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(54) Title: DESIGN IMPROVEMENTS FOR FLUX SWITCHING MACHINES

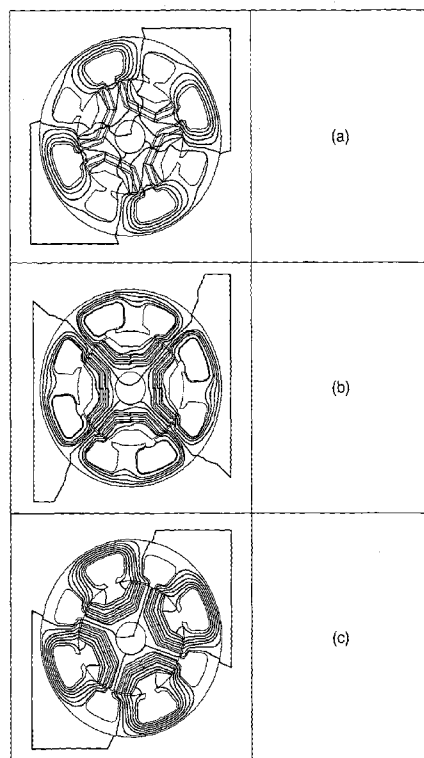


Figure 8

(57) Abstract: Disclosed herein is a design for flux switching machines with one or more armature windings which can deliver controlled torque, in either selected direction on start up, without the use of a mechanical position sensor. Flux switching machines without sensors can operate equally well in either direction. The invention discloses design features for such machines which improves the torque profile of the motor with angle. In three phase machines this delivers higher torque and lower ripple torque. In single phase flux switching machines the invention allows the rotor to be placed in a position where maximum torque can be delivered in either direction by selection of either positive or negative armature current. Rotor slotting is introduced to create a path of low permeability across a rotor tooth with minimal impact on the normal torque producing flux paths. Asymmetry of stator slots is used to further create a stable rotor position when energised by predominantly field means or armature means. Starting of the rotor from this stable position can be achieved in either direction. The method is suitable for starting permanent magnet flux switching motors. The invention results in low cost single phase motors which can start and run in either direction and three phase flux switching motors with improved performance over the prior art.



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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2004 096808 A (AISIN SEIKI) 25 March 2004 (2004-03-25)	11-16
Y	abstract; figures 1,3,4	1-10, 20-24
X	----- WO 2010/015819 A2 (TECHNELEC LTD [GB]; POLLOCK CHARLES [GB]; POLLOCK HELEN [GB]) 11 February 2010 (2010-02-11)	17,19-23
Y	the whole document	1-3, 6-10,18, 20-24
X	----- GB 2 454 171 A (TECHNELEC LTD [GB]) 6 May 2009 (2009-05-06)	1-8, 17-21,23
Y	the whole document	4,5,18
X	----- GB 2 455 122 A (TECHNELEC LTD [GB]) 3 June 2009 (2009-06-03)	17,20-23
A	the whole document -----	6-8



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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2004096808 A	25-03-2004	JP 3991819 B2 JP 2004096808 A	17-10-2007 25-03-2004
WO 2010015819 A2	11-02-2010	CN 102217189 A EP 2321897 A2 GB 2462446 A US 2011181135 A1 WO 2010015819 A2	12-10-2011 18-05-2011 10-02-2010 28-07-2011 11-02-2010
GB 2454171 A	06-05-2009	NONE	
GB 2455122 A	03-06-2009	EP 2232696 A2 GB 2455122 A US 2011037422 A1 WO 2009068889 A2	29-09-2010 03-06-2009 17-02-2011 04-06-2009