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CENTRIFUGAL PUMP

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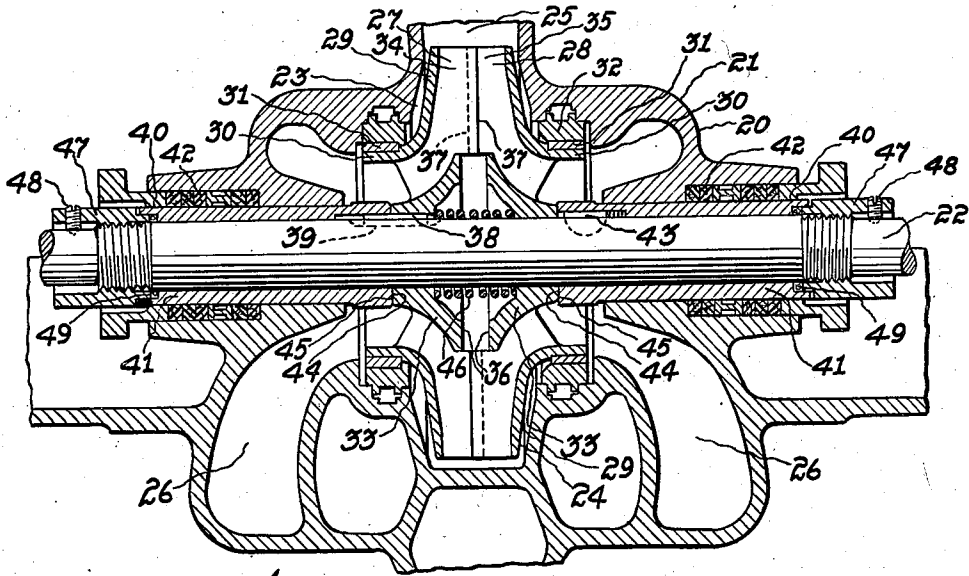


FIG. 1.

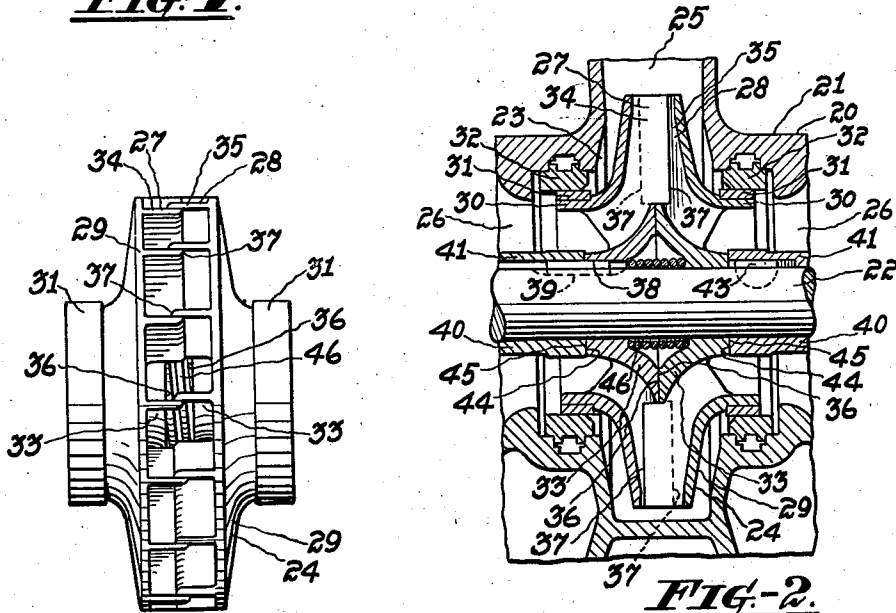


FIG. 2.

FIG. 3.

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UNITED STATES PATENT OFFICE

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CENTRIFUGAL PUMP

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1 Claim. (Cl. 103—97)

This invention relates to pumps, and more particularly to a pump of the centrifugal type.

One object of the invention is to vary the capacity of the pump, and

A more specific object is to vary the effective areas of the blades of the pump impeller in accordance with immediate requirements.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figures 1 and 2 are longitudinal elevations, partly broken away, of a centrifugal pump constructed in accordance with the practice of the invention and showing the impeller sections adjusted to different positions to provide effective blade areas of different proportions, and

Figure 3 is a side elevation of the pump impeller.

Referring more particularly to the drawing, the pump designated, in general, by 20 comprises a casing 21 and a shaft 22 extending horizontally therethrough.

The casing 21 is recessed to provide a pumping chamber 23 for the accommodation of an impeller 24, of the double-suction type, arranged upon the shaft 22. The casing also has a discharge opening 25 for the pumping chamber and inlet channels 26 that lead to the ends of the pumping chamber.

In accordance with the practice of the invention, the impeller 24 consists of two, preferably identical, sections 27—28 that are adjustable relatively to each other endwise of the shaft in order to vary the impelling effect of the impeller and thus the capacity of the pump. Each impeller section comprises a shroud 29 having an integral annular flange 30 that encircles the shaft 22 to receive liquid from the inlet channels 26.

On the peripheral surfaces of the flanges 30 are wearing rings 31 that cooperate with the inner surfaces of rings 32 to limit leakage of liquid from the pumping chamber along the outer surface of the impeller in the direction of the inlet channels.

Each impeller section has a hub 33 of frusto-conical shape connected to the associated shroud 29 by blades 34 and 35 on the opposed surfaces of the sections 27—28, respectively. The opposed surfaces of the flared ends of the hubs 33 constitute seating surfaces 36 that engage each other to limit movement of the impeller sections toward each other.

The seating surfaces 36 lie between the shrouds

and the free radial edges 37 of the blades so that these portions of adjacent blades 34 and 35 may overlap each other in varying degrees, accordingly as the impeller sections are shifted toward or away from each other.

Preferably, only one impeller section, in the present instance that designated 27, is secured against relative rotation upon the shaft, and the hub 33 of said impeller section 27 is accordingly provided with a key slot 38 for slidable engagement with a key 39 seated in the shaft 22. The impeller section 28, on the other hand, may be free to rotate upon the shaft within the limits permitted by the blades 34 of the impeller section 27 and is rotated in unison with the impeller section 27 through the overlapping portions of the blades.

Individual adjusting means 40 for controlling the positions of the impeller sections with respect to each other are disposed upon the shaft 22 and project from the ends of the casing 21 so that they may be readily accessible for adjustment.

In the form shown, each adjusting means 40 comprises a sleeve 41 that is arranged slidably upon the shaft and through a stuffing box 42 in the end of the pump casing. One of the sleeves is also in slidable engagement with the key 39 and the other sleeve is similarly engaged by the key 38 so that the sleeves will rotate with the shaft. The inner ends of the sleeves constitute seating surfaces 44 for the adjacent ends 45 of the hubs 33, said ends being constantly held against the seating surfaces 44 by a spring 46 interposed between the hubs 33 and encircling the shaft 22.

The spring 46 thus also tends to constantly slide the sleeves 41 outwardly along the shaft, and such movement of the impeller sections and the sleeves is limited by collars 47 threadedly connected to the shaft for adjustment longitudinally thereof and having set screws 48 to lock them in fixed position upon the shaft.

A sealing member 49 in the outer end of the sleeve 41 encircles the shaft 22 and is compressed by the collar 47 for preventing leakage of liquid along the surface of the shaft to the exterior of the pump.

In the operation of the device, whenever it is desired to vary the capacity of the pump, the collars 47 are rotated either toward each other or away from each other to decrease or increase the overlapping areas of the blades 34 and 35 and thereby decrease or increase the effective or active area of the impeller blades. Thus, if it be

intended to utilize only a minimum effective area of the blades the collars 47 are screwed inwardly until the surfaces 38 of the impeller hubs are brought into engagement with each other. The pump will then operate at minimum capacity. If, on the other hand, it be desired to increase the capacity of the pump the collars 47 are threaded outwardly to provide the required effective blade area.

The spring 46 will, in the various positions the collars may occupy upon the shaft, maintain the hubs 33 seated firmly against the seating surfaces 45 and the sleeves 41 in the correct position with respect to the collars 47, it being understood that the spring 46 is capable of exerting sufficient force against the impeller sections to move these parts readily along the shaft in the directions of the collars 47. This force will, moreover, be augmented by the pressure of the liquid within the impeller and the impeller sections will, therefore, always be held firmly against

the inner ends of the sleeves 41 under all conditions of operation.

I claim:

A centrifugal pump, comprising a casing, a shaft in the casing, a double suction impeller on the shaft comprising a pair of half-sections having blades on their opposed surfaces in overlapping relation with each other, hubs of frusto-conical shape on the half-sections slidable endwise of the shaft, seating surfaces on the flared ends of the hubs cooperating with each other to limit sliding movement of the half-sections toward each other, sleeves on the shaft adjustable longitudinally of the shaft and relatively to the half-sections and having end portions to serve as abutments for the outer ends of the hubs, and a spring interposed between the inner ends of the hubs for pressing the hubs against the sleeves.

ALEXEY J. STEPANOFF.