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**Isono**

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(54) **FRICITION BRAKE DEVICE**  
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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(56) **References Cited**  
U.S. PATENT DOCUMENTS  
2,240,219 A \* 4/1941 Lambert ..... F16D 55/46 188/152  
5,796,192 A 8/1998 Riepl  
5,911,292 A 6/1999 Schade et al.  
6,397,980 B1 \* 6/2002 Johnson ..... F16D 55/10 188/18 A  
(Continued)

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FOREIGN PATENT DOCUMENTS  
JP 52093857 A \* 8/1977  
JP 8-121509 5/1996  
(Continued)  
OTHER PUBLICATIONS  
International Search Report issued Jul. 17, 2012, in PCT/JP2012/059611, filed Apr. 7, 2012.  
(Continued)

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(57) **ABSTRACT**  
A friction brake device has a brake rotor including a disk part and a subsidiary rotor spaced apart from each other along a rotation axis and a cylindrical part integrally connecting their outer peripheral portions, brake pads which are rotatably supported around an autorotation axis parallel to the rotation axis between the disk part and the subsidiary rotor by a stationary member, rotational torque transmission devices which mutually transmit rotational torques between the brake rotor and the brake pads, and pressing devices which are supported between the disk part and the subsidiary rotor by the stationary member and press the brake pads against the disk part and the subsidiary rotor.

(52) **U.S. Cl.**  
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See application file for complete search history.

**11 Claims, 3 Drawing Sheets**

