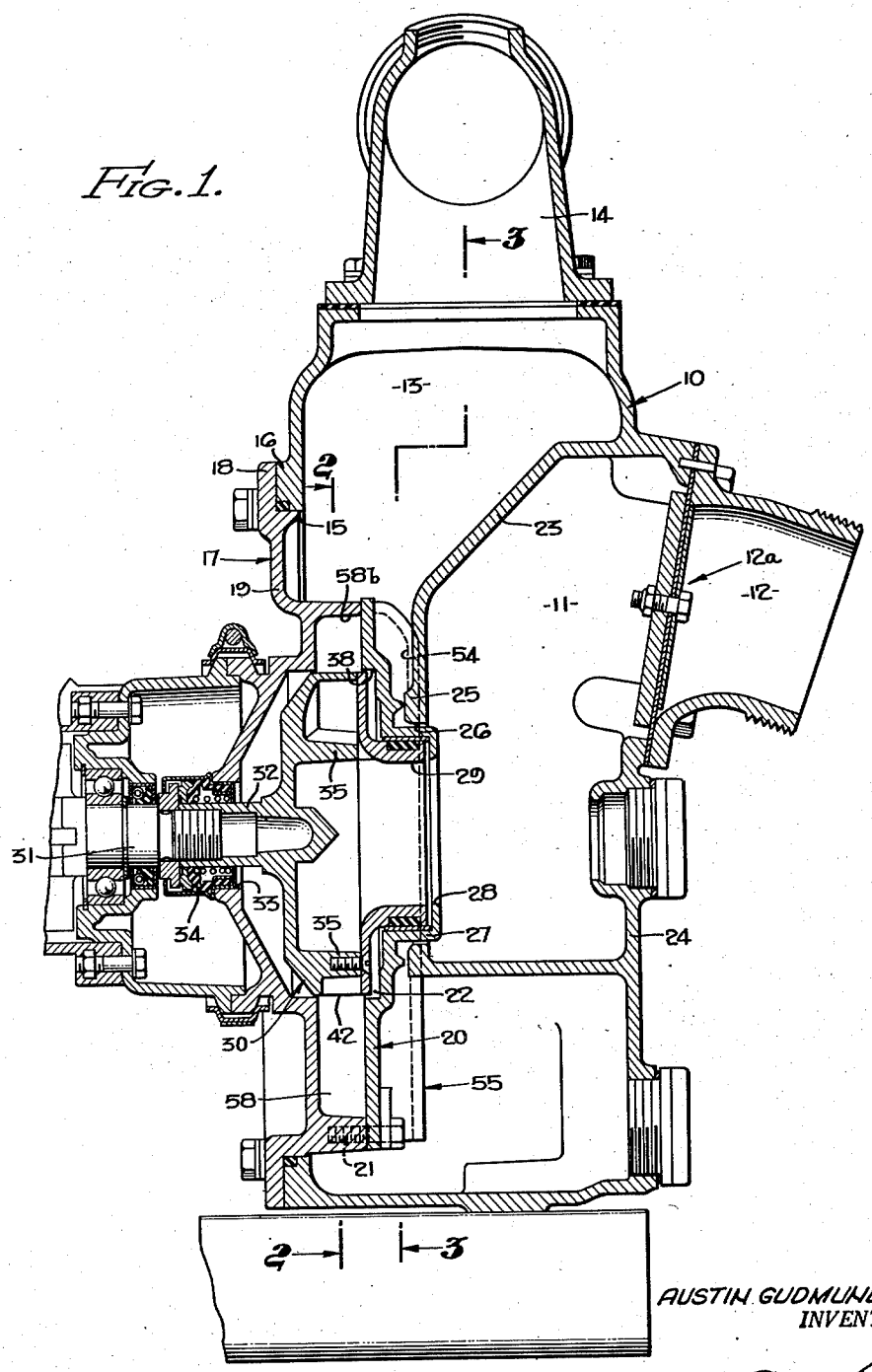
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PUMPING DEVICE

Filed March 3, 1953 2 Sheets-Sheet 1

FIG. 1.



AUSTIN GUDMUNDSEN,
INVENTOR.

BY

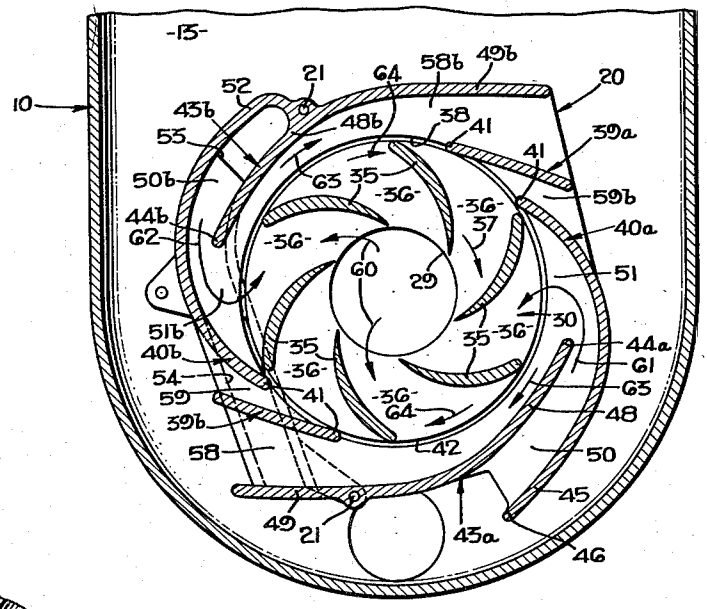
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PUMPING DEVICE

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FIG. 2.



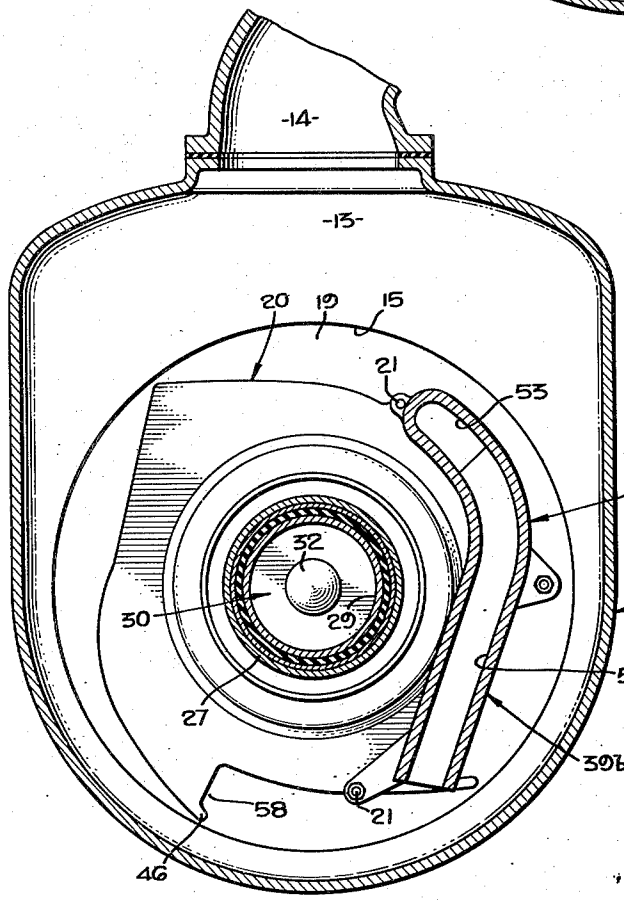


FIG. 3.

AUSTIN GUDMUNDSEN,
INVENTOR.

BY

ATTORNEY

United States Patent Office 2,792,787 Patented May 21, 1957

2,792,787

PUMPING DEVICE

Austin Gudmundsen, Inglewood, Calif., assignor to McCulloch Motors Corporation, Los Angeles, Calif., a corporation of Wisconsin

Application March 3, 1953, Serial No. 340,110

8 Claims. (Cl. 103—113)

This invention relates to centrifugal pumps for the pumping of liquids and relates in particular to improvements in self-priming pumps.

It is an object of the invention to provide a centrifugal pump for liquids having cooperating parts arranged to efficiently perform the priming operation of the pump by removing the air from the pump inlet and the suction duct member connected thereto so that the liquid to be pumped will be drawn by suction through the inlet passage of the pump to the eye of the impeller walls and vanes defining passages communicating the impeller chamber with the outlet chamber of the pump.

It is a further object of the invention to provide a pump body having an impeller chamber with an impeller operating therein, walls forming a priming liquid inlet communicating with the periphery of the impeller chamber and a plurality of stripper vanes following the priming liquid inlet, arranged to strip off and deliver into the outlet chamber of the pump water and entrained air, thereby producing a suction action which will draw air from the inlet passage of the pump through the eye of the impeller.

It is an object of the invention to provide a pump for liquids having a priming liquid inlet port arranged to communicate with the upper portion of the impeller chamber and having a passage connecting it to the lower portion of the outlet chamber of the pump so that liquid relatively free from air bubbles will be delivered into the impeller chamber during the priming operation of the pump.

It is an object of the invention to provide a pump for liquids having primary and secondary stripper vanes arranged around the impeller chamber and defining passages connecting the impeller chamber with the outlet chamber of the pump, there being auxiliary vanes disposed in following relation to the secondary stripper vanes so as to form upper and lower priming liquid inlet passages to connect the outlet chamber with the periphery of the impeller chamber, those auxiliary vanes having their inner ends spaced outwardly from the periphery of the impeller which operates in the impeller chamber so as to leave a space or intercommunicating passage between the inner end of each priming liquid inlet passage and the inner end of the succeeding stripper passage of the pump.

It is an object of the invention to provide a pump for liquids having stripper vanes forming passages for delivery from the impeller chamber to the outlet chamber of the pump and having an auxiliary vane forming a priming liquid inlet passage, the inner end of the auxiliary vane being spaced from the periphery of the impeller so that it will not perform a stripping function during the priming operation of the pump.

Further objects and advantages of the invention may be brought out in the following part of the specification wherein I have described small details of construction for the purpose of making a relatively complete disclosure, without limiting the scope of the invention set forth in the accompanying claims.

Referring to the accompanying drawings which are for illustrative purposes only:

Fig. 1 is a cross-sectional view of the preferred embodiment of the pump showing the inlet impeller and outlet chambers of the pump and the impeller;

Fig. 2 is an enlarged fragmentary sectional view taken as indicated by the line 2—2 of Fig. 1; and

Fig. 3 is a cross sectional view taken as indicated by the line 3—3 of Fig. 1 to show the inner face of the pump assembly which is inserted in the pump housing.

As shown in Fig. 1, the pump has a housing **10** defining an inlet chamber or passage **11** with an inlet port **12**, and an outlet chamber **13** having a discharge port **14** at the top thereof and an opening **15** in its side wall **16** arranged to receive a pump assembly **17** provided with an annular flange **18** whereby it may be bolted in place so as to close the opening **15**. The pump assembly **17** comprises an outer plate **19** and an inner plate **20** which are secured together by screws **21**. These plates are cooperatively formed so that they will form between them an impeller chamber **22** and passage means, to be later described in detail, which connect the impeller chamber with the adjacent portions of the outlet chamber.

The inlet chamber **11** is formed by a hollow wall **23** which projects inwardly from the right side wall **24** of the housing **10**. The wall **23** of the inlet chamber **11** has an annular wall **25** defining an opening **26** through which a tubular projection **27** projects from the plate **20**, this tubular projection having a concentric opening **28** through which water may pass from the chamber **11** to the inlet or eye of an impeller **30** which is supported for rotation in the impeller chamber **22** by a shaft **31** which projects leftwardly from a hub **32** which extends from the body of the impeller **30** through an opening **33** in the outer plate **19**. The impeller **30** rotates in a plane which is at a relatively large angle to horizontal, and is ordinarily vertical for the reason that in the general use of the device the axis of the shaft **31** is horizontal. A high pressure seal **34** is disposed in the opening **33** around the hub **32** to prevent escape of liquid from the impeller chamber **23** through the opening **33**. A flapper check valve **12***a* is disposed so as to close the inlet port **12** of the inlet chamber **11**.

As shown in Fig. 2, the impeller **30** has a plurality of vanes **35** defining impeller passages **36** extending outwardly from the eye **29** of the impeller. The impeller **30** is adapted to be driven in the forward direction indicated by arrow **37**. Around the periphery **38** of the impeller chamber **22** there are a plurality of stripper vanes referred to respectively as primary stripper vanes **39***a* and **39***b* and secondary stripper vanes **40***a* and **40***b*, these vanes having the inner portions thereof spiraling outwardly and having their inner ends **41** close to the periphery **42** of the impeller **30**. In following relation to the secondary stripper vane **40***a* there is an auxiliary vane **43***a*, having its inner end **44***a* spaced outwardly from the periphery **42** of the impeller **30** a distance considerably greater than the distance between the inner ends **41** of the stripper vanes and the periphery **42** of the impeller.

The secondary stripper vane **40***a* extends rightwardly and downwardly and then curves leftwardly at **45**, and its lower end **46** is terminated close to the bottom wall **47** of the outlet chamber **13**. The auxiliary vane **43***a* has a rightward portion **48** which lies substantially parallel to the circular peripheral wall **38** of the impeller chamber **22**, and a leftward portion **49** which diverges from the periphery **38** of the impeller chamber, and also lies in diverging relation to the primary stripper vane **39***b*. The secondary stripper vane **40***a* and the auxiliary vane **43***a* constitute walls of the pump structure defining a priming liquid inlet passage **50** which connects the lower portion

of the outlet chamber **31** with a primary water inlet port **51** communicating with the leftward side of the impeller chamber **22**.

On the lefthand side of the impeller chamber **22** an auxiliary vane **43***b* is disposed in following relation to the secondary vane **40***b*. The inner end **44***b* of the vane **43***b* is spaced from the secondary small vane **40***b* and is also spaced outwardly from the periphery **38** of the impeller **30** a distance considerably greater than the distance between the inner ends **41** of the stripper blades from the periphery **38** of the impeller **30**. The auxiliary vane **43***b* has an inner portion **48***b* which curves upwardly and rightwardly from the inner end **44***b* in nearly parallel relation to the periphery **38** of the impeller chamber **22** and an outer portion **49***b* which diverges rightwardly away from the periphery of the impeller chamber and also extends in diverging relation to the primary stripper vane **39***a*. The secondary vane **40***b* cooperates with the auxiliary vane **43***b* to form a priming liquid inlet port **51***b* and a passage **50***b*. The upper end **52** of the secondary vane **40***b* joins the auxiliary vane **43***b* at a point spaced from its inner end **44***b*. At the upper end of the passage **50***b* there is an opening **53** through the wall of the inner plate **20**, and a passage **54**, extending downwardly from the opening **53** to a point near the bottom of the outlet chamber **13**, is provided by a channel shaped casting **55** bolted onto the inner face of the inner plate **20**. The lower inlet ends of the passages **50** and **54** are disposed relatively close to the bottom wall **47** of the outlet chamber **13** so that the priming liquid which is drawn through the ports **51** and **51***b* into the impeller will be substantially free from air bubbles.

Prior to the starting of the operation of the pump, a body of liquid is placed in, or exists in, the chambers **11** and **13**, the upper level of this body of priming liquid being at or above the upper margin of the eye **29** of the impeller **30**. Rotation of the impeller **30** in its forward or clockwise direction will cause discharge of water from the passages **36** of the impeller outwardly into the outlet chamber **13** through passages **58** and **59** formed between vanes **43***a*, **39***b* and **40***b* and through passages **58***b* and **59***b* formed between the vanes **43***b*, **39***a* and **40***a*. Thereafter, air now in the impeller passages **36** will be violently intermixed with water which surges from the priming liquid inlet passages **50** and **50***b* through the ports **51** and **51***b* into the outer ends of the impeller passages **36** as indicated by arrows **61** and **62**. The mixture of air and liquid will be dragged by the impeller vanes **35** into the passages between vanes **43***a* and the impeller as indicated by arrows **63**. As the froth, consisting of water and entrained air rapidly rotating in small vortices, is carried further along by the impeller as indicated by arrows **64**, it is stripped off by the primary stripper vanes **39***a* and **39***b* and the secondary stripper vanes **40***a* and **40***b*, and the water and entrained air pass out into the outlet chamber **13** through the passages **58**, **58***b*, **59** and **59***b*. This air evacuating effect continues until liquid is pulled through the inlet chamber **11** into the eye **29** of the impeller **30**, whereupon continued rotation of the impeller **30** will act to pump the liquid.

I claim:

1. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of outwardly and forwardly spiraled primary and secondary stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; at least a pair of auxiliary vanes, each of which is disposed in following relation to one of said secondary stripper vanes so as to form upper and lower priming liquid inlet passages to connect said outlet chamber with the periphery of said impeller chamber, the inner ends of said auxiliary vanes being spaced outwardly from the periphery of said impeller so as to leave, between said auxiliary vanes and the periphery of said impeller, spaces which are wider than the spaces between the ends of said stripper vanes and the periphery of said impeller; and wall means forming a passage extending downward from the inlet of the upper priming passage and connecting it with the lower portion of said outlet chamber.

2. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; at least a pair of auxiliary vanes, one of said auxiliary vanes being disposed in following relation to one of said stripper vanes on one side of said impeller chamber and another of said auxiliary vanes being disposed in following relation to one of said stripper vanes on the opposite side of said impeller, so as to form upper and lower priming liquid inlet passages to connect said outlet chamber with the periphery of said impeller chamber, the inner ends of said auxiliary vanes being spaced outwardly from the periphery of said impeller so as to leave, between said auxiliary vanes and the periphery of said impeller, spaces which are wider than the spaces between the ends of said stripper vanes and the periphery of said impeller; and wall means forming a passage extending downward from the inlet of the upper priming passage and connecting it with the lower portion of said outlet chamber.

3. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of outwardly and forwardly spiraled primary and secondary stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; at least a pair of auxiliary vanes, each of which is disposed in following relation to one of said secondary stripper vanes so as to form upper and lower priming liquid inlet passages to connect said outlet chamber with the periphery of said impeller chamber; and wall means forming a passage extending downward from the inlet of the upper priming passage and connecting it with the lower portion of said outlet chamber.

4. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; at least a pair of auxiliary vanes, one of said auxiliary vanes being disposed in following relation to one of said stripper vanes on one side of said impeller chamber and another of said auxiliary vanes being disposed in following relation to one of said stripper vanes on the opposite side of said impeller, so as to form upper and lower priming liquid inlet passages to connect said outlet chamber with the periphery of said impeller chamber; and wall means forming a passage extending downward from the inlet of the upper priming passage and connecting it with the lower portion of said outlet chamber.

5. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of outwardly and forwardly spiraled primary and secondary stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; and at least a pair of auxiliary vanes, each of which is disposed in following relation to one of said secondary stripper vanes so as to form upper and lower priming liquid inlet passages to connect said outlet chamber with the periphery of said impeller chamber, the inner ends of said auxiliary vanes being substantially parallel to and spaced outwardly from the periphery of said impeller so as to leave, between said auxiliary vanes and the periphery of said impeller, spaces which are wider than the spaces between the ends of said stripper vanes and the periphery of said impeller the outer ends of said auxiliary vanes diverging from the periphery of said impeller chamber.

6. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; an auxiliary vane in following relation to one of said stripper vanes so as to form above the horizontal center line of said impeller chamber a priming liquid inlet passage connecting said outlet chamber with the periphery of said impeller chamber, the inner end of said auxiliary vane being spaced outwardly from the periphery of said impeller so as to leave a space between said auxiliary vane and the periphery of said impeller, which space is wider than the spaces between the ends of said stripper vanes and the periphery of said impeller; and wall means forming a passage extending downwardly from the inlet opening of said priming liquid inlet passage to the lower portion of said outlet chamber so that the priming liquid drawn therethrough will be substantially free of air bubbles.

7. In a self-priming centrifgual pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; walls defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; a plurality of stripper vanes disposed with their inner ends positioned close to the periphery of the impeller and defining discharge passages connecting the impeller chamber with said outlet chamber; an auxiliary vane in following relation to one of said stripper vanes so as to form above the horizontal center line of said impeller chamber a priming liquid inlet passage connecting said outlet chamber with the periphery of said impeller chamber the inner end of said auxiliary vane being arranged approximately parallel to the periphery of said impeller chamber and the outer portion of said auxiliary vane diverging from the periphery of said impeller chamber; and wall means forming a passage connecting said priming liquid inlet passage with the outlet chamber at a point below said horizontal center line.

8. In a self-priming centrifugal pump: a rotary impeller; means for supporting said impeller for rotation in a plane disposed at an angle to horizontal; wall defining an impeller chamber receiving said impeller, an inlet passage communicating with the eye of the impeller and an outlet chamber adjacent said impeller chamber; walls forming a priming liquid inlet port communicating with the upper portion of the periphery of said impeller chamber and a duct extending downward from said port and connecting it with said outlet chamber at a point below the level of the body of water existing in said outlet chamber when the pump is idle; and a plurality of stripper vanes directly following said port and forming passages connecting said impeller chamber with said outlet chamber.

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