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Air Detection through Hydrodynamic Response

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By applying an acoustic signal to a primed fluid injection disposable system and measuring the attenuation of the response it is possible to detect air trapped in the system. Depending upon the design of the system, there will be a significant difference in response between a system completely purged of air and one with air still entrapped. Full characterization of the system should enable accurate detection of even small amounts of air.

SPECIFICATION

This is a novel use for existing hemodynamic measurement technologies. The invention allows detection of trapped air bubbles in medical devices where air may be injurious to the patient, and can also detect air in opaque components and act as a "double check" after visual examination of the system. It is often impossible to see all trapped air in the injection fluid path, either because the bubbles are too small or they are hidden behind features of the system.

This could be an improvement over existing methods of air detection, which require the medical technician to visually confirm air or use fixed air detectors which can see bubbles of a given size as they pass by the detector. The technology could be built in to future generations of vascular injection systems. It could also be used in non-VI products where it is very important that no air be present in the fluid. Current air detectors for VI systems rely on detectors in fixed locations to sense bubbles passing by. The proposed technology would sense air in the entire closed system prior to injection.