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GB 2464141 A
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(54) Title of the Invention: **A unit for and method of treating waste**
Abstract Title: **Neutralising washout from concreting operations**

(57) A method of neutralising washout from concreting operations comprises the steps of providing an unit 10 to contain the washout, providing the unit with a store of neutralising agent, receiving the washout in the unit, transferring a liquid washwater component from the washout receiving region 20 of the unit to a washwater containment region 14 of the unit, and supplying the neutralising agent to the washout in the washwater containment region of the unit. Preferably, the neutralising agent is carbon dioxide gas. The pH of the washwater in the washwater containment region may be measured and the supply of neutralising agent regulated based on the measured pH. There may be baskets 21, 22 provided in the washout receiving region such that solid material is retained therein, whilst the washwater drains into the washwater containment region. In another aspect a unit for treating washout is also claimed.

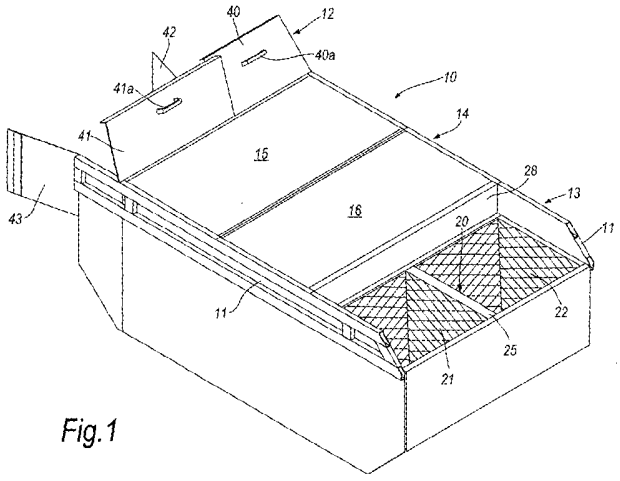

Fig.1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

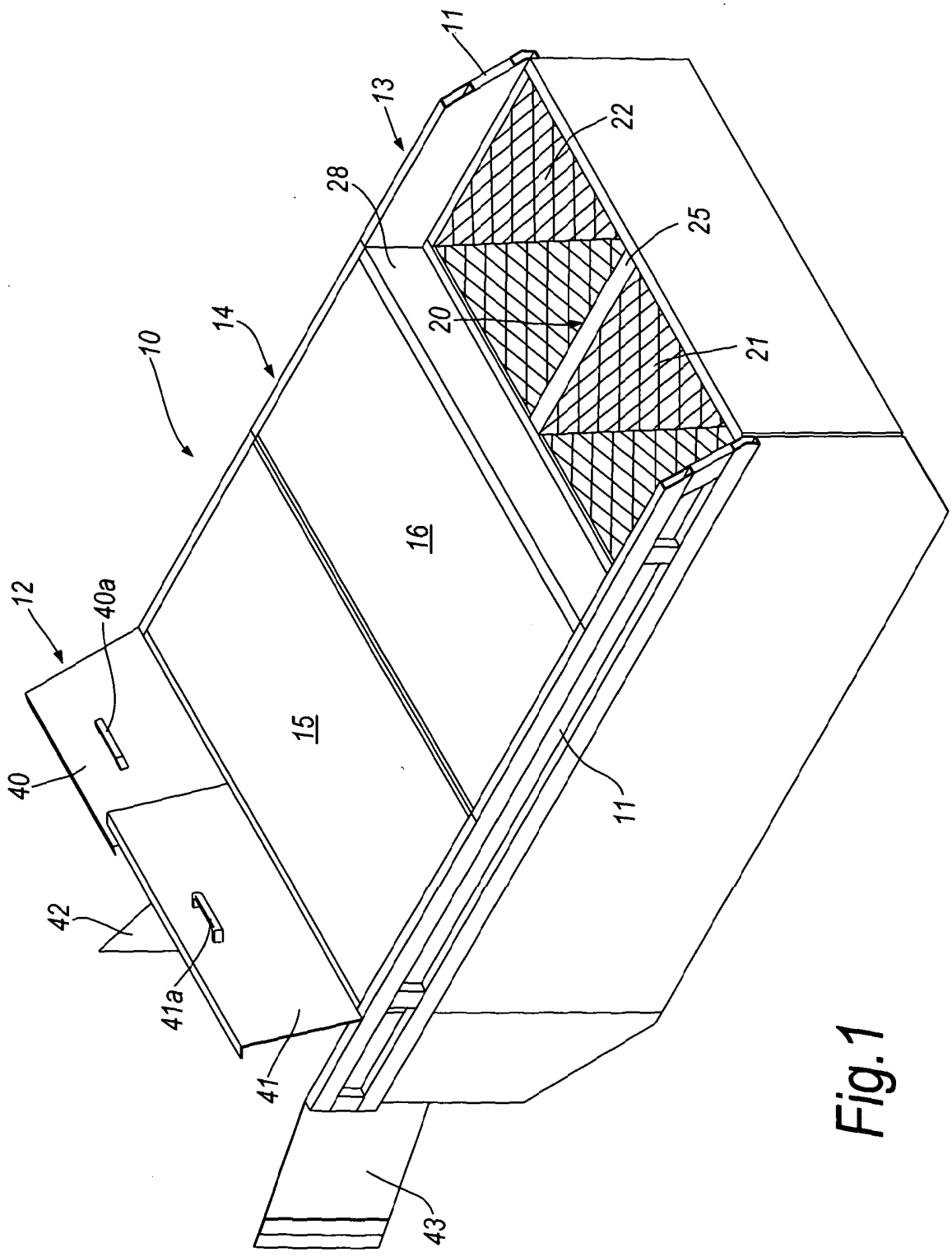

Fig. 1

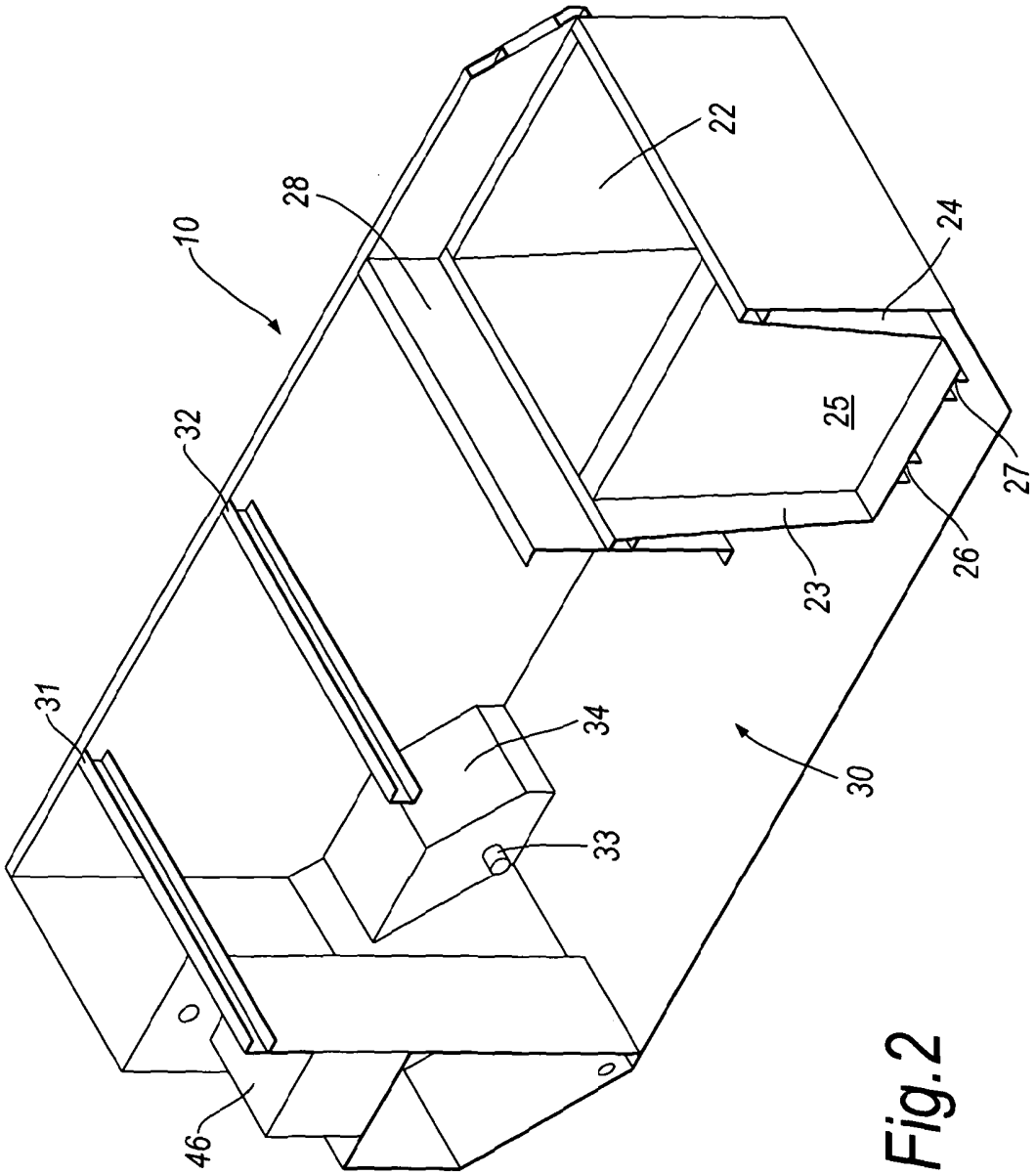

Fig.2

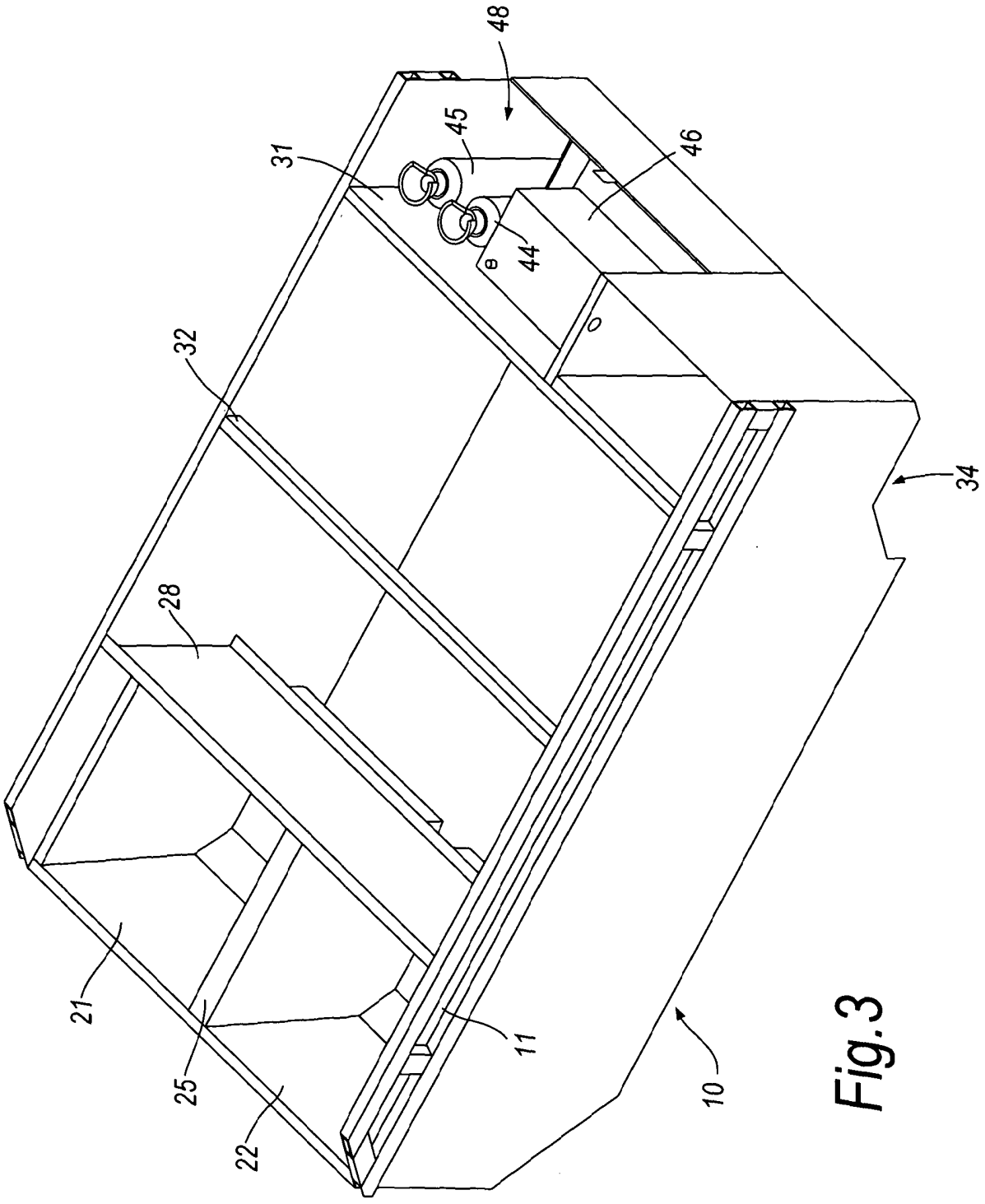

Fig.3

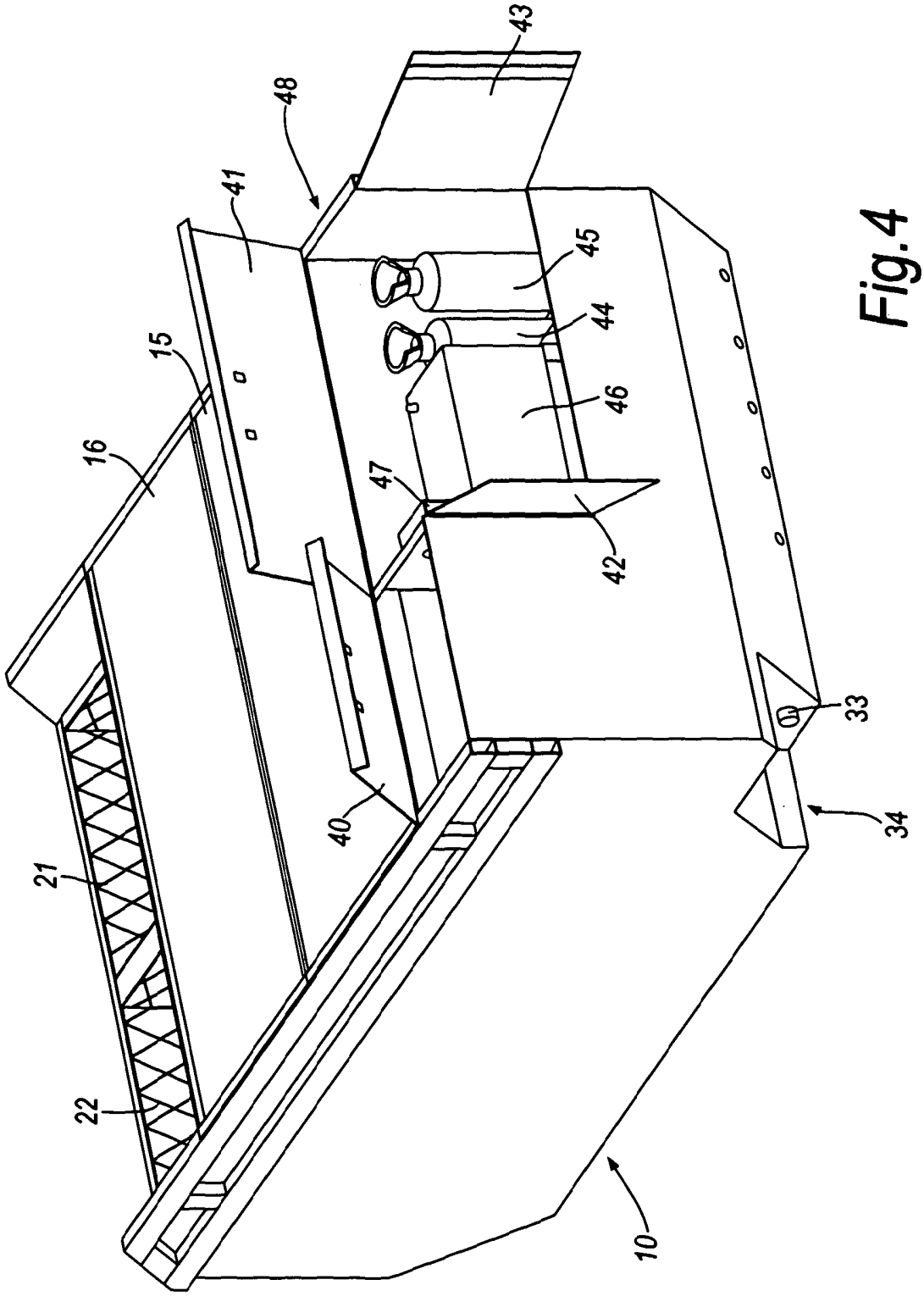

Fig.4

A Unit For and Method of Treating Waste

This invention relates to a unit for, and a method of, treating waste, in particular, but not exclusively, waste from on site concreting operations and the cleaning of concrete delivery lorries

In the construction industry, concrete is emptied from lorries via a discharge chute mounted to the lorry. After the concrete has been emptied, the discharge chute must be washed out before the lorry can leave the construction site. The waste so generated, referred to herein as "washout", comprises waste concrete solids (hereinafter referred to as concrete solids)and a volume of high pH, alkaline water hereinafter referred to as washwater. Sometimes the pH of the washwater can be as high as pH 13.

Traditionally, the washout (containing the waste concrete and the alkaline water either released from the concrete itself or from washing concreting equipment) is dumped into a plastic-lined skip at the construction site. When the skip is full, it is transported to a tip to be disposed of. Transporting the skip to a tip causes problems. Firstly, the washwater is highly alkaline and

is often spilt over the road on the way to the tip. Secondly, it is illegal to tip liquid waste into landfill. Hence, once the skip arrives at the tip, the washwater cannot be disposed of simply.

It is an object of the present invention to provide a unit for, and a method ofreceiving the washout, separating the concrete solids and treating washwater to overcome some or all of the above problems.

According to one aspect of the invention there is provided a unit for treating washout, the unit comprising:

a region for receiving the washout, and separating and storing concrete solids from the washout,

a washwater containment region for the storage and treatment of washwater, and

a pH adjuster for neutralising the washwater,

wherein the pH adjuster is arranged to be connectable to a source of a neutralising agent, and wherein the pH adjuster is arranged to supply the neutralising agent to the washwater in the washwater containment region.

Providing the unit with a neutralising agent source allows the alkaline washwater to be neutralised. The water can then be simply disposed of without having to be

transported. This reduces transportation costs and eliminates the risk of spilling alkaline water on a road.

Preferably the unit is portable. It can then be taken to any site where it is needed and once it is no longer needed taken to another site. Thus the unit is preferably able to be carried on a lorry, preferably on a skip lorry.

Preferably, the unit has a cubic capacity of 1 to $20m^3$, preferably 3 to $10m^3$ and most preferably 4 to $6m^3$.

Preferably, the pH adjuster further comprises:

a pH sensor for measuring a pH level of the washwater, and

a neutralising agent supply controller for controlling supply of the neutralising agent to the washwater,

wherein the pH sensor and neutralising agent supply controller are connected such that the neutralising agent supply controller can regulate the supply of the neutralising agent based on the pH level measured by the pH sensor.

Providing a unit with a pH sensor and a supply controller that allows the pH level of the washwater to

be controlled using a feedback system prevents too much or too little neutralising agent being added to the washwater.

Preferably, the unit comprises a battery accommodation region for accommodating a battery and the pH adjuster is arranged to be powered by the battery such that the unit does not have to rely on an external power supply. This is especially significant in enabling the unit to be used in any of a wide variety of applications.

Preferably, the pH adjuster further comprises a neutralising agent source accommodation region.

Preferably, the neutralising agent source accommodation region and the battery accommodation region are sized so as to accommodate a neutralising agent source and battery that, in use, last approximately the same amount of time. This means that the battery and neutralising agent source can be replaced/re-charged at the same time, making maintenance of the unit easier.

Preferably, the battery accommodation region, neutralising agent source accommodation region and/or the neutralising agent supply controller are all contained within a chamber of the unit. When the battery,

neutralising agent source and supply controller are all contained in a single chamber, which may be compact, the amount of space they take up can be reduced. The regions for receiving washout and the washwater containment region can then be larger for a given size of unit and hence, more washout can be contained and the time between emptyings of the unit can be increased.

Preferably, the neutralising agent is carbon dioxide gas. Adding carbon dioxide gas is safer than adding acid to the washwater

Preferably, the unit includes a plurality of covers covering the washwater containment region and preferably also a viewing flap which can be opened to ascertain the remaining capacity of the washwater containment region. This makes it easy to check to see if the unit needs emptying or will soon need emptying.

It is advantageous that the unit comprises a washout receiving region in which the washout is received and the solids separated from the washwater which is stored in the washwater containment region. Preferably the two regions are arranged such that, the solids in the washout are retained in the washout receiving region and washwater in the washout is drained from the washout

receiving region into the washwater containment region. Separating the liquid from the solid in the washout makes disposal easier.

Preferably, the washwater containment region is fully covered. Providing a covered washwater containment region allows the safe storage of the washwater and reduces the risk of spilling liquid from the unit when it is being transported.

Preferably, the pH adjuster is arranged to supply a neutralising agent to the washwater in the washwater containment region.

Preferably, the ratio of the volume of the washwater containment region to the volume of the washout receiving region is approximately equal to the expected ratio of the volume of liquid in the washout to volume of solid material in the washout. In that case the two regions are likely to become full at about the same time, making it efficient to empty them at the same time, making maintenance of the unit easier. In a typical washout operation, the washout generated contains approximately 10 kg of concrete and 50 litres of water. Preferably, the ratio of the volume of the washwater containment region to the volume of the washout receiving region is

between 3 and 8, more preferably between 4 and 6, and most preferably about 5.

Preferably, the washout receiving region is arranged to accommodate a permeable sack, such that when washout is received in the permeable sack, liquid in the washout drains through the permeable sack into the washwater containment region and solid material in the washout is retained in the permeable sack. This means that the solid material from the washout can be easily removed from the washout receiving region by simply removing the permeable sack.

Preferably, the washout receiving region tapers in a downward direction such that when the permeable sack contains set concrete, the sack can easily be lifted from the unit.

Preferably, the boundary walls of the washout receiving region comprise a mesh structure to allow liquid in the washout to drain into the washwater containment region.

Preferably, the washout receiving region comprises two portions, each portion being arranged to accommodate a respective permeable sack. This enables smaller sacks

of a standard size to be used and allows one sack to be removed and emptied while another sack is still in place in the unit, allowing the unit still to be used.

Preferably, the washwater containment region is fitted with a valve to allow liquid collected to be drained from the unit.

According to another aspect of the invention, there is provided a method of neutralising washout from concreting operations, the method comprising the steps of:

providing a unit to contain the washout,

providing the unit with a store of a neutralising agent,

receiving the washout in the unit, and transfering a liquid (washwater) component from the washout receiving region of the unit to a washwater containment region of the unit and

supplying the neutralising agent to the washwater in the washwater containment region of the unit.

Connecting the unit to a neutralising agent source allows the alkaline water in the washout to be neutralised. The water can then be simply disposed of without having to be transported. This reduces

transportation costs and eliminates the risk of spilling alkaline water on a road.

Preferably, the method comprises the steps of:

measuring the pH level of the washwater in the washwater containment region of the unit, and

regulating the supply of the neutralising agent based on the pH level measured.

Preferably, the method comprises the steps of:

receiving washout in a washout receiving region of the unit,

retaining solid material in the washout in the washout receiving region, and

draining washwater in the washout from the washout receiving region into the washwater containment region in the unit.

Preferably, the method comprises the steps of:

accommodating a permeable sack in the washout receiving region,

receiving washout in the permeable sack,

draining liquid in the washout through the permeable sack into the washwater containment region, and

retaining solid material in the washout in the permeable sack.

The unit to contain the washout may be in any of the forms defined above.

The unit of the invention is defined above as being for treating washout from concreting operations. It should be understood, however, that in the broadest aspect of the invention the unit may be employed for treating other alkaline waste material that includes solid and liquid material.

By way of example, a unit for, and method of, neutralising washout from a concrete discharge chute will now be described with reference to the accompanying drawings of which:

Figure 1 is a front isometric view of a unit according to the present invention;

Figure 2 is a cutaway isometric view of the unit of Figure 1, with lids missing for clarity of illustration;

Figure 3 is a rear isometric view of the unit of Figure 1, with lids missing for clarity of illustration; and

Figure 4 is another rear isometric view of the unit of Figure 1, with the lids shown.

Figure 1 shows a unit 10. The unit has a cubic capacity of approximately $5m^3$. The unit 10 is a conventional skip shape with lifting bars 11 provided along both long sides of the unit. These lifting bars 11 enable the unit 10 to be transported. As shown in Figure 1, the unit 10 can be conceptually divided into three regions; a far end region 12, a central region 14 and a near end region 13.

The central region 14 provides the washwater containment region and takes up most of the volume of the unit.This is covered by two lids 15, 16.

At the rear (region 13) is the washout receiving region 20. Washout from a concreting operations is allowed to run into this region 20 and into baskets 21, 22 placed there. The baskets 21, 22 are made of a mesh material to allow liquid to drain out of them. The mesh of the material is not shown in Figures 2 and 3 for simplicity. The two baskets 21, 22 are separated by a dividing bar 25.

In Figure 2, basket 21 is shown cut-away. This shows tapered walls 23, 24 of the basket 21. It also shows that the basket 21 is supported on two rail-

like supports 26, 27 . The supports 26, 27 allow the basket 21 to be raised from the floor of the unit 10. Basket 22 is also supported by these rail like supports and has tapered side walls.

The baskets 21, 22 are contained within the washout receiving region 20 by a panel 28 attached to side walls of the unit 10 and extending across the width of the unit 10. The panel 28 only extends about halfway to three quarters the way down the height of the unit 10, thereby allowing liquid drained from the baskets 21, 22 to pass under the panel 28 and into the central region 14 of the unit 10.

The central region 14 of the unit 10 provides a liquid chamber 30 where liquid drained from the baskets 21, 22 is collected. At the top of the unit 10, in the central region 14, are located two bars 31, 32, extending across the width of the unit 10. The lids 15, 16 rest on bars 31, 32 and the top of panel 28.

Towards the far end of the liquid chamber 30 is an indent section 34 in a corner of the bottom of the unit 10. The indent section 34 extends into the

unit 10 thereby slightly reducing the capacity of the liquid chamber 30. From the outside of the unit 10, the indent section 34 provides an undercut region. This can be seen in Figure 4. The indent section 34 has a drainage hole 33 extending from the liquid chamber 30 to the outside of the unit 10. The drainage hole 33 is closed by a valve (not shown) to collect liquid in the chamber 30. When liquid is to be drained from the chamber 30, the valve is opened .

At the far region 12, there is a viewing flap 40 located on the top of the unit. The viewing flap 40 can be opened by lifting a handle 40a. A user can open the viewing flap 40 to see into the liquid chamber 30 and see how much capacity is left in the chamber 30.

Adjacent the viewing flap 40, also on the top of the unit 10, is an access flap 41. The access flap can be opened by lifting on handle 41a. The access flap 41 allows a user to look down into a chamber 48. There are also two access doors 42, 43 that are located on the end panel of the unit 10, below the access flap 41. These access doors 42, 43 open to allow horizontal access into the chamber 48.

Hence, by opening access flap 41 and access doors 42, 43 a user can access the chamber 48 from the top and the end of the unit 10.

In the chamber 48, are two carbon dioxide cylinders 44, 45 standing upright on a right hand side of the chamber 48. The carbon dioxide cylinders are connected to a supply controller 47. The supply controller 47 is also located in the chamber 48 and is mounted on a left hand side wall of the chamber. 48. The supply controller 47 is supplied with power by a battery 46. The battery 46 is also located in the chamber 48 between the supply controller 47 and the carbon dioxide cylinders 44, 45.

The supply controller 47 is connected to a pH sensor (not shown) in the liquid chamber 30. It works on a feedback system and controls supply of the carbon dioxide to the liquid chamber 30 so that the liquid in the liquid chamber 30 is neutralised. The carbon dioxide is fed into the liquid chamber 30 by tubes (not shown) that are connected to the liquid chamber 30 via the supply controller 47.

In use, the unit 10 is firstly set up by ensuring a battery 46 and at least one carbon

dioxide cylinder 44, 45 are provided. The battery 46 and carbon dioxide cylinders 44, 45 are connected to the supply controller 47. The drainage valve (not shown) is closed .

In addition, two permeable sacks (not shown), known in the construction industry as intermediate flexible bulk containers, are placed in the washout receiving region 20. One sack is placed in each basket 21, 22.

When a concrete discharge chute on a lorry is to be washed out, the lorry is driven so that the discharge chute is over the washout receiving region 20. Water is washed down the chute and the resulting washout is received in one or both of the two sacks in the baskets 21, 22. The water in the washout drains through the sacks and through the mesh of the baskets 21, 22. The water is collected in the liquid chamber 30.

The solid concrete in the washout is collected in the sacks in the baskets 21, 22. The concrete takes up the tapered shape of the baskets 21, 22 and then sets.

Further washouts can be performed in a similar way. The washout will be received by the sacks in the baskets 21, 22 and the water will drain into the liquid chamber 30 in a similar way. The solid concrete in the washout will be collected in the sacks on top of the concrete already present.

Throughout use of the unit 10, the pH sensor (not shown) monitors the pH of the water in the liquid chamber 30. It communicates with the supply controller 47 in the chamber 48. The supply controller 47 then controls the supply of the carbon dioxide from the cylinders 44, 45 to the liquid chamber 30. As more carbon dioxide is supplied to the liquid chamber, the pH reduces as the carbon dioxide neutralises the alkaline water.

If, at any time, it is suspected that the unit 10 may be full or nearly full (and therefore in need of emptying), the viewing flap 40 can be lifted. This allows a user to look inside the liquid chamber 30 and ascertain the remaining capacity.

If it is established that the liquid chamber 30 is full or nearly full and should be emptied, the valve (not shown)is opened. Allowing liquid to drain

out of the unit via hole 33.. It is important to note that the water should only be emptied if the water has been sufficiently neutralised to be easily and safely disposed of.

During use, the sacks in the baskets 21, 22 will also become full of set concrete. The sacks can be removed from the baskets 21, 22 by simply lifting them out. This may be done using a crane or other lifting device. The tapered walls 23, 24 of the baskets 21, 22 ensure that the sacks can be lifted out easily and that the set concrete does not cause the sacks to become wedged in the unit.

During use, the battery 46 will lose power. The battery 46 can be accessed by opening access flap 41 and/or access doors 42, 43 and can be replaced or re-charged. Similarly, carbon dioxide canisters 44, 45 can be re-filled or replaced.

The unit 10 of this particular example is designed to provide about 6 weeks of typical use. Hence, the battery 46 and the carbon dioxide canisters 44, 45 are expected to last approximately 6 weeks without replacement or recharging.

Claims

1. A method of neutralising washout from concreting operations, the method comprising the steps of:

providing a unit to contain the washout,

providing the unit with a store of a neutralising agent,

receiving the washout in the unit, and transfering a liquid (washwater) component from the washout receiving region of the unit to a washwater containment region of the unit, and

supplying the neutralising agent to the washout in the washwater containment region of the unit.

2. A method as claimed in claim 1 wherein the method further comprises the steps of:

measuring the pH level of the washwater in the washwater containment region of the unit, and

regulating the supply of the neutralising agent based on the pH level measured.

3. A method as claimed in claim 1 or 2 wherein the method further comprises the steps of:

receiving washout in a washout receiving region of the unit,

retaining solid material in the washout in the washout receiving region, and

draining washwater in the washout from the washout receiving region into the washwater containment region in the unit.

4. A method as claimed claim 3 wherein the method further comprises the steps of:

accommodating a permeable sack in the washout receiving region,

receiving washout in the permeable sack,

draining liquid in the washout through the permeable sack into the washwater containment region, and

retaining solid material in the washout in the permeable sack.

5. A unit for treating washout, the unit comprising:

a region for receiving the washout, and separating and storing concrete solids from the washout,

a washwater containment region for the storage and treatment of washwater, and

a pH adjuster for neutralising the washwater, wherein the pH adjuster is arranged to be connectable to a source of a neutralising agent, and wherein the pH adjuster is arranged to supply the neutralising agent to the washwater in the washwater containment region.

6. A unit as claimed in claim 5 wherein the pH adjuster further comprises:

a pH sensor for measuring a pH level of the washwater, and

a neutralising agent supply controller for controlling supply of the neutralising agent to the washwater,

wherein the pH sensor and neutralising agent supply controller are connected such that the neutralising agent supply controller can regulate the supply of the neutralising agent based on the pH level measured by the pH sensor.

7. A unit as claimed in claim 5 or claim 6 wherein the unit comprises a battery accommodation region for accommodating a battery and wherein the pH adjuster is arranged to be powered by the battery such that the unit does not have to rely on an external power supply.

8. A unit as claimed in any of claims 5 to 7 wherein the pH adjuster further comprises a neutralising agent source accommodation region.

9. A unit as claimed in claim 8 when dependent on claim 7 wherein the neutralising agent source accommodation

region and the battery accommodation region are sized so as to accommodate a neutralising agent source and battery that, in use, last approximately the same amount of time.

10. A unit as claimed in claim 8 or 9 when dependent on claim 7 wherein the battery accommodation region, neutralising agent source accommodation region and the neutralising agent supply controller are all contained within a chamber of the unit.

11. A unit as claimed in any of claims 5 to 10 wherein the neutralising agent is carbon dioxide gas.

12. A unit as claimed in any of claims 5 to 11 wherein the unit includes a plurality of covers covering the washwater containment region and a viewing flap which can be opened to ascertain the remaining capacity of the washwater containment region.

13. A unit as claimed in any of claims 5 to 12 wherein the washout receiving region and the washwater containment region are arranged such that the solids in the washout are retained in the washout receiving region, and washwater in the washout is drained from the washout receiving region into the washwater containment region.

14. A unit as claimed in claim 13 wherein the pH adjuster is arranged to supply a neutralising agent to the washwater in the washwater containment region.

15. A unit as claimed in claim 14 wherein the ratio of the volume of the washwater containment region to the volume of the washout receiving region is between 3 and 8.

16. A unit as claimed in any of claims 13 to 15 wherein the washout receiving region is arranged to accommodate a permeable sack, such that when washout is received in the permeable sack, washwater in the washout drains through the permeable sack into the washwater containment region and solid material in the washout is retained in the permeable sack.

17. A unit as claimed in claim 16 wherein the washout receiving region tapers in a downward direction such that when the permeable sack contains set concrete, the sack can easily be lifted from the unit.

18. A unit as claimed in any of claims 13 to 17 wherein the boundary walls of the washout receiving region comprise a mesh structure to allow liquid in the washout to drain into the washwater containment region.

19. A unit as claimed in any of claims 16 to 18 wherein the washout receiving region comprises two portions, each portion being arranged to accommodate a respective permeable sack.

20. A unit as claimed in any of claims 13 to 19 wherein the washwater containment region is fitted with a valve to allow liquid collected to be drained from the unit.

21. A unit for containing washout as hereinbefore described with reference to Figures 1 to 4.

22. A method of neutralising washout from concreting operations, the method including the step of using the unit of any of claims 5 to 21.

Application No:	GB0900891.3	**Examiner:**	Mr Alun Owen
Claims searched:	1-22	**Date of search:**	26 April 2010

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	1-22	US2007/170119 A1 (MICKELSON ET AL.) See especially Figures 1-2, paragraphs [0023]-[0025] & [0045]-[0055] and claim 14
X	1-22	US2005/145548 A1 (RHOADES) Whole document relevant, see especially the Figures and paragraphs [0018], [0025], [0028], [0037] & [0047]
X,E	1-3, 5-6, 8, 11 and 13-14	GB2464141 A (SILTBUSTER) See especially the Figures and page 1, line 20 to page 2, line 10 & page 5, line 17 to page 6, line 4
X	1-22	WO01/64348 A1 (ANCA) See especially the Figures and WPI Abstract Accession Number 2001-541758 [60]
X	1 at least	JP51082957 A (MITSUBISHI) See especially Figure 2 and WPI Abstract Accession Number 1979-28972B [15]
X	1, 5 and 22 at least	KR1020060010678 A (INSUN) See especially the Figures and WPI Abstract Accession Number 2006-763800 [78]

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:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

B01D; B03B; C02F

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

WPI, EPODOC

International Classification:

Subclass	Subgroup	Valid From
C02F	0001/66	01/01/2006