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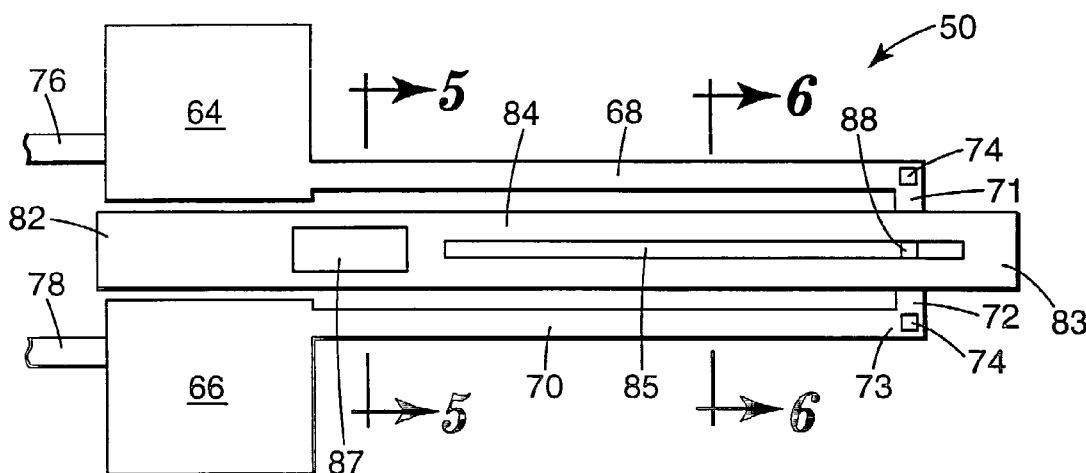
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09/659,798 12 September 2000 (12.09.2000) US</p> <p>(71) Applicant: 3M INNOVATIVE PROPERTIES COMPANY [US/US]; 3M Center, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).</p> <p>(72) Inventors: WEAVER, Billy, L.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). GOETZ, Douglas, P.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). HAGEN, Kathy, L.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). HAMERLY, Michael, E.;</p> | <p>Post Office Box 33427, Saint Paul, MN 55133-3427 (US). SMITH, Robert, G.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US). THEISS, Silva, K.; Post Office Box 33427, Saint Paul, MN 55133-3427 (US).</p> <p>(74) Agents: BARDELL, Scott, A. et al.; Office of Intellectual Property Counsel, Post Office Box 33427, Saint Paul, MN 55133-3427 (US).</p> <p>(81) Designated States (<i>national</i>): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZW.</p> <p>(84) Designated States (<i>regional</i>): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE,</p> |
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(54) Title: DIRECT ACTING VERTICAL THERMAL ACTUATOR WITH CONTROLLED BENDING



(S7) Abstract: A micrometer sized, single-stage, vertical thermal actuator with controlled bending capable of repeatable and rapid movement of a micrometer-sized optical device off the surface of a substrate. The vertical thermal actuator is constructed on a surface of a substrate. At least one hot arm has a first end anchored to the surface and a free end located above the surface. A cold arm has a first end anchored to the surface and a free end. The cold arm is located above the hot arm relative to the surface. The cold arm is adapted to provide controlled bending near the first end thereof. A member mechanically and electrically couples the free ends of the hot and cold arms such that the actuator bends generally at the flexure so that the member moves away from the substrate when current is applied to at least the hot arm.



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