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Huang

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(54) **WATER HEATER PANEL**

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CPC ... ***F24J 2/05*** (2013.01); *Y02E 10/44* (2013.01)

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,084,576 A * 4/1978 Pei F24J 2/045 126/657
4,084,580 A * 4/1978 Roark F24J 2/265 126/645
4,111,187 A * 9/1978 Wiegand F24J 2/045 126/634
4,294,232 A * 10/1981 Boy-Marcotte F24J 2/05 126/649
4,307,711 A * 12/1981 Doundoulakis F24J 2/06 126/600
4,333,448 A * 6/1982 Johnson F24J 2/05 126/569
4,355,628 A * 10/1982 Watts F21S 8/088 126/570
4,546,758 A * 10/1985 Ebernard F24J 2/07 126/635
4,601,282 A * 7/1986 Mountain F24J 242/085 126/573
4,719,902 A * 1/1988 Klier E04H 4/06 126/567
9,051,923 B2 * 6/2015 Kuo F03G 6/005
2006/0207590 A1 * 9/2006 Levin F24J 2/14 126/651
2009/0101207 A1 * 4/2009 Milbourne H01L 31/18 136/259
2010/0206296 A1 * 8/2010 Matalon F24J 2/0483 126/605
2011/0011449 A1 * 1/2011 Morgan H01L 29/70 136/255
2011/0192440 A1 * 8/2011 Wu F24J 2/14 136/244
2011/0290235 A1 * 12/2011 NewDelman F24J 2/0007 126/643
2012/0234313 A1 * 9/2012 Rostami F24J 2/05 126/652
2013/0074830 A1 * 3/2013 Mulcey F24J 2/14 126/657
2013/0081396 A1 * 4/2013 Kuo F24J 2/50 60/641.8
2013/0306130 A1 * 11/2013 Reichstetter H01L 31/0525 136/246
2014/0023803 A1 * 1/2014 Kawanami C03C 3/072 428/34
2015/0267939 A1 * 9/2015 Park F24J 2/05 126/652

* cited by examiner

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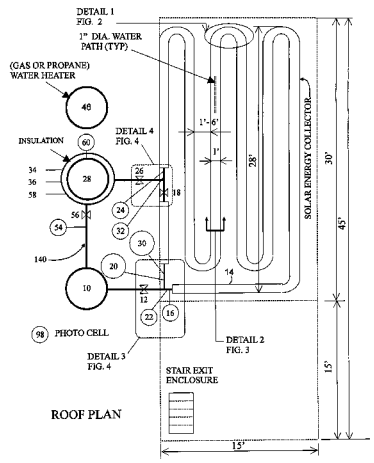
(57) **ABSTRACT**

A solar energy collector comprises a solid body having a substantially planar solar energy absorbing collecting surface. The solid body has a first thickness at a center portion tapering to a second thickness at each of a pair opposing edge portions defining a width of the body. A bore extends completely through the body along its length and is aligned along an axis at the center portion. A window transparent at most solar radiation in the visible spectrum and near UV to infrared-red solar energy wavelengths is disposed at a distance from the collecting surface, the window sealed around a periphery of the collecting surface to define a sealed air gap or nitrogen gas filled gap between the collecting surface and the bottom surface of the window. The solar energy collector is a major component of a solar water heating system.

10 Claims, 18 Drawing Sheets