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(54) **ARRAY OF SOLAR COLLECTORS ALSO  
FUNCTIONING AS A FENCE**

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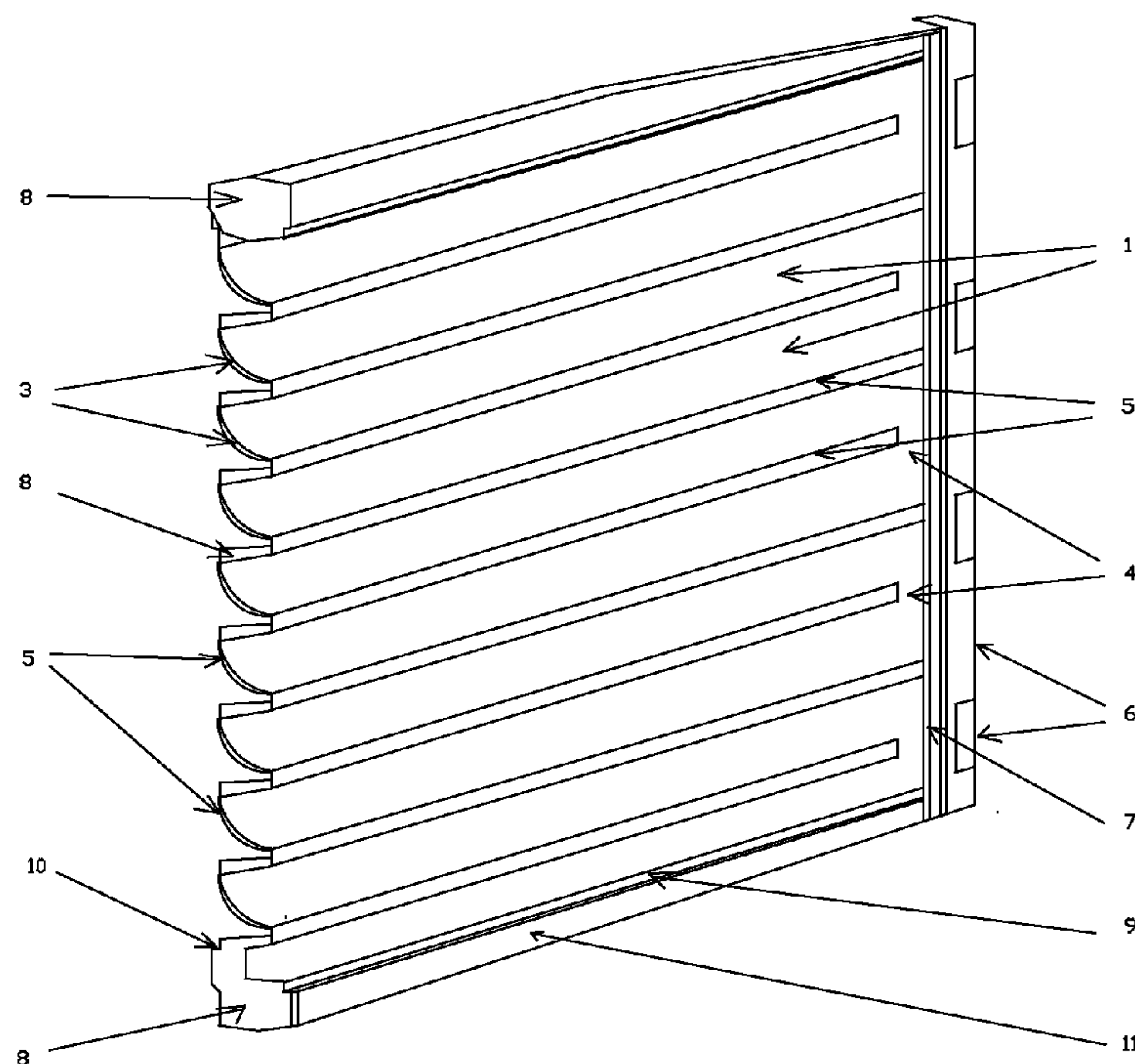
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(57) **ABSTRACT**

A vertical array of concave solar collectors that heat water or other fluids while functioning as a security, privacy, or decorative fence panel. Concave solar collectors are stacked vertically in a specific orientation and spacing to capture maximum solar energy and transfer that energy to water or fluid transfer medias. A design with a minimum footprint and appearance that compliments a wide range of landscaping and building plans. A system of water and fluid channels and pathways molded as a single structure that requires little or no assembly. A collector array designed to function with or without options including glazing panels and insulation panels. The solar collector fence panels can be linked together in series to form systems of varying size and capacity.

Perspective View at Cut line A on figure 1



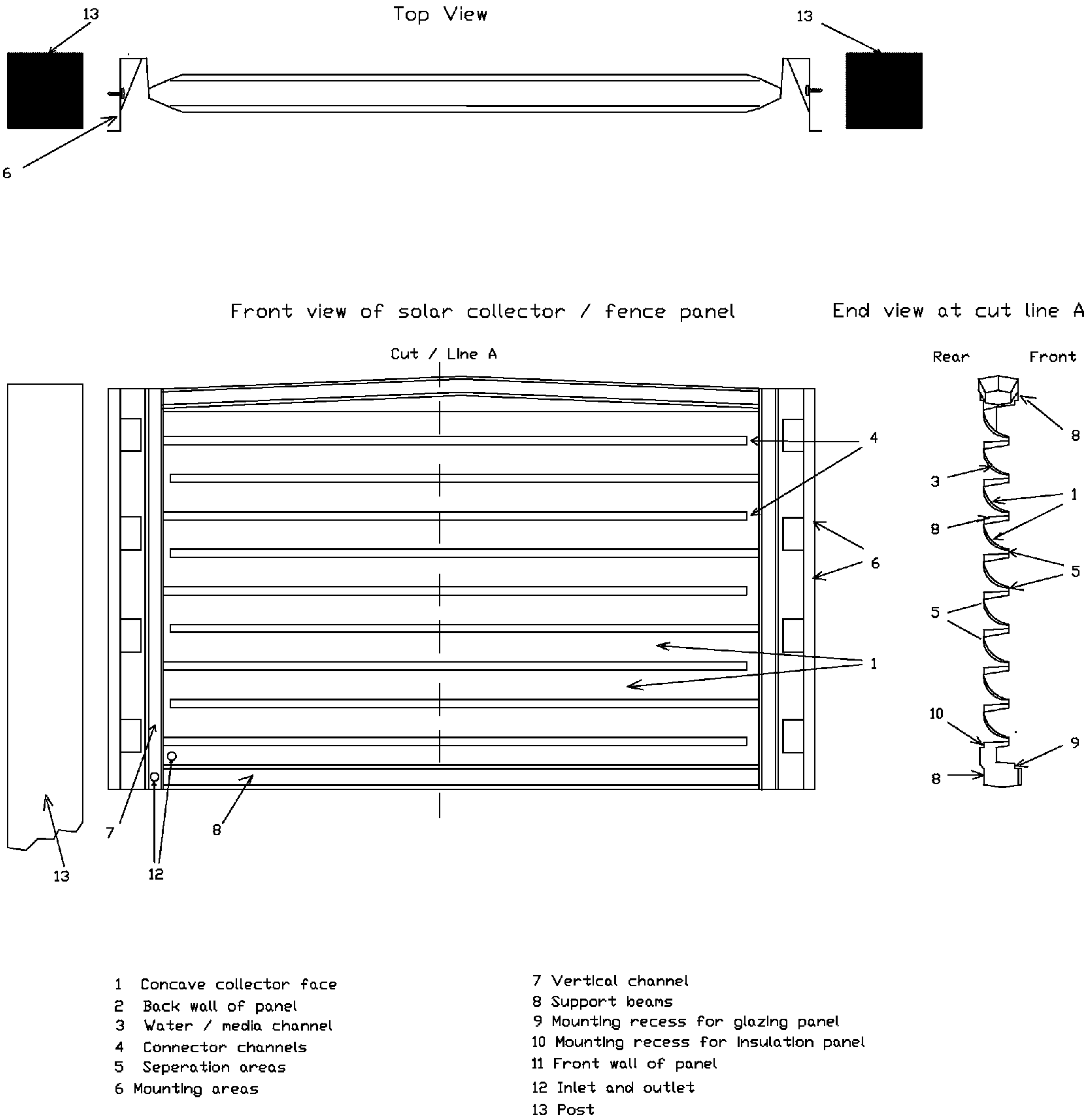
- 1 Concave collector face
- 2 Back wall of panel
- 3 Water / media channel
- 4 Connector channel
- 5 Separation areas

- 6 Mounting areas
- 7 Vertical channel
- 8 Support beams
- 9 Mounting recess for glazing
- 10 Mounting recess for insulation panel
- 11 Front wall of panel

Solar collector array functioning as fence panel

Shown with "Between Post" mounting option

Figure 1



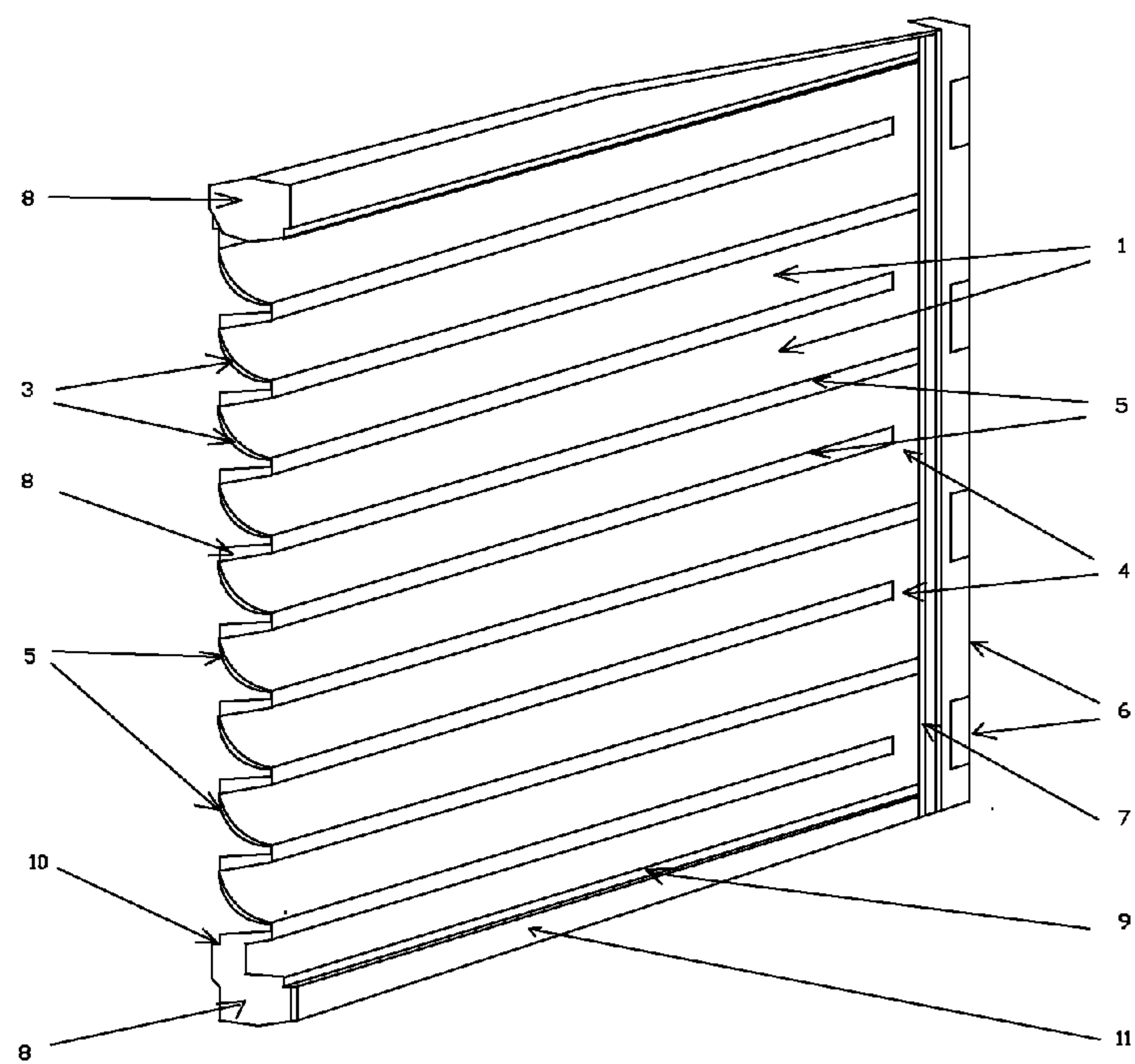
Solar collector array / fence panel,

Figure 1

Solar collector array functioning as Fence panel

Figure 2

Perspective View at Cut line A on figure 1



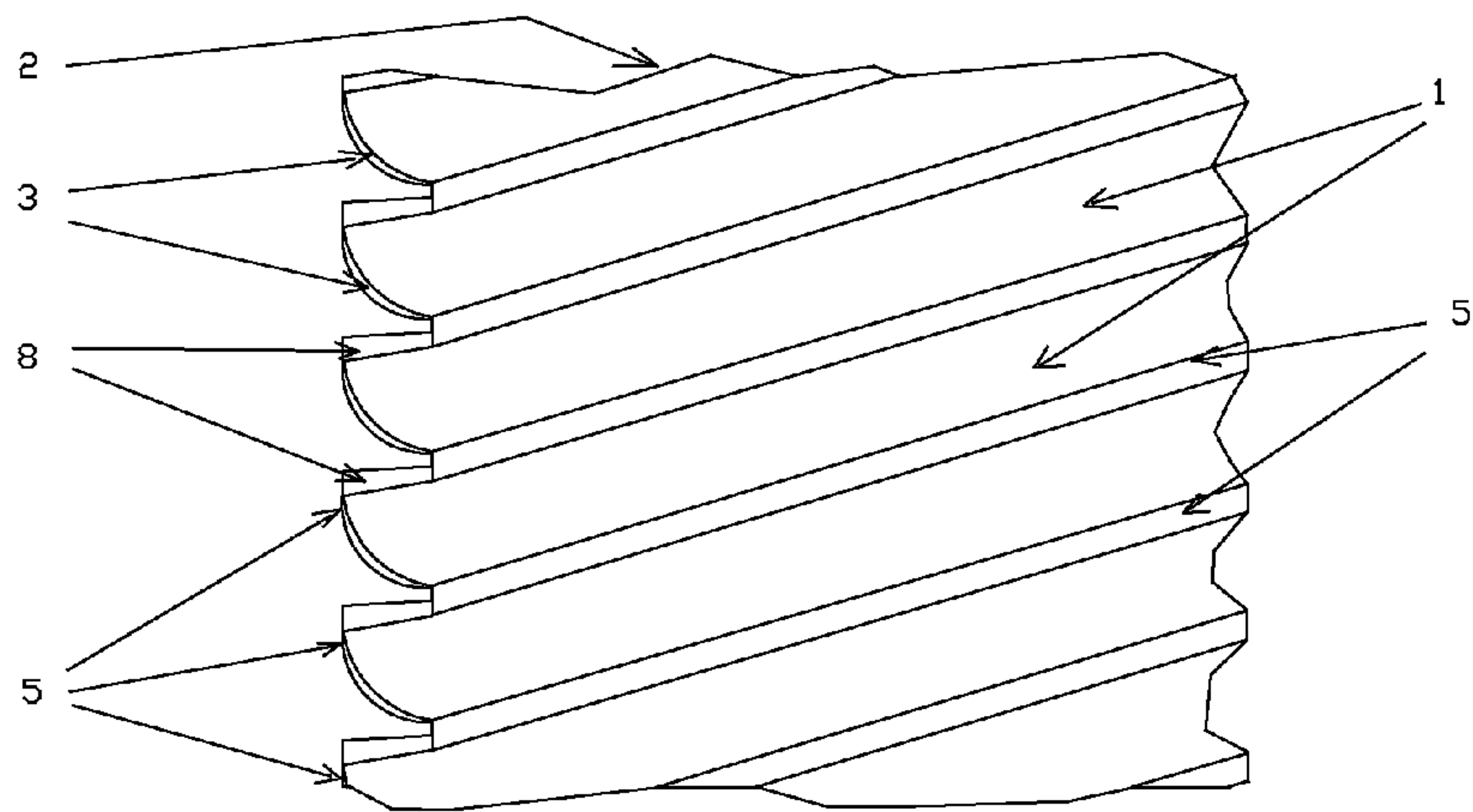
- |   |                        |    |                                      |
|---|------------------------|----|--------------------------------------|
| 1 | Concave collector face | 6  | Mounting areas                       |
| 2 | Back wall of panel     | 7  | Vertical channel                     |
| 3 | Water / media channel  | 8  | Support beams                        |
| 4 | Connector channel      | 9  | Mounting recess for glazing          |
| 5 | Seperation areas       | 10 | Mounting recess for insulation panel |
|   |                        | 11 | Front wall of panel                  |

Solar Collector Array functioning as Fence Panel

Expanded section from figure 2 perspective view

End view at Cut Line A showing water / media channels

Figure 3



- |                          |                            |
|--------------------------|----------------------------|
| 1 Concave collector face | 4 Connector channel        |
| 2 Collector back wall    | 5 Seperation weld areas    |
| 3 Water / media channel  | 8 structural support beams |



## ARRAY OF SOLAR COLLECTORS ALSO FUNCTIONING AS A FENCE

### BACKGROUND OF THE INVENTION

#### Field of the Invention

**[0001]** This invention relates to the field of decorative fences, privacy fence panels, security fencing and to the field of solar water heating devices. The most typical application is where both privacy, decorative, security fencing is required and the solar heating of water is also required. The solar water heating application may include but not be limited to residential hot water assist, swimming pool heating, residential home heating, commercial and industrial heating and process applications.

#### Current Art and Technology

**[0002]** Fences are used for decoration, borders, containment, security, and privacy and are constructed from wood, iron, steel, rocks, concrete, various plastics and other materials. Each of these materials and construction types has advantages and disadvantages. Due to reasons including cost, difficulty of construction, life cycle, maintenance, and appearance plastic fencing has been growing in popularity. Fences made from plastic materials offer major advantages in maintenance, appearance, and cost. Solar water heating technology involves a wide range of collector varieties, typically the current devices are fabricated from many pieces and sub assemblies which are complicated, fragile, and expensive, and are mounted on roofs, fences, or in more open areas.

#### Problems with Current Art

**[0003]** A major concern and limiting factor in plastic fencing design is expansion and contraction due to temperature changes, which has limited design options. Because of these concerns most plastic fence and wall panels currently on the market are fabricated from numerous pieces that are loosely assembled by fitting pieces and subassemblies into slots and grooves, which allow for movement created by expansion and contraction.

**[0004]** Current products on the market require fabrication methods and designs that avoid the problems of expansion and contraction, these methods and designs greatly limit the esthetic and structural choices available. Current products on the market allow a limited number of methods for attaching panels to the posts, columns, or walls they are attached to. Current products on the market involve numerous parts the must be inventoried and grouped into subassemblies before fabrication. Products on the market currently involve many precise steps during installation.

**[0005]** The multi piece fabricated designs and methods currently in use are inefficient due to multiple steps of manufacture and complicated assembly, which adds to time required and total cost of an installation. These current designs require numerous and exacting steps of installation, and they require skilled and experienced installers and along with numerous parts that involve significant installation time and cost. For do it yourself installation the time is much longer and quality is a challenge and major concern. The fact that some fence types, for example privacy fence panels must be fabricated after the plastic boards are extruded creates a major and costly step in the construction of a fence.

**[0006]** Currently the problems created by expansion and contraction encountered when large plastic panels exposed to temperature changes are dealt with in several ways. The most typical is to create large panels such as privacy fence panels by assembling a number of smaller pieces that are fit together loosely with many seams that can accept the expansion and contraction. Another method is to let each end of a panel float in a groove in a post without being actually fastened to the post. When under pressure of wind or other forces current panels can bow to an extent that the end of the panel can come out of the slot in the post which keeps the panel in place. These design and assembly methods also result in panels loose fitting, rattle when tapped, and are weak and apt to sag due to the geometry of the construction.

**[0007]** Current solar heating collector arrays and panels are available in many styles and are designed for function which leaves much to be desired as to being a good fit with landscaping and design esthetics.

#### How this Invention Improves on Current Art

**[0008]** In considering both the fencing and the solar collector functions this invention removes those design restrictions, and allows a much wider range of construction methods, esthetic design options and many better-suited manufacturing methods to be used.

**[0009]** This invention allows the fence panel collector array combination to be securely attached to fence posts or wall to which they are mounted and to be mounted in a vertical orientation such as a typical fence. This invention allows many options including the manufacture of large one-piece fence and wall panels that offer many advantages over current products on the market that require an extensive amount of assembly.

**[0010]** This invention eliminates the design and manufacture of the many parts currently required to fabricate a fence panel and a solar collector panel.

**[0011]** This invention can be incorporated into many different methods of attaching panels to posts, walls, or other supports. This invention allows fence/collector panels, especially larger panels, to be molded as single units. Current designs require various amounts of fabrication in the field during installation. This invention eliminates much of the field fabrication and installation required by current products. The most suitable manufacturing methods involve a front and a back panel being molded and fused together in one step to form all major elements of the invention, which greatly reduces the number of parts, inventory required, and assembly involved in current designs. This invention also greatly simplifies the steps required for installation.

**[0012]** This system improves on other approaches by lowering the overall cost, simplifying the manufacturing process, simplifying the installation process, being stronger and able to avoid damage due to various hazards, and providing esthetic appearances that fit well with many more building and landscaping designs.

**[0013]** The invention allows for the manufacture of large one-piece fence solar collector panels to be molded from various materials including various plastics. The solar collector aspect of the invention requires only connecting hose or pipe to the inlet and outlet ports of each panel and then to the desired circulating and storage systems. The fence panel solar collectors can be connected in series to whatever extent is desired for a particular installation. Any other assembly is dependent upon the intended uses of the heated water or other



fluid. The invention allows the manufacture of panels that are stronger than most plastic fence panels currently on the market, and more damage resistant than most solar collectors currently on the market.

#### SUMMARY OF THE INVENTION

**[0014]** This is a repeat of what has already been said

**[0015]** This invention combines a high functioning privacy or security fence with a cosmetically pleasing solar collector array water heater. The invention allows solar heating and fencing to be pleasingly incorporated into a wide range of building and landscaping designs. The one-piece design of the invention reduces manufacturing, installation, and overall costs of the fence and solar heating arrays being incorporated into an installation.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0016]** This invention is a mechanical system of a number of concave solar collectors arranged vertically and positioned to function as a privacy or security fence and solar water or other fluid heater.

**[0017]** The elements of the one-piece collector/fence system are as follows. Concave collector faces extend horizontally along the fence panel and span between the fence posts. The concave collector faces are positioned at an angle to create a situation in which the sun's rays strike the arc of the collector at various angles during the day. Some areas of the concave collector surfaces will absorb the sun's rays at the most optimum angle while other areas will absorb rays at somewhat less than optimum angles. As the sun moves this will remain the case only the areas of optimum and less than optimum angle will be at different locations on the concave collector faces of the panel. The upper area of the concave collector faces will receive the sun's rays at a 90 degree, or most efficient angle when sun is 15 degrees above the horizon. The lower area of the concave collector faces will receive the sun's rays at a 90 degree, or most efficient angle when sun is 65 degrees above the horizon.

**[0018]** Areas between the top and bottom of the concave collector will receive the sun's rays at a 90 degree, or most efficient angle when sun is between 15 degrees and 65 degrees above the horizon. The concave collector faces will be of a color that best absorbs the sun's rays such as non-reflective black.

**[0019]** The concave collector face forms the front of the water or fluid channels and the back wall of collector array forms the back part of the water channel, determines the volume and shape of the water or media channels. The back wall also forms parts of the support beams that are necessary to the array.

**[0020]** The water/media channels are the paths through which water or other media travel through the collector directly behind the concave solar collector faces which is where the water or other media absorbs heat. The water channels are the paths created by the front of the concave collectors faces and the collector channel back wall along with the connector and vertical channels.

**[0021]** The water channels are positioned one on top of the other and are separated by separation areas, and at either end of the water/media channel, a connector channel connects each water/media channel with the water channel above on one end and water channel below at the other end. The connector channels direct water or media to travel right across

one water channel then flow down through the connector channel to the water channel below, and flow left across the water channel, and so on. These connector channels direct the flow of water or other fluid to cross right to left and left to right through the total of concave collector channels collecting more heat.

**[0022]** The separation areas are designed into the invention and are located at the places where the front and rear walls or parts of the collector join together to create the water or media channels, connector channels, vertical channels, mounting areas, and structural beams of the collector.

**[0023]** The mounting areas are located at the right and left sides of collector/fence panel and are the areas that are attached to fence posts, poles or columns when installing the panels. Several mounting options are well suited and can be incorporated into the collector panel system.

**[0024]** The vertical channel is located at either end of the invention and is a pathway that directs water or media from the bottom of the collector array to the water/media channel behind the top concave collector face. This allows both the inlet and outlet points for the water or media to be located at the bottom of the collector array when that is the preferred water or media path.

**[0025]** Horizontal and vertical support beams are into the invention as integral elements of the design that add support and rigidity to the collector panel system.

**[0026]** A mounting recess is molded into the invention for mounting a glazing panel and is a ledge that runs across the top, bottom, and both sides of the front of the collector array. The ledge allows the glazing to be recessed into the array and allow for secure and easy mounting.

**[0027]** A mounting recess for mounting an insulation panel is molded into the invention and is a ledge that runs across the top, bottom, and both sides of the rear side of the collector array. The ledge allows the insulation panel to be recessed into the array and allow for secure and easy mounting.

**[0028]** An acrylic, glass, or other clear glazing panel is an option that can be installed to the front of the collector array to increase efficiency and extend the operating period of the collector array. The front glazing will also protect the concave collector faces from damage, keep them cleaner, and change the esthetic appearance of the collector array.

**[0029]** An insulation panel can be installed to the rear of the collector array this is an option that can be added to the invention to increase efficiency and extend the operating period of the collector array. The insulation panel will also protect the collector from damage, keep it cleaner, and change the esthetic appearance of the collector array.

#### THE ELEMENTS OF THE INVENTION

**[0030]** The numbers preceding the elements necessary to the invention are referenced to their numbers in the drawings associated with and included in this application.

**[0031]** 1) Concave collector face

**[0032]** 2) Back wall of the panel

**[0033]** 3) Water/media channel

**[0034]** 4) Connector channels

**[0035]** 5) Separation areas

**[0036]** 6) Mounting areas

**[0037]** 7) Vertical channel

**[0038]** 8) Support beams

**[0039]** 9) Mounting recess for glazing panel

**[0040]** 10) Mounting recess for insulation panel

**[0041]** 11) Inlet and outlet



[0042] 12) Front wall of the structure

[0043] 13) Back wall of the structure

#### THE ELEMENTS OF THE INVENTION AND THEIR RELATIONSHIP TO EACH OTHER

[0044] 1) Concave Collector Face, Element 1)

[0045] A “Concave collector face” is labeled element 1) in FIG. 1, FIG. 3, and FIG. 3, Concave collector faces extend horizontally along the fence panel and span between the fence posts. The concave collector faces are positioned at an angle to create a situation in which the sun’s rays strike the arc of the collector at various angles during the day. Some areas of the concave collector surfaces will absorb the sun’s rays at the most optimum angle while other areas will absorb rays at somewhat less than optimum angles. As the sun moves this will remain the case only the areas of optimum and less than optimum angle will be at different locations on the concave collector faces of the panel. The upper area of the concave collector faces will receive the sun’s rays at a 90 degree, or most efficient angel when sun is 10 degrees above the horizon. The lower area of the concave collector faces will receive the sun’s rays at a 90 degree, or most efficient angel when sun is 70 degrees above the horizon. Areas between the top and bottom of the concave collector will receive the sun’s rays at a 90 degree, or most efficient angel when sun is between 10 degrees and 70 degrees above the horizon. The concave collector faces will be of a color that best absorbs the sun’s rays such as non-reflective black.

[0046] 2) Back Wall of the Collector Array, Element 2)

[0047] An “Back wall of the collector array” labeled element 2) in FIG. 1, FIG. 2, and FIG. 3, forms the back part of the water channel, determines the volume and shape of the water or media channels. The Back wall of the collector array also forms parts of the support beams that are necessary to the array.

[0048] 3) Water/Media Channels, Element 3)

[0049] Water/media channels labeled element 3) FIG. 1, FIG. 2, and FIG. 3, are the paths through which water or other media travel right to left and left to right through the solar collector fence panel. The water/media channels are the paths created by the front of the concave collectors faces and the collector channel back wall along with the connector and vertical channels.

[0050] 4) Connector Channels, Element 4)

[0051] The “Connector channels” labeled element 4) in FIG. 1, FIG. 2, and FIG. 3 connect each water/media channel behind the concave collector faces with the water/media channels of the collector faces above and below that channel. Any given water/media channel will connect to a connector channel on one end going up to the water/media channel above, and another connector channel on the opposite end going down to the water/ media channel below.

[0052] The connector channels allow water or media to travel right and left and left to right across the collector, as it is absorbing heat.

[0053] 5) Separations Areas, Element 5)

[0054] The “Separations areas” labeled element 5) in FIG. 1, FIG. 2, and FIG. 3, The separation areas are the places where the front and rear walls or parts of the collector join together to create the water or media channels, connector channels, vertical channels, mounting areas, and structural beams of the collector.

[0055] 6) Mounting Areas, Element 6)

[0056] The “Mounting areas” labeled element 6) in FIG. 1, FIG. 2, and FIG. 3

[0057] The mounting areas are located at the right and left sides of collector/fence panel and are the areas that attach to the fence posts or poles. Several mounting options are well suited and can be incorporated into the collector panel system.

[0058] 7) Vertical Channel, Element 7)

[0059] The “Vertical channel” labeled element 7) in FIG. 1, FIG. 2, and FIG. 3

[0060] The vertical channel directs water or media from the bottom of the collector array to the water/media channel behind the upper most concave collector face. This allows both the inlet and outlet points for the water or media to be located at the bottom of the collector array when that is the preferred water or media path.

[0061] 8) Support Beams, Element 8)

[0062] The “Support beams” labeled element 8) in FIG. 1, FIG. 2, and FIG. 3

[0063] Horizontal and vertical support beams are integral elements of the design that add support and rigidity to the overall collector panel system.

[0064] 9) Mounting Recess for Glazing Panel, Element 9)

[0065] The “Mounting recess for glazing panel” labeled element 9) in FIG. 1, FIG. 2, and FIG. 3 is a recess for mounting a glazing panel is a ledge that runs across the top, bottom, and both sides of the front of the collector array. The ledge allows the glazing to be recessed into the array and allow for secure and easy mounting.

[0066] 10) Mounting Recess for Insulation Panel, Element 10)

[0067] The “Mounting recess for insulation panel” labeled element 10) in FIG. 1, FIG. 2, and FIG. 3 is a recess for mounting a insulation panel is a ledge that runs across the top, bottom, and both sides of the front of the collector array. The ledge allows the insulation panel to be recessed into the array and allow for secure and easy mounting.

[0068] 11) Inlet/Outlet, Element 11)

[0069] The “Inlet/outlet” labeled element 11) in, FIG. 1, FIG. 2, and FIG. 3, are positioned one each at the bottom end of the vertical channel and one each at the end of the bottom most water/media channel, opposite the connector channel allowing water or fluid to enter or exit the panel at these orifices. Water or other fluids can flow either by entering at the lower end of the vertical channel and exiting at the bottom most water/media channel, or in the opposite direction.

[0070] 12) Front Wall of the Structure, Element 12)

[0071] The “Front wall of the structure” labeled element 12) in FIG. 1, FIG. 2, and FIG. 3 is a formed panel which forms the front side of the concave solar collector face—element 1), the front side of the water/media channel—element 3), the connector channels—element 4), the separation areas—element 5), the vertical channel—element 7), the support beams—element 8), the mounting areas—element 6), and creates the rigidity and strength of the invention.

[0072] 13) Rear Wall of the Structure, Element 13)

[0073] The “Rear wall of the structure” labeled element 13) in FIG. 1, FIG. 2, and FIG. 3, is a formed panel which mates with the front wall of the structure to form the back side of the water/media channel—element 3), the connector channels—element 4), the separation areas—element 5), the vertical channel—element 7), the support beams—element 8), and creates the rigidity and strength of the invention.



### How the Invention is Applied and Used

**[0074]** In the solar collector water heating element of the invention water or other fluid picks up heat as it runs horizontally through the channels behind the concave collector faces. The concave collector faces run right and left across the collector fence panel. Each horizontal channel is connected by vertical connector channels at both ends, the connector on one end going to the concave collector above and the other end connecting to the concave collector channel below. This creates a water flow pattern alternating right to left behind one concave collector and left to right in the concave collectors above and below. The water or other fluid travels side to side behind each of the concave collector faces absorbing heat all along the way. A vertical channel at one side of the collector panel assembly routes water or fluid from the bottom of the panel assembly to or from the water channel behind the top concave collector face, depending on the desired direction of flow. Collector/fence panels can be used individually or linked in series to form large systems. The concave collector channels within the structure are positioned in a vertical stacked arrangement, which allows sunlight to strike the concave collector faces to the desired extent.

**[0075]** The vertical arrangement of the collector faces, connector channels, vertical channel and other elements of the invention can be arranged to in total be of a height or width that functions as a decorative, privacy, or other type of fence. The solar collector array fence panels can be used to heat water or other fluids while functioning as security fencing around pools, privacy fencing around residential housing, decorative fencing, and many other fencing and water heating applications. The invention functions as a privacy fence, a security fence, and as a decorative fence in wide range of application from residential to commercial and industrial.

### How the Invention is Made

**[0076]** The one-piece molded collector/fence panel system can be manufactured using several methods. One of the most suitable is twin sheet thermoforming, which involves simultaneously forming two plastic sheets with a female mold of two or more parts. The sheets are formed together while they are still hot enough to fuse together wherever they touch. This allows making the hollow channels and support beams necessary in this design. After forming the exterior, edges are trimmed along whatever lines are required.

**[0077]** Other suitable methods depending on material requirements include blow molding, pressure forming, rotational molding, and other methods that may be able to create the front, back, or both panels. Additional methods may be used to manufacture the panels including injection, compression, reaction, RIM, spray up, or lay-up molding or various methods of stamping, may also be used but may require extra steps of joining the front and back of the array after they are formed.

**[0078]** Once the mold(s) are built manufacturing consists of running mold cycles, what trimming may or may not be needed, attaching threads, nipples, or other suitable transition fittings to the inlet and outlet orifices, and packaging onto pallets.

**[0079]** The fence panels or sections will go from the molding cell onto pallets and on to distribution, retail locations, or job sites.

**[0080]** A suitable material is high-density polyethylene. PVC and abs are also suitable for this invention along with other materials that may be chosen for particular applications

with regard for cost, appearance, resistance to weather elements and other factors. The invention can also be stamped from sheet metal, or made of fiberglass. There are many plastic formulations available with many new plastic materials coming on the market each year and many of those new materials would likely be suitable. The collector array panel system may also be incorporated into fabricated panels or walls by use of fasteners, welding, adhesives or other means.

### Elements that are Essential to the Invention

**[0081]** Several elements of the Array of solar collector panels functioning as a fence invention are essential to its structure and function, those include,

**[0082]** Elements necessary to the system

**[0083]** 1) front wall of the structure

**[0084]** 2) back wall of the structure

**[0085]** 3) concave collector faces

**[0086]** 4) water/media channels

**[0087]** 5) connector channels

**[0088]** 6) separation areas

**[0089]** 7) mounting areas

**[0090]** 8) support beams

**[0091]** 9) inlet outlet orifices

### Elements that are not Essential to the Invention

**[0092]** 10) vertical channel

**[0093]** 11) mounting recess for glazing panel

**[0094]** 12) mounting recess for insulation panel

**[0095]** 13) Acrylic, glass, or other glazing materials shielding the front side of the concave collector array.

**[0096]** 14) An insulation panel mounted to the back side of the unit.

### How to Use the Invention

**[0097]** The solar collector/fence/wall system is designed to heat water or other media by absorbing the sun's rays, while also functioning as a security, privacy, or decorative fence. The system is also designed to mount on the exterior walls of buildings to supply hot water or other media while acting as the decorative and functional exterior surface of the building.

**[0098]** The solar collector/fence/wall system is designed to stand alone or be incorporated into fence or wall panel systems and is well suited to a wide variety of other applications.

**[0099]** A number of options including glazing and insulation can be added to extend the efficiency and seasonal operating range of the overall system.

**[0100]** Applications for solar collector/fence and wall panel system include swimming pool—heater/fences, privacy fences, residential and commercial properties, gardens, it also applies to decorative fences, to livestock fences for animal containment and heating, and for many other fencing applications.

**[0101]** The solar collector/fence and wall panel system can be mounted to the exterior of building walls to supply hot water or other media, additional insulation, a very modernistic appearance, and to display the earth friendly design of the building.

**[0102]** Each panel section has an inlet and an outlet hose connection, which can be connected to a water or fluid storage tank, swimming pool, heat exchanger or other mechanism that will make use of the heat collected by the solar collector arrays in the panel. The collector array fence panels may be incorporated into systems of many configurations, ranging



from manually operated to highly advanced computer controlled systems. The collector array fence panels may be used as individual units or connected in series to form a collector bank, or banks of whatever size a particular installation may require.

#### DESCRIPTION OF DRAWINGS

##### [0103] DESCRIPTION OF DRAWING 1,

[0104] A front, top, and end view at cut line A of a solar collector array fence panel with a between the post mounting option. The end view at the cut line A illustrates the collector faces and the water or fluid channel.

##### [0105] DESCRIPTION OF DRAWING 2,

[0106] A perspective view of a solar collector array fence panel at cut line A. This drawing illustrates the orientation of various elements of the invention in particular the concave solar collector faces.

##### [0107] DESCRIPTION OF DRAWING 3,

[0108] A close up perspective end view of a solar collector array fence panel at vertical cut line A on FIG. 1. This drawing illustrates the water or fluid channel behind the concave collector face and the support beams.

#### DETAILED DESCRIPTIONS OF DRAWINGS

##### Detailed Description of Drawing—FIG. 1

[0109] A front, top, and end view at cut line A of a solar collector array fence panel with a between the post mounting option. The end view at the cut line A illustrates the collector faces and the water or fluid channel. The concave collector faces element 1) are the areas of the absorb sun rays, that energy is transferred to the water or fluid moving through the water or other media flowing through the water/media channel, element 3) located directly behind the concave collector face.

[0110] The water/media channel is formed by and defined by the concave collector in the front and the back wall panel, element 2) which is the back side of the water/media channel.

[0111] Each horizontal water/media channel is connected to other water/media channels by connector channels, element 4). The Connector channels, element 4) are located at both ends of each water/media channel, with the connector on one end going to the concave collector above and the connector located at the other end connecting to the concave collector channel below. This creates a water or fluid flow pattern alternating right to left behind one concave collector and left to right in the concave collectors above and below. The water or other fluid travels side to side behind each of the concave collector faces absorbing heat all along the way. The separation areas, element 5) are the areas where the front and rear of the invention meet and are joined to form the hollow chambers including the water/media channels—element 3), the connector channels—element 4), the vertical channel—element 7), the support beams—element 8), the separation areas also help create the rigidity of the overall structure. The mounting areas—element 6) are the areas at either end of the invention that come in contact with, and would be secured to the posts or columns that support the invention when it is installed. The vertical channel—element 7) is a hollow chamber located at one end of the invention and runs from the upper most water/media channel to the bottom of the structure. The vertical channel will have an orifice at or near its bottom point to which an inlet or outlet hose allowing the invention to be

connected to the rest of the system. The support beams—element 8), are hollow chambers located at the top and bottom of the structure, between each concave collector face—element 1), and at each end of the invention. The geometry of the design of the support beams is such that they provide support and rigidity to the structure of the invention.

[0112] The mounting recess for glazing panel—element 9), is a shape designed into the form of the invention, and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the concave collector faces. The mounting recess for glazing panel is intended to provide a secure area in which to mount a glazing panel of glass, acrylic, plastic, or other suitably clear panel to the front side of the invention. The intention of a glazing panel is to increase the efficiency of the collector under less optimum weather and temperatures conditions, and to help keep the concave collector faces clean of dust and debris.

[0113] The Mounting recess for glazing panel—element 9) will include a face that is parallel to a plane that is parallel to the front plane of the structure of the invention and is  $\frac{1}{4}$  to 2 inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the concave collector faces—element 1).

[0114] The Mounting recess for glazing panel—element 9) will include a face that is perpendicular to a plane that is parallel to the front plane of the structure of the invention and is a minimum of  $\frac{1}{4}$  inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the concave collector faces—element 1).

[0115] The mounting recess for insulation panel—element 10), is a shape designed into the form of the invention, and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter back side of the invention. The mounting recess for insulation panel is intended to provide a secure area in which to mount an insulation panel of insulating material to the back side of the invention. The intention of a insulation panel is to increase the efficiency of the collector under less optimum weather and temperatures conditions, and to help keep the invention clean of dust and debris. The Mounting recess for insulation panel—element 10) will include a face that is parallel to a plane that is parallel to the front plane of the structure of the invention and is  $\frac{1}{4}$  to 2 inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the back side of the concave collector faces—element 1).

[0116] The Mounting recess for insulation panel—element 9) will include a face that is perpendicular to a plane that is parallel to the front plane of the structure of the invention and is a minimum of  $\frac{1}{4}$  inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the back side of the concave collector faces—element 1).

[0117] Inlet and outlet—element 11) are orifices which are the entry and exit points for water or other fluids coming into and exiting the invention. One of the orifices shall be located on the bottom most concave collector face and at the end of that concave collector face that shall not have a connector channel—element 4). This orifice will allow the introduction of water or other fluid into or out of the water/media channel chain behind the concave collector face. One of the orifices shall be located at or near the bottom of the vertical channel—



element 7), which will introduce water or other fluid into or out of the water/media channel behind the upper most concave collector face and at the end of that concave collector face that shall not have a connector channel—element 4).

#### Detailed Description of Drawing—FIG. 2

[0118] A perspective view at cut line A of a solar collector array fence panel. This drawing illustrates the water media channels—element 3) by looking at the cut off, the water/media channels are revealed as narrow channels directly behind the concave collector faces—element 1). The angle and orientation of the concave solar collector faces are also illustrated in this view, with the position of the concave solar collector faces—element 1) being in the 6:00 to 9:00 0 clock position when using a clock reference. The ledge that is the mounting recess for glazing panel—element 9) is shown along the top, bottom and end of the structure forming a recess that positions the glazing panel.

#### Detailed Description of Drawing—FIG. 3

[0119] A close up perspective view at cut line A of a solar collector array fence panel. This drawing illustrates the separation areas—element 5) where the front and rear panels or essentially the two main parts of the collector structure are fused together. The fused areas form the support beams—element 8) that support and make ridged the overall collector structure. The fused areas also form the water/media channels—element 3), the connector channels—element 4), the vertical channel—element 7), and define the mounting surfaces—element 6).

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1. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, comprising



concave collector faces, a front wall of the panel, a back wall of panel, water/media channels, connector channels, separation areas, mounting areas, a vertical channel, support beams, a mounting recess for glazing panel, a mounting recess for insulation panel, a front glazing panel, a rear insulation panel, and inlet outlet orifices, which together allow circulating water or other media to be heated by solar radiation while the solar collector array fence panel functions as cosmetically attractive privacy, security, or decorative fence.

2. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein concave solar collector faces extend horizontally across the width of the solar collector and are arcs of 90 degrees which are positioned to absorb solar radiation and transfer that resulting heat to water or other media flowing against the back side of the concave solar collector faces, and the concave solar collector faces are positioned one atop the other in a vertical pattern, and when viewed as a cross section end view, the arcs of the concave solar collector faces each extend from 180 degrees to 270 degrees with the orientation of 0 degrees being straight up, and the concave solar collector faces are positioned such that the sun's rays strike the arc of the concave collectors at various angles throughout the day, and the upper area of the concave collector face arcs will receive the sun's rays at a most efficient angle when the sun is 15 degrees above the horizon and the lower area of the concave collector faces will receive the sun's rays at the most efficient angle being when sun is 55 degrees above the horizon and the arc dictates that as the sun moves certain areas of the concave solar collector face will receive optimum angle of sun light and other locations on the concave collector faces will receive less than optimum angle of sun light, and the concave collector faces will be of a color that best absorbs the sun's rays such as non-reflective black.

3. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel wherein concave solar collector faces in accordance with claim 2), are arcs of 90 degrees and the radius of the arcs does not affect the design and function of the invention, and the radius of the arc of the concave solar collector faces may be of any length as such radii affect only the physical front to back dimension of the overall structure and the volume and capacity of the collector, and the relative position of the concave solar collector faces is positioned vertically one atop the other, and when looking from an end view each arc is positioned between 6:00 and 9:00 when using a clock example for reference, and the arcs may be mirror reversed to a 3:00 to 6:00 O clock orientation, and it is not necessary that all concave solar collector faces in a given panel array be of the same radius and in some instances it may be an advantage that an array contain solar collector faces of various arc radii.

4. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein separation areas are located on the front side of the structure and the rear side of the structure and are in part the areas where the front panel of the structure and the rear panel of the structure are fused or fastened together to form the entire structure of the invention, and the concave solar collector faces shall be positioned in a stacked orientation directly above one and the next, and are separated by a distance which is defined as the lower most edge of a front

side separation area, and shall be above the upper most edge of the concave solar collector face below, and that vertical distance separating those shall equal not less than 19% of the total vertical height of one concave solar collector face.

5. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein water/media channels are located directly behind the concave collector faces, and when filled with water or other media that water or other media will flow directly behind and in direct contact with rear of the concave collector face, and will absorb heat from that collector face.

6. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein connector channels are located at each end of the water/media channels with one of the connector channels directing or receiving water or fluid from the water/media channel above and the other connector channel directing or receiving water or fluid from the water/media channel below, excepting the top and bottom water/media channel, and which will in effect connect the water/media channels in series allowing the water or media being heated to flow through all water/media channels contained in the invention, and the connector channels shall be sized and shaped to accept the volume of and to not constrict or impede the flow of water or media through the entire system of water/media channels, or the connector channels.

7. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein mounting areas are located at the right and left sides of structure of the collector/fence panel and are the areas that contact and are attached to the fence posts, poles, supports, or columns to which the collector/fence panel is mounted, and mounting areas can contact the post, pole, or columns at any angle of the front, side, or rear of the post, pole, or column.

8. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein a vertical channel will direct water or media to or from the water/media channel behind the uppermost concave collector face in the structure, and opposite the connector channel, and to or from the bottom of the collector array structure thus allowing water or media to enter or exit the at or near the bottom of the collector fence panel.

9. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein support beams are hollow chambers and may be located at the top and bottom of the structure of the collector fence panel and between each concave solar collector face, and at each end of the structure along the mounting areas, and support beams of a size similar to the top and bottom support beams may be located in the vertical center, or the horizontal center of the concave solar collector faces, and the geometry of the support beams will be of a design and size sufficient to provide strength, support, and rigidity to the structure in whatever the overall size of the invention shall be as determined by the radius of the arcs of the concave solar collector faces.

10. A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as



a privacy, security, or decorative fence panel, in accordance with claim 1), wherein a mounting recess for glazing panel is a shape designed into the form of the invention consisting of two plains, one being parallel to the plain of the width and height of the solar collector fence panel, and the other plain being at right angle to the first, and this mounting recess for glazing panel extends across the top, bottom, and up and down both ends of the structure of the invention to completely encompass the perimeter of the array of concave collector faces, and does provide a secure area in which to mount a glazing panel of glass, acrylic, plastic, or other suitably clear panel to the front side of the invention to increase the efficiency of the collector under less optimum weather and temperature conditions, and to help keep the concave collector faces clean of dust and debris, and the mounting recess for glazing panel will include a face that is parallel to a plane that is parallel to the front plane of the structure of the invention and it will be between  $\frac{1}{4}$  to 2 inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the concave collector faces, and the mounting recess for glazing panel will include a face that is perpendicular to a plane that is parallel to the front plane of the structure of the invention and extends a minimum of  $\frac{1}{4}$  inches out from the plain of the mounting recess for glazing panel and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the concave collector faces.

**11.** A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein a mounting recess for insulation panel is a shape designed into the form of the invention consisting of two plains, one being parallel to the plain of the width and height of the solar collector fence panel, and the other plain being at right angle to the first, and this mounting recess for glazing panel extends across the top, bottom, and up and down both ends of the structure of the invention to completely encompass the perimeter of the array of concave collector faces, and does provide a secure area in which to mount an insulating panel to the rear side of the invention to increase the efficiency of the collector under less optimum weather and temperature conditions, and to help keep the concave collector clean of dust and debris, and the mounting recess for glazing panel will include a face that is parallel to a plane that is parallel to the front plane of the structure of the invention and it will be between  $\frac{1}{4}$  to 2 inches wide and extends across the top, bottom, and both ends of the structure of the invention

to completely encompass the perimeter of the total of the concave collector faces, and the mounting recess for glazing panel will include a face that is perpendicular to a plane that is parallel to the rear plane of the structure of the invention and is a minimum of  $\frac{1}{4}$  inches wide and extends across the top, bottom, and both ends of the structure of the invention to completely encompass the perimeter of the total of the concave collector faces.

**12.** A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein inlet and outlet orifices are positioned one each at the bottom end which is closest to the ground of the vertical channel, and one each at the end of the bottom most water/media channel, and at the end opposite the connector channel allowing water or fluid to enter or exit the panel at that point.

**13.** A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein the front wall of the panel of the invention is a single panel formed to create the mounting recess for glazing panel, and the front wall of the panel is a single panel that forms the concave solar collector face, the front side of the water/media channel, the front side of the connector channels, the front side of the certain separation areas, the top and bottom sides of certain separation areas, the front side of the vertical channel, major portions of the support beams, major portions of the mounting areas, creates the nominal front one half of the structure of the invention, and gives rigidity and strength to the structure of the invention.

**14.** A mechanical structure and system that functions as an array of solar collector water heaters while also functioning as a privacy, security, or decorative fence panel, in accordance with claim 1), wherein the back wall of the panel of the invention is a single panel formed to create the mounting recess for insulation panel, and the back wall of the panel mates with the front wall of the panel to form the back side of the water/media channels, the back side of the connector channels, the back side of certain separation areas, the top and or bottom sides of certain separation areas, the back side of the vertical channel, major portions of the support beams, major portions of the mounting areas, creates the nominal rear one half of the structure of the invention, and when fastened or fused to the front wall of the panel those two elements do form all other major elements of the invention and does give rigidity and strength to the structure of the invention.

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