

Expert Declaration Of Eric S. Winkel, Ph.D., P.E. In Support Of Petitioner's Response to Motion to Amend - Case IPR2023-01161

Bazooka Farmstar, LLC v. Nuhn Industries, Ltd.

ESi Matter No: 97175

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

BAZOOKA-FARMSTAR, LLC

Petitioner,

- vs. -

NUHN INDUSTRIES LTD.,

Patent Owner.

Case No: IPR2023-001161

U.S. Patent No. 11,358,425

EXPERT DECLARATION OF ERIC S. WINKEL, PH.D., P.E.
IN SUPPORT OF PETITIONER'S OPPOSITION TO THE MOTION TO
AMEND IN *INTER PARTES* REVIEW OF U.S. PATENT NO. 11,358,425

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TABLE OF ABBREVIATIONS

Abbreviation	Definition
Bazooka or Petitioner	Bazooka-Farmstar, LLC
Bennett	U.S. Patent Application Publication No. 2014/0288763
Bennett-II	U.S. Patent Application Publication No. 2021/0331752
Bradley	Great Britain Patent No. 2,366,218
Bryham	U.S. Patent No. 7,314,395
Carrier	U.S. Patent Application Publication No. 2012/0185129
Carrier-II	U.S. Patent No. 7,478,817
Challenged Claims	Claims 1-21 of U.S. Patent No. 11,358,425
CRU	The USPTO's Central Reexamination Unit
IPR	<i>Inter Partes</i> Review
Lyseng	Ron Lyseng, <i>Float your boat in a slurry moat</i> , The Western Producer (August 29, 2013).
Melnikov	Russian Patent Application No. 2012137830/11 (EX1024-EX1025)
Manure Manager	MANURE MANAGER, Jan./Feb. 2011 (EX1088)
Manure Manager II	MANURE MANAGER, July/Aug. 2011 (EX1089)

Abbreviation	Definition
Nuhn Pump	Patent Owner's pump disclosed in Manure Manager (EX1089, 27).
Patent Owner	Nuhn Industries Ltd.
POSA	Person of Ordinary Skill in the Art
Puck	U.S. Patent Application Publication No. 2014/0112093
PTAB	U.S. Patent Trials and Appeals Board
Respondent	Patent Owner or Nuhn Industries Ltd.
The '125 Application	U.S. Patent Application No. 17/590,125
The '133 Provisional	U.S. Provisional Patent Application No. 61/805,133
The '224 Patent	U.S. Patent No. 11,448,224
The '422 Patent	U.S. Patent No. 10,710,422
The '425 Patent	U.S. Patent No. 11,358,425
The '425 Prosecution	The Prosecution of U.S. Patent No. 11,358,425
The '425 Reexamination	The Reexamination of U.S. Patent No. 11,358,425
The '425 Reexamination Request	The Request for <i>Ex Parte</i> Reexamination of U.S. Patent No. 11,358,425
The '557 Patent	U.S. Patent No. 10,974,557

Abbreviation	Definition
The '557 Reexamination	The Reexamination of U.S. Patent No. 10,974,557
The '557 Reexamination Request	The Request for <i>Ex Parte</i> Reexamination of U.S. Patent No. 10,974,557
The '598 Provisional	U.S. Provisional Patent Application No. 61/867,598
The '636 Patent	U.S. Patent No. 9,694,636
The '638 Patent	U.S. Patent No. 10,124,638
The '758 Patent	U.S. Patent No. 8,944,758
The '789 PCT	PCT Application No. PCT/CA2014/050,789
The '835 Patent	U.S. Patent No. 11,491,835
The '015 Litigation	United States District Court for the Southern District of Iowa, Civil Action No. 3:22-cv-00015-SMR.
Truxor	DOROTEA MEKANISKA AB, TRUXOR AMPHIBIAN TOOL CARRIER (EX1006)
Truxor-II	DOROTEA MEKANISKA AB, TRUXOR AMPHIBIAN TOOL CARRIER (2013) (EX1021)
Truxor-III	DOROTEA MEKANISKA AB, TRUXOR AMPHIBIAN TOOL CARRIER (2013) (EX1022)

Abbreviation	Definition
Truxor-IV	DOROTEA MEKANISKA AB, TRUXOR AMPHIBIAN TOOL CARRIER (EX1023)
SenwaTec	SENWATEC-SCHRÖER UMWELT-& GEWÄSSERTechnologie GmbH & Co. KG, LIGHT AMPHIBIOUS BOAT/VEHICLE “AMPHI- KING®” SWT--AB380 (EX1012)
USPTO	United States Patent and Trademark Office
Yoon	KR Publication No. 20130016490 (EX1010-EX1011)

I. INTRODUCTION

1. I have been retained by Merchant & Gould P.C. to serve as an expert on behalf of Bazooka in the above-referenced matter to provide my technical review, analysis, and opinions concerning the validity of the substitute claims proposed by the Patent Owner in IPR2023-01161 relating to the '425 Patent.

2. I previously executed a declaration relating to the validity of the '425 Patent claims, which I understand was filed with Bazooka's petition for *inter partes* review of the '425 Patent as EX1004. I am providing this declaration as a supplement to my prior declaration to address the substitute claims proposed in Patent Owner's motion to amend.

3. My efforts on this case continue to be billed at a rate of \$250 per hour, with reimbursement for expenses incurred. I have no financial interest in the dispute between Bazooka and Nuhn Industries Ltd., and my compensation is not contingent upon the outcome of this IPR.

II. SUMMARY OF OPINIONS

4. It is my opinion that the proposed amended claims 22-42 of the '425 Patent are invalid as obvious over the prior art. Specifically, it is my opinion that:

5. Patent Owner's proposed amended claims 22-25, 27-28, and 33-40 of the '425 Patent are unpatentable as obvious over Cheramie in view of Yoon or Carrier. Cheramie discloses an amphibious dredging vehicle capable of pumping

liquid manure. Yoon and Carrier each disclose amphibious vehicles with pumping systems that are operated by a remote control. Prior to the filing date of the '425 Patent, POSAs would have been motivated to combine the vehicle of Cheramie with remote control technology, such as the technology disclosed in Yoon and Carrier, to make the vehicle of Cheramie safer to operate in dangerous environments where dredging vehicles are operated.

6. Patent Owner's proposed amended claims 22-25, 27-28, and 33-40 of the '425 Patent are unpatentable as obvious over SenwaTec in view of Yoon or Carrier. SenwaTec discloses an amphibious dredging vehicle capable of pumping liquid manure. Yoon and Carrier each disclose amphibious vehicles with pumping systems that are operated by a remote control. Prior to the filing date of the '425 Patent, POSAs would have been motivated to combine the vehicle of SenwaTec with remote control technology, such as the technology disclosed in Yoon and Carrier, to make the vehicle of SenwaTec safer to operate in dangerous and/or unpleasant environments for humans, such as manure lagoons.

7. Patent Owner's proposed amended claims 22-25, 27-28, and 33-40 of the '425 Patent are unpatentable as obvious over Truxor in view of Yoon or Carrier. Truxor discloses an amphibious dredging vehicle capable of pumping liquid manure. Yoon and Carrier each disclose amphibious pumping vehicles that are operated by a remote control. Prior to the filing date of the '425 Patent, POSAs were motivated to

combine amphibious pumping vehicles, such as the vehicle of SenwaTec, with remote control technology, such as the technology disclosed in Yoon and Carrier, to make such amphibious pumping vehicles safer to operate in dangerous environments, such as freezing cold lakes, swamps, and oil spill sites.

8. Patent Owner's proposed amended claims 22-42 of the '425 Patent are unpatentable as obvious over Puck in view of Bryham and Manure Manager which discloses the Nuhn Pump. Puck discloses a remote-control agitation boat that must be manually launched from a trailer into a manure lagoon. Prior to the filing date of the '425 Patent, manure lagoons were known to be dangerous and unpleasant environments. Bryham teaches powered, steerable wheels for converting a boat into an amphibious vehicle and describes how by using the amphibious vehicle, operators do not need to get wet when launching and retrieving a watercraft. A POSA would have been motivated to combine the powered, steerable wheels of Bryham with the remote-control agitation boat of Puck to prevent operators from having to enter hazardous and unpleasant manure lagoons when launching the remote-controlled Puck boat. Furthermore, a POSA would have been to use the Nuhn Pump on the Puck vehicle to take advantage of the pump's improved efficiency and manure pumping capabilities. Using the efficient and robust Nuhn Pump would make the Puck vehicle less likely to be stuck in the manure lagoon due to breakdown or running out of fuel. A POSA would have understood that using a "submersible

centrifugal unit that does not require priming,” such as the Nuhn Pump, would remove the need to prime the pump of Puck, thereby removing a potential failure mode and an additional step required to operate the vehicle.

III. LEGAL PRINCIPLES

9. I am not an attorney. My understanding of patent law and the applicable legal principles and standards comes from explanations provided to me by counsel.

A. Invalidity by Anticipation, Obviousness, and Interpreting Claims Before the Patent Office

10. My prior declaration, executed on June 29, 2023, outlines my understanding of various aspects of patent law, including invalidity by anticipation, obviousness, and interpreting claims before the USPTO. EX1004, Section III.A-C.

B. Invalidity by Failure to Comply with the Written Description Requirement

11. I understand that during an IPR, the Patent Owner may propose a reasonable number of substitute claims. I understand that during an IPR proceeding, the USPTO evaluates the validity of both issued patent claims and proposed substitute claims. I understand that a proposed substitute claim is invalid if it lacks written description support in the original disclosure of the patent. To the extent the Patent Owner relies on the priority date of an earlier-filed disclosure, I understand that a proposed substitute claim is invalid if it lacks written description support in the earlier-filed disclosure.

12. I understand that the specification must contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains to make and use the same. I understand that the test for sufficiency of the written description is whether the disclosure of the application relied upon reasonably conveys to those skilled in the art that the inventor had possession of the claimed subject matter as of the filing date. I understand that the written description test requires an objective inquiry into the four corners of the specification from the perspective of a POSA, which requires the specification to describe an invention understandable to that skilled artisan and show that the inventor actually invented the invention claimed. I understand that a word for word recitation of a claim limitation is not sufficient to satisfy the written description.

13. Finally, I understand that a description in the specification which renders the invention obvious is not sufficient to satisfy the written description requirement. I understand that the disclosure must actually disclose the invention, rather than merely allowing a POSA to speculate as to modifications that an inventor might have envisioned but failed to disclose.

C. Means-Plus-Function Claim Terms

14. I understand that 35 U.S.C. § 112(f) allows a patentee to claim an invention in functional rather than structural language. I understand that this form of

claim drafting is referred to as means-plus-function claiming. I understand that means-plus-function claiming applies only to purely functional limitations that do not provide the corresponding structure for performing the claimed function.

15. As noted above, it is my understanding that the interpretation of claim language as a means-plus-function limitation under 35 U.S.C. § 112(f) is a legal question that is based on the following underlying factual questions: (1) whether the words of the claim are understood by persons of ordinary skill in the art (POSAs) to have a sufficiently definite meaning as the name for structure, and (2) what structure is disclosed in the specification for performing the claimed function. I understand the PTAB will determine as a matter of law whether a term or phrase is a means-plus-function claim limitation. I am not providing an opinion on the legal question of whether any phrases are means-plus-function limitations, however, I have provided my opinions on the underlying factual determinations as to what a POSA would have understood about specific claim terms and the content of the specification.

16. I understand that the presence of the word “means” in a claim creates the presumption that the claim term is a means-plus-function claim term. Likewise, I understand that the absence of the word “means” in a claim creates the presumption that the claim term is not a means-plus-function claim term. However, I understand that this presumption is not a strong presumption. I understand that the key inquiry

for determining whether a claim term is a means-plus-function term is whether the words of the claim are understood by persons of ordinary skill in the art (POSA) to have a sufficiently definite meaning as the name for structure.

17. I understand that once a claim term is determined to be a means-plus-function term, then the function recited in the claim must be determined. I understand that the function of a means-plus-function claim term is defined only by the words of the claim language. I also understand that a means-plus-function claim term may recite multiple functions, in which case, the corresponding structure in the specification must perform all the functions recited in the claim.

18. Once the function of a claim is determined, I understand that the structure in the specification corresponding to the claimed function must be determined. I understand the corresponding structure is the structure in the specification that performs all of the functions recited in the means-plus-function claim term.

IV. MATERIALS CONSIDERED IN FORMING MY OPINIONS

19. In forming the opinions expressed in this declaration, I have relied on my own knowledge, experience, and expertise, as well as the knowledge of a POSA in the relevant timeframe. In addition, I have reviewed and relied upon all documents referenced in my prior declaration submitted in conjunction with IPR2023-01161, the materials referenced in my declarations submitted in conjunction with IPR2024-

00004 and IPR2024-00098, the declaration and materials referenced in the declarations of Douglas Prairie (EX2004, EX2029), and the additional materials provided in Appendix A.

V. CLAIM CONSTRUCTION

A. Liquid Manure Pump

20. I understand that claims should be given their ordinary and customary meaning as understood by a POSA, viewing the claim terms in the context of the entire patent. I understand that the context of the patent includes the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art. I understand that if the intrinsic evidence does not establish the meaning of a claim, then extrinsic evidence may be considered.

21. The amended claims seek to remove the term “fluid pump,” which is used extensively throughout the specification of the ’425 Patent and ’758 Patent and replace it with the term “liquid manure pump” which is never used in the specification of the ’425 Patent nor the ’758 Patent.

22. I understand that the PTAB construed the term “liquid manure pump” in the institution decision for the ’835 Patent in IPR2024-00004. *See* IPR2024-00004, Paper 12 at 16-18. I understand that the PTAB found that the Patent Owner failed to provide any argument as to the specific structure required to pump liquid

manure. Thus, since the parties both agreed that liquid manure includes at least some suspended solids, the PTAB “construe[d] the term ‘liquid manure pump’ only to the extent that it requires a pump with a structure that is capable of pumping liquid with suspended solids.” *Id.* at 18. There is no specific or required structure to pump liquid manure, beyond the structure of a conventional centrifugal water or irrigation pump, which were known in the art for pumping liquid manure. Therefore, it is my opinion that the term “liquid manure pump” should be interpreted consistently with the ’835 Patent institution decision as “a pump with a structure that is capable of pumping liquid with at least some suspended solids.”

23. The PTAB’s construction of the term “liquid manure pump” properly covers any conventional water pump or irrigation pump that is capable of pumping water from a lake, stream, or other reservoir, which includes suspended solids. As is well documented throughout the literature, “liquid manure” is generally understood as a mixture of water and manure with a total solid content of less than approximately 5%. EX1004, Section V.B.i-ii; *see also* EX1100, 76 (showing that concentrations in manure lagoons range from 2 percent to “less than ½” percent solids); *see also* EX1101, 5 (providing that the total solids content of lagoons is 1-3% for stage 1 lagoons and <1% for stage 2 lagoons).

24. Patent Owner has argued in this IPR that the “liquid manure” should be construed to mean “animal manure contained in a farm lagoon, which includes

suspended solids[.]” completely removing the term “liquid” from the definition. Paper 27 at 15. However, Patent Owner does not dispute that its definition of “liquid manure” **would include** ‘a mixture of water and manure with a total solid content of less than about 5%.’ And the literature is clear that “[l]iquid manures with less than approximately 4% total solids can be pumped from earthen basins or lagoons using pumps designed for conventional water irrigation.” EX1004, ¶103 (citing EX1040, 64).

25. Additionally, Patent Owner has repeatedly cited Depeault in support of its position that water pumps are incapable of pumping liquid manure, specifically citing from a section of Depeault stating that “[t]he top crust in the reservoir is mostly cow manure. This upper or floating crust can become relatively hard and can reach six feet in thickness.” EX2003, 1:45-47. However, Patent Owner’s own cited literature demonstrates that crusts do not even form on hog lagoons, which are a prime focus of the ’425 Patent. *See* EX2030 (“Crusts do not occur on pig slurry stores[.]”); *see also* EX1029 (“Liquid manure from animal husbandry operations, particularly pig farming operations, is typically stored in a large manure reservoir or lagoon”) (incorporated-by-reference into the ’425 Patent).

26. Other literature indicates that crust may form only for specific types of livestock manure, cattle, particularly if hay or silage is fed to the cattle or if bedding is collected with the manure. EX1064, 12-13. A POSA would have understood that

a crust is not necessarily present and in many liquid manure storages there is no crust at all. One example of a liquid manure lagoon containing no crust is shown in the image below:



EX1102, 9.

27. Aside from the reference in Depeault to a possible six-foot thick crust that *may* form, neither Patent Owner nor Mr. Prairie provides any technical support for the solids concentration or particulate sizes found in a liquid manure lagoon. Their reliance on Depeault to characterize and help define “liquid manure” is misleading and is incorrect. The crust, which Depeault describes as having “a consistency of dry peat moss” and “relatively hard,” is not liquid and it is not liquid manure, it is hard and it is a solid, as clearly stated in Depeault. EX2003, 1:27-29, 45-46. The crust is a solid material, which does not flow, and therefore a POSA would not understand it to be “liquid manure” as Patent Owners asserts.

28. There are numerous technical references that characterize the typical solids concentrations found in manure lagoons and the typical size distribution of particles found in manure lagoons. I provided one such reference in my declaration dated June 29, 2023, related to the '425 Patent. EX1004, ¶¶92-93. Additionally, numerous other references provide similar information regarding the particle size distributions in liquid manures and in manure lagoons and the typical solids concentrations found in manure lagoons. For example, Jett reports particulate size distributions in swine manure particles as being smaller than approximately 3.36 mm. EX1097, 2. Marcato reports that most particles in raw and digested pig slurry are on the order of 1 mm (1000µm) or smaller. EX1098, 5. Meyer explains that “[r]egardless of animal class, the largest amount of TS were found to be smaller than 0.125 mm and the least amount of TS were found to be <0.25 and >0.125 mm.” EX1099, 3. The various studies reporting particulate size distributions in liquid manure demonstrate that the particle sizes may depend on a variety of factors including source animal, %TS, location (depth) in the storage/treatment system, and animal feed. However, the studies generally report that average manure particles are typically less than 1 mm in size. The largest particles reported in liquid manures are on the order of a few mm (typically 3 to 6 mm). In sum, a POSA would have understood that the particles found in liquid manures are orders of magnitude smaller

than the possible six-foot thick crust disclosed in Depeault and relied on by Patent Owner to (incorrectly) define “liquid manure.”

29. Other references describe that the “pump type recommended” for pumping from lagoons is a “closed impeller.” A POSA would have understood that a “closed impeller” centrifugal pump for pumping liquid manure from lagoons is the same type of pump used in high-pressure, high-volume water pumping applications. EX1101, 4.

30. Contrary to Patent Owner’s assertions otherwise, a POSA would have understood liquid manure, such as the liquid manure found in lagoons, to have a total solids content of a few percent or less. A POSA would have also understood that solids content of liquid manure is comprised of relatively small particles suspended in the liquid, which are typically on the order of a few millimeters or less in size. A POSA would have also understood that because of these characteristics, liquid manures found in lagoons were (and are) pumped with conventional water pumps and irrigation equipment. *See* EX1004, Section V.B.iii.a; EX1101, 4. While it is possible that a crust may form under specific conditions and circumstances, this crust that may form does not define liquid manure nor does it define the requirements for pumping liquid manure.

B. Fluid Mover

31. I understand that Patent Owner argues in its Patent Owner Response that “fluid mover” should be afforded a means-plus-function construction. Paper 27 at 18-19. If the Board applies a mean-plus-function construction, it is my opinion that the term should be interpreted as a “pump, conduit, and nozzle.”

32. It is my understanding that the interpretation of claim language as a means-plus-function limitation under 35 U.S.C. § 112(f) is a legal question that is based on the following underlying factual questions: (1) whether the words of the claim are understood by persons of ordinary skill in the art to have a sufficiently definite meaning as the name for structure, and (2) what structure is disclosed in the specification for performing the claimed function. I am not providing an opinion on the legal question of whether this phrase is a means-plus-function limitation, however, I have provided my opinions on the underlying factual determinations below.

33. Regarding the second question, “what structure is disclosed in the specification for performing the claimed function,” the fluid mover has a single identified function: moving fluid. Though many components described in the specification of the ’425 Patent perform that function, the surrounding claim language of proposed claims 28 and 40 further require that “at least one of the speed

and direction of the vehicle is controlled by a fluid mover when the vehicle is floating.”

34. A POSA would have understood that the pump, conduit, and nozzle assembly would move fluid and would also control at least one of speed and direction of the vehicle when the vehicle is floating.

35. Regarding the fluid pump, conduit, and nozzle assembly, the ’425 Patent describes the pump as being fluidically connected to the fluid nozzles of the vehicle via fluid conduits.

The fluid pump **9** comprises a pump housing **18** with three tangential fluid outlets **19** that are combined into a single fluid conduit **20**. The single fluid conduit **20** is then split into left side **21** and right side **22** fluid conduits which connect at the front and rear of the vehicle to form a complete circuit. The fluid pump **9** is thus fluidically connected to all fluid nozzles of the vehicle via the fluid conduits **20-22**.

EX1001, 5:42-48 (emphasis added).

36. The ’425 Patent also describes the use of the pump to drive fluid through the conduits and out of the nozzles to vary the speed and direction of the vehicle while floating.

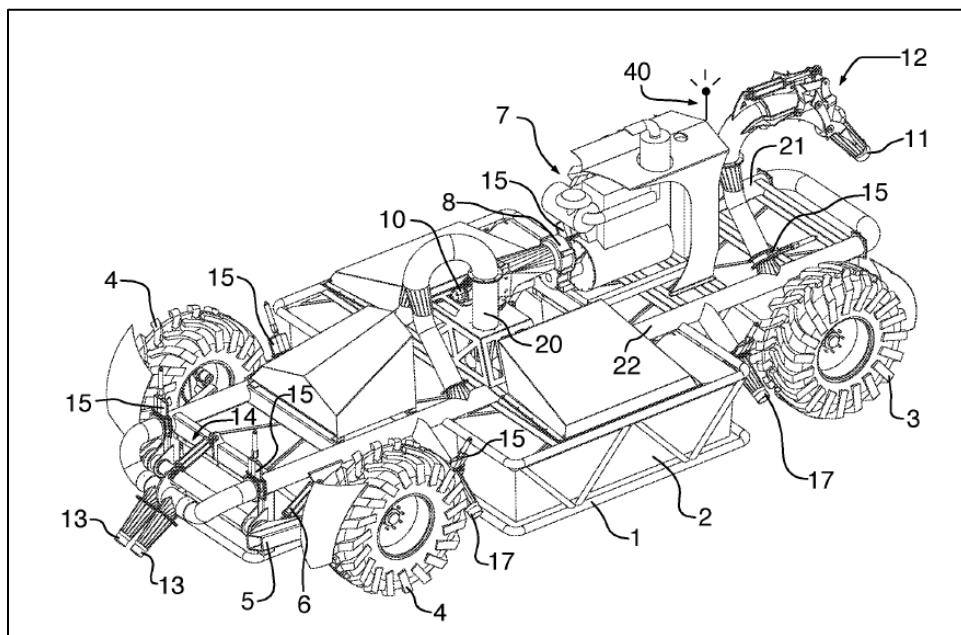
valves **15** and the plurality of fluid nozzles is used to provide directional control and motive power for the vehicle while floating. For example, proportioning fluid flow from the right side fluid nozzles **17** to the left side fluid nozzles **16** causes the vehicle to turn to the right while floating. Similarly, fluid flow may be proportioned between the first fluid nozzle **11** and the second fluid nozzles **13** to cause the vehicle to move forward or backward. By rotating the second fluid nozzles **13** fully downwardly and then up toward the front of the vehicle using the second articulation means **14**, the vehicle may also be directed rearward and/or slowed in its forward movement speed. Thus, the combination of proportioning flow between the plurality of fluid nozzles using the valve structure and/or articulating the nozzles may be used to control forward, rearward, left and right movement and speed of the vehicle. The flow rate of the fluid pump **9** may also be adjusted to enhance directional and speed control via the plurality of nozzles while floating.

EX1001, 6:1-18 (emphasis added).

37. I understand that Mr. Prairie has argued that the structure associated with the term “fluid mover” should be interpreted to mean “valve(s) and fluid nozzle(s).” EX2029, ¶¶113-118. I disagree because valve(s) and fluid nozzle(s) lack any structure that would cause a fluid to move. In contrast, a fluid pump is a structure that provides motive force to a fluid and causes a fluid to move or flow. Valves and nozzles may restrict or may alter the flow generated by a pump, they are not capable of moving liquid on their own. Therefore, a POSA would not have understood “valve(s) and fluid nozzle(s)” as the structure that performs the function of moving

fluid and would not understand the term “fluid mover” to refer to valves and/or nozzles.

38. The '425 Patent identifies the valves with reference number 15 and the nozzles with reference number 11, 13, 16, and 17, which are shown in Figure 2 of the '425 Patent, below.



EX1001, FIG. 2.

39. The valve(s) and fluid nozzle(s) do not drive the movement of the fluid that is discharged through the conduits and fluid nozzles. Rather, this function is performed by a pump. *See, e.g.,* EX1001, 8:5-11 (“In operation an operator . . . begin[s] pumping fluid with the fluid pump through the fluid conduits and selectively open[s] at least the second fluid nozzles to cause the vehicle to move . . .”). Without the pump, the valves and nozzles of the '425 Patent would not

move any fluid. Therefore, a POSA would expect the fluid mover to require some additional component (i.e. the pump) for driving the movement of the fluid. The valves and nozzles that Patent Owner and Mr. Prairie attempt to associate with the term “fluid mover” lack any capacity to create fluid movement or flow. In other words, the structures they associate with the term “fluid mover” are incapable of moving fluid by themselves.

40. Instead, as explained above, a POSA would have understood that the pump, conduit, and nozzle described in the '425 Patent would perform the function of moving the fluid and would be capable of controlling the speed and direction of the vehicle while floating. Therefore, it is my opinion that one of the structures associated with the function of moving fluid would be understood by a POSA to mean a “pump, conduit, and nozzle.”

VI. PRIOR ART USED IN ANTICIPATION AND OBVIOUS ANALYSIS

41. In addition to the prior art cited in the Petition, the following references support my opinion that the proposed amended claims of the '425 Patent are invalid as obvious over 35 U.S.C. § 103.

A. Cheramie

42. Cheramie describes an amphibious dredging vehicle. EX1087, Abstract.

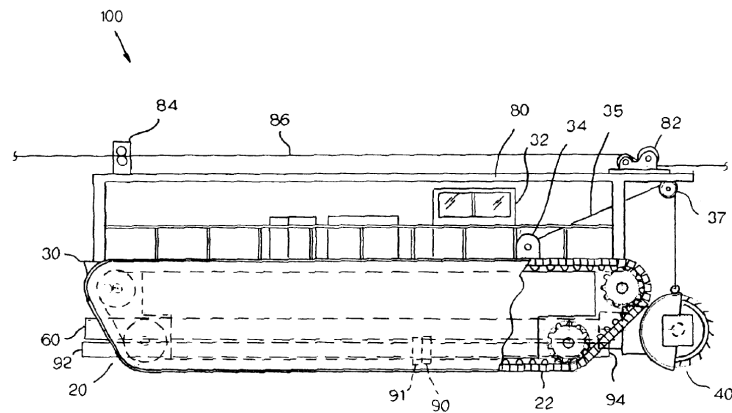


FIG. 1

Id., FIG. 1.

43. Cheramie discloses a floatable vehicle body comprising “sturdy and floatable pontoon[s].” *Id.*, 4:17-18.

44. Cheramie discloses two pumps, a dredge pump and a water pump, both of which are used for propelling and steering the vehicle while it is floating and both positioned along the underside of the floatable vehicle body, and both of which are arranged between the vehicle tracks. *Id.*, 3:21-27, FIGS. 1-2. The pumps are connected to directable discharges 60, 92 through aluminum pipes with diameters between 4 inches and 10 inches. *Id.*, 5:24-27, 5:63-67. Discharge of fluid through the directable discharges is used to propel and steer the vehicle while floating. *Id.*, 5:24-30, 6:3-6.

45. Cheramie teaches a diesel engine that powers a hydraulic pump for pressurizing hydraulic fluid in a hydraulic circuit. *Id.*, 4:36-40. The hydraulic fluid powers hydraulic drive motors for the vehicle tracks and hydraulic motors for the

propulsion pumps that propel and steer the vehicle while floating. *Id.*, 4:50-55, 5:44-59.

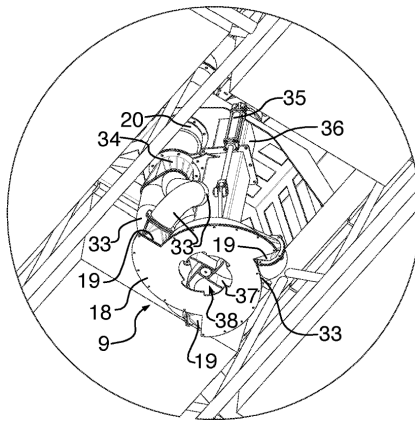
B. Manure Manager

46. I understand that Manure Manager (EX1088) is a printed publication that describes Patent Owner's Pump. I understand that Manure Manager is prior art under at least 35 U.S.C. §102(a)(1) because Manure Manager published and was publicly accessible before the effective filing date of the '425 Patent.

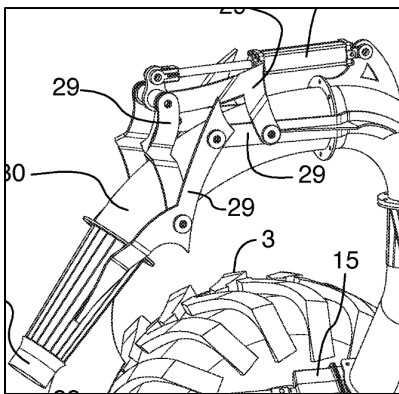
47. Manure Manager describes Patent Owner's Nuhn Pump—which is similar to the pump described in the '425 Patent and the commercial embodiment of the '758 Patent (incorporated by reference into the '425 Patent).



EX1088, 27.



EX1001, FIG. 8; EX1088, 27.



EX1001, FIG. 5; EX1088, 27.

VII. GROUND 1: AMENDED CLAIMS 22-25, 27-28, 33-40 ARE UNPATENTABLE AS OBVIOUS OVER CHERAMIE IN VIEW OF YOON OR CARRIER.

48. It is my opinion that proposed claims 22-25, 27-28, and 33-40 would have been obvious to a POSA at the time of the invention in view of the teachings of Cheramie in further view of the remote-control teachings of Yoon or Carrier.

A. Motivation to Combine Cheramie with Yoon or Carrier

49. The motivation to combine Cheramie with the remote-control teachings of Yoon or Carrier is identical to the motivations explained with respect to Truxor.

EX1004, ¶¶255-262. Regarding the combination of Truxor and Yoon, the PTAB determined that “Petitioner has established a reasonable likelihood of succeeding in showing that claim 1 is unpatentable over the combination of Truxor and Yoon.” Paper 12 at 13. Regarding the addition of remote control to Truxor, the PTAB found that “Patent Owner does not argue, and we see no reason to believe, that adding remote control to Truxor is not within the ability of one of skill in the art.” *Id.*, 20.

50. Cheramie teaches an amphibious vehicle with a dredging pump. EX1087, 3:21-27. The vehicle described by Cheramie is used in wetlands, such as degraded marshes. *Id.*, 2:14-15. The Cheramie vehicle incorporates both a dredge pump and a water pump powered by hydraulic drive motors and a power plant in the form of a diesel engine. *Id.*, 4:32-47.

51. A POSA would have understood that such environments could be dangerous for users of the vehicle. A POSA would have understood that dredging and dredging vehicles present hazards to those on-board, including exposure to machinery, noise/vibration, and falls overboard or vessel sinking/capsizing. For example, Verna and Prieto-Portar write in “A Simple Method of Risk/Hazard Assessment in Dredging” that “[d]redging and marine construction is inherently dangerous.” EX1103, 4. Regarding Dredger Accidents, one website states: “Dredgers carry and use heavy machinery, including cranes, grabbers, and buckets. Dredging equipment is, however, dangerous to work with and many seamen and

other maritime workers are injured or killed in dredger accidents.” EX1104, 1. An article published on Industrial Safety & Hygiene News (“ISHN”) titled “Most dangerous jobs in the U.S.: The top 20” ranks “Dredge, excavating, and loading machine operators” as the sixth most dangerous job. EX1105, 3. ISHN also provides that “[d]redge operator fatalities often occur when dredge equipment becomes unstable and sinks.” *Id.*

52. Yoon and Carrier each disclose amphibious pumping vehicles operated by remote control that allows for users to operate the amphibious vehicles from land. *See* EX1011, Summary; EX1005, ¶¶[0059], [0064]-[0065]; *see also* EX1004, ¶¶141-151, 195-202.

53. A POSA would have been motivated to combine the teachings of Cheramie, describing an amphibious dredging vehicle, with remote-control technology, like that disclosed for the amphibious pumping vehicles of Yoon or Carrier, to eliminate the risk of harm to operators of the Cheramie dredging vehicle. Cheramie, Yoon, and Carrier each disclose amphibious vehicles that are used in environments that are dangerous or unpleasant for humans. Yoon and Carrier each teach remote-control systems which allow operators to control the vehicle and onboard equipment, including pumps for pumping liquids with suspended solids, from land, thereby reducing the risk of harm to the operator in dangerous environments. EX1011, ¶[0048]; EX1005, ¶¶[0059], [0064]-[0065]. A POSA would

have recognized the risks of harm to operators using the amphibious dredging vehicle of Cheramie and would have been motivated to make Cheramie safer for operators by adding remote-control technology as taught by Yoon or Carrier.

54. POSAs were motivated to combine remote-control technology with amphibious vehicles such as Cheramie, Truxor, and SenwaTec before the filing date of the '425 Patent. In 2012, Melnikov recognized that one disadvantage of currently available amphibious machines includes “the presence of an operator located on the machine itself, which limits the use thereof in conditions dangerous for humans.” EX1025, 4. While Melnikov teaches adding remote controls to the vehicle of Truxor, a POSA would have recognized that teaching applies equally to Cheramie, because both are amphibious vehicles with pumping/dredging capabilities which may be operated in hazardous environments. A POSA would have been motivated to combine the remote-control technology taught by Yoon or Carrier with the teachings of Cheramie for the same reasons. Paper 12 at 20.

B. Claim 22

[22.0] An amphibious vehicle, comprising:

55. Cheramie discloses an amphibious vehicle. EX1087, Abstract.

[22.1] a floatable vehicle body with a front, a rear, and an underside;¹

56. Cheramie discloses a floatable vehicle body comprising two floatable pontoons. *Id.*, 3:59-63. The floatable vehicle body of Cheramie includes a front, a rear, and an underside. *See Id.*, FIGS. 1-3.

[22.2] ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor;

57. Cheramie discloses a ground engaging propulsion structure comprising a plurality of ground engaging elements. Cheramie teaches first and second tracks that are mounted on the floatable pontoons and are powered by hydraulic motors. *Id.*, 4:10-16, 4:48-53.

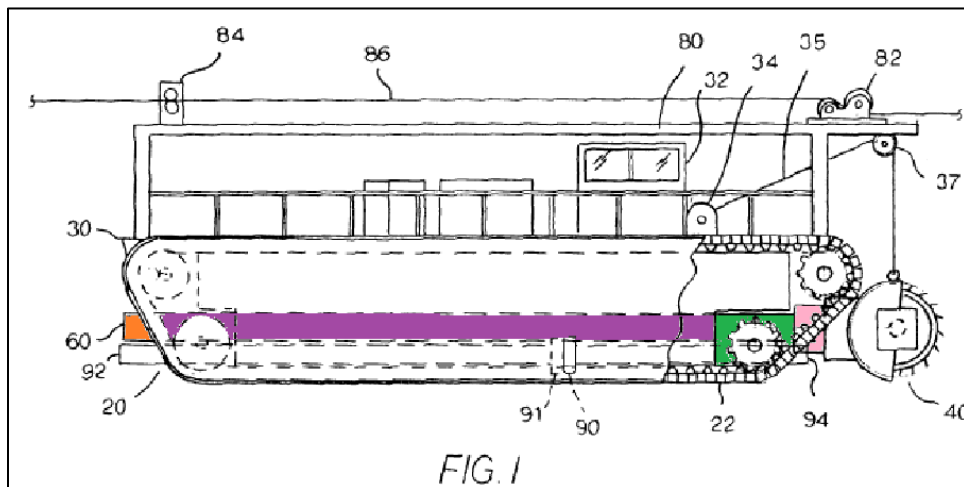
[22.3] a ~~fluid~~ liquid manure pump for pumping liquid manure, the liquid manure pump including a housing and an impeller that are positioned along the underside of the floatable vehicle body between at least two of the ground engaging elements such that the housing and the impeller are rearward of the front of the vehicle body and forward of the rear of the floatable vehicle body and such that the impeller is immersed in and configured to pump the liquid manure when the vehicle is floating;

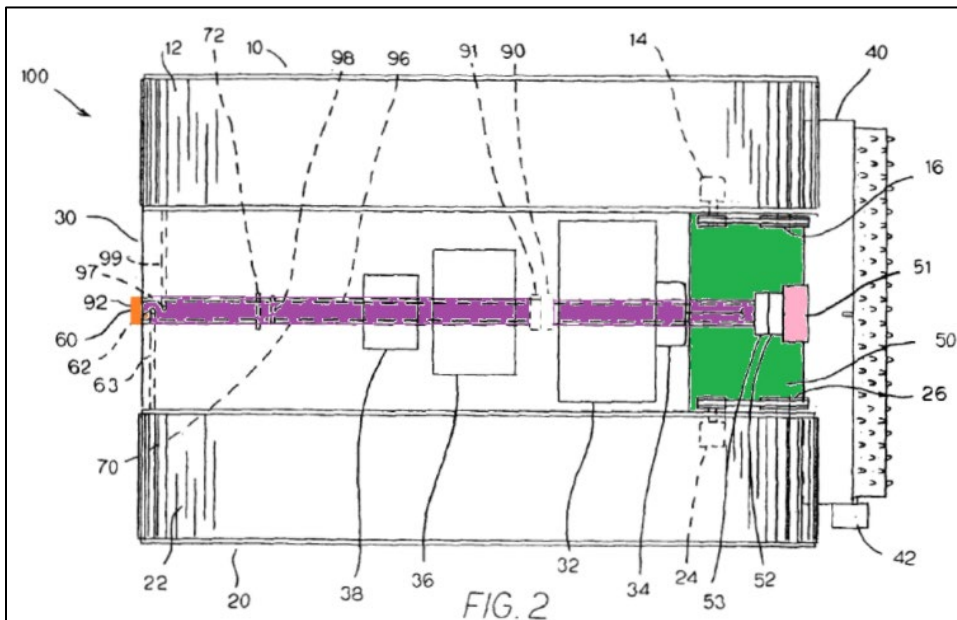
58. Cheramie discloses a fluid pump capable of pumping liquid manure, including a housing and impeller positioned along the underside of the floatable

¹ Underlined text indicates wording that was added to the proposed amended claims whereas text with a strikethrough indicates wording that was removed from the original claims as the proposed amended claims are written.

vehicle body. The housing and impeller are rear of the front of the vehicle body, forward of the rear of the vehicle body, between the ground engaging elements, and are immersed in the fluid when the vehicle is floating.

59. Specifically, Cheramie discloses a dredge pump 50 (green). *Id.*, 4:24-27. Cheramie describes that the dredge pump 50 (green) includes an impeller housing 51 (pink) for pumping material from the degraded marshes and to propel the vehicle. *Id.*





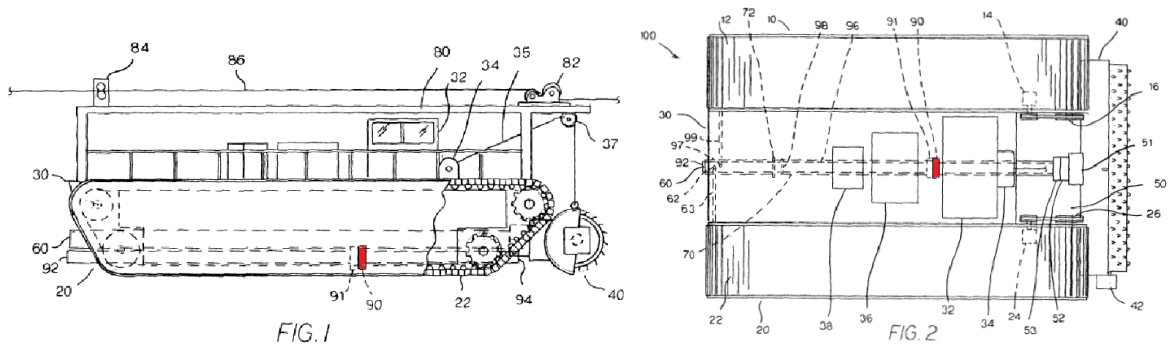
Id., FIGS. 1-2 (annotated)

60. As shown in FIGS. 1-2, the dredge pump 50 (green) and the impeller housing 51 (pink) are each located along the underside of the vehicle between the tracks, rearward of the front of the vehicle, and forward of the back of the vehicle. The dredge pump 50 is connected to discharge plumbing 70. *Id.*, 5:24-27. The discharge plumbing is connected to a directable discharge 60 at a rear end of the vehicle. *Id.*, 5:18-27. Given that each of the cutterhead 40 and impeller housing 51 (pink) are arranged the same vertical elevation relative to the vehicle, a POSA would have understood that when the vehicle is floating, fluid would flow through the cutterhead 40 into the impeller housing 51 (pink), which would cause the impeller to be immersed in the fluid. *Id.*, FIG. 1, 4:24-27. A POSA would have understood that the impeller rotates within the impeller housing 51 (pink) to create fluid flow to

drive fluid through the discharge plumbing 70 and out of the directable discharge 60. *Id.*, 4:24-27, 5:1-43. Thus, a POSA would have understood that the impeller and housing of the dredge pump 50 (green) would be immersed in the fluid in order to pump dredged material (i.e. fluids laden with suspended solids).

61. POSAs would have understood that dredging pumps, like the dredge pump 50 of Cheramie, are capable of pumping liquid manure as well as higher solid content forms of manure, as they have long been used for this purpose. *See* EX1043, 3; EX1058, 2; EX1066, 64; EX1085, 1; EX1086, 4-5.

62. Cheramie also discloses a fluid pump 90 (red) for pumping water from the degraded marshes in which the vehicle is operating in order to propel the vehicle. EX1087, 5:44-52. The fluid pump 90 (red) is centrally located along the underside of the vehicle between the tracks of the vehicle and the front and back of the vehicle. *Id.*, FIGS. 1-2. Cheramie teaches that the water pump 90 is powered by a hydraulic drive motor 91 and has a water intake 94 toward the forward end of the vehicle and a directable discharge 92 at the rear of the vehicle. *Id.*, 5:46-48. As shown in the images below, a POSA would have understood that these components are positioned at the same vertical elevation relative to the vehicle and therefore must be immersed in surrounding fluid to function. A POSA would have understood that the water pump 90 would naturally have included an impeller and housing to adequately perform the “desired propulsion” functions described in Cheramie. *Id.*, 6:6.



Id., FIGS. 1-2.

63. Thus, Cheramie teaches not one, but two fluid pumps capable of pumping liquid manure—a dredge pump 50 and a water pump 90. Both of which would have included an impeller and housing that are immersed in the fluid when the vehicle is floating.

64. A POSA would have also understood that both the dredge pump 50 and the water pump 90 of Cheramie would be capable of pumping fluid with suspended solids, which are inherently present in a dredging environment. A POSA would have understood that liquid manure is a mixture of water and animal waste having a total solids content less than about 4-5% and that conventional water pumps and irrigation systems were used for pumping liquid manure. *Supra* Section V; *see also* EX1004, ¶¶87-104; EX1040, 64 (“Liquid manures with less than approximately 4% total solids can be pumped from earthen basins or lagoons using pumps designed for conventional water irrigation.”); EX1041, 5 (“Effluents from manure lagoons, feedlot runoff holding ponds, and milkhouses (less than 4 percent solids content) can

often be handled by conventional irrigation pumps and equipment.”). Indeed, the ’425 Patent itself acknowledges the use of irrigation equipment for pumping liquid manure: “[l]iquid manure . . . is typically stored . . . until there is a sufficient quantity available to spread or **irrigate onto farm land for disposal.**” EX1029, 1:14-17 (incorporated-by-reference into the ’425 Patent) (emphasis added). Therefore, a POSA would have understood that both the dredge pump and water pump of Cheramie would be capable of pumping liquid with suspended solids.

65. While Patent Owner argues against this widely published and generally accepted definition of liquid manure and its associated solids content and properties, little or no empirical data supporting that position has been provided. Its argument involves a citation from Depeault related to the possibility that a hard crust as much as six feet thick may form. EX2003. However, Patent Owner’s own literature demonstrates that crusts do not even form on hog lagoons, which are a prime focus of the ’425 Patent. *See* EX2030 (“Crusts do not occur on pig slurry stores[.]”); EX1029 (“Liquid manure from animal husbandry operations, particularly pig farming operations, is typically stored in a large manure reservoir or lagoon”) (incorporated-by-reference into the ’425 Patent).

66. In relying on this specific citation to Depeault, Patent Owner and its expert, Mr. Prairie, attempt to redefine liquid manure to include hard solid objects, even solid objects six feet thick. Nuhn argues that “liquid manure” encompasses

much higher solids concentrations, and much larger solids (up to six feet in dimension) than the literature describes are found in liquid manure of liquid manure lagoons. However, Patent Owner has not argued that its overly broad and unconventional definition of liquid manure would not also include the contents of manure lagoons having water and manure mixtures with a total solid content of less than about 5%, as are typical of liquid manure lagoons. *See, e.g.*, EX1041, 5. Thus, even under Patent Owner's definition, liquid manure would still *encompass* mixtures having less than about 5% total solid contents that behave very much like water and can be pumped with conventional water pumping equipment. *See* EX1004, ¶¶87-104.

67. As established in the pertinent literature, “[l]iquid manures with less than approximately 4% total solids can be pumped from earthen basins or lagoons using pumps designed for conventional water irrigation.” EX1040, 64; EX1041, 5. Thus, a POSA would have understood that either of the dredge pump 50 or the water pump 90 of Cheramie would have been capable of pumping at least forms of liquid manure having less than approximately 4% total solids. Because the term “liquid manure pump” is broad enough to cover any pump capable of pumping liquid with suspended solids (including low solid content liquid manures), a POSA would have understood Cheramie to teach “a liquid manure pump.”

68. Additionally, Yoon discloses a water pump that is similarly capable of pumping liquid manure. Patent Owner argues that the pump of Yoon would clog if used to pump liquid manure. Paper 20, 56. Patent Owner suggests that “A POSITA would also understand from Yoon that a pump requiring a ‘sludge filtering device’ is not a pump that pumps liquid manure” *Id.* However, this position is not supported and is inconsistent with the explicit teachings of Yoon, which discloses a vehicle—an amphibious water treatment device—installed on “tanks, reservoirs, and so on, into which waste materials are dumped in order to treat industrial waste materials.” EX1011, ¶[0001]. Yoon refers to “livestock wastewater” disposed of by “livestock sheds.” EX1011, ¶[0002]. Belying Patent Owner’s position and arguments, Yoon discloses a “water collection device (300)” which is positioned downstream of the water pump. EX1011, ¶[0069], FIG. 1. Yoon teaches that sludge passes through the filtering net 210 and that both wastewater and sludge are sent to the “water collection device” (after passing through the water pump) for separation. EX1011, ¶¶[0058], [0069]–[0071] (“[S]ludge flow[s] through the absorption hose (180) and the water pump (131)[.]”). Thus, the water pump (131) of Yoon pumps sludge.

69. As explained above, contrary to Patent Owner’s arguments, a POSA would have understood that the vehicle of Yoon was intended for use in liquid manure (“livestock wastewater”) and that the water pump of Yoon was capable of

pumping liquid manure and wastewater with suspended solids (“sludge”). A POSA would similarly have understood that the water pump of Cheramie would be similarly capable of pumping liquid manure—water with at least some suspended solids.

[22.4] a power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the ~~fluid~~ liquid manure pump; and,

70. Cheramie teaches a power source connected to a hydraulic pump which powers both the ground engaging structure and the fluid pumps. Cheramie discloses a “diesel engine 36 [that] powers pump 37A that pressurizes hydraulic fluid in a conventional hydraulic circuit 137[.]” EX1087, 4:32-38. The hydraulic circuit 137 provides power to the hydraulic drive motors for the vehicle tracks, the hydraulic drive motor for the dredge pump 50, the hydraulic motor for the water pump 90, and the hydraulic rams for the directable discharges from the two pumps. *Id.*, 4:36-47.

[22.5] a wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the ~~fluid~~ liquid manure pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating.

71. Cheramie teaches an amphibious vehicle with tracks that vary the speed and direction of the vehicle on land and water, and fluid pumps that can be used to pump liquid manure. *Id.*, 3:59-4:19, 5:44-59. Cheramie teaches directable discharges

connected to the pumps which can be used to control the flow of fluid and to move (propel) the vehicle and that aiming the directable discharge allows the operator to control the direction of the vehicle. *Id.*, 5:19; 5:44-52.

72. Yoon and Carrier each disclose amphibious pumping vehicles enabling operators to control the vehicle, its pump systems, and other attachments using remote control. EX1011, ¶[0048], EX1005, ¶¶[0059], [0064]-[0065]. As explained above (and considering Melnikov's teaching to add remote control to Truxor and similar amphibious vehicles), a POSA would have been motivated to implement the remote-control systems taught by Yoon or Carrier to control the vehicle and attachments of Cheramie from a safe location. *Supra* Section VII.A. Remote control of hydraulic systems was known in the art and there would have been a high likelihood of success in adding the remote-control system of Yoon or Carrier to the vehicle of Cheramie to control the hydraulically powered propulsion system and pumps. *See* EX1004, Section V.D-E.

C. Claims 23-25

[23] The vehicle of claim 22, wherein the vehicle further comprises a conduit fluidly connected to the ~~fluid~~ liquid manure pump.

[24] The vehicle of claim 23, wherein the conduit comprises an opening at an end thereof.

[25] The vehicle of claim 324, wherein the wireless remote control is configured to control an orientation of the opening.

73. Cheramie teaches conduits fluidly connected to the fluid pumps with openings at the ends of the conduits that can change orientations using hydraulic rams. Cheramie discloses that the water pump 90 is connected to a “discharge plumbing 96, which preferably is aluminum pipe with a diameter between 4 inches and 10 inches.” EX1087, 5:64-67. Regarding the dredge pump 50, Cheramie discloses that the “discharge 60 is operatively connected to cutterhead 40 and dredge pump 50 by conventional discharge plumbing 70, which preferably is aluminum pipe with a diameter between 4 inches and 10 inches.” *Id.*, 5:24-27. A POSA would have understood that aluminum pipes operatively connected to the water pump or dredge pump are fluidly connected conduits.

74. Cheramie also discloses a “directable-discharge-control means” for changing the orientations of the conduits connected to the pumps. *Id.*, 5:31-32; 6:7-10. Cheramie explains that by “controlling the aim or orientation of the directable discharge 60, the operator may control the direction of the amphibious dredging 100 vehicle when the dredge pump 50 is being used to move the amphibious dredging vehicle 100 through water.” *Id.*, 5:5-9. Cheramie teaches that the directable-discharge control means are operatively connected to hydraulic rams which “may be controlled to select and maintain the desired aim of the directable discharge.” *Id.*, 5:34-43; 6:14-16. A POSA would have understood that the directable discharges include an opening at the terminal end through which to discharge the fluid. *Id.*,

FIGS. 1, 3. A POSA would have understood that the combination of Cheramie and Yoon or Carrier would yield an amphibious vehicle that could be steered by remote control by changing the orientation of the directable discharge. *See id.*, 5:5-9.

D. Claim 27

[27] The vehicle of claim 23, wherein the vehicle further comprises a nozzle at the end of the conduit, wherein the ground engaging propulsion structure comprises a front set of ground engaging wheels that are rotatably attached to a front set of spindles and a rear set of ground engaging wheels that are rotatably attached to a rear set of spindles, and wherein the liquid manure pump is positioned rearward of the front set of spindles and forward of the rear set of spindles.

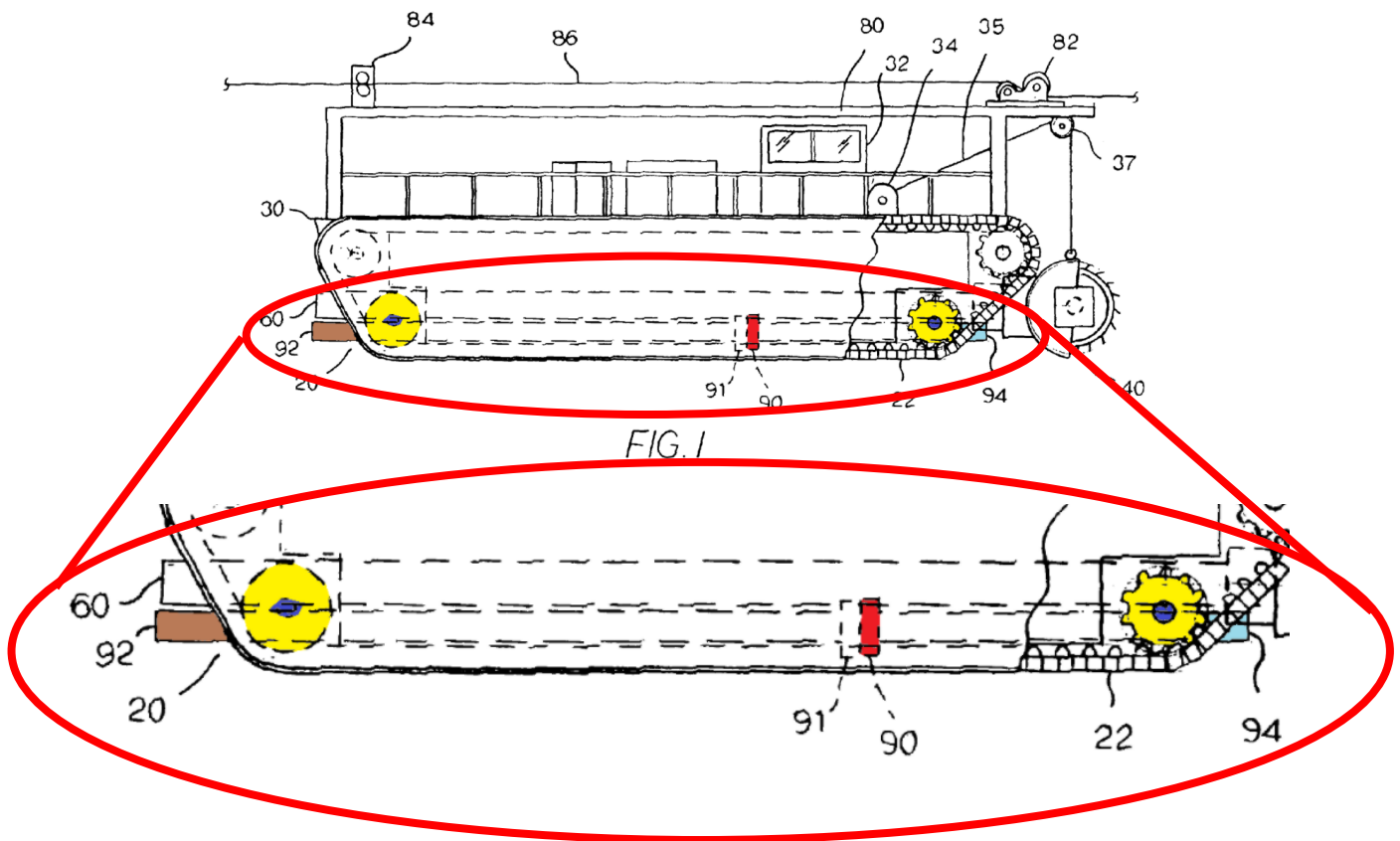
75. Cheramie depicts front and back wheels (shown below in yellow) attached to spindles (blue) for driving the vehicle tracks. *Id.*, FIGS. 1-2. Cheramie also specifically mentions the use of both tracks and wheels with amphibious vehicles. *Id.*, 1:54-58. A POSA would have understood that it was a matter of design choice and that either tracks or wheels can be used interchangeably with amphibious vehicles. Yoon or Carrier disclose an amphibious vehicle having multiple wheels. EX1011, ¶¶[0033], [0054]; EX1005, ¶[0026]. While there are differences between wheel-based and track-based systems and potential benefits of one type of system

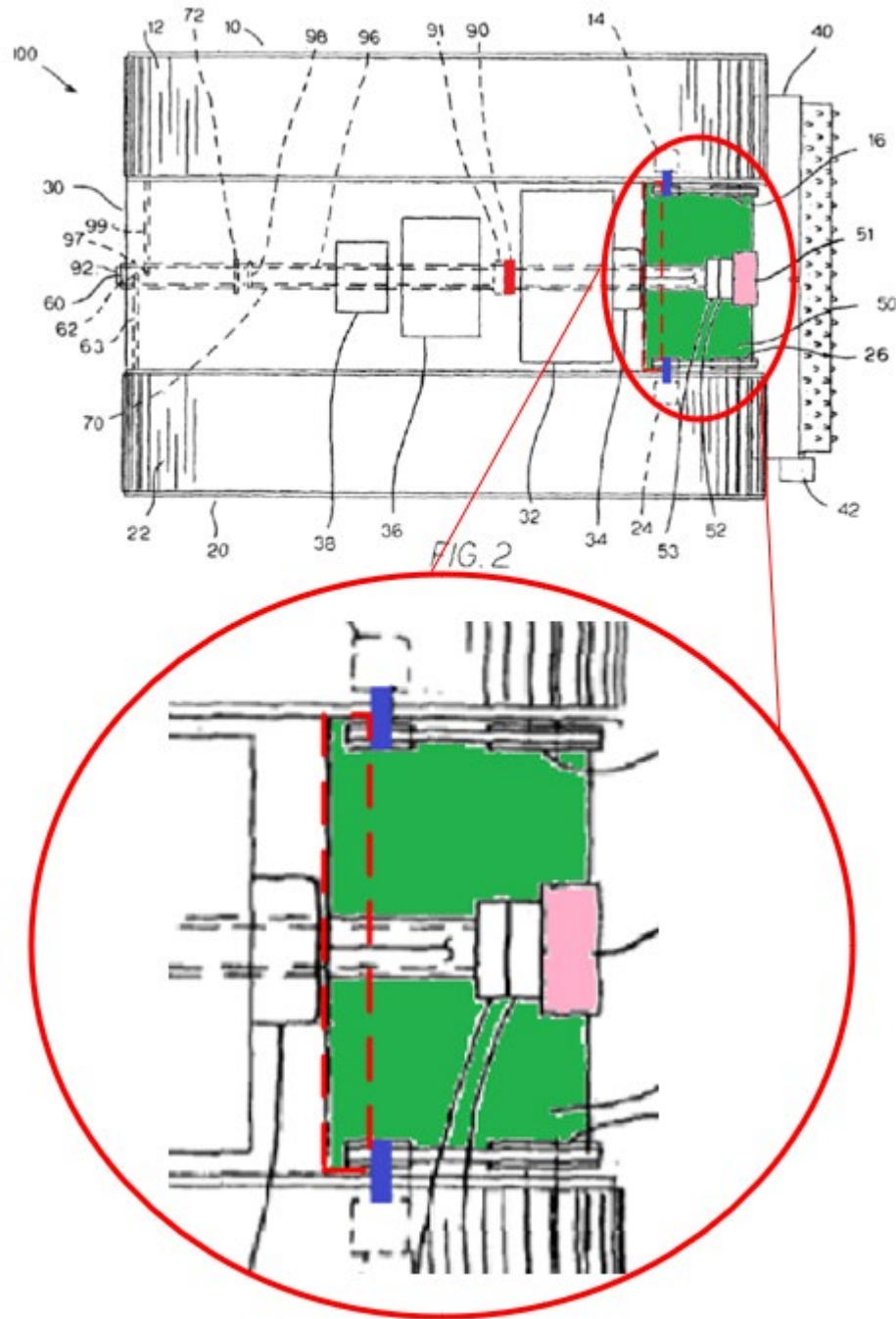
versus the other,² a POSA would have understood that using wheels or tracks is a matter of design choice. A POSA would have understood that the track-based system of Cheramie could be exchanged for the wheel-based system of Yoon or Carrier using well-established technology that was known in the art with expected results. The predictable result would be a vehicle driven with wheels rather than tracks. A POSA would have understood that wheels may be substituted for tracks and vice-versa for propelling an amphibious vehicle. Prior art amphibious vehicles offered the option of track-based or wheel-based propulsion systems for the very same vehicle. Yoon and Carrier both illustrate how wheels and tracks can be used interchangeably with amphibious vehicles without significantly altering performance. Yoon states: “caterpillar wheels [i.e. tracks] may be installed instead of the moving wheels.” EX1011, ¶[0055]. Carrier also references an alternative “track system employed.” EX1005, ¶[0053].

76. POSAs substituting the vehicle tracks for ground engaging wheels would have been motivated to attach the ground engaging wheels to the already provided axles (blue in FIG. 2, below).

² For example, a track system may reduce ground pressure by distributing the vehicle weight over a larger surface area, whereas a wheeled based system might be lighter, less expensive, or provide better traction in some scenarios.

77. Substituting the sprockets for wheels at the axles would result in the dredge pump 50 being rearward of the front set of spindles and forward of the rear set of spindles (see red dashed region in annotated FIG. 2, below).

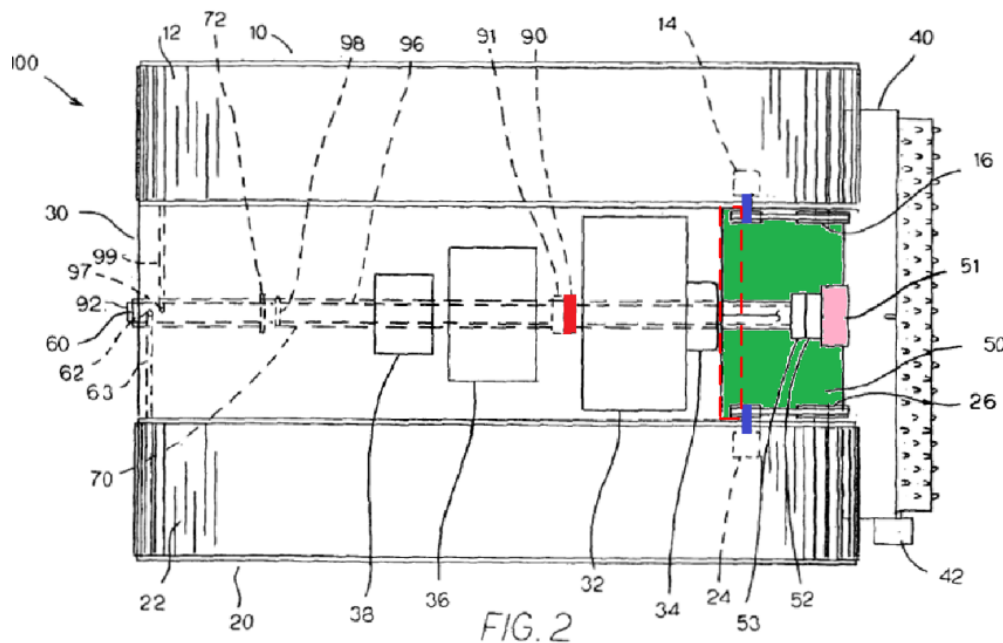




EX1087, FIGS. 1-2 (annotated).

78. Cheramie also teaches a water pump 90 (red, above) that is located between the front and rear blue axles. Like the dredge pump 50, the water pump 90

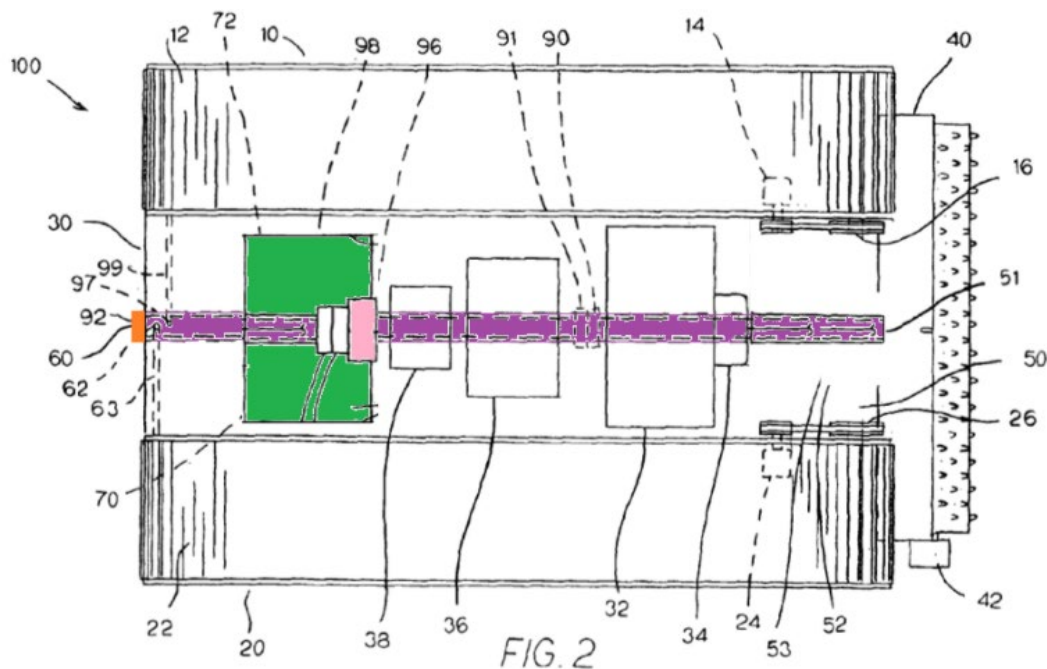
(red) is located between an intake 94 (turquoise, above) at the front of the vehicle and is used to pump fluid from the intake 94 (turquoise, above) to the directable discharge 92 (brown, above). *Id.*, 5:44-59. A POSA would have understood that the logical choice for the water pump 90 would be a pump containing an impeller and a housing because it would be best suited to provide efficient and reliable “desired propulsion” functionality described by Cheramie. *Id.* at 6:6. A POSA would have understood that such impeller equipped pumps were well suited for providing sustained and powerful flows of fluid. POSAs would have understood that such water pumps are capable of pumping liquid manure. *See* Section VII.B.



EX1087, FIG 1 (annotated).

Id., FIG. 2 (annotated).

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plumbing 70 (purple, below) between the cutterhead 40 and the impeller housing 51 (pink). The dredged material would then move through the impeller housing 51 (pink) into another section of the discharge plumbing 70 (purple) between the impeller housing 51 (pink) and the directable discharge 60 (orange). Finally, the dredged material would exit the discharge plumbing 70 (purple) through the directable discharge 60 (orange).

E. Claim 28

[28] The vehicle of claim 122, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

81. Cheramie discloses that, while floating, the speed and direction of the vehicle is controlled by a fluid mover. Cheramie describes that the operation of the tracks moves fluid to propel and steer the vehicle while it is floating. *Id.*, 4:48-50. Cheramie also describes that directable discharge of fluid from the pumps through the discharge plumbing moves fluid to propel and steer the vehicle while it is floating. *Id.*, Abstract, 1:54-56, 5:3-9, 5:46-52. Furthermore, Cheramie discloses a directable discharge connected to the discharge plumbing. *Id.* 5:24-28. A POSA would have been motivated to add a nozzle to the end of the directable discharge 60 as to accelerate fluid flow from the directable discharge and better propel the vehicle, as is commonly done in the marine industry. *See, e.g.*, EX1014. Nozzles and their functions were well known in the art and were used to accelerate fluid to convert

potential energy (pressure) into kinetic energy to propel vehicles. A POSA would have understood the benefits and drawbacks of nozzle propulsion and would have been aware of many nozzle options available for propelling and steering watercraft.

F. Claim 33

[33] The vehicle of claim 425, wherein the power source is connected to the hydraulic pump by a mechanical drive and is connected to the ~~fluid~~ liquid manure pump by the mechanical drive.

82. Cheramie discloses a “powerplant in the form of diesel engine 36 [that] powers pump 37A that pressurizes hydraulic fluid in a conventional hydraulic circuit 137[.]” EX1087, 4:32-38. A POSA would have understood that a diesel engine includes an output shaft. *See* EX1004, ¶277-280. A POSA would have also understood that hydraulic pumps include an input shaft to drive the pump mechanism. *Id.* Thus, a POSA would have understood that Cheramie discloses a mechanical drive connection between the diesel engine and hydraulic pump.

83. Cheramie further discloses a “mechanical transmission[] driven . . . by [the] central powerplant . . . driving the dredge pump 50.” EX1087, 5:11-16. A POSA would have understood the mechanical transmission described by Cheramie as one type of “mechanical drive” connecting the central powerplant and the dredge pump 50.

84. Cheramie also teaches that the water pump 90 that is powered by a hydraulic drive motor 91 and that the dredge pump 50 is powered by hydraulic drive

motor 53. EX1087, 5:1, 5:45-46. A POSA would have understood that a hydraulic motor includes an output shaft and that fluid pumps include an input shaft coupling to drive the pump impeller. *See* EX1004, ¶279. Thus, a POSA would have understood that Cheramie discloses a mechanical drive connection between the diesel engine and the water pump 90.

85. A POSA would also have understood there were a finite number of options for coupling the hydraulic and fluid pumps to the power source, including mechanical drives, which were a matter of design choice. Mechanical drives were known in the art and there would have been a high likelihood of success in using a mechanical drive to connect these pumps to the power source. *Id.*, ¶280.

G. Claim 34

[34] The vehicle of claim 1233, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed.

86. A POSA would have understood that hydraulic motors, such as the hydraulic motors 14, 24 for the vehicle tracks of Cheramie, are operable at variable speed (by regulating the amount of fluid flow to the hydraulic motors). A POSA would have understood that such hydraulic drive systems have long been used to provide variable speed operation to the components which they power, this is sometimes referred to as “proportional control.” A POSA would have understood

that proportional control had been implemented with various remote control systems decades prior to the claimed priority date of the '425 Patent.

87. Yoon and Carrier each disclose amphibious pumping vehicles enabling operators to control the vehicle, its pump systems, and other attachments using remote control. EX1011, ¶[0048], EX1005, ¶¶[0059], [0064]-[0065]. As explained above (and considering Melnikov's teaching to add remote control to Truxor and similar amphibious vehicles), a POSA would have been motivated to implement the remote-control systems taught by Yoon or Carrier to control the vehicle and attachments of Cheramie from a safe location. *Supra* Section VII.A. Remote control of hydraulic systems was known in the art and there would have been a high likelihood of success in adding the remote-control system of Yoon or Carrier to the vehicle of Cheramie to control the hydraulically powered propulsion system. *See* EX1004, Section V.D-E.

H. Claim 35-38

[35] The vehicle of claim 1234, wherein the ground engaging ~~propulsion structure comprises~~ elements consists of a set of ground engaging wheels.

[36] The vehicle of claim 1435, wherein the set of ground engaging wheels comprises at least consists of two powered ground engaging wheels at the front of the floatable vehicle body and two powered ground engaging wheels at the rear of the floatable vehicle body.

[37] The vehicle of claim 1435, wherein the set of ground engaging wheels comprises consists of four powered ground engaging wheels, and wherein each powered ground engaging wheel of the set of wheels is independently powered and is operable at variable speed.

[38] The vehicle of claim ~~16~~37, wherein the four powered ground engaging wheels are operable at variable speed by the hydraulic motor.

88. Cheramie discloses a tracked vehicle and also discusses the interchangeability of wheels and tracks. EX1087, 1:54-58. A POSA would have understood that it would have been a matter of design choice to substitute wheels for the tracks of Cheramie, with one wheel positioned at each corner of the vehicle, which is the conventional arrangement of wheels on a four-sided and four-wheeled vehicle. *Supra* Section VII.D. It would have also been obvious to provide each wheel with its own variable speed hydraulic motor, as Cheramie teaches separate hydraulic motors for each ground engaging element. *Id.*, 4:40-47. A POSA would have understood that such hydraulic motors are able to be operated at variable speed by regulating the amount of fluid flow to the hydraulic motors.

I. Claim 39

[39] The vehicle of claim ~~17~~38, wherein the vehicle further comprises a nozzle at the end of the conduit.

89. Cheramie discloses a directable discharge for propelling the vehicle. EX1087, Abstract. A POSA would have found it obvious to include a nozzle at the end of the directable discharge to accelerate the fluid from the directable discharge to better propel the vehicle while floating. Nozzles were known in the art and were commonly used with marine water jet propulsion systems. A POSA would have had a high likelihood of success in adding a nozzle to the directable discharge of

Cheramie, and such a combination would have produced predictable results. Nozzles and their functions were well known in the art and were used to accelerate fluid to convert potential energy (pressure) into kinetic energy to propel vehicles. A POSA would have understood the benefits and drawbacks of nozzle propulsion and would have been aware of many nozzle options available for propelling and steering watercraft. *Supra* Section VII.E.

J. Claim 40

[40] The vehicle of claim ~~17~~38, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

90. Cheramie and Yoon or Carrier render obvious Claim 40. *Supra* Section VII.E.

VIII. GROUND 2: AMENDED CLAIMS 22-25, 27-28, and 33-40 ARE UNPATENTABLE AS OBVIOUS OVER SENWATEC IN VIEW OF YOON OR CARRIER.

91. It is my opinion that proposed claims 22-25, 27-30, and 33-40 would have been obvious to a POSA at the time of the invention in view of the teachings of SenwaTec in further view of the remote-control teachings of Yoon or Carrier. A POSA would have been motivated to combine SenwaTec with the remote-control teachings of Yoon or Carrier. EX1004, Section IX.A. The motivation to combine SenwaTec with the remote-control teachings of Yoon or Carrier is the same as Cheramie and Truxor. *Supra* Section VII.A; *see also* EX1004, Section IX.A. In

general, a POSA would have understood the SenwaTec vehicle may operate in environments that are hazardous and/or unpleasant for operators onboard and would have been motivated to provide remote control functionality to provide a safer method to control the multi-functional amphibious vehicle of SenwaTec.

A. Claim 22

[22.0] An amphibious vehicle, comprising:

[22.1] a floatable vehicle body with a front, a rear, and an underside;

[22.2] ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor;

[22.4] a power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the ~~fluid~~ liquid manure pump; and,

[22.5] a wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the ~~fluid~~ liquid manure pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating.

92. SenwaTec in view of Yoon or Carrier would have rendered obvious Elements [22.0]-[22.2] and [22.4]-[22.5]. EX1004, ¶¶299-307.

[22.3] a ~~fluid~~ liquid manure pump for pumping liquid manure, the liquid manure pump including a housing and an impeller that are positioned along the underside of the floatable vehicle body between at least two of the ground engaging elements such that the housing and the impeller are rearward of the front of the vehicle body and forward of the rear of the floatable vehicle body and such that the impeller is immersed in and configured to pump the liquid manure when the vehicle is floating;

93. SenwaTec discloses a pump that was used to pump various forms and concentrations of manure. I understand that EX1081 and EX1082 are the full video and accompanying translation of EX1028. As shown in EX1081 at 8:54-10:18, SenwaTec pumped (human/municipal) waste from a manure holding reservoir, which was subsequently applied onto agricultural fields. A POSA would have understood that manure is commonly applied to agricultural fields as fertilizer, and therefore would have understood the material pumped by the vehicle to be a fluid form of manure.

94. Furthermore, EX1084 specifically depicts and describes the Amphi-King vehicle pumping manure. Patent Owner attempts to draw a distinction between human waste and other types of animal manure based on its method of treatment. But Eckhard Funck, the operator of the vehicle depicted in EX1082-EX1084, has described that the human manure that he pumped using the Amphi-King was not artificially processed and included debris such as condoms, tampons, and toilet paper. EX1094, ¶32. Thus, regardless of how the term is construed, EX1081-EX1082 illustrate that the centrifugal pump of SenwaTec is capable of pumping high-solids content manure and would be similarly capable of pumping liquid manure with lower suspended solid, as “liquid manure” is commonly defined. SenwaTec includes a liquid manure pump.

95. A POSA would have understood that the SenwaTec pump is a centrifugal pump including a housing and impeller, because it is described as a “Centrifugal pump with HARDOX inner casing, 6” suction x 6” discharge,” EX1012, which is confirmed by the testimony of Mr. Funck and Mr. Speerschneider. EX1094, ¶28; EX1096, ¶12.

96. A POSA would have also understood that the location of the pump on the vehicle is a matter of design choice, which is further evidenced by the pump being mounted to the articulating arm of the vehicle, which is configured to provide the ability for the operator to selectively vary the location of the pump with respect to the vehicle. EX1012, 1.

97. A POSA would have further understood that the pump could be moved by the articulating arm to a position along the underside the vehicle body. I understand that Mr. Funck testified that he operated the Amphi-King vehicle to do exactly this. EX1094, ¶33.1. A POSA would have understood that when arranged in such a position, the pump would be located between at least two of the ground engaging elements (i.e.) the front wheels (see dashed red region below).



EX1012, 2 (annotated).

B. Claims 23-25, 28, and 33-40

[23] The vehicle of claim 22, wherein the vehicle further comprises a conduit fluidly connected to the ~~fluid~~ liquid manure pump.

[24] The vehicle of claim 23, wherein the conduit comprises an opening at an end thereof.

[25] The vehicle of claim 324, wherein the wireless remote control is configured to control an orientation of the opening.

[28] The vehicle of claim 122, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

[33] The vehicle of claim 425, wherein the power source is connected to the hydraulic pump by a mechanical drive and is connected to the ~~fluid~~ liquid manure pump by the mechanical drive.

[34] The vehicle of claim 1233, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed.

[35] The vehicle of claim 1234, wherein the ground engaging ~~propulsion structure comprises~~ elements consists of a set of ground engaging wheels.

[36] The vehicle of claim 1435, wherein the set of ground engaging wheels comprises at least consists of two powered ground engaging wheels at the front of the floatable vehicle body and two powered ground engaging wheels at the rear of the floatable vehicle body.

[37] The vehicle of claim 1435, wherein the set of ground engaging wheels comprises consists of four power ground engaging wheels, and wherein each powered ground engaging wheel of the set of wheels is independently powered and is operable at variable speed.

[38] The vehicle of claim 1637, wherein the four powered ground engaging wheels are operable at variable speed by the hydraulic motor.

[39] The vehicle of claim 1738, wherein the vehicle further comprises a nozzle at the end of the conduit.

[40] The vehicle of claim 1738, wherein ~~the~~ at least one of the speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover when the vehicle is floating.

98. Claims 23-25, 28, and 33-40 are obvious over SenwaTec in view of Yoon or Carrier. EX1004, ¶¶308-329.

99. It would have been an obvious matter of design choice to use four wheels instead of six wheels. A POSA would have understood that using four wheels, as opposed to six wheels, on the vehicle is a matter of design choice and would potentially reduce the cost of the vehicle. Four-wheel vehicle designs were known in the art and commonly employed with amphibious vehicles. A modification from six to four wheels would not have produced unexpected results, would not have significantly altered the function and performance of the vehicle, and would have been an obvious variation consistent with the principles known in the art.

100. Additionally, SenwaTec discloses a “powerful centrifugal pump” attached to a conduit and nozzle that, when pumping, is a fluid mover. The “powerful centrifugal pump” that “deliver[s] 40 kW of pumping power” would produce a reaction force when spraying fluid. EX1012, 1. A POSA would have understood that the vehicle of SenwaTec could be propelled and steered (and thus the speed or direction of the vehicle could be controlled) by using the “powerful centrifugal pump” to spray jets of fluid in the opposite direction. *Id.* This is the same principle of operation that is used to control the speed or direction of jet boats. The powerful centrifugal pump, conduit, and nozzle of SenwaTec move fluid and would therefore be understood by a POSA to be “a fluid mover.”

C. Claim 27

[27] The vehicle of claim 23, wherein the vehicle further comprises a nozzle at the end of the conduit, wherein the ground engaging propulsion structure comprises a front set of ground engaging wheels that are rotatably attached to a front set of spindles and a rear set of ground engaging wheels that are rotatably attached to a rear set of spindles, and wherein the liquid manure pump is positioned rearward of the front set of spindles and forward of the rear set of spindles.

101. SenwaTec discloses a ground engaging propulsion structure that comprises front and rear sets of wheels that are rotatably attached to front and rear spindles. EX1012. As outlined below, a POSA would have understood it to be obvious to arrange the pump between the front spindles and the rear spindles, as

described in claim 27, or to have configured the articulating arm of SenwaTec to permit the pump to be moved to such a location.

102. A POSA would have understood that the location of the pump on the vehicle is a matter of design choice with tradeoffs and drawbacks associated with each of the different designs. For example, the design of SenwaTec, with the pump arranged on the articulating arm, provides for maximum flexibility for changing the location of the pump on the vehicle. However, as explained below, a POSA would have understood that the flexibility provided by the articulating arm would not be associated with maximum vehicle stability. Therefore, a POSA seeking to increase the stability of the SenwaTec vehicle would have understood it to be a matter of design choice to move the pump to a more central location, such as between the front and rear wheel spindles.

103. Specifically, a POSA would have understood that positioning heavier components, such a pumping system, in a central location on a floating vehicle, is beneficial. Weight distribution and center of gravity location is an important consideration when designing a floating vehicle because off-centered weight distribution may cause a vessel to list and/or adversely affect its stability. For example, the textbook Introduction to Naval Architecture (“Tupper”) states that: “[a]s the position of the centre of gravity is so important for stability it must be established accurately for the ship as completed. During design it is determined by

calculation by considering all weights making up the ship – steel, outfit, fittings, machinery and systems – and assessing their individual centres of gravity.” EX1106, 3.

104. Further, a POSA would have understood that positioning the pump in this centralized location would also minimize the effect of any reaction forces from the pump which may adversely affect the stability of the vehicle. A POSA would have understood that accelerating fluid while pumping will generate reaction forces, equal and opposite the momentum change of the fluid. The reaction forces are governed by the momentum equation, for a fluid volume, which is described in many fluid mechanics textbooks. *See, e.g.*, EX1107, 3-4.

105. Initially the fluid in a manure lagoon or any reservoir is stationary and does not have any momentum, but when it is discharged from the pump, the pumping action has added momentum to the fluid system. A POSA would have understood that this change in momentum produces a reaction force and the magnitude of that force is equal to and opposite the time rate of change of the linear momentum of the system. *Id.* Therefore, a POSA would have understood locating the pump system near the center of the vehicle, between the front and rear tire spindles, would minimize the vessel’s roll and pitch response to the forces generated while pumping. In general, if the reaction forces pass through the center of gravity of the floating vehicle, there will be no net moment causing the floating vehicle to pitch and/or roll.

Whereas the further the force acts from the center of gravity the greater its effect on the vehicle's stability.

IX. GROUND 3: AMENDED CLAIMS 22-25, 27-28, and 33-40 ARE UNPATENTABLE AS OBVIOUS OVER TRUXOR IN VIEW OF YOON OR CARRIER.

106. It is my opinion that proposed claims 22-25, 27-28, and 33-40 would have been obvious to a POSA at the time of the invention in view of the teachings of Truxor in further view of the remote-control teachings of Yoon or Carrier. A POSA would have been motivated to combine Truxor with the remote-control teachings of Yoon or Carrier. EX1004, Section VIII.A. The motivation to combine Truxor with the remote-control teachings of Yoon or Carrier is the same as Cheramie. *Supra* Section VII.A; *see also* EX1004, Section VIII.A. In general, a POSA would have understood the Truxor vehicle may operate in environments that are hazardous and/or unpleasant for operators onboard and would have been motivated to provide remote control functionality to provide a safer method to control the multi-functional amphibious vehicle of SenwaTec.

A. Claim 22

[22.0] An amphibious vehicle, comprising:

[22.1] a floatable vehicle body with a front, a rear, and an underside;

[22.2] ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor;

[22.4] a power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the ~~fluid~~ liquid manure pump; and,

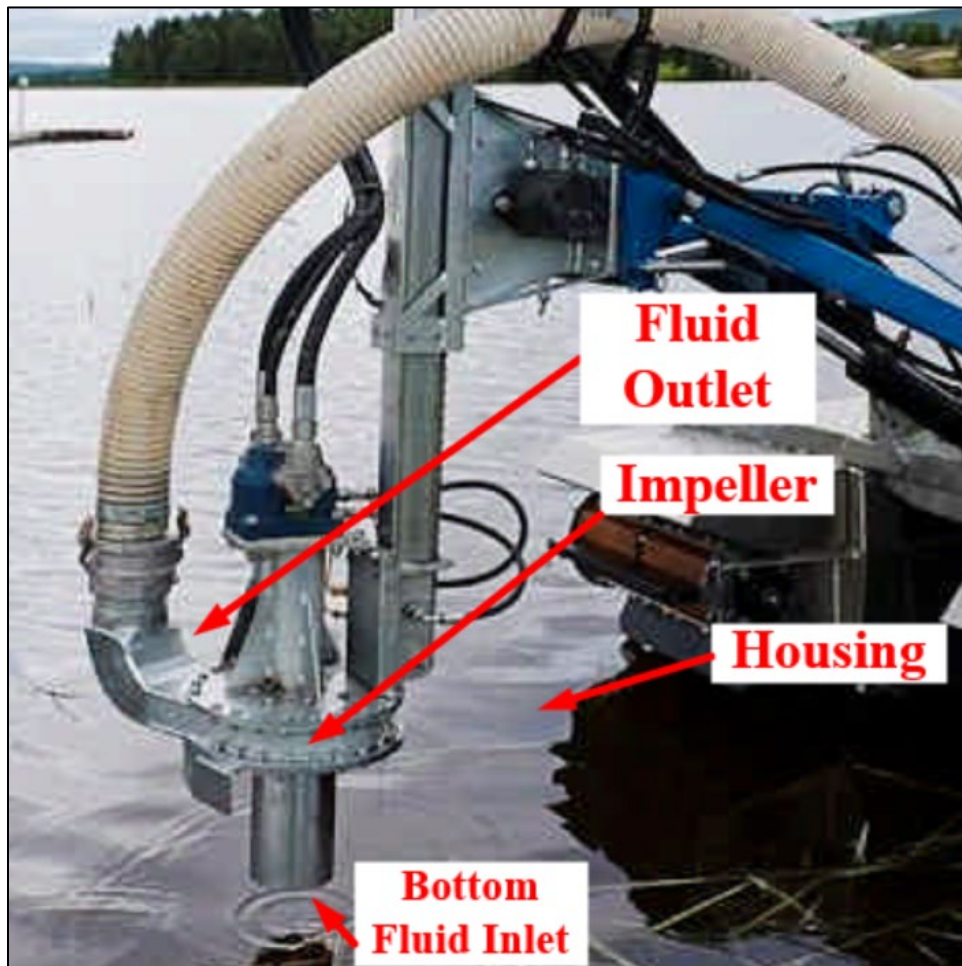
[22.5] a wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the ~~fluid~~ liquid manure pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating.

107. Truxor in view of Yoon or Carrier would have rendered obvious Elements [22.0]-[22.2] and [22.4]-[22.5]. EX1004, ¶¶263-271.

[22.3] a ~~fluid~~ liquid manure pump for pumping liquid manure, the liquid manure pump including a housing and an impeller that are positioned along the underside of the floatable vehicle body between at least two of the ground engaging elements such that the housing and the impeller are rearward of the front of the vehicle body and forward of the rear of the floatable vehicle body and such that the impeller is immersed in and configured to pump the liquid manure when the vehicle is floating;

108. Truxor discloses a fluid pump that is capable of pumping liquid manure, *i.e.* liquid with suspended solids.

109. A POSA would have understood that the Doro Pump is a centrifugal pump based on its geometry. A POSA would have further understood that such centrifugal pumps include a spinning impeller inside a housing.



EX1006, 10 (annotated).

110. A POSA would have understood that the Doro pump includes a bottom fluid inlet that draws fluid into the pump housing through an inlet, and that the spinning impeller accelerates the fluid, moving it from the inlet toward the outer edge of the pump where it is discharged through a fluid outlet. A POSA would have understood that, as illustrated in the annotated image below, the Doro Pump includes a bottom fluid inlet, a fluid outlet, an impeller, and a housing. A POSA would have

understood that the Doro Pump impeller would be located within the housing of the pump above the bottom fluid inlet and adjacent to the fluid outlet.

111. A POSA would have understood that Truxor is capable of pumping liquid with suspended solids because Truxor discloses that the Doro Pump is capable of pumping “sediment”, “cut off roots”, “stones”, bits of wood”, and “sand[.]” *Id.* A POSA would have understood that such a pump would be capable of pumping liquid with suspended solids and would therefore be properly understood to be a liquid manure pump.

112. POSAs would have understood that dredging pumps, like the Doro Pump, are capable of pumping liquid manure as well as higher solid content forms of manure, as they have long been used for this purpose. *See* EX1043, 3; EX1058, 2; EX1066, 64; EX1085, 1; EX1086, 4-5.

113. A POSA would have understood that the location of the pump on the vehicle is a matter of design choice with tradeoffs and drawbacks associated with each of the different designs. For example, the design of Truxor, with the pump arranged on the articulating arm, provides for maximum flexibility for changing the location of the pump on the vehicle. However, as explained below, a POSA would have understood that the flexibility provided by the articulating arm also would be associated with drawbacks that could negatively affect vehicle stability. Therefore, a POSA seeking to increase the stability of the Truxor vehicle would have

understood it to be a matter of design choice to move the pump to a more central location.

114. A POSA would have further understood that the pump could be moved by the articulating arm to a position under the vehicle body, such that it is located rearward of the front of the vehicle and forward of the rear of the vehicle. Alternatively, a POSA would have understood that the articulating arm could be modified to permit the pump to be moved to a position underneath and between front and rear ends of the vehicle body. A POSA would have understood that such an arrangement of the pump with respect to the vehicle body would be beneficial for various reasons, including those explained below. Furthermore, a POSA would have understood that the attachment point for the articulating arm on the vehicle could be shifted rearwardly to allow the pump to be inserted into the fluid through the space between the two pontoons on the Truxor vehicle. *See* EX1006, 10.

115. A POSA would have understood that positioning heavier components, such a pumping system, in a central location on a floating vehicle, is beneficial. Weight distribution and center of gravity location is an important consideration when designing a floating vehicle because off-centered weight distribution may cause a vessel to list and/or adversely affect its stability. For example, the textbook *Introduction to Naval Architecture* (“Tupper”) states that: “[a]s the position of the centre of gravity is so important for stability it must be established accurately for the

ship as completed. During design it is determined by calculation by considering all weights making up the ship – steel, outfit, fittings, machinery and systems – and assessing their individual centres of gravity.” EX1106, 3.

116. Further, a POSA would have understood that positioning the pump in this centralized location would also minimize the effect of any reaction forces from the pump which may adversely affect the stability of the vehicle. A POSA would have understood that accelerating fluid while pumping will generate reaction forces, equal and opposite the momentum change of the fluid. The reaction forces are governed by the momentum equation, for a fluid volume, which is described in many fluid mechanics textbooks. *See, e.g.*, EX1107, 3-4.

117. Initially the fluid in a manure lagoon or any reservoir is stationary and does not have any momentum, but when it is discharged from the pump, the pumping action has added momentum to the fluid system. A POSA would have understood that this change in momentum produces a reaction force and the magnitude of that force is equal to and opposite the time rate of change of the linear momentum of the system. *Id.* Therefore, a POSA would have understood locating the pump system near the center of the vehicle, between the front and rear tire spindles, would minimize the vessel’s roll and pitch response to the forces generated while pumping. In general, if the reaction forces pass through the center of gravity of the floating vehicle, there will be no net moment causing the floating vehicle to pitch and/or roll.

Whereas the further the force acts from the center of gravity the greater its effect on the vehicle's stability.

B. Claims 23-25, 28, and 33-40

[23] The vehicle of claim 22, wherein the vehicle further comprises a conduit fluidly connected to the ~~fluid~~ liquid manure pump.

[24] The vehicle of claim 23, wherein the conduit comprises an opening at an end thereof.

[25] The vehicle of claim 324, wherein the wireless remote control is configured to control an orientation of the opening.

[28] The vehicle of claim 422, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

[33] The vehicle of claim 425, wherein the power source is connected to the hydraulic pump by a mechanical drive and is connected to the ~~fluid~~ liquid manure pump by the mechanical drive.

[34] The vehicle of claim 4233, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed.

[35] The vehicle of claim 4234, wherein the ground engaging ~~propulsion structure comprises~~ elements consists of a set of ground engaging wheels.

[36] The vehicle of claim 4435, wherein the set of ground engaging wheels ~~comprises at least~~ consists of two powered ground engaging wheels at the front of the floatable vehicle body and two powered ground engaging wheels at the rear of the floatable vehicle body.

[37] The vehicle of claim 4435, wherein the set of ground engaging wheels ~~comprises~~ consists of four power ground engaging wheels, and wherein each powered ground engaging wheel of the set of wheels is independently powered and is operable at variable speed.

[38] The vehicle of claim ~~16~~37, wherein the four powered ground engaging wheels are operable at variable speed by the hydraulic motor.

[39] The vehicle of claim ~~17~~38, wherein the vehicle further comprises a nozzle at the end of the conduit.

[40] The vehicle of claim ~~17~~38, wherein ~~the~~ at least one of the speed and direction of the vehicle when the vehicle is floating is controlled by a fluid mover when the vehicle is floating.

118. Claims 23-25, 28, and 33-40 are obvious over Truxor in view of Yoon or Carrier. EX1004, ¶¶272-290.

119. Furthermore, Truxor discloses a vehicle with a fluid mover (pump, conduit, and nozzle). The Doro Pump and the nozzle of Truxor could be used to propel the vehicle and control the speed and direction of the vehicle while floating. Operation of the Doro Pump and the conduit and nozzle of Truxor would produce a jet of fluid and a corresponding reaction force in the opposite direction.



EX1006, 10.

120. The reaction force would cause the vehicle of to be propelled in the direction of the reaction force while the vehicle is floating. Thus, operation of the Doro Pump with conduit and the nozzle, and variation of the direction of the nozzle, would move fluid and control the speed and direction of the vehicle while it is floating. A POSA would have understood that this is the same principle of operation that is used to control the speed or direction of jet boats. The Doro pump, conduit, and nozzle of Truxor move fluid and would therefore be understood by a POSA to be “a fluid mover.”

C. Claim 27

[27] The vehicle of claim 23, wherein the vehicle further comprises a nozzle at the end of the conduit, wherein the ground engaging propulsion structure comprises a front set of ground engaging wheels that are rotatably attached to a front set of spindles and a rear set of ground engaging wheels that are rotatably attached to a rear set of spindles, and wherein the liquid manure pump is positioned rearward of the front set of spindles and forward of the rear set of spindles.

121. Truxor discloses a vehicle with tracks. EX1006, 3. Yoon or Carrier disclose an amphibious vehicle having multiple wheels. EX1011, ¶¶[0033], [0054]; EX1005, ¶[0026]. A POSA would have understood that wheels may be substituted for tracks and vice versa for propelling an amphibious vehicle. EX1004, ¶283. It would have been obvious to a POSA that wheels could be readily substituted for the tracks of Truxor, with one wheel positioned at each corner of the vehicle, which is the typical arrangement of wheels on a four-sided and four-wheeled vehicle.

122. A POSA would have understood it to be obvious to arrange the pump between the front spindles and the rear spindles, as described in claim 27, or to have configured the articulating arm of Truxor to permit the pump to be moved to such a location.

123. A POSA would have understood that the location of the pump on the vehicle is a matter of design choice with tradeoffs and drawbacks associated with each of the different designs. For example, the design of Truxor, with the pump arranged on the articulating arm, provides for greater flexibility for changing the location of the pump on the vehicle. However, as explained below, a POSA would have understood that the flexibility provided by the articulating arm also would be associated with drawbacks that could adversely affect vehicle stability. Therefore, a POSA seeking to increase the stability of the Truxor vehicle would have understood it to be a matter of design choice to move the pump to a more central location, such as between the front and rear wheel spindles.

124. Specifically, a POSA would have understood that positioning heavier components, such a pumping system, in a central location on a floating vehicle, such as between the spindles, is beneficial. Weight distribution and center of gravity location is an important consideration when designing a floating vehicle because off-centered weight distribution may cause a vessel to list and/or adversely affect its stability. For example, the textbook Introduction to Naval Architecture (“Tupper”)

states that: “[a]s the position of the centre of gravity is so important for stability it must be established accurately for the ship as completed. During design it is determined by calculation by considering all weights making up the ship – steel, outfit, fittings, machinery and systems – and assessing their individual centres of gravity.” EX1106, 3.

125. Further, a POSA would have understood that positioning the pump in this centralized location would also minimize the effect of any reaction forces from the pump which may adversely affect the stability of the vehicle. A POSA would have understood that accelerating fluid while pumping will generate reaction forces, equal and opposite the momentum change of the fluid. The reaction forces are governed by the momentum equation, for a fluid volume, which is described in many fluid mechanics textbooks. *See, e.g.*, EX1107, 3-4.

126. Initially the fluid in a manure lagoon or any reservoir is stationary and does not have any momentum, but when it is discharged from the pump, the pumping action has added momentum to the fluid system. A POSA would have understood that this change in momentum produces a reaction force and the magnitude of that force is equal to and opposite the time rate of change of the linear momentum of the system. *Id.* Therefore, a POSA would have understood locating the pump system near the center of the vehicle, between the front and rear tire spindles, would minimize the vessel’s roll and pitch response to the forces generated while pumping.

In general, if the reaction forces pass through the center of gravity of the floating vehicle, there will be no net moment causing the floating vehicle to pitch and/or roll. Whereas the further the force acts from the center of gravity the greater its effect on the vehicle's stability.

X. GROUND 4: AMENDED CLAIMS 22-42 ARE UNPATENTABLE AS OBVIOUS OVER PUCK IN VIEW OF BRYHAM AND MANURE MANAGER.

127. Puck in view of Bryham and Manure Manager would have rendered claims 22-42 obvious.

A. Motivation to Combine Puck, Bryham, and Manure Manager

128. It would have been obvious to a POSA to add the steerable, hydraulically powered, all-terrain wheels of Bryham to the Puck manure boat, and extend the remote-control functions of Puck to the wheels of Bryham. EX1004, Section X.A.

129. Puck teaches a manure pumping agitator including a slurry pump in the form of a “Cornell Redi-Prime centrifugal pump” EX1014, ¶[0025]. Puck describes a process that requires the user to prime the pump using a remote control prior to use. *Id.*, ¶[0031]. Puck relies on the manure pump to pump the manure and propel the vehicle about the liquid manure lagoon. *Id.*, ¶[0035].

130. Manure Manager II, an excerpt of which is shown below, is another printed publication describing various multi-outlet high efficiency pumps. Manure

Manager II describes a multi-outlet pump made by Patent Owner (above) and a dual outlet pump made by Fisher Pumps (below), another manufacturer of pumping equipment:

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Manure Manager • July/August 2011 23

EX1089, 23.

131. Manure ManagerII describes how dual outlet pump designs “equalize[] pressure” and “maximize[] horsepower.” *Id.* Fisher, a brochure distributed by Fisher Pumps,³ further touts various benefits of dual tangential outlet pumps:

Double discharge impeller equalizes case pressure & allows impeller to center in the case. NO one sided thrust load!

Double discharge case does not require fluid to travel more than 180 degrees before discharging for better efficiency & less internal wear.

EX1090, 1.

132. Manure Manager describes the Nuhn Pump as being dual outlet (“dual ported”), having a “hardened and balanced drive shaft,” and providing the “fastest load times in the industry.” EX1088, 27. Manure Manager also shows the Nuhn Pump mounted on and powered by a vehicle.

³ EX1090 is a prior art printed publication that describes the benefits of dual outlet pumps. EX1090 was published and was publicly accessible before the effective filing date of the ’425 Patent. EX1091, ¶¶7, 12.



EX1088, 27.

133. A POSA looking to select an improved pump for use on the Puck vehicle would have been motivated to use the Nuhn Pump, given the various teachings in the literature, often alongside Patent Owner's own pump advertisements, touting the efficiency and durability benefits of such dual outlet pumps. A POSA would have had a reasonable expectation of success in using the Nuhn Pump based on it being vehicle mounted and powered.

134. Furthermore, a POSA would have been further motivated to use the Nuhn Pump on the Puck vehicle because of the pump's advertised manure pumping

capabilities, which would allow the Puck vehicle to more efficiently pump manure, saving fuel costs, time, and providing better agitation.

135. In addition to the enhanced efficiency and durability and improved manure pumping capabilities of the Nuhn Pump, a POSA would have understood that such “submersible centrifugal unit[s] do] not require priming, draining or sealing.” EX1090, 2. A POSA would have understood the Nuhn Pump, as described in Manure Manager, to be a “submersible centrifugal unit.” *Id.*, 2.

136. A POSA would have been motivated and had a reasonable expectation of success in combining the Nuhn Pump with the Puck vehicle to take advantage of the pump’s improved efficiency and manure pumping capabilities. Both qualities are even more important given that the Puck vehicle uses the pump to propel itself around the lagoon. Using the efficient and robust pump described in Manure Manager, the Nuhn Pump would make the Puck vehicle more fuel efficient and less likely to become stuck given the improved propulsion efficiency. *See* EX1089, 23; EX1090, 7; EX1088, 27.

137. Furthermore, a POSA would have understood that using a “submersible centrifugal unit that does not require priming,” such as the Nuhn Pump, would remove the need to prime the pump of Puck, thereby removing a potential failure mode and additional step required to operate the vehicle. EX1090, 2.

B. Claim 22

[22.0] An amphibious vehicle, comprising:

[22.1] a floatable vehicle body with a front, a rear, and an underside;

[22.2] ground engaging propulsion structure comprising a plurality of ground engaging elements powered by a hydraulic motor;

[22.4] a power source connected to a hydraulic pump, the power source configured to provide power to both the ground engaging propulsion structure and the ~~fluid~~ liquid manure pump; and,

[22.5] a wireless remote control configured to enable an operator who is remote from the vehicle to: (1) control the ground engaging propulsion structure; (2) control a flow of liquid manure from the ~~fluid~~ liquid manure pump; (3) control at least one of the speed and direction of the vehicle when the vehicle is ground engaging; and, (4) control at least one of the speed and direction of the vehicle when the vehicle is floating.

138. Puck in view of Bryham would have rendered obvious Elements [22.0]-[22.2] and [22.4]-[22.5]. EX1004, ¶¶341-350.

[22.3] a ~~fluid~~ liquid manure pump for pumping liquid manure, the liquid manure pump including a housing and an impeller that are positioned along the underside of the floatable vehicle body between at least two of the ground engaging elements such that the housing and the impeller are rearward of the front of the vehicle body and forward of the rear of the floatable vehicle body and such that the impeller is immersed in and configured to pump the liquid manure when the vehicle is floating;

139. Puck in view of Bryham and Manure Manager would have rendered obvious Element 22.3. This would have resulted in a liquid manure pump with a housing and impeller immersed in the fluid along the underside of the vehicle forward of the rear of the vehicle and rearward of the front of the vehicle.

140. Puck teaches a vehicle with a pump capable of pumping liquid manure, which is located forward of the rear end and rearward of the aft end of the vehicle body. *See* EX1014, FIG. 1.

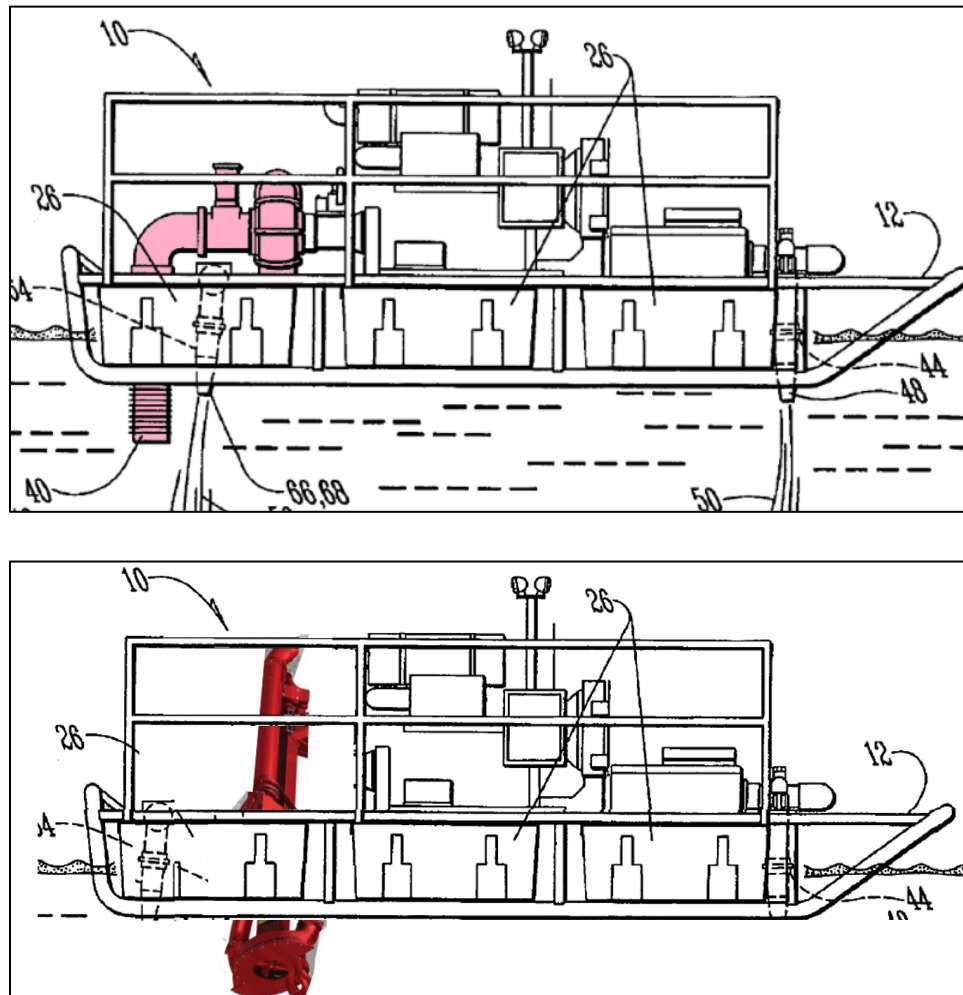
141. Manure Manager teaches a pump with a bottom fluid inlet and an impeller within a housing which are immersible in a fluid reservoir:



EX1088, 27 (annotated).

142. A POSA would have been motivated to substitute the Puck pump with the Nuhn Pump described in Manure Manager, to take advantage of the improved efficiency and manure pumping capabilities described in Manure Manager. A POSA would also have been motivated to substitute the Puck pump with the Nuhn Pump described in Manure Manager because an immersible pump does not require priming when the housing and impeller are immersed in the fluid.

143. When substituting the Puck pump for the Nuhn Pump, a POSA would have been motivated to locate the Nuhn Pump adjacent to the power source, just as the Puck pump was. A POSA would have understood that the Nuhn Pump could be immersed into the fluid and could pass through the same opening which the intake conduit 40 and nozzles 66, 68 extend, which provides an access from the top of the vehicle to the fluid below.



EX1014, FIG. 4; EX1088, 27 (modified and annotated).

144. The Puck vehicle is described as being constructed with a steel tubular frame. EX1014, ¶[0022]. A POSA would have also understood that the normal and typical arrangement for four-sided vehicles would naturally result in attaching the wheels of Bryham to the Puck vehicle such that one wheel is located at each corner of the steel frame. A POSA would have understood that attaching the wheels to the steel frame in such an arrangement would have provided a stable and durable configuration for such a wheeled vehicle. A POSA would have understood that when the wheels and pump were arranged on the vehicle in such a configuration, the impeller would be immersed, and the pump would be located between the wheels when the vehicle is floating.

C. Claims 23-25, 28, 30, and 33-40

[23] The vehicle of claim 22, wherein the vehicle further comprises a conduit fluidly connected to the ~~fluid~~ liquid manure pump.

[24] The vehicle of claim 23, wherein the conduit comprises an opening at an end thereof.

[25] The vehicle of claim ~~3~~24, wherein the wireless remote control is configured to control an orientation of the opening.

[28] The vehicle of claim ~~1~~22, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

[30] The vehicle of claim ~~8~~29, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control the at least one of the speed and direction of the vehicle when the vehicle is floating.

[33] The vehicle of claim ~~42~~5, wherein the power source is connected to the hydraulic pump by a mechanical drive and is connected to the ~~fluid~~ liquid manure pump by the mechanical drive.

[34] The vehicle of claim ~~42~~33, wherein the wireless remote control is configured to operate the hydraulic motor to operate the ground engaging propulsion structure at variable speed.

[35] The vehicle of claim ~~42~~34, wherein the ground engaging ~~propulsion structure comprises~~ elements consists of a set of ground engaging wheels.

[36] The vehicle of claim ~~44~~35, wherein the set of ground engaging wheels ~~comprises at least~~ consists of two powered ground engaging wheels at the front of the floatable vehicle body and two powered ground engaging wheels at the rear of the floatable vehicle body.

[37] The vehicle of claim ~~44~~35, wherein the set of ground engaging wheels ~~comprises~~ consists of four powered ground engaging wheels, and wherein each powered ground engaging wheel of the set of wheels is independently powered and is operable at variable speed.

[38] The vehicle of claim ~~46~~37, wherein the four powered ground engaging wheels are operable at variable speed by the hydraulic motor.

[39] The vehicle of claim ~~47~~38, wherein the vehicle further comprises a nozzle at the end of the conduit.

[40] The vehicle of claim ~~47~~38, wherein ~~the~~ at least one of the speed and direction of the vehicle ~~when the vehicle is floating~~ is controlled by a fluid mover when the vehicle is floating.

145. It would have been obvious to a POSA to implement the Nuhn Pump on the Puck vehicle in the same manner in which the Puck pump was implemented on the Puck vehicle. Specifically, a POSA would have been motivated to connect the output of the Nuhn Pump to the transport pipe 42 to permit the pumped fluid to

be discharged through the nozzles 66, 68, 48. A POSA would have been motivated to connect the Nuhn pump in such a way so as to retain the steering, propulsion, and agitation functionality of the vehicle while it is floating in a liquid manure lagoon. Therefore, claims 23-26, 28-30, and 33-40 are obvious over Puck in view of Yoon or Carrier. EX1004, ¶¶351-359, 362-374.

D. Claims 26 and 29, 31-32, and 41-42

[26] The vehicle of claim ~~4~~25, wherein the vehicle further comprises a first fluid nozzle at the end of the conduit that is positioned at the front of the floatable vehicle body, a pair of second fluid nozzles at the rear of the floatable vehicle body, and side fluid nozzles on opposite sides of the floatable vehicle body.

[29] The vehicle of claim ~~1~~22, further comprising a plurality of fluid nozzles fluidly connected to the fluid-liquid manure pump, the plurality of fluid nozzles including side fluid nozzle on opposite sides of the floatable vehicle body.

[31] The vehicle of claim ~~4~~25, further comprising a plurality of fluid nozzles fluidly connected to the fluid liquid manure pump, the plurality of fluid nozzles including a pair of left side fluid nozzles provided on a left side of the floatable vehicle body and a pair of right side fluid nozzles provided on a right side of the floatable vehicle body.

[32] The vehicle of claim ~~10~~31, wherein the wireless remote control is configured to control opening and closing of a valve structure to proportion flow between the plurality of fluid nozzles to control the at least one of the speed and direction of the vehicle when the vehicle is floating.

[41] The vehicle of claim ~~17~~38, further comprising a plurality of fluid nozzles fluidly connected to the fluid liquid manure pump, the plurality of fluid nozzles including a first fluid nozzle at the front of the floatable vehicle body, a pair of second fluid nozzles at the rear of the floatable vehicle body, a pair of left side fluid nozzles provided on a left side of the floatable vehicle

body, and a pair of right side fluid nozzles provided on a right side of the floatable vehicle body.

[42] The vehicle of claim 20 41, wherein the wireless remote control is configured to control the plurality of fluid nozzles to control ~~the~~ at least one of the speed and direction of the vehicle when the vehicle is floating.

146. Puck already describes a plurality of fluid nozzles arranged about the vehicle body that are used to propel and to steer the vehicle. EX1014, ¶[0011]. A POSA would have understood it to be obvious to simply add more fluid nozzles to the various sides of the vehicle through which fluid could be discharged to control the speed and direction of the vehicle.

147. Puck teaches that the nozzles are mounted on pivot pipes such that their orientation can be changed to propel the vehicle forward or rearward or to steer it left or right. A POSA would have understood that steering could be accomplished by alternately discharging fluid through one of two nozzles on the left or right side of the vehicle rather than rotating a single nozzle toward the left or right side of the vehicle. Such a modification would have been a matter of design choice. For example, rather than requiring a hydraulic cylinder, pivot pipe, and rotatable nozzle, one could provide multiple fixed nozzles on each side of the vehicle with valves controlling which of the nozzles fluid is discharged from. Puck already discloses selectively controlling gate valves to selectively discharge fluid from various nozzles. EX1014, ¶[0033]. A POSA would have understood that right/left turning

could be accomplished by selectively discharging fluid through fixed nozzles on opposite sides of the vehicle. Thus, it would have been obvious to a POSA to have added a pair of nozzles disposed on either side of the vehicle to augment the vehicle's steering system. Such a combination would result in two rear fluid nozzles (already provided as reference numbers 66 and 68), two side fluid nozzles on each side of the vehicle, and a front fluid nozzle (already provided as reference number 48), thereby rendering obvious claims 26, 29, 31, and 41.

148. Puck further teaches a remote control system for opening and closing the valves that direct fluid to each of the nozzles to propel and steer the vehicle, thereby rendering obvious claims 32 and 42. EX1014, ¶[0033].

E. Claim 27

[27] The vehicle of claim 23, wherein the vehicle further comprises a nozzle at the end of the conduit, wherein the ground engaging propulsion structure comprises a front set of ground engaging wheels that are rotatably attached to a front set of spindles and a rear set of ground engaging wheels that are rotatably attached to a rear set of spindles, and wherein the liquid manure pump is positioned rearward of the front set of spindles and forward of the rear set of spindles.

149. As noted above, a POSA would have been motivated to have substituted the Puck pump with the Nuhn pump and would have been motivated to extend the Nuhn Pump into the fluid reservoir using the same opening as used for the intake conduit of Puck. *Supra* Section X.A-B.

150. The Puck vehicle is described as being constructed with a steel tubular frame. EX1014, ¶[0022]. A POSA would have also understood that the normal and typical arrangement for four-sided vehicles would naturally result in attaching the wheels of Bryham to the Puck vehicle such that one wheel is located at each corner of the steel frame. A POSA would have understood that attaching the wheels to the steel frame in such an arrangement would have provided a stable and durable configuration for such a wheeled vehicle. A POSA would have understood that when the wheels and pump were arranged on the vehicle in such a configuration, the impeller would be immersed, and the pump would be located between the wheels when the vehicle is floating.

151. To the extent that the Nuhn Pump would not already be arranged forward of the rear spindles and rearward of the front spindles when implemented within the vehicle of Puck, as explained above, POSA would have considered it obvious to have located the pump in such a way so as to centrally locate the center of gravity and mitigate the effect of any negative forces generated by the operation of the fluid pump.

152. Specifically, a POSA would have understood that positioning heavier components, such a pumping system, in a central location on a floating vehicle, is beneficial. Weight distribution and center of gravity location is an important consideration when designing a floating vehicle because off-centered weight

distribution may cause a vessel to list and/or adversely affect its stability. For example, the textbook Introduction to Naval Architecture (“Tupper”) states that: “[a]s the position of the centre of gravity is so important for stability it must be established accurately for the ship as completed. During design it is determined by calculation by considering all weights making up the ship – steel, outfit, fittings, machinery and systems – and assessing their individual centres of gravity.” EX1106, 3.

153. Further, a POSA would have understood that positioning the pump in this centralized location would also minimize the effect of any reaction forces from the pump which may adversely affect the stability of the vehicle. A POSA would have understood that accelerating fluid while pumping will generate reaction forces, equal and opposite the momentum change of the fluid. The reaction forces are governed by the momentum equation, for a fluid volume, which is described in many fluid mechanics textbooks. *See, e.g.*, EX1107, 3-4.

154. Initially the fluid in a manure lagoon or any reservoir is stationary and does not have any momentum, but when it is discharged from the pump, the pumping action has added momentum to the fluid system. A POSA would have understood that this change in momentum produces a reaction force and the magnitude of that force is equal to and opposite the time rate of change of the linear momentum of the system. *Id.* Therefore, a POSA would have understood locating the pump system

near the center of the vehicle, between the front and rear tire spindles, would minimize the vessel's roll and pitch response to the forces generated while pumping. In general, if the reaction forces pass through the center of gravity of the floating vehicle, there will be no net moment causing the floating vehicle to pitch and/or roll. Whereas the further the force acts from the center of gravity the greater its effect on the vehicle's stability.

XI. THE AMENDED CLAIMS LACK SUPPORT UNDER § 112(a)

155. Patent Owner's amended claims seek to replace the term "fluid pump for pumping liquid manure" with "liquid manure pump." It is my opinion that this new term lacks written description support in the specification.

156. It is my understanding that aside from the proposed claims of the '425 Patent, neither the '425 Patent, nor the incorporated-by-reference '758 Patent, include any reference to the term "liquid manure pump." Instead, the '425 Patent generally describes a fluid pump that is used for pumping liquid manure.

157. The specification of the '425 Patent does not describe any required structural features for a "liquid manure pump" in a way that would structurally distinguish a "liquid manure pump" from any other fluid pump that is used to pump liquid manure. As explained in detail above and in my earlier declaration, people in the manure management industry had long used a wide variety of pumps, including

centrifugal water pumps and conventional irrigation pumps, for pumping liquid manure. *Supra*, Section VII.B; *see also* EX1004, Section V.B.ii.a.

158. Therefore, to the extent that a “liquid manure pump” is understood to mean anything other than “a fluid pump” it is my opinion that the proposed claims of the ’425 Patent are invalid under 35 U.S.C. § 112(a) as failing to sufficiently describe the claimed invention.

XII. CONCLUSION

159. I reserve the right to supplement my opinions as appropriate. I further reserve the right to supplement my opinions regarding any objective indicia of non-obviousness if Patent Owner alleges or offers any purported evidence of any such objective indicia of non-obviousness with regard to the proposed claims.

160. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

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June 27, 2024

Date

Technical Review by:



Daniel B. Honeycutt, MSME, PE
Senior Consultant

June 27, 2024

Date

Appendix A

List of Additional Materials Considered

Patents and Patent Applications

- U.S. Patent No. 6,922,922 (Cheramic)

Declarations

- Declaration of Royal Burrows, Dated June 21, 2023
- Declaration of Eckhard Funck, Dated March 12, 2024
- Declaration of Reinhard Speerschneider, Dated May 9, 2024

Non-Patent Literature

- UD UMWELT-DIENSTE GMBH AMPHI-KING MANURE PUMPING VIDEO.
- English Translation of UD UMWELT-DIENSTE GMBH AMPHI-KING MANURE PUMPING VIDEO and declaration of Ute von Wietersheim, Dated January 31, 2024.
- *Gequirilter Klärschlamm*, MAIN POST, <https://www.mainpost.de/regional/main-spessart/gequirilter-klaerschlam-art-5778615> (last updated Oct. 15, 2010).
- English Translation of *Gequirilter Klärschlamm* and declaration of Ute von Wietersheim, Dated January 27, 2024.
- *Custom Applicator Uses Dredge to Pump Lagoons*, 33 FARM SHOW MAG., no. 4, 2009, at 9.
- Don D. Jones et al., *Closure of Earthen Manure Structures (Including Basins, Holding Ponds and Lagoons)*, in ANIMAL AGRIC. & ENV'T: NAT'L CTR. FOR MANURE & ANIMAL WASTE MGMT. WHITE PAPERS (J. M. Rice, et al., ed., 2006).
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- Fisher Pumps, Inc., FISHER PUMPS.
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- S. C. Jett et al., *Size Distribution and Nutritional Value of Swine Manure Separates*, 17(5) TRANSACTIONS OF THE ASAE 965 (1974).
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- William L. Kranz et al., *Application of Liquid Animal Manures Using Center Pivot Irrigation Systems*, U. NEB. EXTENSION (May 10, 2007).
- T. M. Verna and L. A. Prieto-Portar, *A Simple Method of Risk/Hazard Assessment in Dredging*, WESTERN DREDGING ASSOCIATION TECHNICAL CONFERENCE AND TEXAS A&M UNIVERSITY DREDGING SEMINAR 233 (June, 2012).
- *Dredger Accidents*, MARITIME INJURY GUIDE, <https://www.maritimeinjuryguide.org/maritime-accidents-injuries/vessel-injuries/dredger/> (last visited June 24, 2024).
- ERIC C. TUPPER, INTRODUCTION TO NAVAL ARCHITECTURE 71 (5th ed. 2013).
- DONALD F. YOUNG ET AL., A BRIEF INTRODUCTION TO FLUID MECHANICS 141-142 (Penny Perrotto et al. eds., 2d ed. 2001).
- Deposition Transcript of Ian Nuhn, Taken on May 30, 2024.