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(54) **NEUTRON SCATTER CAMERA FOR IMPROVED NEUTRON DETECTION**

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**Related U.S. Application Data**

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(51) **Int. Cl.**  
**G01T 3/06** (2006.01)

(52) **U.S. Cl.** ..... **250/390.11**

(58) **Field of Classification Search** ..... 250/390.11  
See application file for complete search history.

(56) **References Cited**

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(57) **ABSTRACT**

An instrument that will directly image the fast fission neutrons from a special nuclear material source wherein the neutron detection efficiency is increased has been described. Instead of the previous technique that uses a time-of-flight (TOF) between 2 widely spaced fixed planes of detectors to measure scatter neutron kinetic energy, we now use the recoil proton energy deposited in the second of the 2 scatter planes which can now be repositioned much closer together. Allowing the 2 planes to be placed closer together has been shown to provide up to about a ~170% improvement in detection efficiency without adding additional detectors and ancillary electronics. The distance between planes also may be dynamically changed using a suitable common technique such as a gear- or motor-drive to toggle between the various positions. The angular resolution of this new configuration is diminished but this loss of resolution may be acceptable for those applications where only modest directionality is sufficient to identify a threat.

**13 Claims, 16 Drawing Sheets**

