Try an isolated gain passive solar house

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How would you like to cut your annual heating bill in half? This can be made possible with the use of passive solar energy systems.

Every three days, the sun showers the earth with more energy than all of the fossil fuels on earth. Yet less than 5% of America's houses use any type of solar energy system. This may be because the solar energy systems of the past were expensive and required builders to totally redesign the house around the solar energy system. With the passive energy design, the house itself becomes the energy system, and as a result a traditional looking house is still possible. Also, the passive design can be built for only about 5% more than the normal construction costs, compared to up to 25% more for the active system (solar collection dishes or panels mounted on a roof).

Active solar systems

The active solar energy system uses solar collection panels, storage tanks, an energy transfer mechanism, and an energy distribution system. This type of system always employs some kind of working fluid which collects, transfers, stores, and distributes the collected solar energy (see Fig. 1). To handle this working fluid, extensive plumbing must be installed in the house. Also, large storage tanks are used to hold the heated fluid until it is needed. Because of the plumbing and storage tanks involved, the house is designed around the energy system. People don't want to live in energy systems, they want to live in houses. And because of the plumbing, tanks, and the structural modifications that must be made to the house, the initial expenditure for an active system can be very costly. With the advent of passive solar homes, these concerns are alleviated.

Passive solar systems

The passive solar energy system reduces energy consumption by paying close attention to site orientation, and the use of large amounts of south facing windows to allow low angle winter sunshine into the structure. These are the collection devices. And the house itself, along with proper insulation, is the storage device. There is no fluid involved, only air, in the passive solar design. And there is no mechanical means of collecting, storing, or distributing the energy.

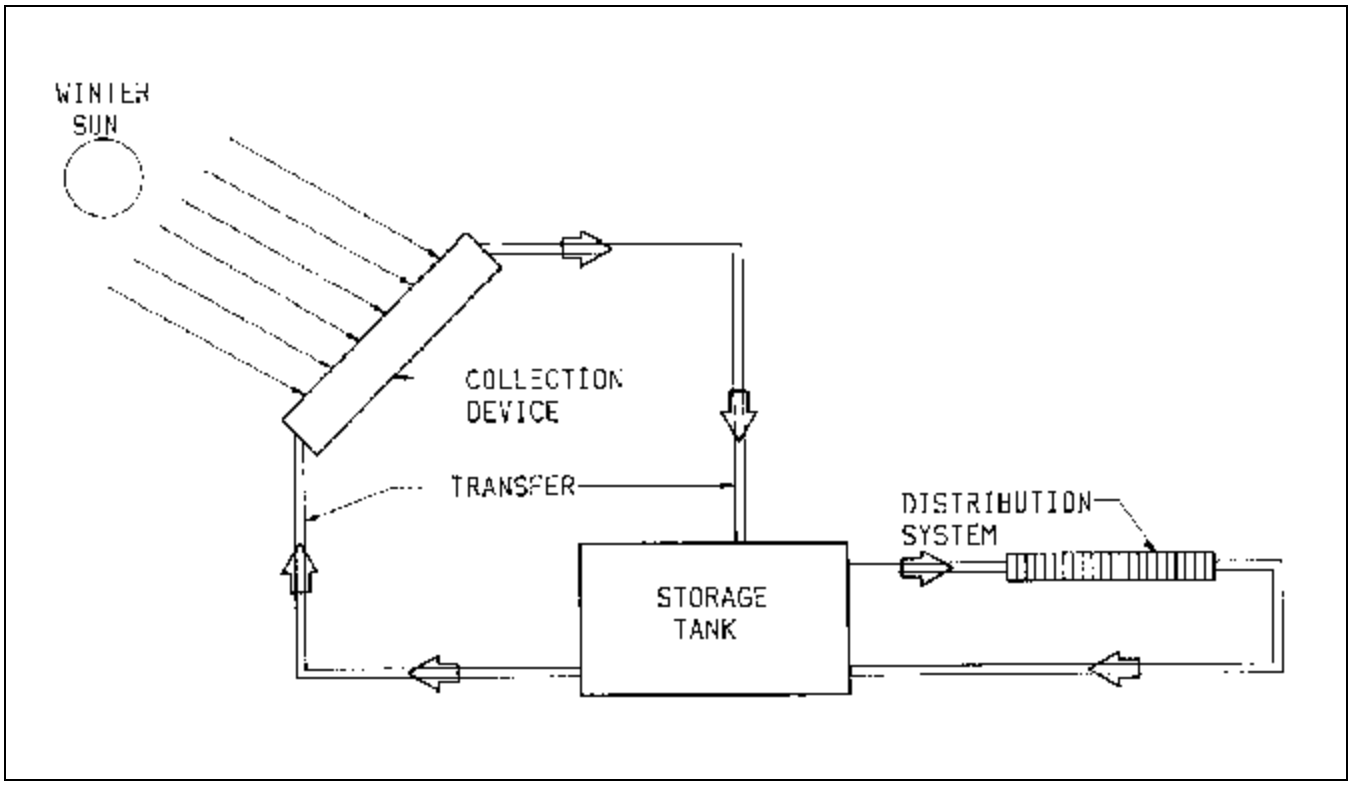

Figure 1. Active solar system

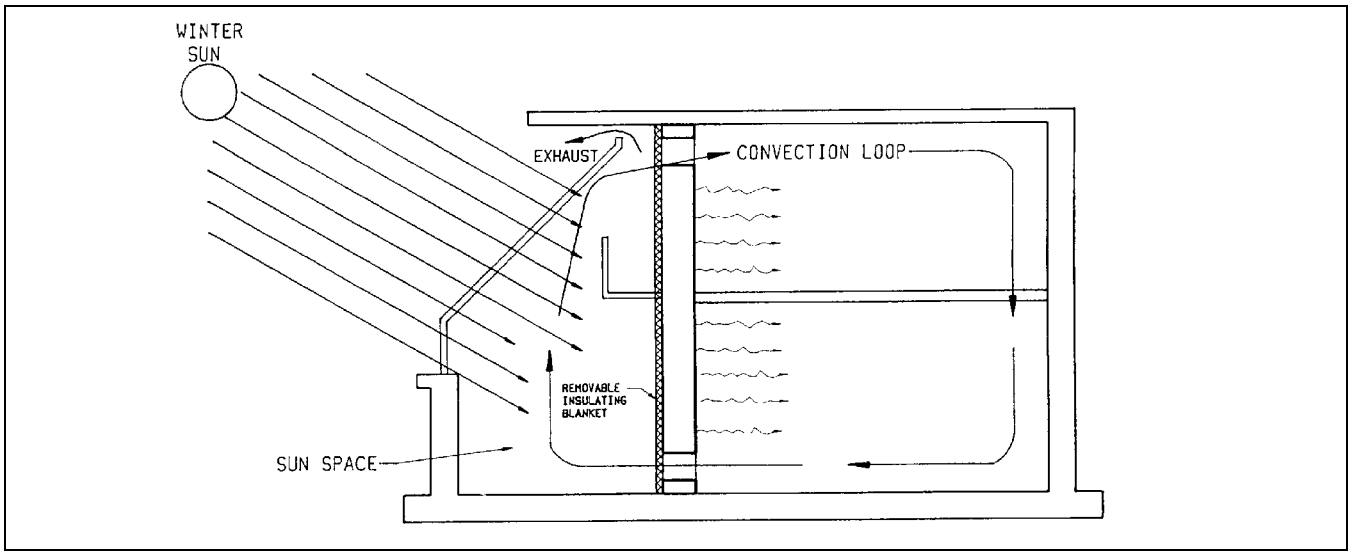

Figure 2. Isolated gain system using a sun space

Isolated gain system

There are many variations to the passive solar design. But one of the most effective and attractive is the isolated gain system (see Fig. 2). The isolated gain system consists of a greenhouse, sun porch, or other south facing room attached to the main part of the house. This space acts as both the solar collector and storage area, and serves a useful function of transferring excess heat to the main part of the house. The sun space is often combined with some sort of thermal mass (material that conducts heat), such as plants and soil, or masonry within the sun space. In this way the system can provide heat in two ways according to the temperature outside.

For daytime operation, solar radiation passes through the windows into the sun space and heats up the thermal mass within. Heat is then transferred throughout the rest of the house by means of vents, ducts, windows, or doors. As the space is being heated during the day, the warm air is allowed to escape to the main part of the house and cool air enters. This then forms a natural convection loop that evenly distributes the warm air.

At night the sun space cools slowly as heat is released by the thermal mass within the sun space. If the wall between the sun space and the house is used as thermal mass, it will give off heat to both the sun space and the house. For this reason an insulated shutter can be placed on the sun space side of the thermal wall to reduce heat entering the space.

Because the passive solar system uses traditional building methods and materials, this type of system can be built for only 5 to 10 percent over the normal cost of new home construction. Also, an isolated gain system is a good solution for retro-fitting an existing house by adding on the sun space. Besides cutting fuel bills by 40% or more, there is the added advantage of interesting living space added to your home.

So with all this free, renewable energy available to heat our homes, consider using a passive energy system to heat your home. D