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(54) **Ultrasonic surgical system**

(57) An ultrasonic surgical system utilizes a digital control system to generate ultrasonic drive current for transducers (36) that are located in a hand piece (30) and are attached to a surgical scalpel or blade (32) in the hand piece so as to vibrate the blade in response to the current. The digital control includes a digital signal processor (DSP) or microprocessor (60); a direct digital synthesis (DDS) device; a phase detection logic scheme, a control algorithm for seeking and maintaining resonance frequency; and design scheme that allows to regulate current, voltage, and power delivered to an ultrasonic thereby a device. Such system allows the power versus load output curve to be tailored to a specific hand piece, which improves efficiency and reduces

heat. Further, the components of the digital system are much less sensitive to temperature variations, thereby allowing it to operate with narrow as needed frequency range around the desired resonance in order to avoid excitation of other resonances. Also, the digital system provides increased flexibility in locating the resonance frequency of the blade and running diagnostic tests. The start of a user initiated diagnostic test that requires movement of the blade is caused by operating two of the system switches, which guards against accidental operation of the blade which could be harmful if in contact with tissue and also generate false diagnostic results. In addition, the system has interlock with an Electrosurgical unit so that it is not effected by the electromagnetic interference generated by that unit.

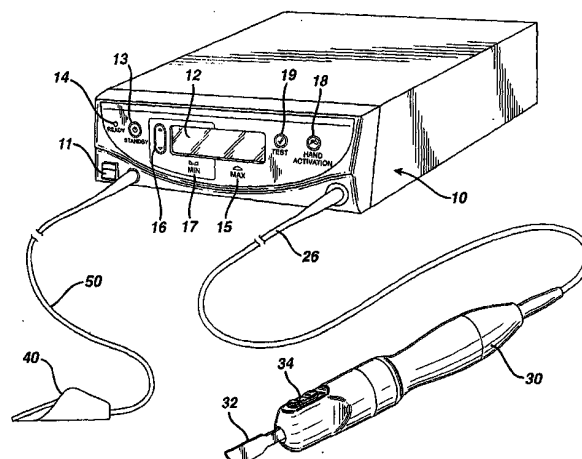


FIG. 1



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 30 8901

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.7)
X	EP 1 025 806 A (ETHICON ENDO SURGERY INC) 9 August 2000 (2000-08-09) * column 3, line 35 - column 5, line 12 * * column 10, line 48 - column 13, line 43 *	1,5,6, 10-13	A61B17/32 B06B1/00
Y	* figures 1,3,4 *	2-4	
Y	US 6 066 135 A (HONDA YOSHITAKA) 23 May 2000 (2000-05-23) * figures 1,12 *	2-4	
A	* column 4, line 3 - column 8, line 33 *	1,10-13	
A	US 5 652 479 A (LOCASCIO JAMES J ET AL) 29 July 1997 (1997-07-29) * claims 1,2 *	3	
A	EP 0 875 301 A (ETHICON ENDO SURGERY INC) 4 November 1998 (1998-11-04) * figures 4,5,10,12 * * column 10, line 44 - column 13, line 6 *	5,6	
A	US 5 451 161 A (SHARP MICHAEL) 19 September 1995 (1995-09-19) * figures 1,2 * * column 5, line 55 - column 6, line 55 * * column 8, line 1 - column 9, line 30 *	2-4	TECHNICAL FIELDS SEARCHED (Int.Cl.7) A61B B06B
A	US 4 879 528 A (GOTANDA MASAKAZU) 7 November 1989 (1989-11-07) * the whole document *	1-6, 10-13	
A	WO 00/51508 A (SOUND SURGICAL TECHNOLOGIES LL) 8 September 2000 (2000-09-08) * the whole document *	1	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 December 2003	Examiner Beck, E
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			

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European Patent
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Application Number

EP 01 30 8901

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-6, 10-13



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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 01 30 8901

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-6,10-13

An ultrasonic surgical system with a controlled power supply

2. claims: 7-9

An ultrasonic surgical system with a power level switch
circuit

3. claim: 14

An ultrasonic surgical system with an electrical
interference detector

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 30 8901

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-12-2003

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专利名称(译)	超声波手术系统		
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[标]申请(专利权)人(译)	伊西康内外科公司		
申请(专利权)人(译)	爱惜康内镜手术，INC.		
当前申请(专利权)人(译)	爱惜康内镜手术，INC.		
[标]发明人	WIENER EITAN T DONOFRIO WILLIAM T		
发明人	WIENER, EITAN T. DONOFRIO, WILLIAM T.		
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CPC分类号	A61B17/320068 A61B2017/00026 A61B2017/00725 A61B2017/320069 A61B2017/320071 A61B2017/320089 B06B1/0253 B06B2201/76		
代理机构(译)	FISHER , ADRIAN JOHN		
优先权	09/693621 2000-10-20 US		
其他公开文献	EP1199047A2 EP1199047B1		
外部链接	Espacenet		

摘要(译)

超声外科手术系统利用数字控制系统产生用于换能器 (36) 的超声驱动电流, 换能器 (36) 位于手持件 (30) 中并且附接到手持件中的外科手术刀或刀片 (32) 以便振动刀片响应当前。数字控制包括数字信号处理器 (DSP) 或微处理器 (60) ;直接数字合成 (DDS) 设备;相位检测逻辑方案, 用于寻找和维持共振频率的控制算法;和设计方案, 允许调节输送到超声波的装置的电流, 电压和功率。这种系统允许功率与负载输出曲线适合于特定的手持件, 这提高了效率并减少了热量。而且, 数字系统的部件对温度变化的敏感性要小得多, 从而允许它在所需谐振周围的所需频率范围窄的情况下工作, 以避免激励其它谐振。此外, 数字系统在定位刀片的共振频率和运行诊断测试方面提供了更大的灵活性。用户启动的需要刀片移动的诊断测试的开始是由操作两个系统开关引起的, 这防止了刀片的意外操作, 如果与组织接触则可能是有害的并且还产生错误的诊断结果。此外, 该系统与Electrosurgical单元互锁, 因此不会受到电磁干扰的影响那个单位。

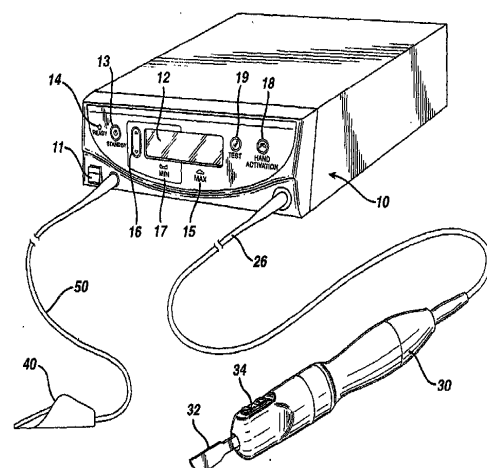


FIG. 1