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GB 2259733 A	GB 2249121 A	GB 2242926 A
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(71) Applicant(s)

Stephen Arthur Bannocks
8 Greenaway Road, NEWTON ABBOT, Devon,
TQ12 1NL, United Kingdom

(72) Inventor(s)

Stephen Arthur Bannocks

(74) Agent and/or Address for Service

Withers & Rogers
4 Dyer's Buildings, Holborn, LONDON, EC1N 2JT,
United Kingdom

(54) Water recirculation system and storage tank for use therein

(57) A water recirculation system comprises means to collect rainwater, means to convey said water to a storage tank and means to convey water from said tank to a lavatory cistern. The tank is preferably double-walled with the space between the walls containing an insulating material.

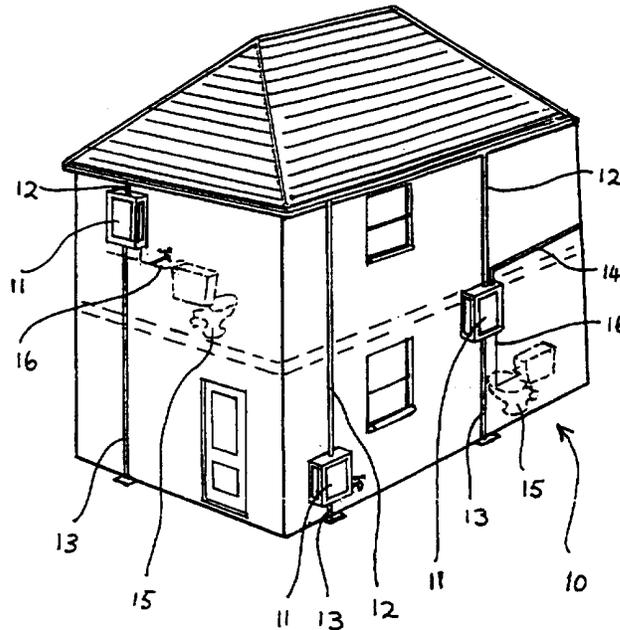


FIG. 1

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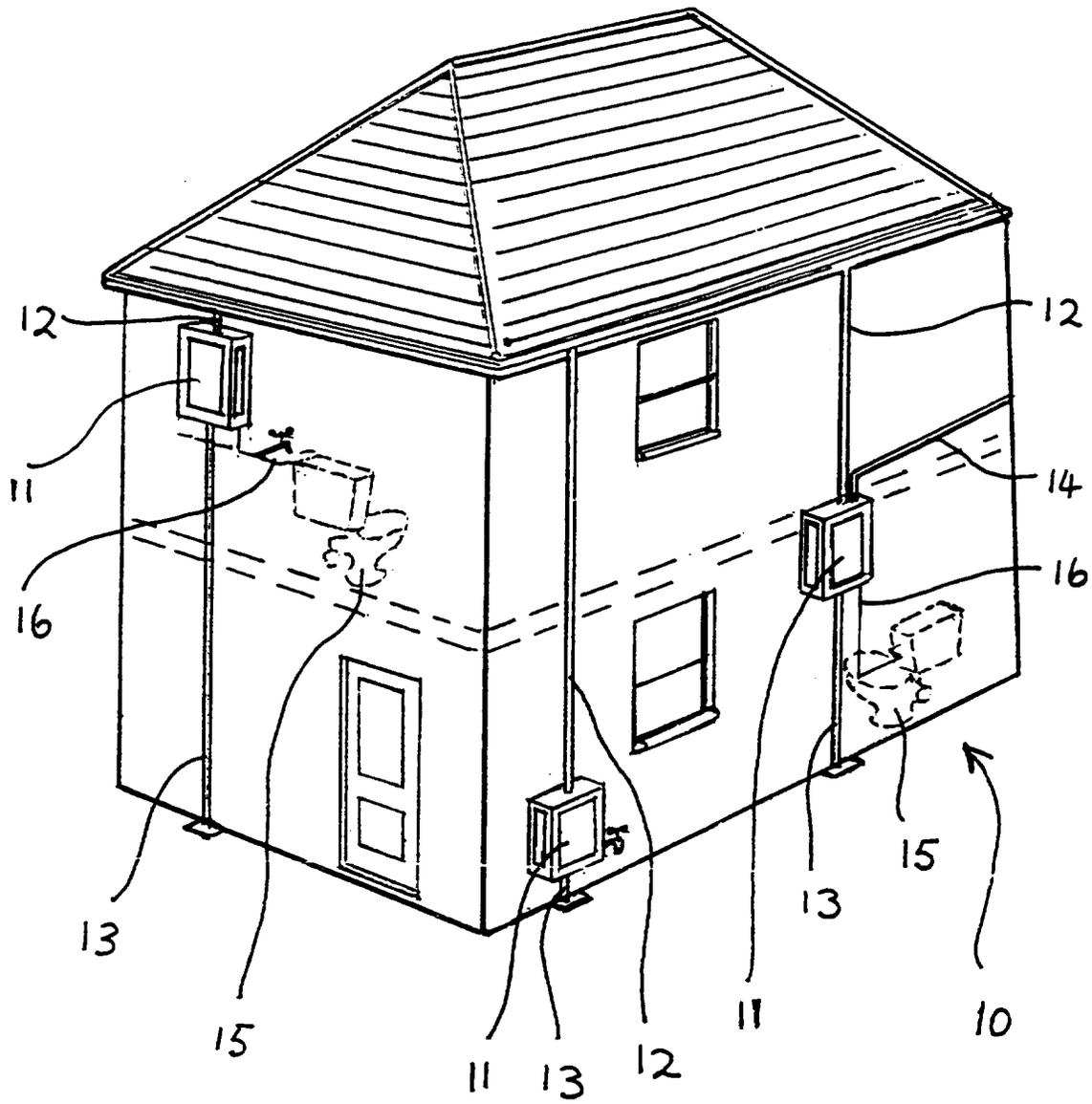
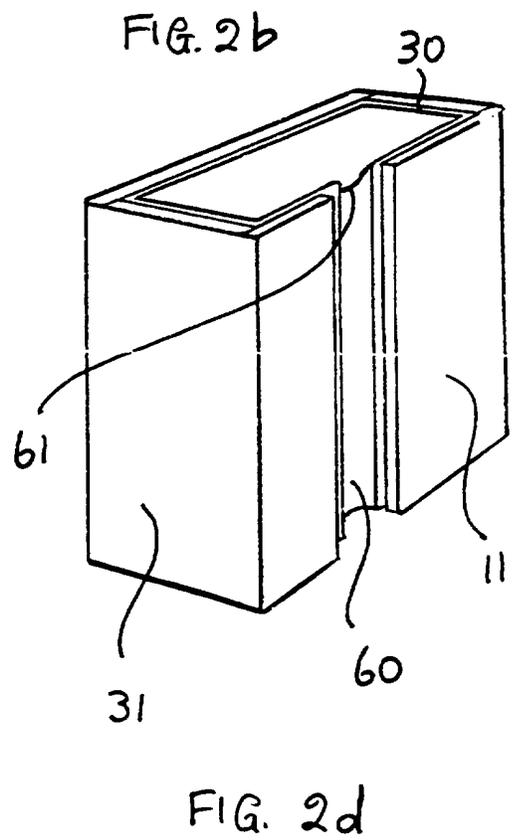
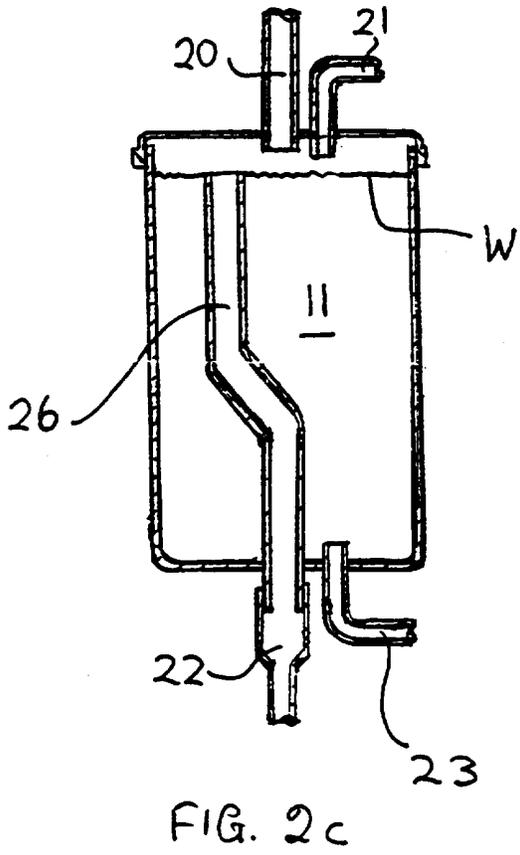
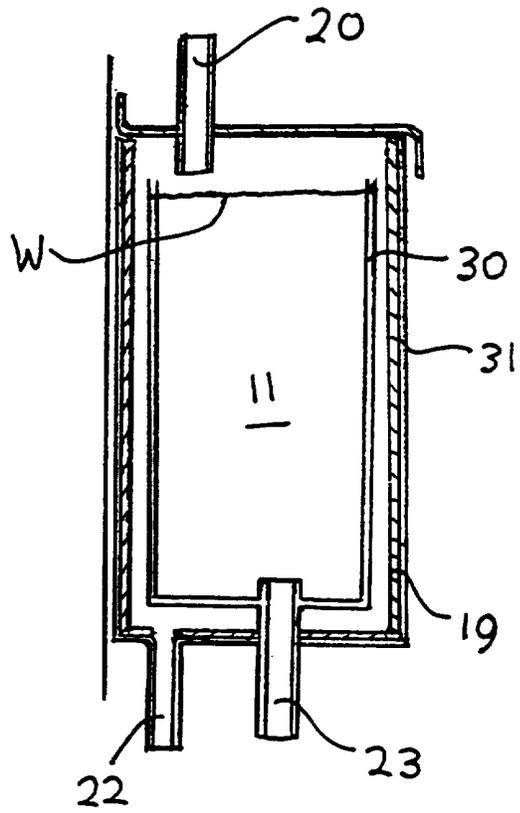
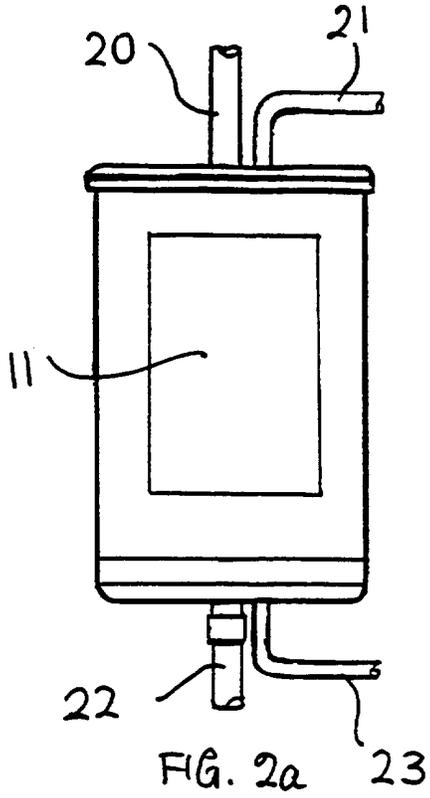


FIG. 1



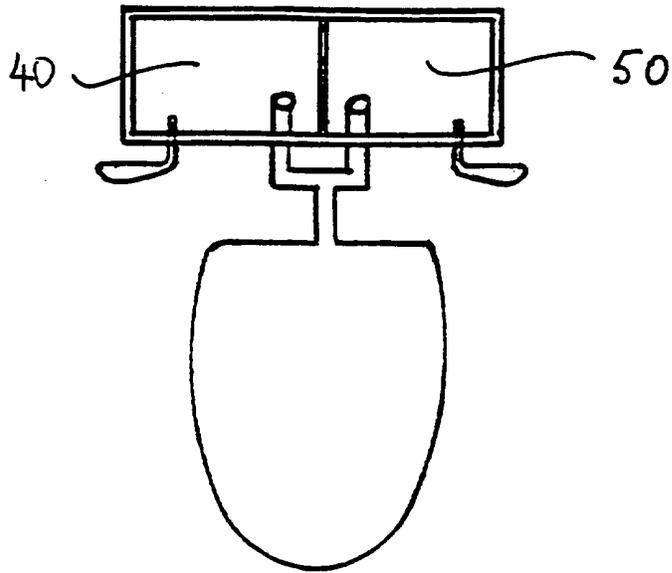


FIG. 3a

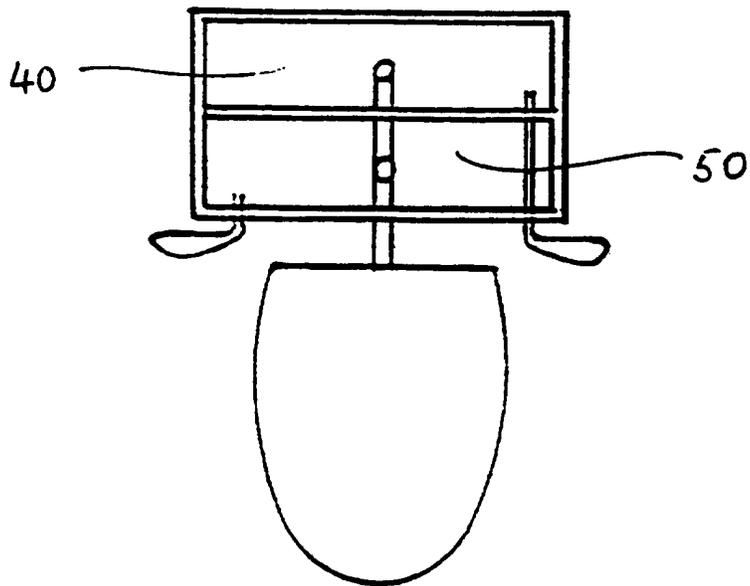


FIG. 3b

WATER RECIRCULATION SYSTEM

This invention relates to a system for the recirculation of water for use in place of potable water where use of such water is unnecessary, for example to flush lavatories.

In the UK, all water supplied to buildings is potable although it is not essential for all purposes that the water is of such quality. For example, the water used for flushing lavatories or for an outside tap need not be of drinking standard. Thus the use of potable water for such purposes is wasteful. Additionally, the gradual introduction of water metering has caused such wasteful usage to be expensive particularly in large buildings housing many people, for example in office blocks.

According to the invention, a water recirculation system comprises means to collect rain water falling on the roof of a building, means to convey collected water to at least one storage tank; and means to convey water from the storage tank to a lavatory for the flushing thereof. Optionally, the collected rainwater may be mixed with collected non-foul waste water from use within the building before being conveyed to the lavatory.

Preferably, the collected non-foul waste water is from sinks, wash basins, baths, showers, washing machines and dishwashers. Advantageously, the waste water generally contains soap or detergent which, when used to flush the lavatory, will assist in the cleaning thereof.

Preferably, the means to collect rainwater comprises a tank mounted externally of the building. Conveniently, the rainwater may be collected directly from an existing

guttering system on the building. The storage tank or tanks may be mounted at ground level, just above ground level, or may be mounted in an elevated position. Mounting of the tank on a wall simplifies installation of the system in a building; for example the need to reinforce flooring to support the weight of a storage tank is eliminated. Additionally, the use of a wall mounted tank facilitates installation in a lavatory cubicle space. Optionally, pumps may be incorporated in the system to pump water to or from the storage tank.

Preferably, the storage tank is provided with a capacity regulator device such that the weight of the water stored therein will not deform the tank or promote its detachment from its mounting and such that the tank will not overflow. The capacity regulator device may be in the form of a valve, for example of the ballcock operating type or may be a simple weir-type arrangement or a standpipe. Optionally, a double-walled tank may be used, which would allow the use of a simple weir as a capacity regulator, excess water overflowing and collecting between the walls of the tanks, and would limit damage to the integrity of the tank walls on freezing due to the presence of an expansion gap. Conveniently, the expansion gap also prevents deformation of the tank caused by the weight of the water held therein. Optionally, the tank may be insulated to prevent the water from freezing; the insulation material may conveniently be disposed in the expansion gap.

Water ducted from the tank to a lavatory may enter the lavatory cistern or may be ducted directly to the lavatory bowl, bypassing the cistern, the ducting itself bearing the flushing mechanism for the lavatory.

It is recognised that occasions may arise where insufficient recirculated water is stored in the storage tank to flush a lavatory and thus mains water ought still to be plumbed to the lavatory. Accordingly, a second aspect of the invention provides a lavatory cistern which has discrete dual supplies of mains water and of recirculated water. Preferably, means are provided to prevent the recirculated water from contaminating the mains water or from entering the mains supply.

The dual supply to the lavatory cistern may be achieved by the provision of branched ducting between the lavatory inlet pipe, the cistern and the storage tank. Alternatively, the lavatory may be provided with a divided cistern, each division of which is independently operable with regard to filling and flushing. Preferably, a cistern divided into two chambers is provided, each of the two chambers being able to be filled and flushed separately. The division may be longitudinal, transverse or such that the chambers are superposed. Preferably, one chamber is supplied directly with recirculated water while the other is supplied from the mains.

Embodiments of the invention will now be described by way of example with reference to the attached drawings of which:

Figure 1 shows schematically a water recirculation system installed in a domestic house;

Figures 2a, 2b, 2c and 2d show respective embodiments of a water storage tank suitable for use with the invention; and

Figures 3a and 3b show two variants of a dual supplied lavatory cistern.

With reference to Figure 1, a house, generally indicated 10, has three storage tanks 11 mounted on its outside walls. Rainwater is collected in the guttering of the house drainage system and is conveyed to the tanks 11 by ducting 12. Excess water leaving the tanks 11 from overflow devices re-enters the normal house drainage system 13. Non-foul waste water from the house 10 is conveyed to at least one tank 11 by a duct 14. Optionally, rainwater and waste water are mixed in one or more of the tanks 11. Water is ducted from tanks 11 to lavatory 15 by ducting 16.

Figure 2a shows a front elevation of a storage tank 11 for use in the system of the invention. The tank 11 is provided with an inlet 20 for rainwater, an inlet 21 for waste water, an outlet 22 for excess water and an outlet 23 to duct stored water to a lavatory.

Figure 2b is a cross-section of an insulated double-walled tank 11 using a simple weir-type arrangement as an overflow. Insulation 19 is provided between the inner tank 30 and the outer tank 31. In use, water entering the inner tank 30 is conveyed through the inlet 20. The upper level of the wall of tank 30 is lower than the wall of the outer tank 31. When the water has reached the level indicated W, excess water will flow over the wall of tank 30 at a predetermined point and pass between the walls of the tanks 30, 31 until it enters the outlet 22 whence it is conveyed away from the tank. The outlet 23 from which water is ducted to the lavatory opens solely into the inner tank 30. The mouth of the outlet 23 is raised above the floor of the tank to allow particulate

to sediment out of the collected water and be retained in the tank.

Figure 2c shows an alternative weir-type arrangement in a single-walled tank. Water enters the tank through inlets 20, 21 until the level of water is sufficiently high that it flows into the overflow standpipe 26 whence it is ducted away from the tank through outlet 22 into the house drainage system.

Figure 2d is a perspective view of an insulated double walled tank 11, the tank having an upright recess 60 formed in one double wall which, conveniently, can accommodate a drainpipe. The recess may be constituted by a gap in the outer wall and a groove in the inner wall; the upper edge 61 of the groove is lower in the inner tank 30 than in the outer tank 31, to provide a weir.

Figure 3a is a plan view of a dual supplied toilet cistern which is divided transversely into two chambers 40, 50, recirculated water being held in the chamber 40 and mains water in the chamber 50.

Figure 3b shows a twin supplied lavatory cistern divided longitudinally; again recirculated water is held in the chamber 40 and mains water in the chamber 50.

The chambers 40, 50 each have their own flushing mechanisms such that they are able to be flushed independently. Ducting between the chambers and the lavatory bowl is also divided to prevent contamination of the mains supply water with recirculated water.

CLAIMS

1. A water recirculation system comprising means to collect rainwater falling on the roof of a building, means to convey collected water to at least one storage tank; and means to convey water from the storage tank to a lavatory for the flushing thereof.
2. A water recirculation system according to Claim 1, including means to mix collected non-foul waste water from use within the building with the collected rainwater before being conveyed to the lavatory.
3. A water recirculation system according to Claim 2, in which the collected non-foul water is from sinks, wash basins, baths, showers, washing machines and dishwashers.
4. A water recirculation system according to Claim 1, in which the rainwater is collected directly from the guttering.
5. A water recirculation system according to Claim 1, in which the said at least one storage tank is mounted externally of the building.
6. A water recirculation system according to any preceding claim, in which the said at least one storage tank is mounted in an elevated position.
7. A water recirculation system according to any preceding claim, in which the system further includes at least one pump to pump water to or from the storage tank or tanks.
8. A water recirculation system according to any

preceding claim, in which the collected water is ducted directly to the lavatory cistern.

9. A water recirculation system according to any one of Claims 1 to 7, in which the collected water is ducted directly to the lavatory bowl, the ducting incorporating a flushing mechanism.

10. A water recirculation system according to any preceding claim, in which mains water is also supplied to the lavatory cistern.

11. A water recirculation system according to Claim 10, in which the lavatory cistern is divided into two discrete chambers respectively for mains and recirculated water.

12. A water recirculation system according to Claim 11, in which the two chambers are independently flushable.

13. A storage tank suitable for use in a system according to any preceding claim, the tank including means for inlet of water from a roof and means for outlet of water to a lavatory cistern.

14. A storage tank according to Claim 13, in which the tank includes a capacity regulator device.

15. A storage tank according to Claim 14, in which the capacity regulator device is in the form of a ballcock-operated valve, a weir or a standpipe.

16. A storage tank according to any one of Claims 13 to 15, in which the tank is double-walled.

17. A storage tank according to Claim 16, in which the space between the walls contains an insulating material.

18. A water recirculation system substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

Application number
 GB 9524081.8

Relevant Technical Fields

(i) UK Cl (Ed.O) E1X (XK7B)

(ii) Int Cl (Ed.6) E03B 3/02

Search Examiner
 DAVE HAWORTH

Date of completion of Search
 5 FEBRUARY 1996

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
 1-12 AND 18

Categories of documents

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| <p>X: Document indicating lack of novelty or of inventive step.</p> <p>Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.</p> <p>A: Document indicating technological background and/or state of the art.</p> | <p>P: Document published on or after the declared priority date but before the filing date of the present application.</p> <p>E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.</p> <p>&: Member of the same patent family; corresponding document.</p> |
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Category	Identity of document and relevant passages	Relevant to claim(s)
X, P	GB 2286849 A (LANGFORD)	1-10
X	GB 2283048 A (ALLAN)	1-10
X	GB 2271372 A (SALES)	1-10
X	GB 2266116 A (DEVEY)	1-10
X	GB 2249121 A (LUCY)	1-10
X	GB 2242926 A (KELLY)	1-10
X	GB 2235719 A (DUNNING)	1-10
Y	GB 2288413 A (ELSOM)	10-12

Databases:The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).



Application No: GB 9524081.8
Claims searched: 13-17

Examiner: D. Haworth
Date of search: 23 May 1996

**Patents Act 1977
Further Search Report under Section 17**

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.O): E1X (XK7B); E1C (C22E); E1T (TZ)

Int Cl (Ed.6): E03B 11/00, 11/02; E03D 1/00, 5/00
Other: Online - WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	US 3965493 A (BEMIS)	X:13-16 Y:17
X	US 3467967 A (STEINMAN)	X: 13-16 Y: 17
Y	GB 2286609 A (CRAIG)	17
Y	GB 2259733 A (HAMER)	17

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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.
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