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W. J. WOODS

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IMPELLER

Filed Feb. 7, 1933

Fig. 1.

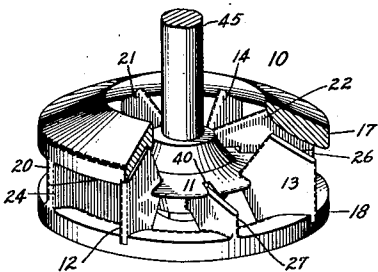


Fig. 2.

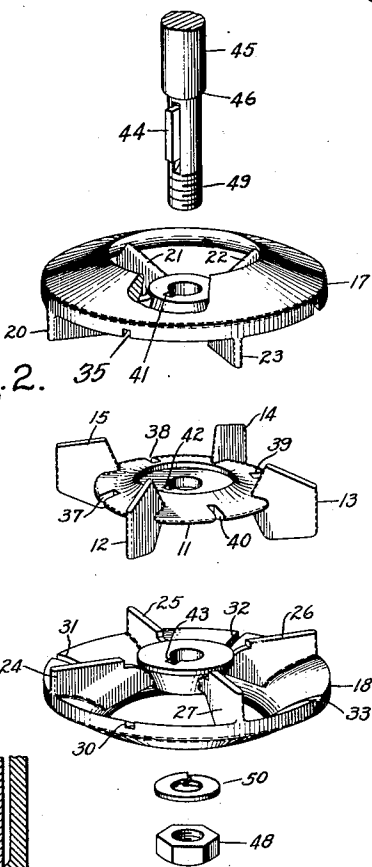
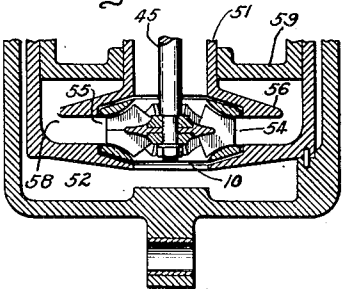


Fig. 3.



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IMPELLER

Application filed February 7, 1933. Serial No. 655,602.

My invention relates to electro-hydraulic operators, more particularly to the construction of an impeller for the hydraulic operator, and has for an object the provision of an efficient impeller of inexpensive and sturdy construction.

Heretofore, impellers have been constructed by casting, a plurality of sand cores being necessary for the casting operation. Impellers of this type have been satisfactory for the larger sizes of hydraulic operators but for the smaller sizes the friction of the operating fluid against the relatively rough surfaces of the impeller is disproportionately large. For the best results, therefore, it is preferable to construct the impeller by die casting, the die casting method providing a smooth surface and, therefore, a minimum amount of friction. However, it is very difficult, if not impossible, to die cast the impeller as a unitary structure because of the difficulty in draining the cores.

In carrying out the present invention in one form thereof, I provide for the die casting of component parts of the impeller and assemble the parts together so as to provide a very sturdy and rigid construction. More specifically, a number of the impeller vanes are formed integrally with a center member, and two end members are provided with a plurality of vanes so that the vanes on the end members align themselves with each other when the end members are assembled together on opposite sides of the center member.

For a more complete understanding of my invention, reference should now be had to the drawing wherein I have shown in Fig. 1 an impeller constructed in accordance with the present invention; Fig. 2 is an exploded view of Fig. 1 showing how the impeller is constructed and how it can be assembled together, while Fig. 3 is a fragmentary sectional view showing the impeller of Fig. 1 as applied to the hydraulic operator.

Referring now to the drawing, I have shown my invention in one form as applied to an impeller 10 designed for use with hydraulic operators. It will be observed that the impeller 10 consists of a center member

11 to which are integrally secured the vanes 12 to 15, inclusive. Arranged on opposite sides of the center member 11 are the end members or shrouds 17 and 18. A plurality of vanes 20 to 23, inclusive, are formed integrally with the shroud 17. Similarly, the vanes 24 to 27, inclusive, are formed integrally with the shroud 18. The vanes on the respective shrouds are of substantially one half the height of the vanes on the center member 11. When the impeller is assembled, however, the vanes on the respective shrouds are in alignment one with the other. In order to provide for the maximum strength and rigidity, the lower edges of the vanes 12 to 15, inclusive, on the center member 11 are fitted tightly in the slots 30 to 33, inclusive, provided in the lower shroud 18, the upper edges of the vanes being fitted tightly in similar slots provided in the upper shroud 17. Thus, for example, when the impeller is in the assembled position shown in Fig. 1, the vane 12 of the center member 11 rests in a slot 30 of the shroud 18 and in the slot 35 of the shroud 17.

For the purpose of further increasing the sturdiness of the impeller, slots 37 to 40, inclusive, are provided in the center member 11 for the reception of the vanes carried by the shrouds 17 and 18. Thus, for example, it will be seen that the vane 27 in the shroud 18 extends into approximately half of the slot 40 whilst the corresponding vane 23 of the shroud 17 occupies the other half of the slot. By interlocking the respective vanes in this manner the impeller is very strong and the likelihood of failure of any part is diminished to a negligible degree. Furthermore, by this construction each part may be die cast and by die casting the parts the cost of the impeller is decreased and smooth surfaces are assured throughout so that the liquid friction losses are reduced to a minimum.

It will further be observed that the hub portions of the center member 11 and of the shrouds 17 and 18 are provided with the respective slots 42, 41 and 43 for the reception of a key 44 carried by the driving shaft 45. The torque applied by the driving shaft

45 is, therefore, applied equally to the component parts of the impeller. The shroud 17 abuts against a shoulder 46 provided on the driving shaft. With the impeller in the assembled relation a nut 48 is secured upon the end 49 of the driving shaft against a lock washer 50 to hold the impeller in the assembled relation.

In Fig. 3 I have shown my invention as applied to a hydraulic operator of the type described and claimed in my copending application Serial No. 485,474, filed September 30, 1930, entitled Hydraulic operator and assigned to the same assignee as the present invention.

It will be observed that the impeller 10 is arranged to receive the operating fluid from the oil supply tube 51 and from the chamber 52. By the action of the vanes the liquid is discharged from the nozzle portions 54 and 55 formed by the shrouds. The flared ends 56 of the tube 51 provide smooth passageways such as 58 for the flow of the operating fluid in a radial direction and this radial flow creates a pressure differential between opposite sides of a piston 59. This pressure differential causes the piston to be moved upwardly.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An impeller comprising a center member having a hub and vanes formed integrally therewith, end members each provided with a hub having vanes formed integrally therewith, said vanes being of lesser height than the vanes of the center member,

and means for mounting said end members on opposite sides of said center member so that the vanes carried by said end members are complementary to each other.

2. A rotary impeller provided with a plurality of vanes, comprising three axially disposed die cast members, the two end members being provided with vanes complementary to each other, and the center member being provided with vanes interposed between and alternating with said complementary vanes provided on said end members.

3. An impeller comprising a center member, a plurality of vanes formed integrally with said center member, a pair of shrouds, a plurality of vanes formed integrally with said respective shrouds, each of said shrouds being provided with slots intermediate their respective vanes for the reception of each of the vanes provided on said center member, the said center member being provided with a plurality of slots for the reception of said vanes carried by said shrouds so that said vanes are interlocked with said center member and said shrouds when in the assembled relation.

4. An impeller formed by die casting, comprising a center member having a plurality of vanes formed integrally therewith, a pair of shrouds each being provided with a hub and a plurality of vanes formed integrally between said shrouds and said hubs, said shrouds being provided with slots intermediate the vanes for the reception of the vanes of said center member, the said center member being provided with slots for the reception of the vanes of said shrouds so that the vanes of said center member occupy the slots provided on said respective shrouds, said slots on said center member providing for the reception of the vanes of said shrouds, said vanes on said shrouds being complementary to each other.

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