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EXTRA CAPACITY DISPLACEMENT PUMP

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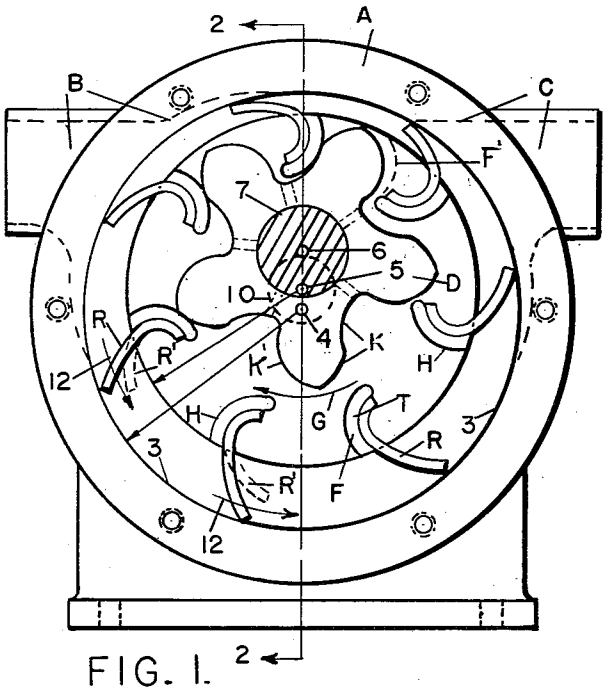


FIG. 1.

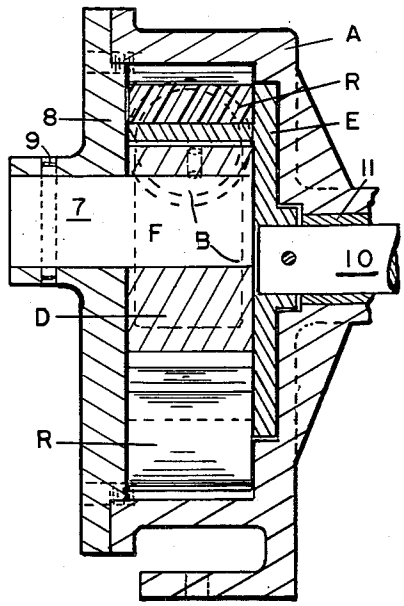


FIG. 2.

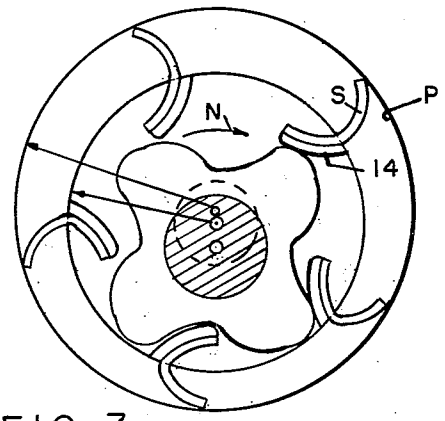


FIG. 3.

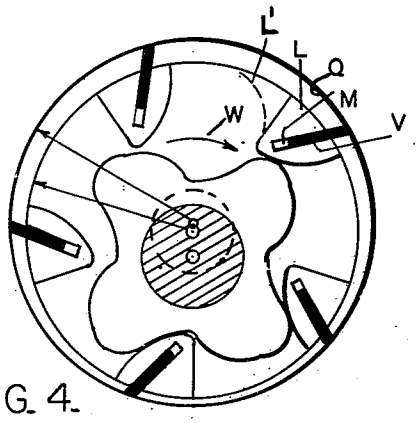


FIG. 4.

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EXTRA CAPACITY DISPLACEMENT PUMP

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10 Claims. (Cl. 103—126)

My invention relates to circulating pumps using internal gears. The driving and driven flanks of the teeth of these gears may be shaped according to the curves in Reissue Patent No. 21,316 when Gerotor curves are used or they may be shaped according to the Rotoid tooth curves in Patent No. 2,666,336.

One of the objects of my invention is to increase the capacity of the circulating pump shown and described in Patent No. 2,696,170 without increasing the size of the gears themselves.

Another object of my invention is to provide means to prevent the creation of excess pressures in the discharge from the pump so that an automobile radiator or the thin tubing used in household water systems will not burst.

Another object of my invention is to provide for a pump having substantially close fits between the gears and the walls on the inside of the pump so that the discharge pressures may be more positively controlled than in Patent No. 2,696,170.

A further object of my invention is to provide a pump having a positive displacement in addition to the water circulated by a pump consisting solely of rubber vanes rotating eccentrically in its pumping cavity.

Fig. 1 is a left hand view of Fig. 2 with the cover removed.

Fig. 2 is a vertical section of Fig. 1 on line 2—2.

Fig. 3 shows a pair of Gerotor gears in a pump cavity similar to Fig. 1.

Fig. 4 shows the same gears as in Fig. 3 with vanes in slots in the teeth.

Fig. 1 shows a pump casing A with a discharge port B and an intake port C, an inner gear D and an outer gear or impeller E with teeth F. The gears rotate in a clockwise direction shown by the arrow G. The teeth F have driving flanks H which maintain continuous fluid tight engagements during the driving range of tooth engagement with the flanks K of the inner or pinion gear D. The opposite flanks K' of the teeth of D are enlarged as described in Patent No. 2,696,170. On the teeth F are shown flexible extensions or blades R which travel around in the bore 3 which is eccentric to the impeller E. The bore E may be centered at 4 and the impeller at 5. The pinion D is centered at 6. These extensions R may be made of rubber or neoprene or other suitable or resilient material.

These extensions R act like the blades or vanes of a centrifugal pump and sweep the fluid from the intake port C around in the casing to the discharge port B and are forced inward towards the top of the pinion teeth at full mesh while the latter are driving fluid out of the spaces between the teeth F into the discharge port B. The impeller E and teeth F and extensions R may all be of the same material. In this case the thickness T of the teeth F may determine their stiffness or rigidity and the thinness of the extensions R may determine their resiliency.

Should the discharge port B be closed or should there

be too much resistance in the piping attached to this port the extensions R will be forced inward to some such position as R' shown in dotted line in Fig. 1. Fluid will then be bypassed to prevent the excess build up of discharge pressure. The arrows 12 indicate this bypassing.

Fig. 3 shows a pair of Gerotors having 4 and 5 teeth shaped according to Patent No. 2,696,170 with the flexible extensions on the teeth 14 of the outer gear. These flexible extensions S travel around in the bore P (similar to the bore 3 in Fig. 1) when the gears rotate in the direction of the arrow N.

In Fig. 4 is shown the same pair of Gerotors as in Fig. 3 but with slots M for the vanes V in the outer gear teeth L. Centrifugal force throws the vanes out against the bore Q and excess pressure will push the vanes inward.

If desired the teeth F in Fig. 1 can be made as thick as the teeth L in Fig. 4 so that slots with vanes can be used with the Rotoids instead of the flexible extensions R. As described in Patent No. 2,696,170 the enlargement K' of the pinion teeth in Fig. 1 and of the Gerotor pinion teeth in Figs. 3 and 4 are limited by the inner ends of the impeller teeth during tooth engagement. These enlargements in turn limit the thickness of the impeller teeth. The maximum thickness of the impeller teeth F in Fig. 1 is indicated by the dotted line F' and in Fig. 4 by the dotted line L' for the teeth L.

I do not limit my invention to the gears shown in the drawings. Other types of internal gears may be used. Internal gears having crescents between the teeth at open mesh may be used. My invention is the addition of flexible extensions or blades on the outside of the outer gear or impeller to increase the pump capacity by their centrifugal action.

What I claim is:

1. In a pumping mechanism, a casing having intake and discharge ports, a bore in said casing, a drive shaft, an impeller having teeth and mounted on said shaft and in said bore, the inner surface of said bore providing substantial clearance around said impeller, a pinion inside of and eccentric to said impeller and mounted on a shaft and bearing supported by said casing, said impeller having more teeth than said pinion, blades extending outward beyond said teeth of said impeller to maintain contact with the inner surface of said bore during normal operation and capable of moving inward away from said inner surface to prevent excess pressure in said discharge port, spaces between the teeth of said impeller to permit a substantial radial flow of fluid, the teeth of said impeller and said pinion cooperating to act as displacement members and said blades acting as centrifugal members.

2. The combination according to claim 1 having a difference of 1 tooth in the numbers of teeth of said gears.

3. The combination claimed in claim 1 having a difference of more than one tooth in the numbers of teeth in said gears.

4. The combination according to claim 1 having a difference of one tooth in the numbers of teeth of said gears and having said blades flexible.

5. A rotary fluid mechanism comprising a casing, an intake passage and a discharge passage in said casing, a drive shaft, an impeller having teeth and mounted on said shaft and in said casing, a pinion gear in said casing within and eccentric to said impeller, a shaft and bearing for said pinion gear supported by said casing, said pinion gear having teeth, each of which has an enlarged portion on one side face relative to the other side face, said enlarged portions of the teeth of said pinion gear each being limited in size and shape to pass the inner ends of the teeth of said impeller during tooth engage-

ment, one face of the teeth of said impeller maintaining continuous fluid tight engagement at steady angular speeds with contours on said other face of said teeth of said pinion gear, the thickness of the teeth of said impeller in cross section relative to a plane at right angles to the axis of rotation being limited by and shaped to clear said enlarged portions of said pinion teeth during tooth engagement, and having the bore in said casing around said impeller eccentric to the center of said impeller, said impeller having blades extending outside of its teeth against said bore, said bore allowing the outer ends of said blades to move outward relative to its center while receiving fluid and causing said outer ends to move inward while discharging fluid, and openings for a substantial radial flow of fluid in and out between the teeth of said impeller and having all of said teeth of said impeller and said pinion gear cooperating to act as displacement members and said blades acting as centrifugal members to prevent excess pressures in said discharge passage.

6. The combination according to claim 5 having said blades of said impeller sufficiently resilient to further prevent excess discharge pressures.

7. The combination according to claim 5 said pinion gear having one less tooth than said impeller.

8. The combination according to claim 5 having slots in the teeth of said impeller and having said blades capable of moving substantially radially inward and outward in said slots.

9. The combination claimed in claim 5, and said impeller having at least two teeth more than said pinion gear.

10. In a pumping mechanism, a casing having intake and discharge ports, a bore in said casing, a drive shaft, an impeller having teeth and mounted on said shaft and in said bore, the inner surface of said bore providing substantial clearance around said impeller, a pinion inside of and eccentric to said impeller and mounted on a shaft and bearing supported by said casing, said impeller having more teeth than said pinion, blades extending outward beyond said teeth of said impeller to maintain contact with the inner surface of said bore during normal operation and capable of moving inward away from said inner surface to prevent excess pressure in said discharge port, spaces between the teeth of said impeller to permit a substantial radial flow of fluid, the teeth of said impeller and said pinion cooperating to act as displacement members and said blades acting as centrifugal members, said bore being eccentric to said impeller.

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