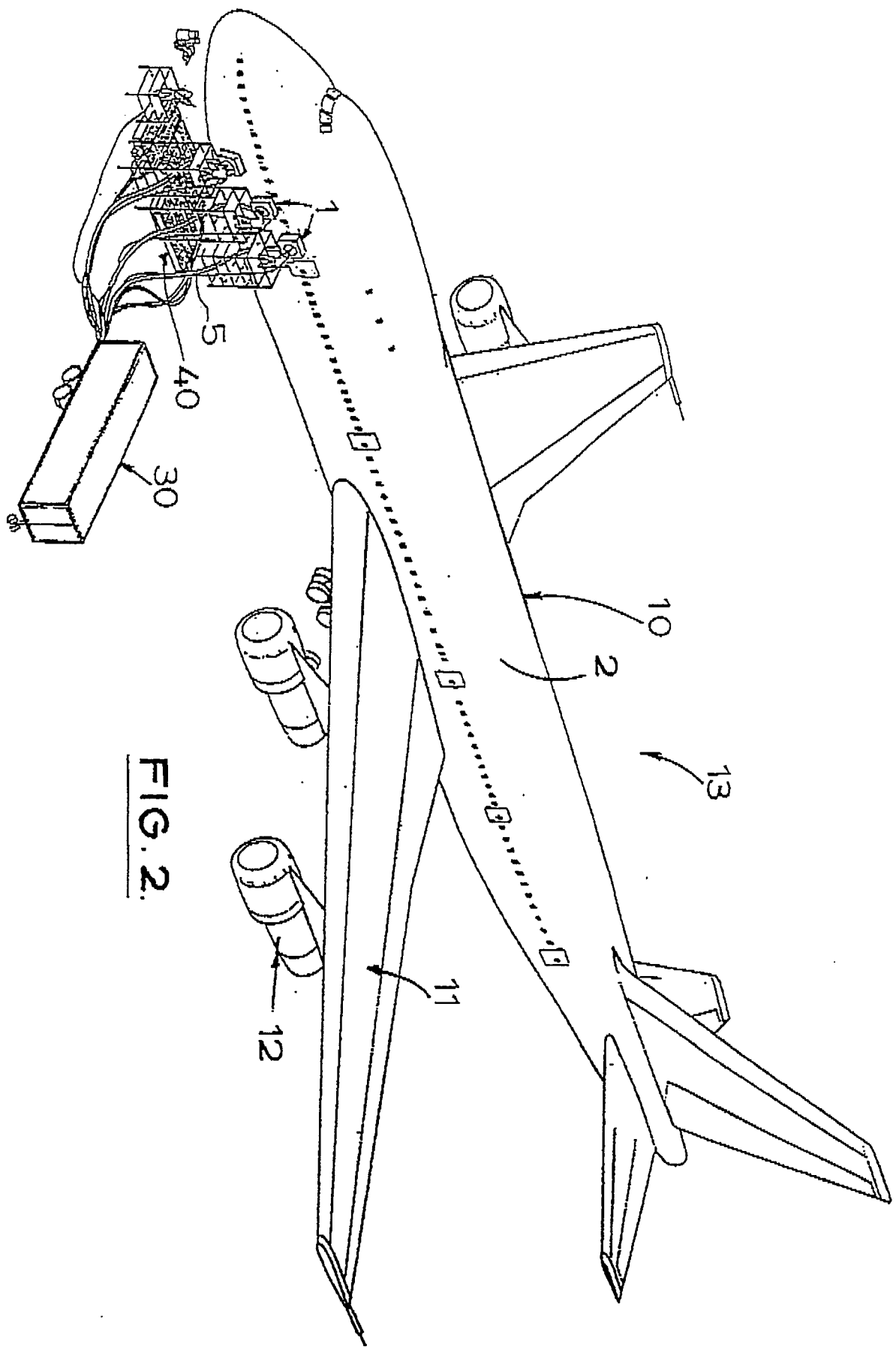
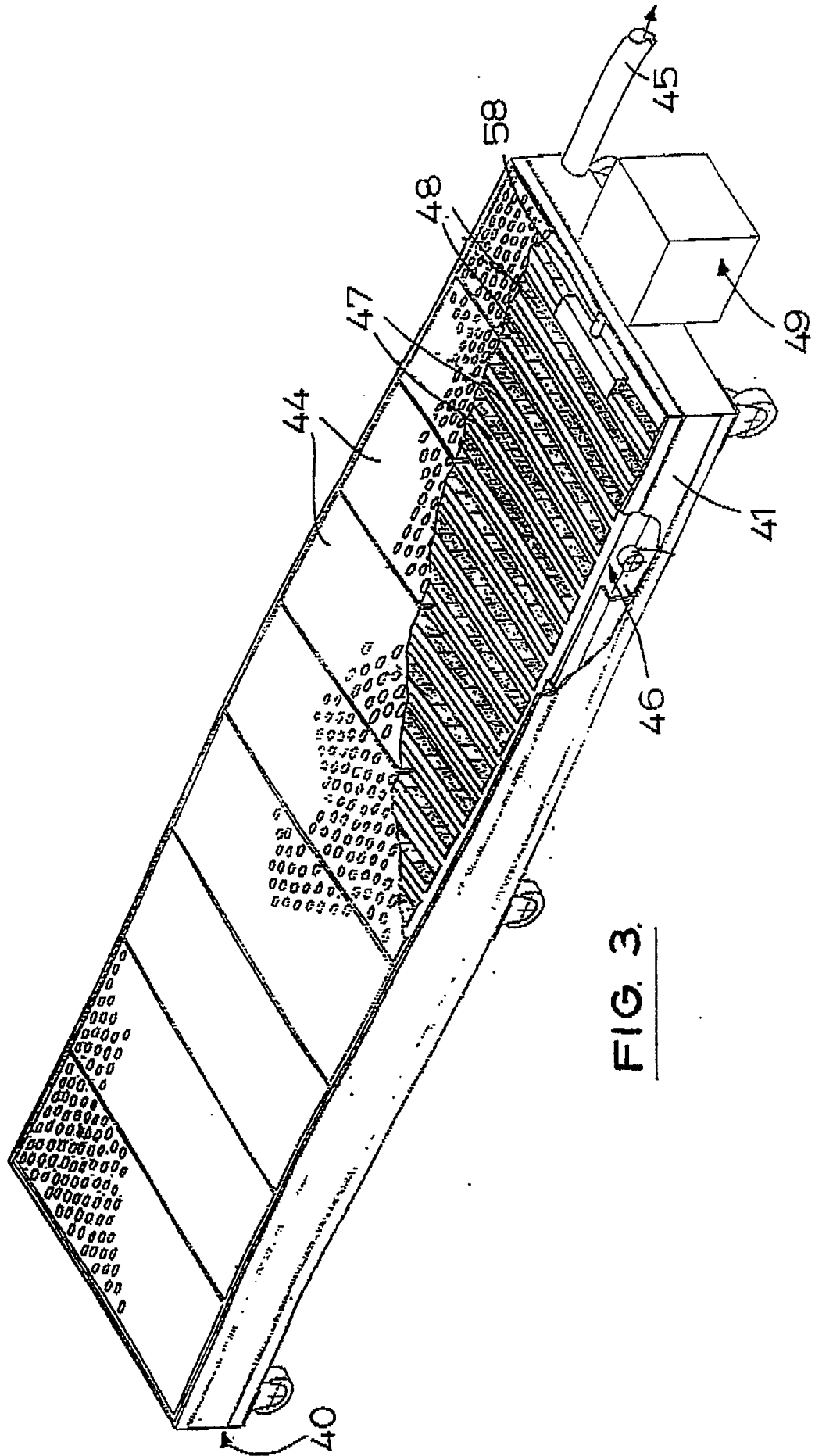


FIG. 2.



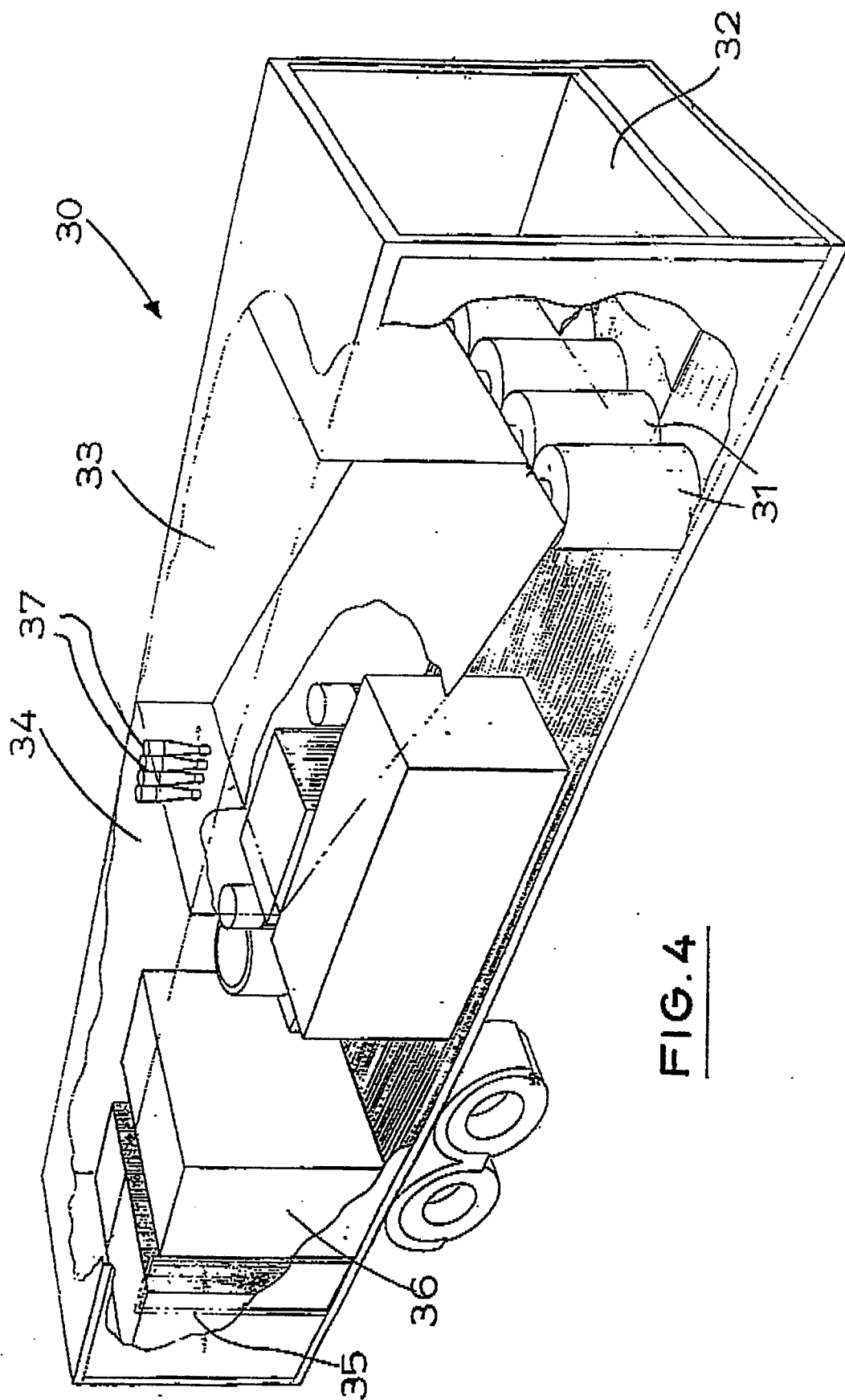


FIG. 4

