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Roof Water Collection and Delivery System

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2007237249

(71) Applicant(s)
Dan Allen

(72) Inventor(s)
Allen, Dan

(74) Agent / Attorney
Wallington-Dummer, Suite 904 37 Bligh Street, Sydney, NSW, 2000

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ABSTRACT

A roof water collection and delivery system for a building; said building having a sloping roof; a roof water collector mounted on said roof so as to duct water falling on said roof to at least one water storage tank mounted in association with said sloping roof surface; said at least one water storage tank mounted such that a base of said tank is above a level of guttering; said guttering arranged at lower edges of said sloping roof; and wherein said roof water collector is mounted at an intermediate location on said roof between said at least one water storage tank and an uppermost portion of said sloping roof.

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**COMPLETE SPECIFICATION
for a
DIVISIONAL PATENT APPLICATION**

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Invention Title:

ROOF WATER COLLECTION AND DELIVERY SYSTEM

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The invention is described in the following statement, including the best method of performing it known to us:

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Our Ref: 072050

ROOF WATER COLLECTION AND DELIVERY SYSTEM

The present invention relates to apparatus and method for collection of rainwater falling on the roof of a building, and more particularly for an arrangement of making such water available through gravity feed.

BACKGROUND

Many arrangements are known for collecting rainwater from roof tops. Generally such arrangements make use of the existing guttering and downpipes of a building to direct water flowing into the gutters and into the downpipes to water tanks installed at some level below that of the gutters.

A disadvantage of these systems is that for the collected water to be made available at outlets inside the building, pumps and the ancillary electrical and plumbing installations are required. Pumps are expensive to acquire and install and not infrequently require maintenance or repair.

It is an object of the present invention to address or ameliorate the above disadvantages, or to at least provide a useful alternative.

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BRIEF DESCRIPTION OF INVENTION

Accordingly, in a first broad form of the invention, there is provided a roof water collection and delivery system for a building; said building having a sloping roof; a roof water collector mounted on said roof so as to duct water falling on said roof to at least one water storage tank mounted in association with said sloping roof surface; said at least one water storage tank mounted such that a base of said tank is above a level of guttering; said guttering arranged at lower edges of said sloping roof; and wherein said roof water collector is mounted at an intermediate location on said roof between said at least one water storage tank and an uppermost portion of said sloping roof.

Preferably, said roof water collector includes an elongate collector manifold and a flexible collector sheet extending from said collector manifold; water flowing down said sloping roof surface flowing onto said flexible sheet to enter said elongate collector manifold; said elongate collector manifold connected to said at least one water tank by a water conducting conduit.

Preferably, said water collector includes a fabricated trough adapted for location in a valley between two adjoining sloping roof surfaces; said fabricated trough provided with a water outlet at a lower end of said

trough for connection to said at least one water tank by a water conducting conduit.

Preferably, said water storage tank is mounted below said roof surface.

5 Preferably, said water storage tank is mounted on said roof surface.

Preferably, said water collector comprises a front wall of said storage tank; said storage tank mounted on a sloping roof surface such that a rear wall of said storage tank is closest to a lower edge of said sloping roof surface; said front wall provided with perforations through which water flowing down said sloping roof surface enters said storage tank through said perforations.

15 Preferably, said storage tank includes side walls of a generally triangular shape; a top of an installed said storage tank at least close to horizontal.

Preferably, water collected in said water storage tank is made available to water outlets in said building through gravity feed to said outlets.

20 Preferably, said water storage tank is sized so as to be manipulated by a single system installer.

Preferably, said water storage tank is sized so as to be inserted between adjacent roof trusses in a roof space; said trusses spaced apart at standard truss spacing.

5 Preferably, said water storage tank is provided with inlet and outlet fittings; said outlet fittings adapted for interconnection of two or more said water storage tanks so as to provide a desired water storage capacity.

10 Preferably, said flexible collector sheet is adapted to conform to contours of a roof surface; an upper edge of said flexible collector sheet arranged on said roof surface so as to intercept rainwater flowing down said roof surface; a lower edge of said flexible collector sheet affixed to an underside of said elongate collector manifold.

15 Preferably, said upper edge of said flexible sheet is interposed between overlapping edges of a first upward row of roof tiles and a second next lower row of roof tiles.

20 Preferably, said upper edge of said flexible collector sheet is affixed to a roof surface with a suitable adhesive.

Preferably, said collector manifold comprises an elongate tubular member closed at each outer end; said elongate

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member provided along a lowermost edge with a series of apertures; said apertures adapted to receive for entry into said elongate member of water flowing down said flexible collector sheet.

5 Preferably, said collector manifold is formed into a roll-formed channel; said channel including a bottom portion and one side portion rising from a lower edge of said bottom portion; said channel further including an upper surface and a partially

10 Preferably, said collector manifold is connected to said water storage tank by at least one water conducting conduit; one at least one water conducting conduit connecting an end of said collector manifold to an inlet fitting of said water storage tank.

15 Preferably, said roof water collector is located on said roof such that said collector manifold is at a level at least equal to the level of the uppermost portion of said water storage tank.

20 In a further broad form of the invention, there is provided a roof water collection and distribution system; said system including at least one water storage tank mounted to a sloping roof surface and a roof water collector connected to said water storage tank; said roof water collector including an elongate water collecting

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manifold and a water collector sheet; said water collector sheet extending upward from said manifold along said sloping roof; and wherein water flowing down said sloping roof surface, is intercepted to flow onto said water collector sheet; water intercepted by said sheet flowing into said water collector manifold.

In yet another broad form of the invention, there is provided a roof water collection and distribution system; said system including a water storage tank mounted to a sloping roof surface and a roof water collector; said roof water collector including a collector trough formed so as to locate in a valley channel between adjoining sloping roof surfaces; said trough having an end portion at a lower end of said trough; said lower end portion provided with a fitting for connection of a water conducting conduit; said conduit connecting said collector trough to said water storage tank.

In another broad form of the invention there is provided a roof water collection and distribution system; said system including a water storage tank mounted between adjacent trusses of a sloping roof surface; said system further including a roof water collector connected to said water storage tank; said roof water collector including an elongate water collecting manifold and a water collector sheet; said sheet extending upward from

said manifold along said sloping roof; and wherein water flowing down said sloping roof surface, is intercepted to flow onto said water collector sheet; water intercepted by said sheet flowing into said water collector manifold.

5 In a further broad form of the invention, there is provide a method of providing rainwater to at least one water outlet in a building; said method including the following steps:

(a) mounting a water storage tank on a sloping roof of
10 said building,

(b) mounting a roof water collector on said sloping roof between said water storage tank and an uppermost portion of said roof,

(c) connecting said roof water collector to said water
15 storage tank,

and wherein said water storage tank is provided with an outlet for connection of a water delivery pipe; said water delivery pipe connected to said at least one water outlet within said building.

20 In still a further broad form of the invention, there is provided a roof water collection and distribution system; said system including a water storage tank mounted to a sloping roof surface; an installed said water storage

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tank including a rear wall adjacent a lower edge of said
sloping roof surface; a front wall of said water storage
tank provided with apertures such that at least a portion
of water flowing down said sloping roof surface is
5 intercepted by said front wall; water entering said water
storage tank through said apertures.

10 **BRIEF DESCRIPTION OF DRAWINGS**

Embodiments of the present invention will now be
described with reference to the accompanying drawings
wherein:

Figure 1 is perspective view of a tiled roof showing
15 an embodiment of the present invention installed,

Figure 2 is a perspective view of a portion of a roof
water collector according to a preferred embodiment of the
invention as viewed from the collection and water entry
side,

20 Figure 2A is a sectioned view of a further example of
a roof water collector,

Figure 3 is a cross section of a roof space showing a
further preferred embodiment of the invention,

Figure 4 is a perspective view of another embodiment
25 of a roof water collector mounted in a roof valley,

Figure 5 is a side elevation view of a sloping roof surface with a water storage tank according to a further preferred embodiment mounted on the sloping roof surface,

Figure 6 is a perspective view of an array of two of the water storage tanks of Figure 5 installed on a sloping roof surface,

Figure 7 is a further perspective view of the water storage tank of Figures 5 or 6 provided with augmented water capturing elements.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

First Preferred Embodiment

With reference to Figure 1, a roof water collection and delivery system 10 is located on the sloping roof 12 of a building 14. In this instance, the system 10 includes two identical water storage tanks 16 connected together by connector 18 so as to effectively form one storage facility. A feature of the arrangement is that the water storage facility is mounted so that the base of the tank or tanks are above the level of the roof guttering 23 at the edge of the sloping roof 12. System 10 further includes a roof water collector 17.

Preferably, water storage tanks 16 are of a size which is readily manipulated by one installing person. The modular arrangement of interconnecting two or more tanks allows for

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a convenient manner of providing a desired total storage volume in accordance with roof catchment areas and rainfall patterns for example. Storage tanks 16 may be fixed to the roof by fasteners (not shown), for example through flanges 5 20 provided along edges of the base of the tanks or with suitable brackets.

Preferably also, the water storage tanks 16 are located towards the lower edge 22 of the roof 12, so that not only is the catchment area above the roof water collector 10 maximised, but the tanks may be located approximately over the load bearing outer wall 24.

The roof water collector 17 is installed at an intermediate position on the roof between the water storage tank or tanks 16, and the uppermost portion of the roof 15 (not visible in Figure 1). With reference also to Figure 2, in this embodiment, the roof water collector 17 includes a collector manifold 26 and a flexible collector sheet 28 extending from underneath collector manifold 26. The roof water collector 17 is located "upstream" of the storage 20 tanks 16, at a point where the uppermost point of the storage tanks is at least just below the level the collector manifold 26.

Collector manifold 26 is provided with perforations or slots 30 arranged along the length of the manifold, and

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which allow water intercepted by the flexible collector sheet 28 to enter the collector manifold. Collector manifold 26 is also fixed to the roof by suitable brackets (not shown). It will be understood that although the collector manifold has been illustrated as a tubular element, any at least partially enclosed channel, blocked off at both ends and able to receive water from the roof water collector, and conduct that water to an outlet, may form a water collecting manifold. Likewise the water entry into the manifold need not be a series of slots as illustrated in Figure 2 but may be of any other suitable configuration. Thus for example the collector manifold may have a profile as shown in the inset of Figure 2A. In this arrangement the collector manifold is roll-formed to include a bottom portion 31 and one side portion 32 rising from the lower edge of the bottom portion 31. A top portion 33 extends over the bottom portion and a front portion 34 extends downwards towards the bottom, leaving a gap to form a continuous opening 36 along its lower edge at the junction with the lower edge of the flexible collector sheet 28.

Flexible collector sheet 28 is the same length as collector manifold 26 and is adapted to conform along its upper edge 38 with the contours of the roof to which the system is installed. Collector sheet 28 acts to intercept

rainwater flowing down the sloping roof 12. In the example shown in Figure 1, the upper edge 38 may be inserted between the overlapping edges of the row of upward tiles 40 "upstream" of the collector sheet 28 and the next lower row of tiles 41.

The flexibility of the collector sheet 28 allows it to conform also to other roof profiles such as corrugated iron and other metal profile roofing materials. In the case of continuous metal sheeted roof surfaces, the upper edge 38 of the sheet 28 is worked into the troughs and fixed in place with a suitable adhesive.

Although in the illustration of Figure 1, the roof water collector is shown as being in one piece, it will be understood that roof water collectors may also be provided in relatively short lengths and linked together in similar manner to the storage tanks 16.

At least one end of the collector manifold 26 (or a line of interconnected manifolds) is connected by a water conducting conduit 42 to an inlet 44 of at least one of the water storage tanks 16.

Where needed, a leaf deflecting mesh 27 may extend from proximate the upper edge 38 of collector sheet 28 to the top of the collector manifold 26.

Second Preferred Embodiment

In this second preferred embodiment shown in Figure 3, one or more roof water storage tanks 16 as described above, may be supported below the roof line between adjoining roof trusses 50 of a sloping roof 12.

A roof water collector 17 as previously described is situated on the roof surface either immediately above or at some suitable location so that the collector manifold 26 is at least above the highest point of the storage tank 16. A water conducting conduit 42 conducts water collected by the roof top collector 17 through the roof to enter the storage tank 16.

As before both roof water collector 17 and water storage tank 16 may be ones of a number of interlinked collectors and storage tanks.

Third Preferred Embodiment

In a third preferred embodiment of the present invention, with reference to Figure 4, a roof water collector 54 may be located in the valley 56 of a roof 12; that is, within the channel provided at the junction of two sloping roof surfaces 12A and 12B.

In this embodiment, one or more water storage tanks 16 as previously described, may be installed in the vicinity of the roof valley 56 as shown in Figure 4.

Typically, especially on a tiled roof, the valley channel 58 lies at a level somewhat below the tile surfaces. The water collector 54 in this embodiment is a fabricated trough forming a base and end portions so as to fit in the valley channel 58. Water flowing off the adjoining roof surfaces enters the water collector 54. Preferably, water collector 54 is provided with a mesh cover 60 to prevent leaves and other detritus from entering the water collector 54. The lowermost end portion 62 of the water collector trough is provided with an outlet to which a water conduction conduit 42 connects the water collector 54 with the nearest of the water storage tanks 16.

In each of the above described embodiments, an outlet fitting 45 of the water storage tank 16 (or of one of the interconnected storage tanks) is connected to a water distribution pipe 47 leading to one or more water outlets within the building as best seen in Figure 3. Stored water may be used for a variety of uses; for example flushing toilets, or with suitable filtering provide a source of clean drinking water.

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In at least one form of the invention, the water storage tank 16 may be provided with a water level sensing system (not shown) and connected to mains water supply so that when collected roof water falls to some predetermined minimum level, a replacement volume of mains water may be automatically added to the tank.

Fourth Preferred Embodiment

In a fourth preferred embodiment of the invention, with reference to Figures 5 to 7, one or more storage tanks 116 are again adapted for mounting to the surface of a sloping roof 112 of a building 114. In this instance however, each tank 116 is itself adapted to act as the water collector. As best seen in the side elevation view of Figure 5, a storage tank 116 is provided with generally triangular shaped sides 115 tapering from the rear wall 117 of the tank to a collection front wall 119. As can be seen in Figures 6 and 7, front wall 119 of the tank is perforated, for example with slots 121. A flexible collector sheet 128 extends from the lower edge of front wall 119 and, as described above, is made to conform to the configuration of the roof surface.

Front wall 119 is of sufficient height to intercept water flowing down the surface of sloping roof 112 and allow water to enter the tank 116. The top 123 of tank 116 is

preferably horizontal to maximise the volume of water which may be stored in the tank. Tanks 116 may be provided in a range of side wall profiles to suit a range of roof slopes so that the top/s 123 of the installed tank or tanks are as close to horizontal as possible.

Where a large roof is involved so that a large volume of water may be expected to flow to the tank 116, a raised lip 125 may be provided as shown in Figure 7 to more effectively capture the flow of water.

As well, as also shown in Figure 7, collector sheet 128 may be broadened out and be provided with side water guide elements 127 to provide a larger catchment for a single tank 116 installation.

As also previously described, tanks 116 are preferably provided as modular units adapted for side by side interconnected installation as shown in Figure 6 so that a closely spaced array of such tanks arranged adjacent a lower edge 122 of a sloping roof 112, can effectively collect most of the water flow from the roof to the point where all the tanks are filled. Once filled, water simply bypasses the tanks and flows to the gutter system 120 of the building.

In this embodiment also, leaves and other detritus may readily be prevented from entering through the perforations

121 in front wall 11 by a suitable mesh over the perforations.

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CLAIMS

1. A roof water collection and delivery system for a building; said building having a sloping roof; a roof water collector mounted on said roof so as to duct water falling on said roof to at least one water storage tank mounted in association with said sloping roof surface; said at least one water storage tank mounted such that a base of said tank is above a level of guttering; said guttering arranged at lower edges of said sloping roof; and wherein said roof water collector is mounted at an intermediate location on said roof between said at least one water storage tank and an uppermost portion of said sloping roof.
2. The system of claim 1 wherein said roof water collector includes an elongate collector manifold and a flexible collector sheet extending from said collector manifold; water flowing down said sloping roof surface flowing onto said flexible sheet to enter said elongate collector manifold; said elongate collector manifold connected to said at least one water tank by a water conducting conduit.
3. The system of claim 1 wherein said water collector includes a fabricated trough adapted for location in a valley between two adjoining sloping roof surfaces;

said fabricated trough provided with a water outlet at a lower end of said trough for connection to said at least one water tank by a water conducting conduit.

4. The system of any one of claims 1 to 3 wherein said water storage tank is mounted below said roof surface.
5. The system of any one of claims 1 to 3 wherein said water storage tank is mounted on said roof surface.
6. The system of claim 1 wherein said water collector comprises a front wall of said storage tank; said storage tank mounted on a sloping roof surface such that a rear wall of said storage tank is closest to a lower edge of said sloping roof surface; said front wall provided with perforations through which water flowing down said sloping roof surface enters said storage tank through said perforations.
7. The system of claim 6 wherein said storage tank includes side walls of a generally triangular shape; a top of an installed said storage tank at least close to horizontal.
8. The system of any one of claims 1 to 7 wherein water collected in said water storage tank is made available to water outlets in said building through gravity feed to said outlets.

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9. The system of any one of claims 1 to 8 wherein said water storage tank is sized so as to be manipulated by a single system installer.
10. The system of any one of claims 1 to 3 wherein said water storage tank is sized so as to be inserted between adjacent roof trusses in a roof space; said trusses spaced apart at standard truss spacing.
11. The system of any one of claims 1 to 10 wherein said water storage tank is provided with inlet and outlet fittings; said outlet fittings adapted for interconnection of two or more said water storage tanks so as to provide a desired water storage capacity.
12. The system of any one of claims 2 to 11 wherein said flexible collector sheet is adapted to conform to contours of a roof surface; an upper edge of said flexible collector sheet arranged on said roof surface so as to intercept rainwater flowing down said roof surface; a lower edge of said flexible collector sheet affixed to an underside of said elongate collector manifold.
13. The system of claim 12 wherein said upper edge of said flexible sheet is interposed between overlapping edges

of a first upward row of roof tiles and a second next lower row of roof tiles.

14. The system of claim 12 wherein said upper edge of said flexible collector sheet is affixed to a roof surface with a suitable adhesive.

15. The system of any one of claims 2 to 14 wherein said collector manifold comprises an elongate tubular member closed at each outer end; said elongate member provided along a lowermost edge with a series of apertures; said apertures adapted to receive for entry into said elongate member of water flowing down said flexible collector sheet.

16. The system of any one of claims 2 to 14 wherein said collector manifold is formed into a roll-formed channel; said channel including a bottom portion and one side portion rising from a lower edge of said bottom portion; said channel further including an upper surface and a partially

17. The system of any one of claims 2 to 16 wherein said collector manifold is connected to said water storage tank by at least one water conducting conduit; one at least one water conducting conduit connecting an end of said collector manifold to an inlet fitting of said water storage tank.

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18. The system of any one of claims 2 to 17 wherein said
roof water collector is located on said roof such that
said collector manifold is at a level at least equal
to the level of the uppermost portion of said water
5 storage tank.
19. A roof water collection and distribution system; said
system including at least one water storage tank
mounted to a sloping roof surface and a roof water
collector connected to said water storage tank; said
10 roof water collector including an elongate water
collecting manifold and a water collector sheet; said
water collector sheet extending upward from said
manifold along said sloping roof; and wherein water
flowing down said sloping roof surface, is intercepted
15 to flow onto said water collector sheet; water
intercepted by said sheet flowing into said water
collector manifold.
20. A roof water collection and distribution system; said
system including a water storage tank mounted to a
20 sloping roof surface and a roof water collector; said
roof water collector including a collector trough
formed so as to locate in a valley channel between
adjoining sloping roof surfaces; said trough having an
end portion at a lower end of said trough; said lower
25 end portion provided with a fitting for connection of

a water conducting conduit; said conduit connecting said collector trough to said water storage tank.

21. A roof water collection and distribution system; said system including a water storage tank mounted between adjacent trusses of a sloping roof surface; said system further including a roof water collector connected to said water storage tank; said roof water collector including an elongate water collecting manifold and a water collector sheet; said sheet extending upward from said manifold along said sloping roof; and wherein water flowing down said sloping roof surface, is intercepted to flow onto said water collector sheet; water intercepted by said sheet flowing into said water collector manifold.

22. A method of providing rainwater to at least one water outlet in a building; said method including the following steps:

(d) mounting a water storage tank on a sloping roof of said building,

(e) mounting a roof water collector on said sloping roof between said water storage tank and an uppermost portion of said roof,

(f) connecting said roof water collector to said water storage tank,

and wherein said water storage tank is provided with an outlet for connection of a water delivery pipe; said water delivery pipe connected to said at least one water outlet within said building.

23. A roof water collection and distribution system; said system including a water storage tank mounted to a sloping roof surface; an installed said water storage tank including a rear wall adjacent a lower edge of said sloping roof surface; a front wall of said water storage tank provided with apertures such that at least a portion of water flowing down said sloping roof surface is intercepted by said front wall; water entering said water storage tank through said apertures.

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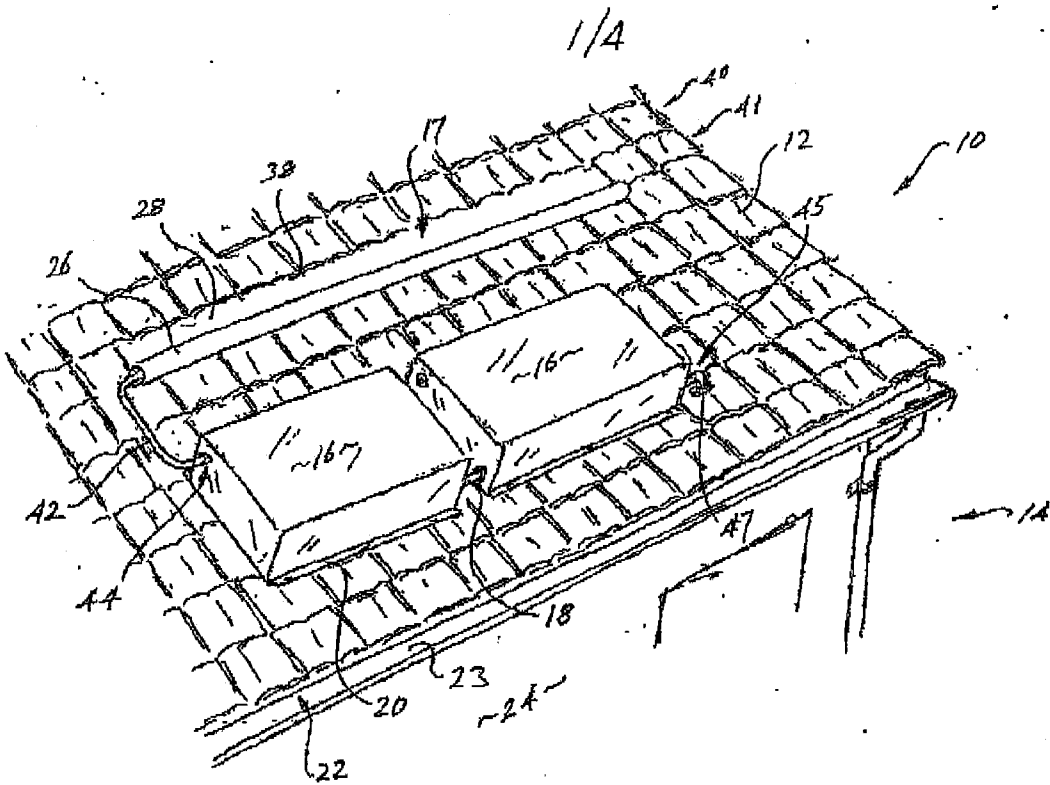


Fig. 1

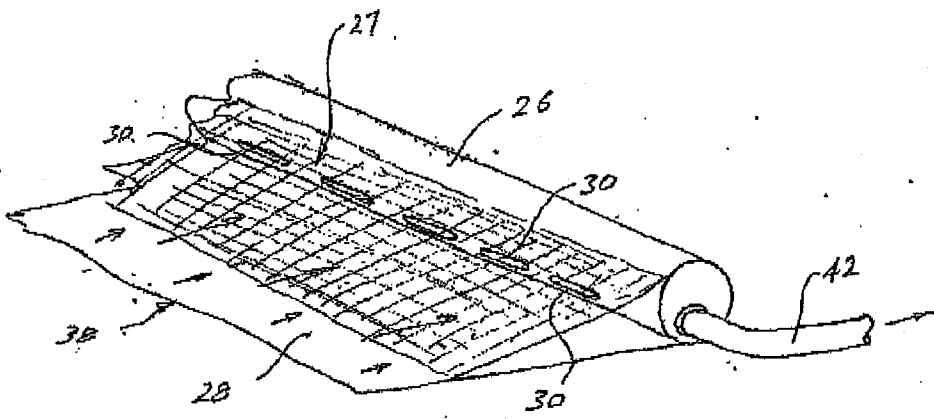


Fig. 2

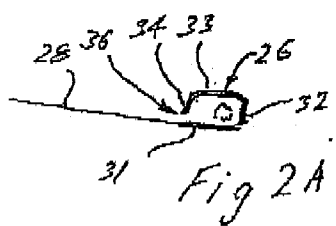


Fig 2A

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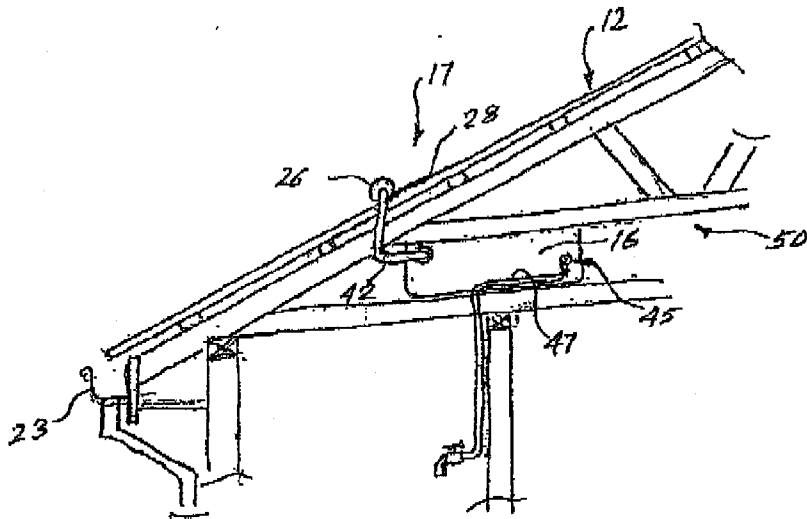


Fig. 3

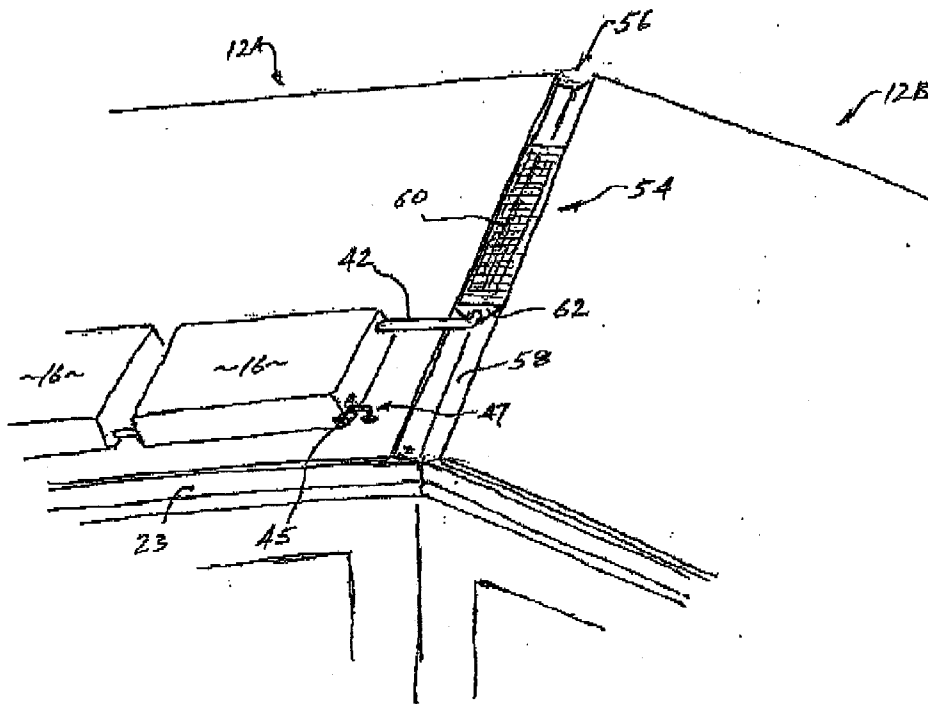
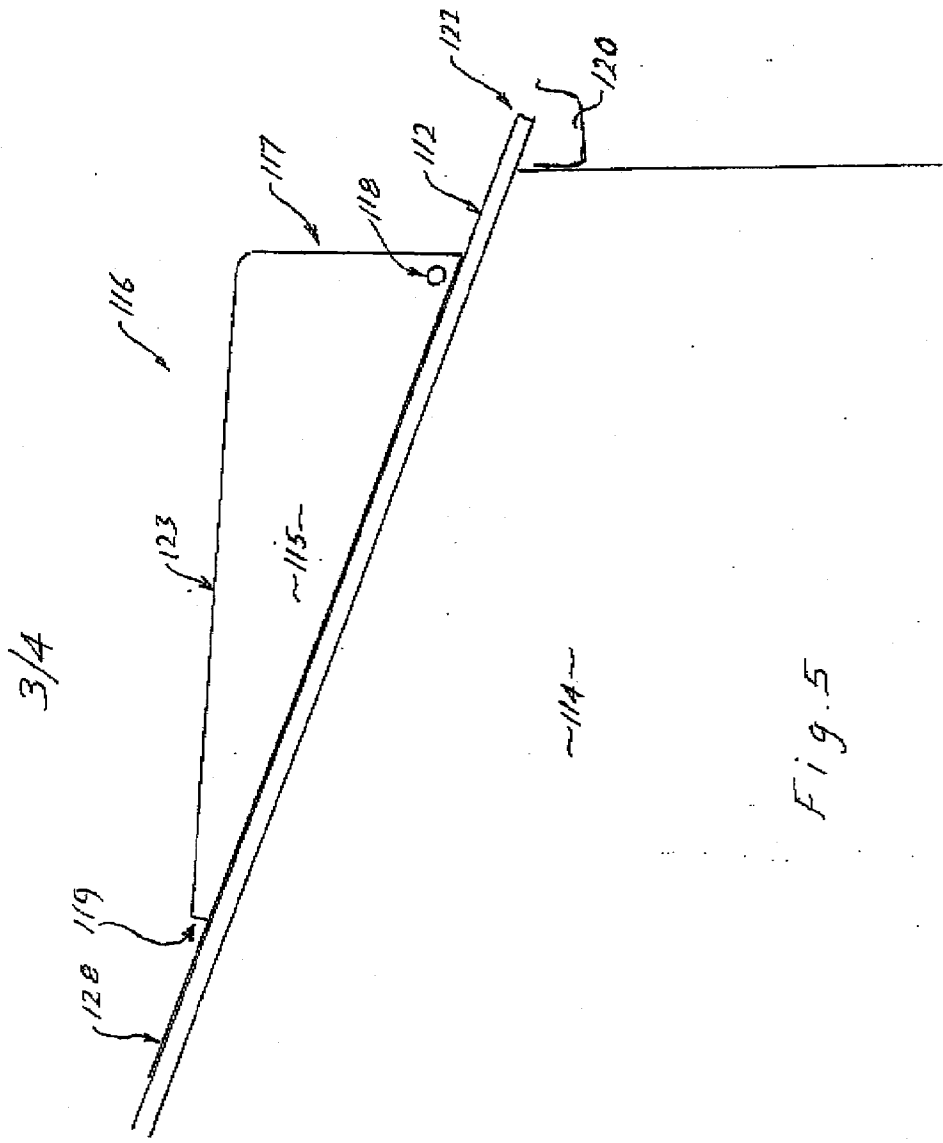


Fig. 4

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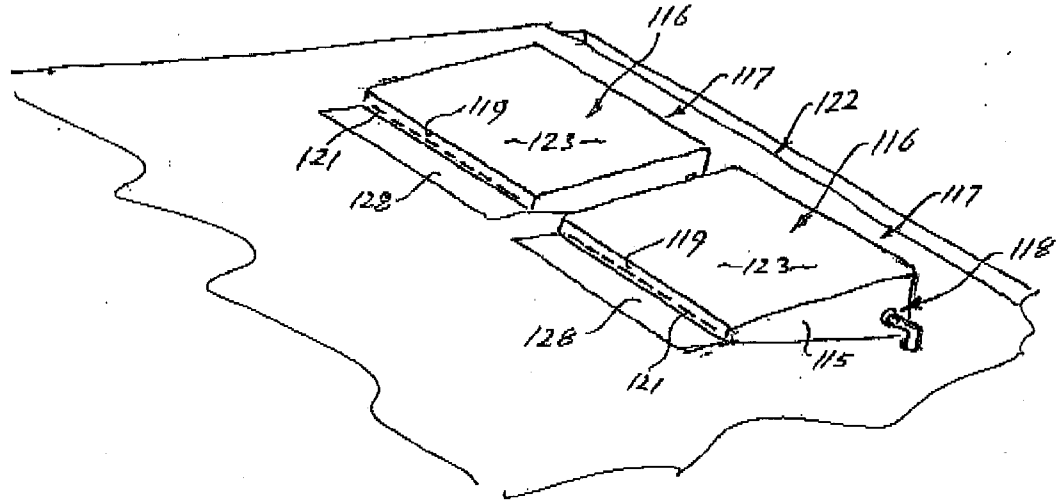


Fig. 6

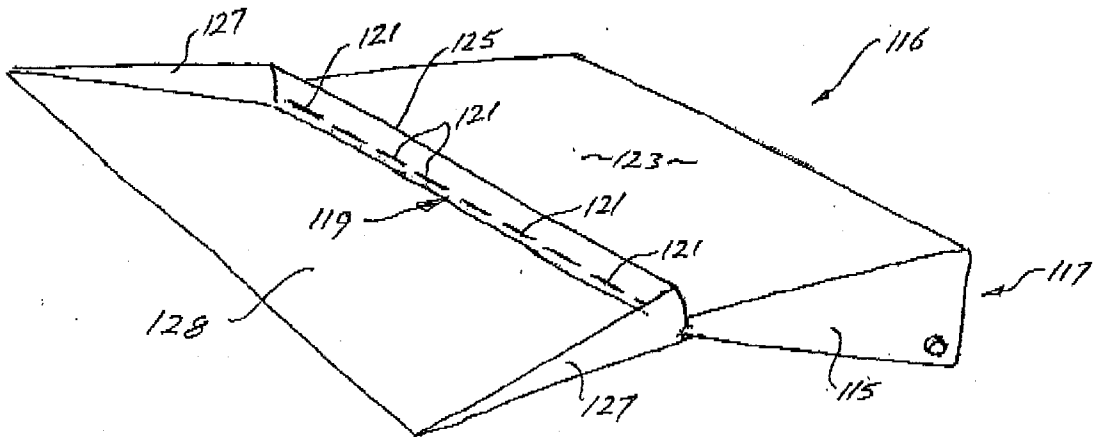


Fig. 7