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Henoch et al.

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[54] **FLUID CONDUIT**

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[58] **Field of Search** 417/48, 49, 50; 310/11; 244/205; 440/6

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,212,592	7/1980	Olich et al.	417/50
4,687,418	8/1987	Gotou et al.	417/50
4,809,354	2/1989	Kawashima	384/114
4,842,170	6/1989	Vecchio et al.	222/594
4,859,885	8/1989	Kliman et al.	310/11
4,869,647	9/1989	Aoyama et al.	415/50
4,882,514	11/1989	Brynsvold et al.	310/208
5,026,681	6/1991	Hed	505/165
5,273,465	12/1993	Meng	440/6
5,685,698	11/1997	Smoll	417/50
5,923,104	7/1999	Haaland et al.	310/11
5,993,164	11/1999	Diaz	417/50

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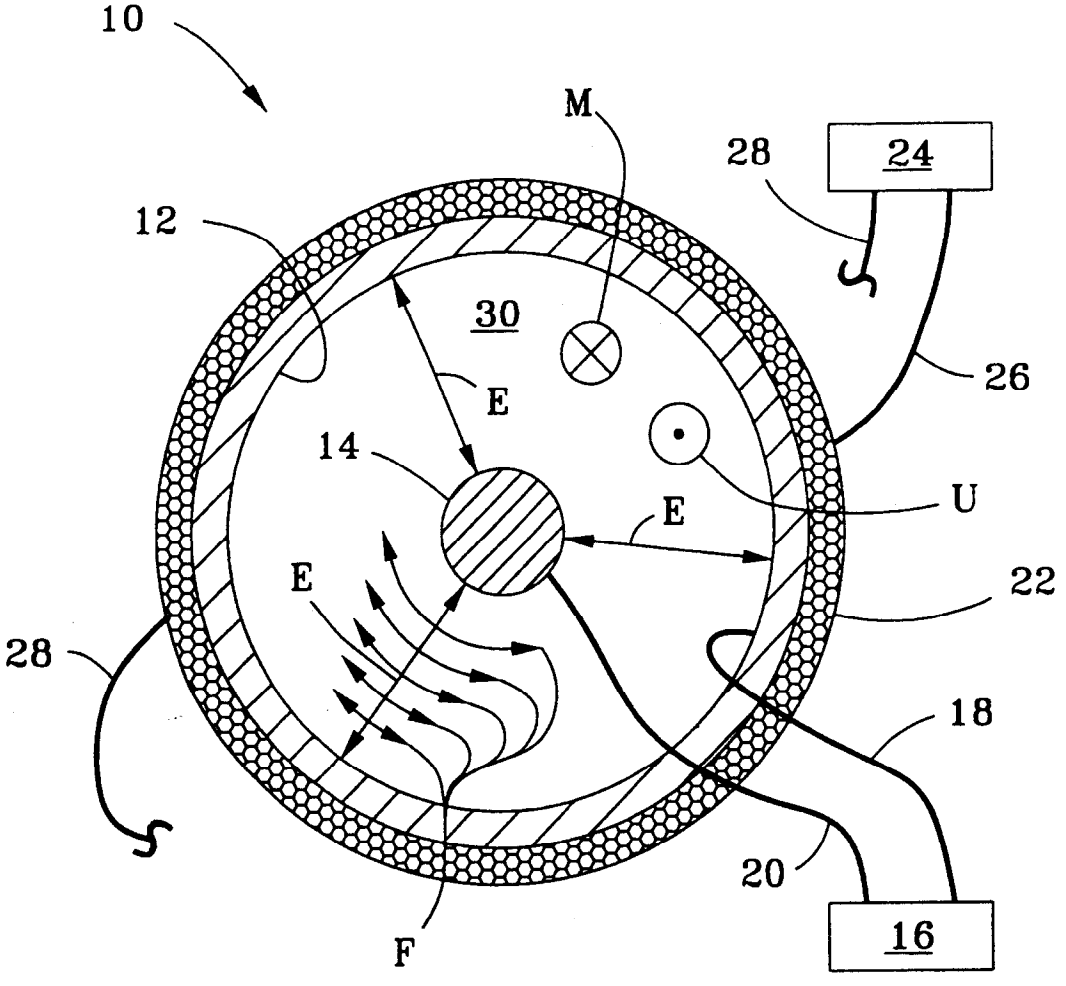
[57] **ABSTRACT**

A fluid conduit for flowing electrically conductive fluids includes an electrically conductive pipe, an electrically conductive rod extending axially through the pipe and centrally thereof, a first power source in electrical communication with the pipe and rod, a solenoidal electromagnet disposed around the pipe and a second power source in electrical communication with the electromagnet. Activation of the first and second power sources creates an electric and a magnetic field, respectively, within the pipe which interact and result in a circumferential force in the flow with consequent reduction in wall friction in the pipe.

10 Claims, 2 Drawing Sheets