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(71) Applicant (for all designated States except US):  
**NANOMUSCLE, INC.** [US/US]; 2545 W. 10th Street,  
Suite A, Antioch, CA 94509 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **MACGREGOR,  
Roderick** [GB/US]; 5402 Piute Court, Antioch, CA 94509  
(US). **SZILAGYI, Andrei** [US/US]; 5341 Blackhawk  
Drive, Danville, CA 94506 (US). **VON BEHRENS, Peter,  
Emery** [US/US]; 4021 Rocky Point Drive, Antioch, CA  
94509 (US).

(74) Agent: **BACKUS, Ken, R.**; Cooley Godward LLP, 3000  
El Camino Real, Five Palo Alto Square, Palo Alto, CA  
94306-2155 (US).

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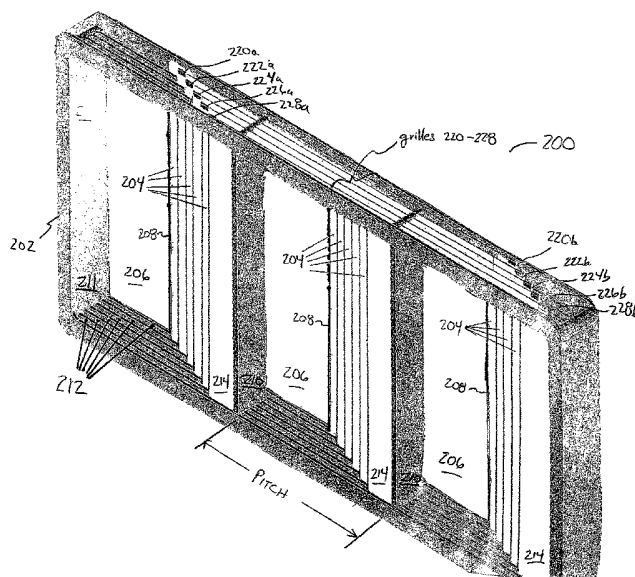
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- with international search report
- before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

[Continued on next page]

(54) Title: FLOW CONTROL ASSEMBLIES HAVING INTEGRALLY FORMED SHAPE MEMORY ALLOY ACTUATORS



(57) Abstract: In one embodiment of the present invention, a shape memory alloy ("SMA")- actuated flow controller comprises a number of grille members, each having a long axis and being slideable relative to one another parallel to that long axis. The SMA-actuated flow controller also includes a frame configured to guide the number of grille members, and an actuator disposed within the frame to move at least one of the number of grille members for varying a size of an aperture. Further, the actuator includes an SMA actuator that includes a number of SMA elements each connecting one grille member to another.



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/13259

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : F16K 11/065

US CL : 137/625.33; 251/11

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)

U.S. : 137/625.33; 251/11

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 practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,054,522 A (KOWANZ et al) 8 October 1991 (08.10.1991), see entire document	1-7, 21-24
Y	US 6,363,183 A (Koh) 26 March 2002 (26.03.2002), column 7, lines 47-65.	1-7, 21-24



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"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

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Facsimile No. (703) 305-3230

Authorized officer

John Fox

Telephone No. 571-272-4395

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/13259

## Box No. 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 No. 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:  
This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

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.: 1-7 and 21-24

Remark on Protest

☐

The additional search fees were accompanied by the applicant's protest.

☐

No protest accompanied the payment of additional search fees.