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(54) **MICROMANIFOLD ASSEMBLY**

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(58) **Field of Classification Search** 422/99–100, 422/103–104
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,677,577	A	7/1972	Krauer et al.	285/137
4,089,549	A	5/1978	Vyse et al.	285/137
4,915,419	A	4/1990	Smith, III	285/26
4,995,646	A	2/1991	Johnston et al.	285/137
5,209,525	A	5/1993	Ito	285/137
5,288,113	A	2/1994	Silvis et al.	
5,366,620	A	11/1994	Schick	
5,419,208	A	5/1995	Schick	
5,472,598	A	12/1995	Schick	
5,482,628	A	1/1996	Schick	
5,487,569	A	1/1996	Silvis et al.	
5,494,641	A	2/1996	Krstanovic	
5,525,301	A *	6/1996	Newberg et al.	422/99
5,534,152	A	7/1996	Schick	
5,540,464	A	7/1996	Picha	
5,644,395	A	7/1997	Folta	
5,730,943	A *	3/1998	Ford et al.	422/101
5,736,036	A	4/1998	Upchurch et al.	
5,786,209	A *	7/1998	Newberg	435/309.2
5,846,396	A	12/1998	Zanzucchi et al.	
5,855,229	A	1/1999	Gulf, Jr.	137/884
5,865,474	A	2/1999	Takahashi	285/124.1
5,890,745	A *	4/1999	Kovacs	285/24
5,987,735	A	11/1999	Horning et al.	
5,988,703	A	11/1999	Craig	285/288.1
6,083,763	A	7/2000	Balch	
6,086,825	A	7/2000	Sundberg et al.	
6,090,251	A	7/2000	Sundberg et al.	

(Continued)

OTHER PUBLICATIONS

U.S. Appl. No. 10/350,541, filed Jan. 24, 2003, Renzi.

(Continued)

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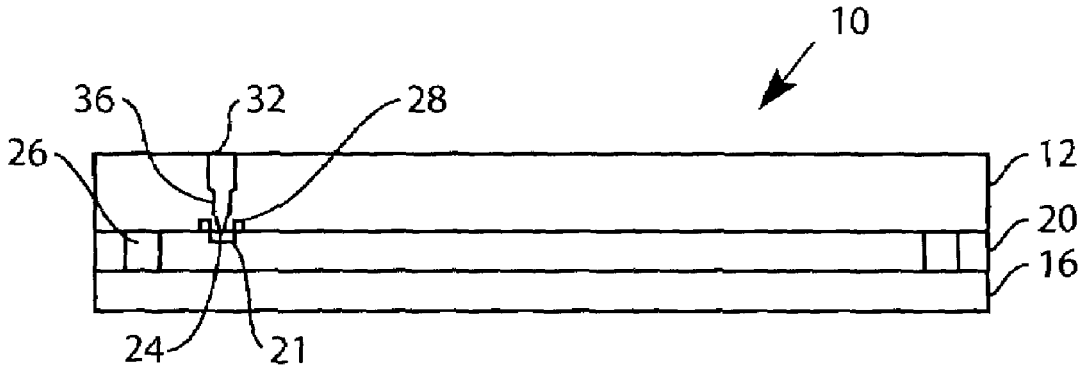
(57) **ABSTRACT**

A micromanifold for connecting external capillaries to the inlet and/or outlet ports of a microfluidic device can employ a ferrule/capillary assembly that includes: (a) a ferrule comprising an elongated member and having a bore traversing from a proximal end to a distal end of the member, wherein the bore has an inner surface and wherein the distal end of the ferrule has a tapered, threaded exterior surface, and (b) a capillary that is positioned within the bore wherein the capillary's outer surface is in direct contact with the bore's inner surface. No mating sleeve is required for the one-piece ferrule. Alternatively, the capillaries can be bonded to channels that traverse the manifold and therefore obviate the need for a ferrule.

9 Claims, 3 Drawing Sheets