



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
23.09.1998 Bulletin 1998/39

(51) Int Cl.⁶: **H01F 27/28, H01F 7/08,
F16K 31/06**

(43) Date of publication A2:
05.08.1998 Bulletin 1998/32

(21) Application number: **98300502.6**

(22) Date of filing: **26.01.1998**

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Kawaguchi, Tomoyoshi**
Tomioka-shi, Gunma-ken (JP)

(74) Representative: **Britter, Keith Palmer**
Britter & Co.
Barn West, The Dixies,
High Street, Ashwell
Baldock Hertfordshire SG7 5NT (GB)

(30) Priority: **28.01.1997 JP 29546/97**

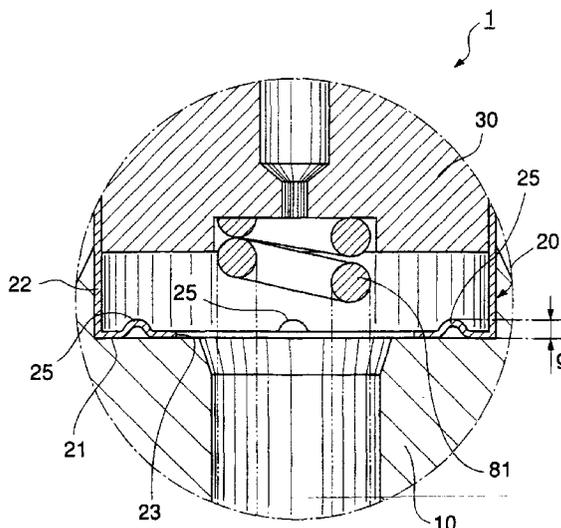
(71) Applicant: **ZEXEL CORPORATION**
Tokyo (JP)

(54) **Solenoid valve**

(57) A solenoid valve (1) comprises a fixed core (10), a bottomed tube (20) formed of a non-magnetic material and having a bottom (21), a movable core (30) slidably received within the bottomed tube (20) and opposed to the fixed core (10) with a gap therebetween, and a solenoid (60) for causing the movable core (30) to operate. The solenoid valve (1) also comprises a protruding portion (25,25') which is formed on the bottom (21) of the bottomed tube (20) and which protrudes in a

direction of sliding of the movable core (30). The protruding portion (25,25') may comprise a plurality of convex-shaped protruding portions (25), a ridge-shaped protruding portion (25,25') extending along a whole circumference of the bottom (21) of the tube (20) or a plurality of ridge-shaped protruding portions (25,25') formed at circumferential equal intervals along a circumference of the tube bottom (21). The or each protruding portion (25,25') has a predetermined height.

FIG.3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 0502

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US 5 593 132 A (HRYTZAK BERNARD J) 14 January 1997 * column 5, line 4 - line 12 * ---	1,2,5	H01F27/28 H01F7/08 F16K31/06
A	US 1 582 986 A (REYROLLE & COMPANY) 4 May 1926 * page 1, line 36 - line 43 * ---	4,6	
A	DE 39 12 719 A (DIESEL KIKI CO) 26 October 1989 ---		
A	DE 28 35 749 A (VOEGELI ERNST F) 22 February 1979 -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01F F16K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 3 August 1998	Examiner Vanhulle, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (F04C01)