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ABSTRACT

A water storage tank comprising a front wall including an upper portion and a lower portion, said lower portion adapted to provide free-standing stability to said water storage tank. The water storage tank also comprises a plurality of apertures adapted to allow water input and output from the water storage tank as well as between water storage tanks. The water storage tank comprises internal reinforcing means to prevent bulging.

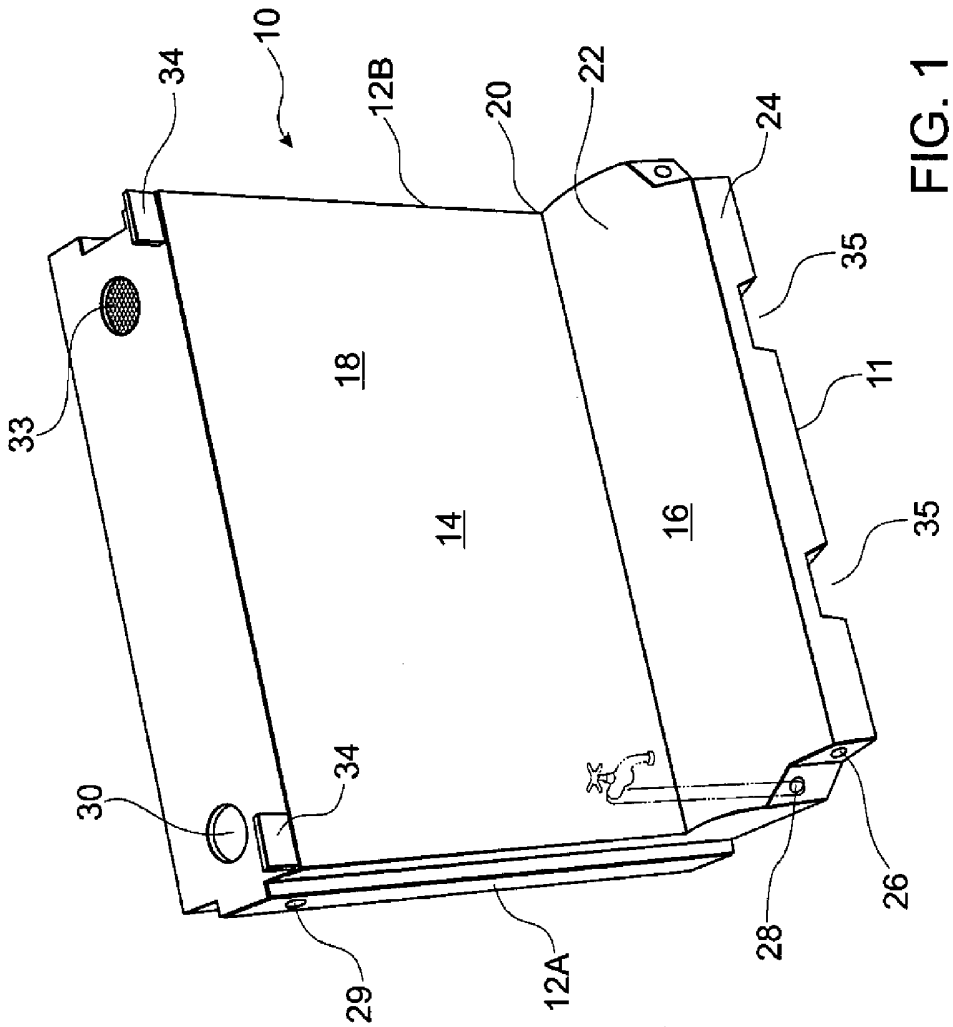


FIG. 1

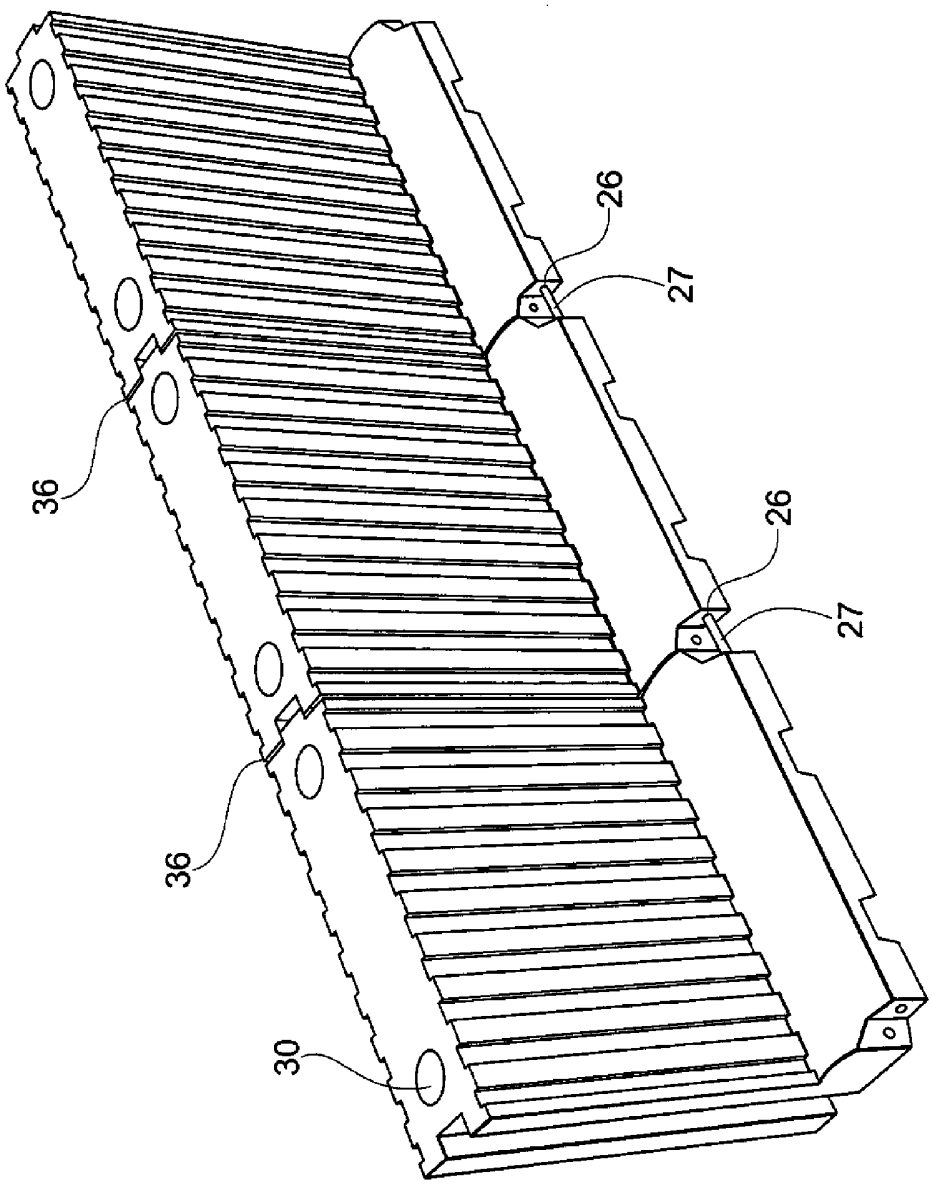


FIG. 3

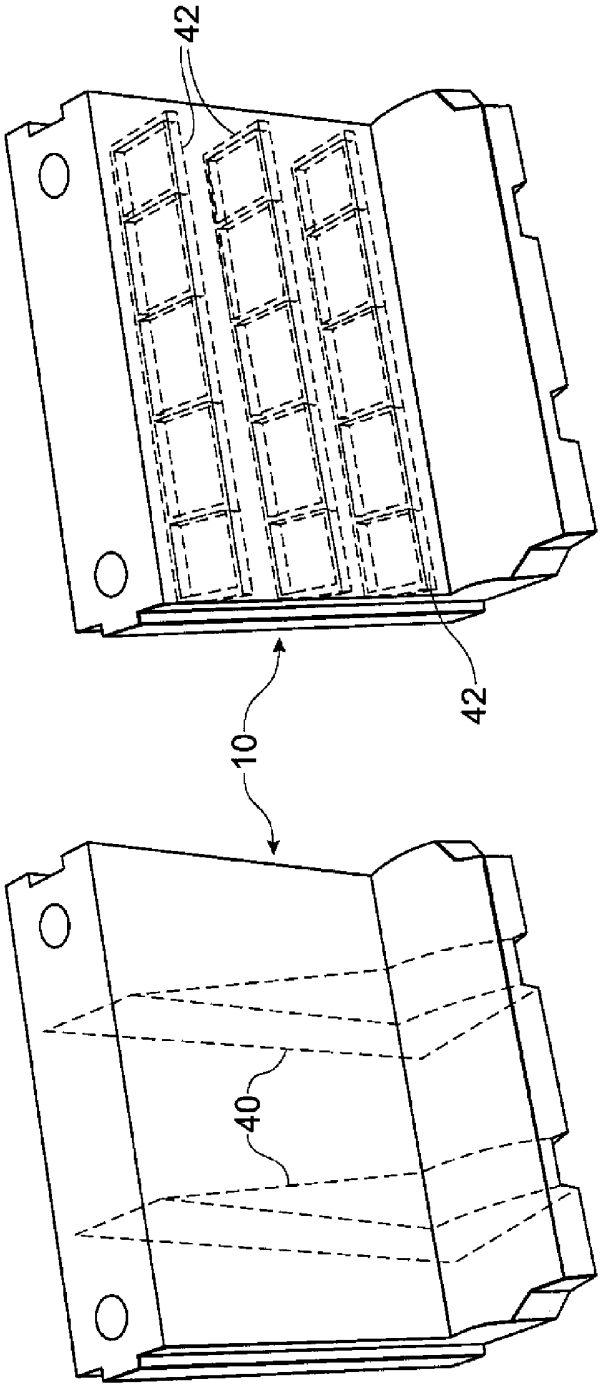


FIG. 5B

FIG. 5A

# WATER STORAGE TANK

## FIELD OF THE INVENTION

The present invention broadly relates to an apparatus for storing water. In particular, this invention relates to a modular self-standing storage tank which is used to contain runoff rain water.

## BACKGROUND OF THE INVENTION

Water shortages are becoming commonplace, especially in areas with sporadic rainfall or prolonged dry periods. In recognition of this, various methods to capture and store water have been used. Water may be stored aboveground, partially underground, or may be entirely subterranean. Storage modes have included dams, ponds, reservoirs and tanks. The most cost-effective of these are large volume dams. However, their construction and subsequent water treatment and distribution are an increasing and expensive problem for communities.

To address water needs in isolated areas which are not serviced by water reticulation mains, it is known to collect rainwater on rooves of buildings and to re-direct it into storage tanks. Rainwater storage tanks are typically large and above ground and are usually circular, with the size and dimensions dictated by their location. In addition, conduit, hoses or other apparatus are generally needed to deliver the collected water where required.

Unfortunately, these traditional above ground tanks can place undesirable demand on space as well as being aesthetically obtrusive. This is particularly so in medium and high density residential and commercial

properties. To this end, various water storage systems comprising individual but interconnected water tanks which form a fence-like structure have been developed. These water storage tanks have the advantage of combining water storage with a fence structure that can be placed where desired.

One such water storage system (WO9311310) utilises planar rectangular-shaped interconnected tanks. These tanks are stabilised by connecting sheets that are mounted to each tank. A variation to this system is one which utilises external supports that are mounted onto a foundation to receive each tank module within that system.

In another water storage system (JP9165941), individual tanks or modules are placed on separate external footings between the gaps of upright posts, thus serving to stabilise the water-containing units.

The use of these external supports, footings, stabilising connectors and foundations add to the complexity, space, aesthetics and cost of water storing devices.

## OBJECT OF THE INVENTION

Accordingly, it is an object of the invention to provide an improved water storage tank which overcomes one or more of the problems of the prior art or provides a commercial alternative.

## SUMMARY OF THE INVENTION

In a first aspect of the present invention, there is provided a water storage tank comprising a front wall including an upper portion and a lower portion, said lower portion adapted to provide free-standing stability to said water storage tank.

Preferably, the lower portion includes a flared foot adapted to provide free-standing stability.

Suitably, the water storage tank includes a plurality of apertures adapted to allow water input and output from said water storage tank.

More suitably, the plurality of apertures comprise one or more apertures adapted to allow water flow communication between adjacent water storage tanks.

The flared foot may include one or more apertures to allow water flow communication between adjacent water storage tanks.

Preferably, the water storage tank includes internal reinforcing means. The internal reinforcing means may be in the form of indents, baffles or reinforcing elements.

The water storage tank preferably includes one or more interlocking ends to allow engagement of one or more adjacent water storage tanks.

More preferably, the water storage tank comprises a substantially vertical rear wall adapted to prevent a child from climbing it.

Even more preferably, the water storage tank is at least 1.2 metres high.

The water storage tank is preferably formed from heat absorbing plastics which absorb solar heat to generate stored heated water. A suitable plastic is black polyethylene or other black plastics.

In a second aspect of the present invention, there is provided a water storage tank comprising;

a substantially planar base;

a pair of substantially vertical side walls extending upwardly from said base;

a substantially vertical rear wall joining said side walls and said base;

a front wall joining said side walls and said base, said front wall including a lower portion, an upper portion and a junction therebetween, wherein said upper portion extends upwardly from said junction and said lower portion extends downwardly and outwardly from said junction; and a plurality of apertures adapted to allow water input and output from said water storage tank.

Preferably, the plurality of apertures include one or more apertures to allow water flow communication between adjacent water storage tanks.

More preferably, the water storage tank includes internal reinforcing means.

The internal reinforcing means may be in the form of indents, baffles or reinforcing elements.

Even more preferably, the water storage tank includes one or more interlocking ends engageable with one or more adjacent water storage tanks.

The substantially vertical rear wall is suitably adapted to prevent a child from climbing it.

Suitably, the water storage tank is at least 1.2 metres high.

The water storage tank is preferably formed from heat absorbing plastics which absorb solar heat to generate stored heated water. A suitable plastic is black polyethylene or other black plastics.

## BRIEF DESCRIPTION OF THE DRAWINGS

In order that the present invention may be more readily understood and placed into practical effect, preferred embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of a water storage tank according to a preferred embodiment;

FIG. 2 is a side view of FIG. 1;

FIG. 3 is a perspective view of three adjacent water storage tanks interconnected to each other;

FIGS. 4A and 4B show reinforcing indents in the front and rear walls;

FIG. 5A shows a pair of internal reinforcing baffles within a water storage tank; and

FIG. 5B shows three rows of reinforcing elements within a water storage tank.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a water storage tank 10 is shown in an upright position. As shown in FIGS. 1 and 2, the water storage tank 10 includes a substantially planar base 11 and a pair of substantially vertical side walls 12A,12B joining the planar base 11. The water storage tank 10 further includes a substantially vertical rear wall 13 joining each of the side walls 12A,12B and the base 11.

As shown in FIG. 1, the water storage tank 10 includes a front wall 14 joining each of the side walls 12A,12B and the planar base 11. The front wall

14 includes a lower portion 16, an upper portion 18 and a junction 20 therebetween, wherein the upper portion 18 extends upwardly from the junction 20 and the lower portion 16 extends downwardly and outwardly from the junction 20.

The lower portion 16 extends into a flared foot 22 which terminates into a substantially vertical foot portion 24. Both the flared foot 22 and the vertical foot portion 24 are reinforced to guard against accidental damage, preferably with thickened portions, either produced in the manufacturing process or added post-production. While the preferred embodiment shows the flared foot 22 as being curved, an angular-shaped foot is also contemplated.

The water storage tank 10 includes a plurality of optionally accessed cut-outs or apertures 26, 28, 29 and 30 which are integrally formed within the tank 10. The apertures 26, 28, 29 and 30 may be accessed by engaging a saw or other like cutting implement along a preformed raised guideline (not shown). Conveniently, small indents are provided as a guide for hole-saw entry.

As shown in FIGS. 1 and 2, a pair of first apertures 26 are located on each of the side walls 12A, 12B of the flared foot 22 to allow water flow communication between adjacent water storage tanks 10. The apertures 26 are typically 150 mm from the base of the flared foot 22. Drainage of each water storage tank 10 may be achieved by accessing apertures 26 without a tap if required.

A pair of second apertures 28 are located below the junction 20 on the side walls 12A,12B of the flared foot 22. The apertures 28 may be threaded to readily attach to like threaded connectors and taps for ready water access.

When optionally accessed, a pair of third apertures 29 provide for water overflow, *eg.* to adjacent water storage tanks 10 or into storm water drainage if desired. Each of the apertures 26,28 and 29 include an internal thread to which standard threaded pipeline connectors may be used, *eg.* 25 mm.

As shown in FIG. 1, a pair of fourth apertures 30 are located on the top wall 32 of the water storage tank 10 to optionally include a mesh 33 to prevent ingress of foreign bodies, *eg.* as shown in one aperture 30. Preferably, the top wall 32 of each water storage tank 10 is raked to prevent water pooling.

Optional tabs 34 are attached to the top front corners of each water storage tank 10. Each tab 34 allows for possible attachment of trellis, lattice, wire or mesh so that, for example, plants may be trailed over the water storage tank 10 when desired.

The rear wall 13 may optionally include a strip (not shown) disposed along the back which allows one or more water storage tanks 10 to be attached to other structures such as posts and walls if desired.

To prevent stored water from stagnating over a long period of time, either apertures 26 or 28 may be opened to release water.

Advantageously, the water storage tank 10 may incorporate transport recesses 35 on the planar base 11 for providing stability when moving, *eg.* by forklifts and the like.

In use, a minimum water level of about 300 mm is maintained within the water storage tank 10 to provide additional stability. Significantly, the shape of the flared foot 22 provides the requisite stability to enable the water storage tank 10 to be self-supporting or free-standing without the aid of external structures such as external footings or braces.

The water storage tank 10 may connect to each other by way of asymmetrical interlocking ends 33. As shown in FIG. 3, three adjacent water storage tanks 10 are interconnected by the interlocking ends 33 in the form of male-female couplings to allow close abutment between adjacent water storage tanks 10. In use, apertures 26 are connected via a conduit 27 to allow water flow communication between adjacent water storage tanks 10.

Conveniently, to facilitate ease of removal of a middle unit if desired, a gap between adjacent water storage tanks 10 is provided which allows for access to apertures 28 *eg.* to insert or remove a connection or for drainage.

To minimise the inherent risk of the exemplified slimline water storage tank 10 from stretching, warping or 'bulging' under pressure when made from thermoplastic polyolefins such as polyethylene, additional rigidity may be incorporated internally within each of the water storage tanks 10.

In one embodiment, FIGS. 4A and 4B show indents 37, 38 which are formed in the rear and front walls, 13, 14 of the water storage tank 10 and joined to the thermoplastic polymer, *eg.* polyethylene during the moulding process, *eg.* by rotomoulding. While the preferred embodiment describes three indents, two of such indents are also contemplated. The indents 37, 38 are located at the recessed portions of the front wall 14 thus retaining the

overall appearance. If alternative aesthetics are desired, surface plates may be placed over the front wall to retain a smooth, fence-like appearance.

FIG. 5A shows another embodiment wherein baffles 40 are formed in the water storage tank 10, extending up from the planar base 11 and tapering to a point near the top wall 32. The baffles 40 are as wide as the water storage tank 10, joining the rear and front walls 13, 14, including with a small cut-out at the bottom to prevent compartmentalisation. While three baffles are shown, two baffles may also be used.

In yet another embodiment, FIG. 5B shows a series of pre-fabricated reinforcing elements 42 inside the water storage tank 10. During the moulding process, the reinforcing elements 42 are held away from the side walls 12A, 12B to enable the polyethylene to form a bond between the reinforcing elements 42 as well as covering them with polyethylene, thus forming a seamless and rigid structure supported internally. It is contemplated that at least two and preferably three elements are reinforced at the ends and along the length of the water storage tank 10. The reinforcements 42 may be made from box aluminium, stainless steel, or other alloys, inclusive of ferrous and non-ferrous materials, which do not react with the stored liquids.

The indents 37, 38, baffles 40 and reinforcing elements 42 are located substantially in the middle of the water storage tank 10, rather than extending to either the top wall 32 or the planar base 11 so as to avoid compartmentalisation and therefore water stagnation.

It will be appreciated that although the preferred embodiment of the water storage tank 10 is made of polyethylene, other thermoplastic polyolefins such as polypropylene, polystyrene, thermoplasic elastomer or ethylene-propylene rubbers, other materials known in the art such as fibreglass, concrete castings and fibrous cement are also contemplated.

It will also be appreciated that this invention provides efficient rainwater storage in various applications such as fences, retaining walls and other barriers which can be placed where desired. In particular, the number of water storage tanks 10 may be altered to suit changing water capacity needs. Further, loss of valuable ground space is minimised while providing sustainable water collection for use as well as allowing for the disposal of surplus water, *eg.* into stormwater drains.

Unlike previous storage tank systems, the present invention may be used as a detached single water storage tank 10 module or unit, independent of any external supporting devices. Water storage tanks 10 may also be used as boundaries to separate different areas, for example to form a non-load bearing wall to surround a building, in populated pedestrian areas, parks, golf courses, to form a wall for grain storage between silos, gardens, pools, spas as well as being placed against existing fences, barrier walls or buildings. The modular water storage tank 10 may also be used to store grey water or waste water if desired.

In particular, the water storage tanks 10 may form a spa or pool fence, wherein the substantially vertical side of each tank 10 is positioned outwardly from the spa or pool, thereby preventing a child from climbing up the water

storage tank 10 and accessing the partitioned off area. The height of the water storage tank 10 may be varied to comply with most requisite pool fence height standards, *eg.* from 1.2 metres.

The water storage tank 10 may advantageously be formed from heat absorbing plastics which absorb solar heat to generate stored heated water. A suitable plastic is black polyethylene or other black plastics. The heated water may be used to supply a pool, spa, shower or like purposes and provide a less costly alternative to fences or other storage tanks containing solar heating panels.

The sound-absorbing qualities of water may also be utilised to provide a sound barrier, as well as the heat-absorbing qualities to shade, for example the "hot" wall of a building.

If desired, one or both rear and front walls 13, 14 of the water storage tank 10 may carry aesthetic patterns to suit different environments, *eg.* fence-like, stone, brick or pebble-like surface profiles.

Advantageously, the water storage tanks 10 may be used in the construction of retaining walls, serving both to store water as well as stabilising terraced areas. The water storage tanks 10 may be both located adjacent to each other as well as located in a step-wise manner down a gradient. In contrast to conventionally-formed water storing tank systems, the water storage tank 10 of the present invention does not require external supporting structures and may be placed above ground as well as partially subterranean. Typically, about one third of the water storage tank 10 is embedded in the ground. If further required, partial burial of the water

storage tank 10 up to and covering the flared foot 22 provides additional self-supporting stability. Rainwater runoff may be directed from collection surfaces, *eg.* rooves via conduit in the normal manner into one or more water storage tanks 10 placed in communication with each other to form either an above ground, partially or wholly subterranean water storage system. When partially buried, water may also be collected via the inlet apertures 30 on the top wall 32.

It will be appreciated by the skilled person that the present invention is not limited to the embodiments described in detail herein, and that a variety of other embodiments may be contemplated which are nevertheless consistent with the broad spirit and scope of the invention.

Throughout this specification, unless the context required otherwise, "comprise", comprises" and "comprising" are used inclusively rather than exclusively, in that one or more other integers or groups of integers may be included with a stated integer or group of integers.

Claims defining the invention are as follows:

1. A water storage tank comprising a front wall including an upper portion and a lower portion, said lower portion adapted to provide free-standing stability to said water storage tank.

2. The water storage tank according to claim 1 wherein said lower portion includes a flared foot adapted to provide free-standing stability.

3. The water storage tank according to claim 1 or claim 2 comprising a plurality of apertures adapted to allow water input and output from said water storage tank.

4. The water storage tank according to claim 3 wherein said plurality of apertures comprising one or more apertures adapted to allow water flow communication between adjacent water storage tanks.

5. The water storage tank according to any one of claims 2 to 4 wherein said flared foot includes one or more apertures to allow water flow communication between adjacent water storage tanks.

6. The water storage tank according to any one of the preceding claims comprising internal reinforcing means.

7. The water storage tank according to any one of the preceding claims comprising one or more interlocking ends to allow engagement of one or more adjacent water storage tanks.

8. The water storage tank according to any one of the preceding claims wherein said water storage tank comprises a substantially vertical rear wall adapted to prevent a child from climbing it.

9. The water storage tank according to any one of the preceding claims wherein said water storage tank is at least 1.2 metres high.

10. The water storage tank according to any one of the preceding claims wherein said water storage tank water is formed from a heat absorbing plastic which absorbs solar heat to generate stored heated water.

11. The water storage tank according to claim 10 wherein said heat absorbing plastic is a black polyethylene.

12. A water storage tank comprising;

a substantially planar base;

a pair of substantially vertical side walls extending upwardly from said base;

a substantially vertical rear wall joining said side walls and said base;

a front wall joining said side walls and said base, said front wall including a lower portion, an upper portion and a junction therebetween, wherein said upper portion extends upwardly from said junction and said lower portion extends downwardly and outwardly from said junction; and a plurality of apertures adapted to allow water input and output from said water storage tank.

13. The water storage tank according to claim 12 wherein said plurality of apertures include one or more apertures to allow water flow communication between adjacent water storage tanks.

14. The water storage tank according to claim 12 or claim 13 comprising internal reinforcing means.

15. The water storage tank according to claims 12 to 14 comprising one or more interlocking ends engageable with one or more adjacent water storage tanks.

16. The water storage tank according to claims 12 to 15 wherein said substantially vertical rear wall is suitably adapted to prevent a child from climbing it.

17. The water storage tank according to claims 12 to 16 wherein said water storage tank is at least 1.2 metres high.

18. The water storage tank according to claims 12 to 17 wherein said water storage tank is formed from a heat absorbing plastic which absorbs solar heat to generate stored heated water.

19. The water storage tank according to claim 18 wherein said heat absorbing plastic is a black polyethylene.

20. The water storage tank substantially as herein described with reference to the accompanying drawings.

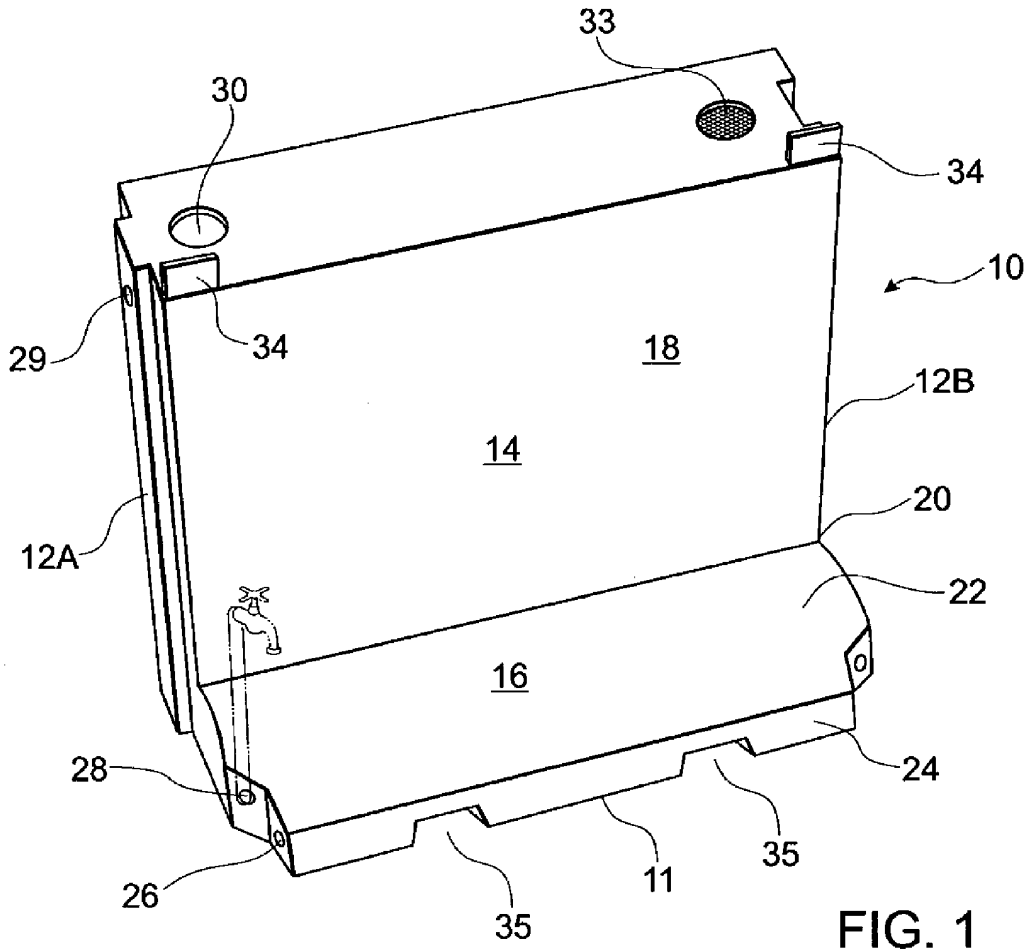


FIG. 1

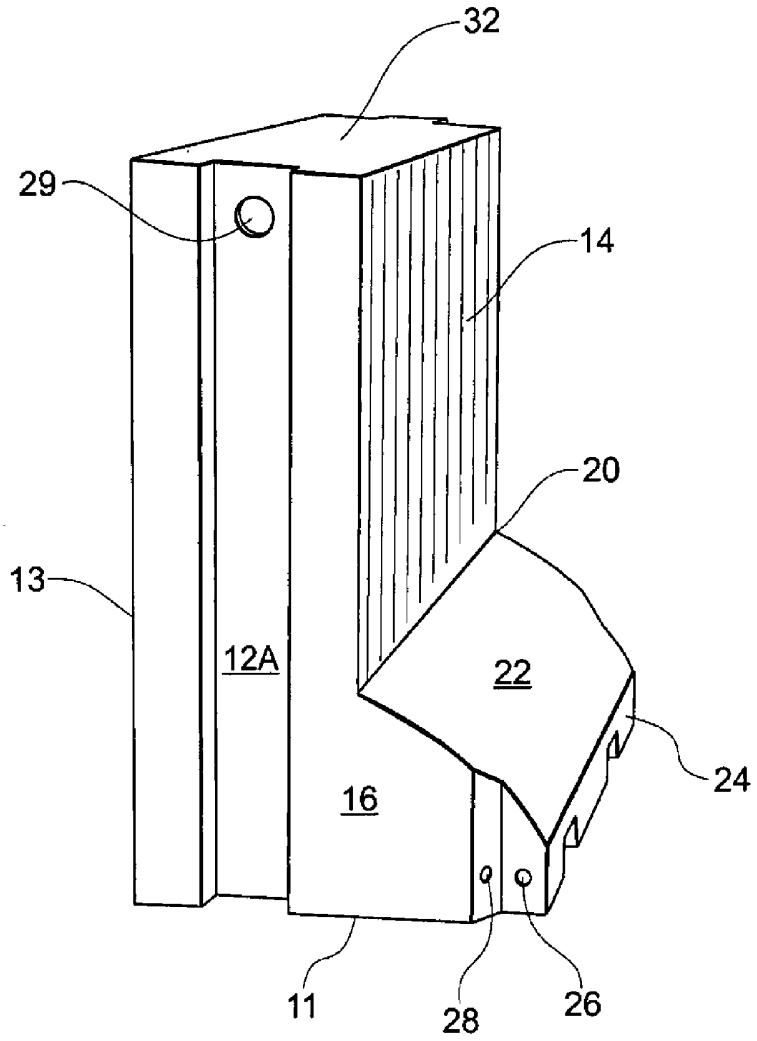


FIG. 2

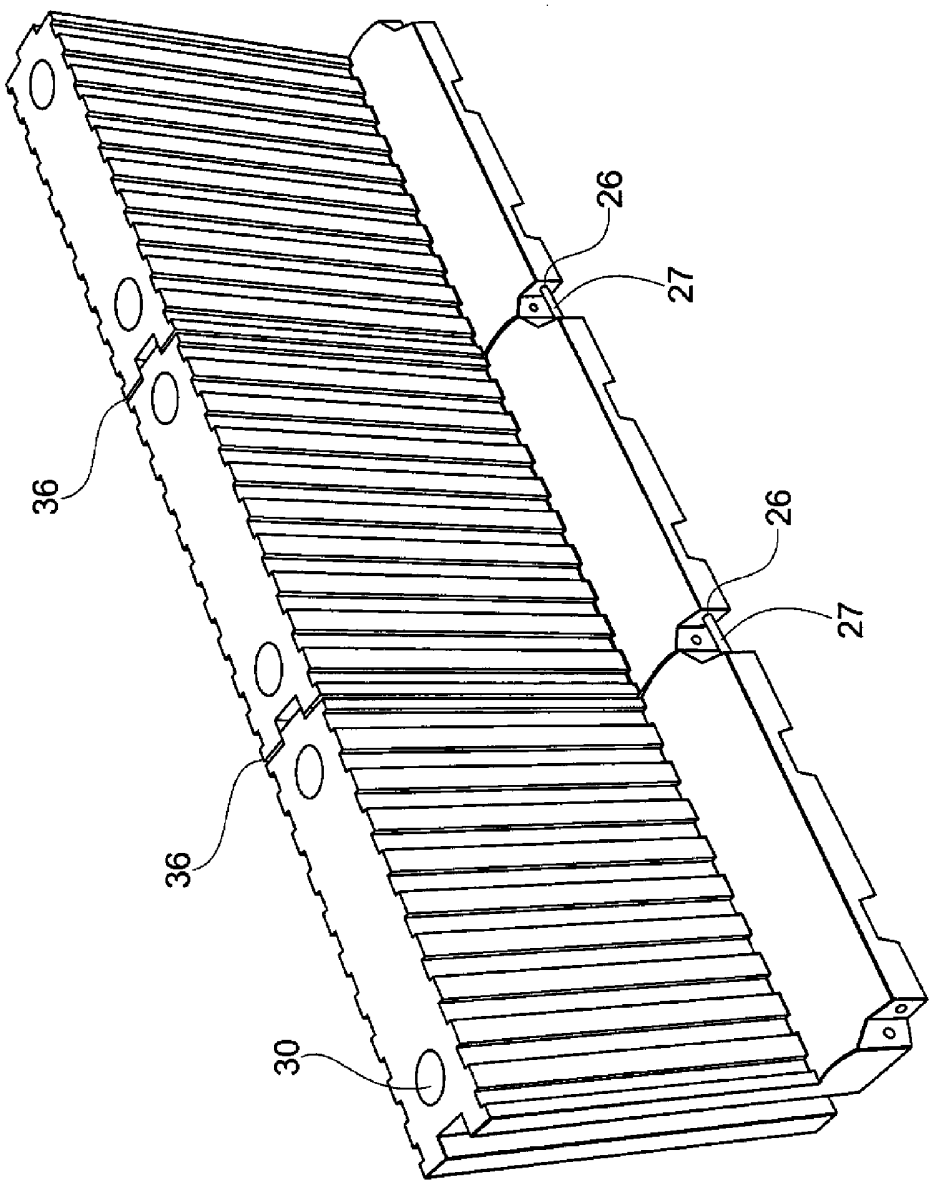


FIG. 3

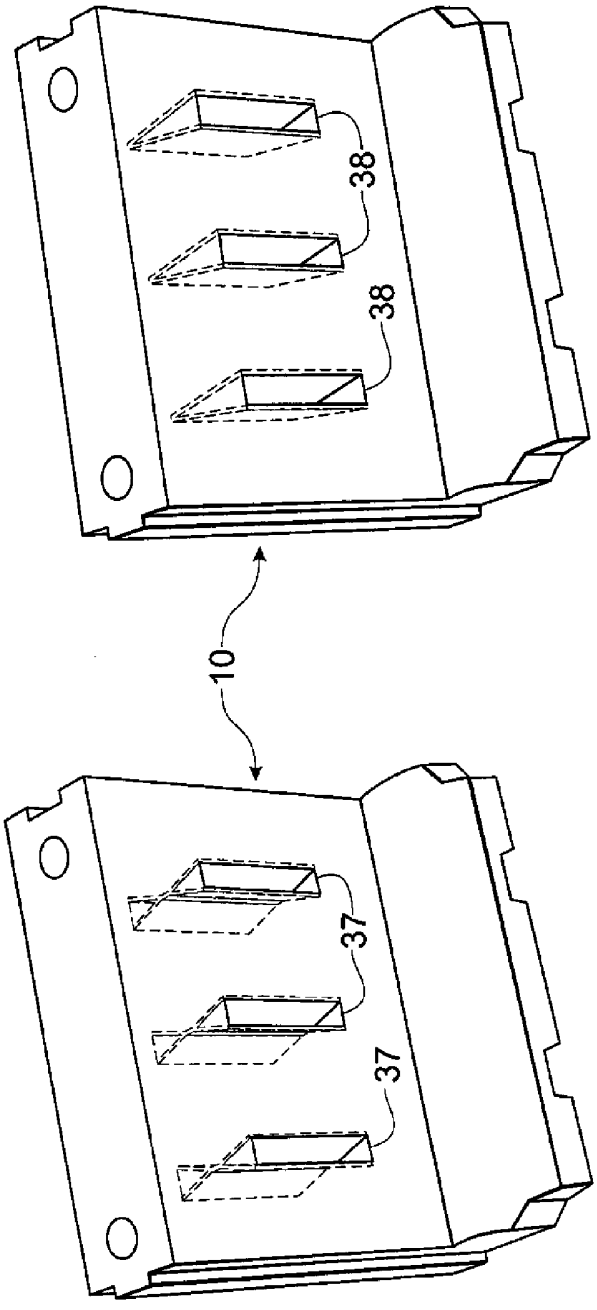


FIG. 4B

FIG. 4A

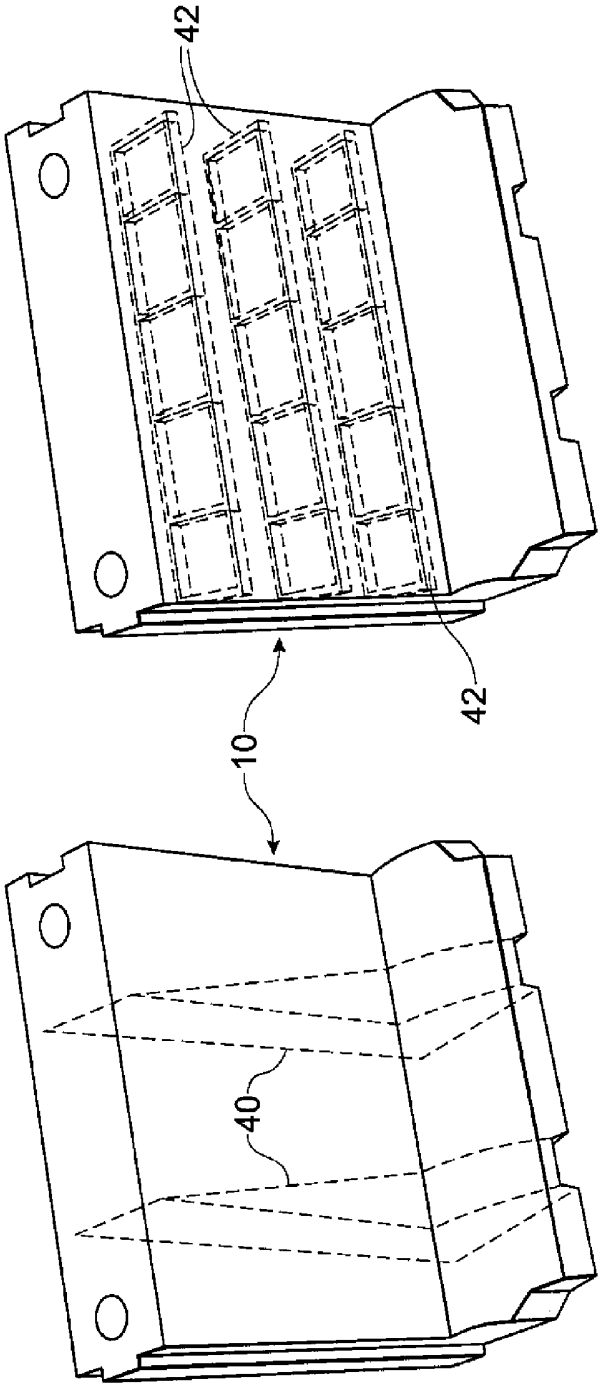


FIG. 5B

FIG. 5A