Resumo

This work represents the development of a fluidic counter, taking as a starting basis the twisted ring counter prototype already in existence.

First, a general survey of counters is presented and their main features both from a designers and a user's viewpoint are highlighted.

After a brief introduction to fluidics and fluidic elements, a detailed examination of the design alternatives for a fluidic counter is carried out. The twisted ring counter emerges from this analysis as a very attractive alternative, particularly following the disclosure of new methods for decoding, setting and bi-directional operation.

Then the behaviour of the existing prototype is scrutinized. All characteristic curves relevant to a clear understanding of the static conditions are presented. Furthermore the trouble spots at high counting speeds, caused by the dynamic transients, are located.

The study of the dynamics of the existing prototype shows the need for a design method which would not only allow an assessment of the size and shape of the dynamic transients but also indicate how to minimize them. Such a design method is proposed and thoroughly tested; its usefulness is clearly demonstrated by the dramatic improvement in the counting speed of the existing prototype achieved with its applications.

The realization of a new prototype of fluidic twisted ring counter is attempted next. In this context the design of two new momentum interaction gates is presented in detail. An assessment of the performance of this new prototype is made, revealing that it is more efficient and better balanced dynamically than the prototype in existence at the beginning of this work. This performance assessment culminates with some reliability tests which prove the faultless behaviour of the new counter prototype over the whole of its frequency range.

Finally the most important conclusions emerging from this work are draw up together with suggestions for further work.