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(71) Applicant (for all designated States except US): **HYDRO-
CISION INC** [US/US]; 100 Burt Road, Suite G01, An-
dover, MA 01810 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **STAID, Kevin, P.**
[US/US]; 20 Boylston Street, Lowell, MA 01852 (US).
FRASSICA, James [US/US]; 5 Essex Place, Chelmsford,
MA 01824 (US). **DION, Ernest, Allen** [US/US]; 23

Garfield, Avenue, Danvers, MA 01923 (US). **HESKETH,
David, P.** [US/US]; 211 Oakland Avenue, Methuen,
MA 01844 (US). **MERANDA, Joseph, A.** [US/US]; 46
Sherman Avenue, Haverhill, MA 01832 (US).

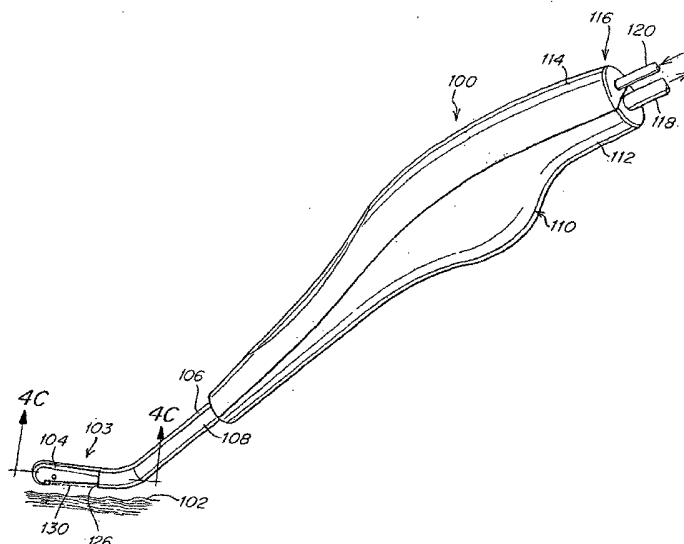
(74) Agent: **WOLF, GREENFIELD & SACKS, P.C.**; 600 At-
lantic Avenue, Boston, MA 02210 (US).

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[Continued on next page]

(54) Title: NOZZLE ASSEMBLIES FOR LIQUID JET SURGICAL INSTRUMENTS AND SURGICAL INSTRUMENTS EM-
PLOYING THE NOZZLE ASSEMBLIES



(57) Abstract: Disclosed are nozzles and nozzle assemblies of liquid jet-forming surgical instruments, surgical instruments (100) employing such nozzles and/or nozzle assemblies, and methods of fabricating the nozzle assemblies in forming surgical instruments. Also, disclosed are liquid jet-forming surgical instruments including both liquid jet-forming nozzles and optional evacuation lumens, which when provided can be configured to receive the liquid jet and evacuate the liquid forming the liquid jet. Certain embodiments of such surgical instruments include inventive nozzle alignment component(s) to facilitate alignment of the nozzles and evacuation lumen upon assembly. In certain embodiments, surgical instruments are provided that include a nozzle that is shaped to form a liquid jet, which has surfaces that are optically smooth.



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INTERNATIONAL SEARCH REPORT

In National Application No
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A. CLASSIFICATION OF SUBJECT MATTER
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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

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 135 977 A (DRASLER WILLIAM J ET AL) 24 October 2000 (2000-10-24) column 5, line 44 - column 6, line 26 column 9, lines 38-48 figure 27	1, 2, 6, 9, 15-21, 26, 27, 86, 89, 111, 113
X	US 5 135 482 A (NERACHER ARNOLD) 4 August 1992 (1992-08-04) column 4, line 26 - column 5, line 1 figures 6-8	1, 3, 4, 30, 31, 33, 38-45, 59, 61, 86, 89, 112

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

16 June 2004

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Schießl, W

INTERNATIONAL SEARCH REPORT

ational application No.
PCT/US2004/002893

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

see annex

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4,6,9,15-21,26,27,30-70,86,89,111-113

2. claims: 5,71-85,115-138

3. claims: 7,10-13,87,90-92,94-104,114

4. claims: 8,14,22-25,88,105-110,139-141

5. claims: 28,29

6. claim: 93

INTERNATIONAL SEARCH REPORT

International Application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6135977 A	24-10-2000	NONE	
US 5135482 A	04-08-1992	CH 667996 A5 CH 670947 A5 AT 62119 T CA 1281968 C DE 3678557 D1 EP 0232678 A2 JP 62170261 A	30-11-1988 31-07-1989 15-04-1991 26-03-1991 08-05-1991 19-08-1987 27-07-1987