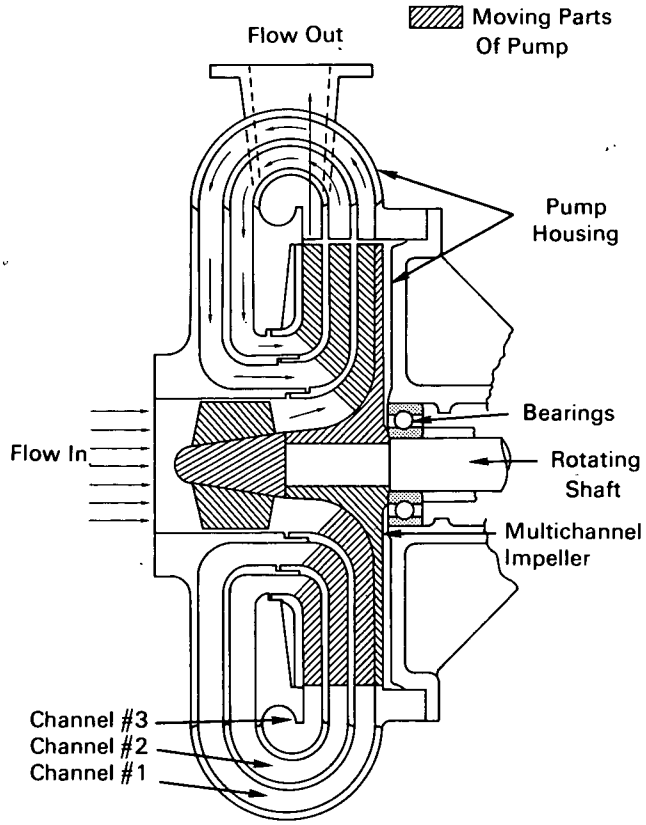
NASA TECH BRIEF

A Concept for Improving Efficiency of Multistage Centrifugal Pumps



The problem:

Energy losses within centrifugal pumps include losses arising from friction of the impeller disks on the fluid circulating in the clearances between the impeller disks and the impeller shrouds. Since these disk friction losses are proportional to the third power of the disk peripheral velocity multiplied by the second power of the disk diameter, they are particularly significant in high-speed and high-discharge pressure pumps. Such pumps usually require several stages, and, in conventional multistage pumps, each impeller contributes to the total disk friction energy loss.

The solution:

A multichannel impeller consisting of successive stage impellers arranged concentrically without clearances between them. The figure illustrates the conceptual design for such a multichannel impeller having three channels, or stages. In this design, the clearance pockets between the disks and shrouds are reduced to two, compared to the six clearance pockets in a conventional three-stage pump. The corresponding reduction in disk friction is predicted to increase the pump efficiency by 5 to 10%.

How it's done:

As illustrated in the figure, several impellers are stacked concentrically and rotate as a single unit. The discharge from the first-stage impeller is directed through a channel in the pump casing to the inlet of the second-stage impeller; the discharge from the second-stage impeller is channelled to the inlet of the third-stage impeller; and the discharge from the last-stage impeller exits from the pump housing.

Notes:

1. This design may be useful in pumps where high discharge pressure or low specific speed is required.
2. This development is a concept only. As of the date of publication of this Tech Brief, neither a model nor prototype has been constructed.
3. Requests for further information may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B70-10287

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: Henry F. Gardy of
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