Feb. 9, 1932. A. A. LA POINTE 1,844,772

ELECTROMAGNETIC PUMP

Filed Jan. 8, 1931

Fig. 1.

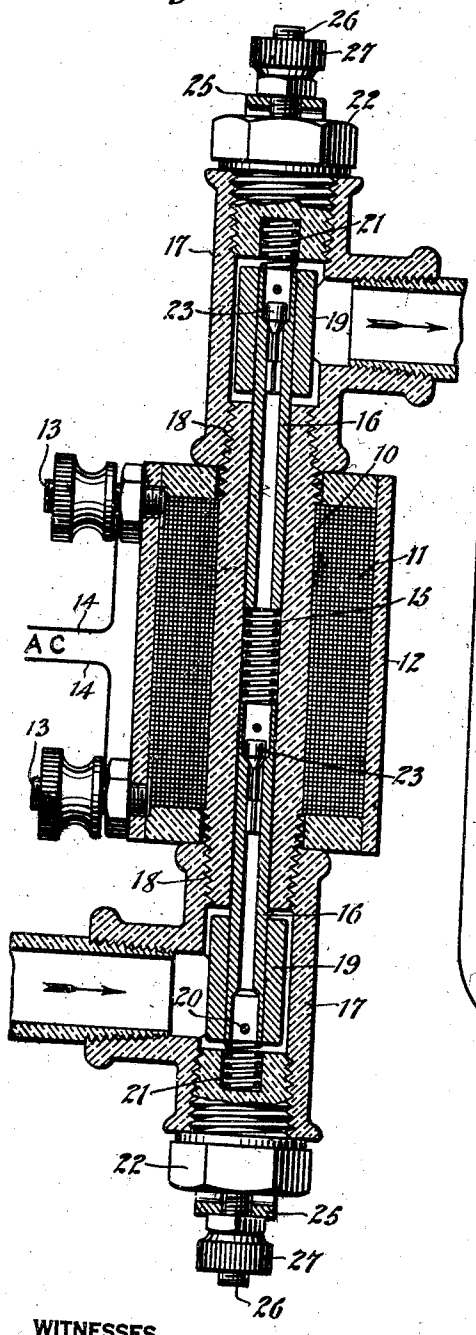
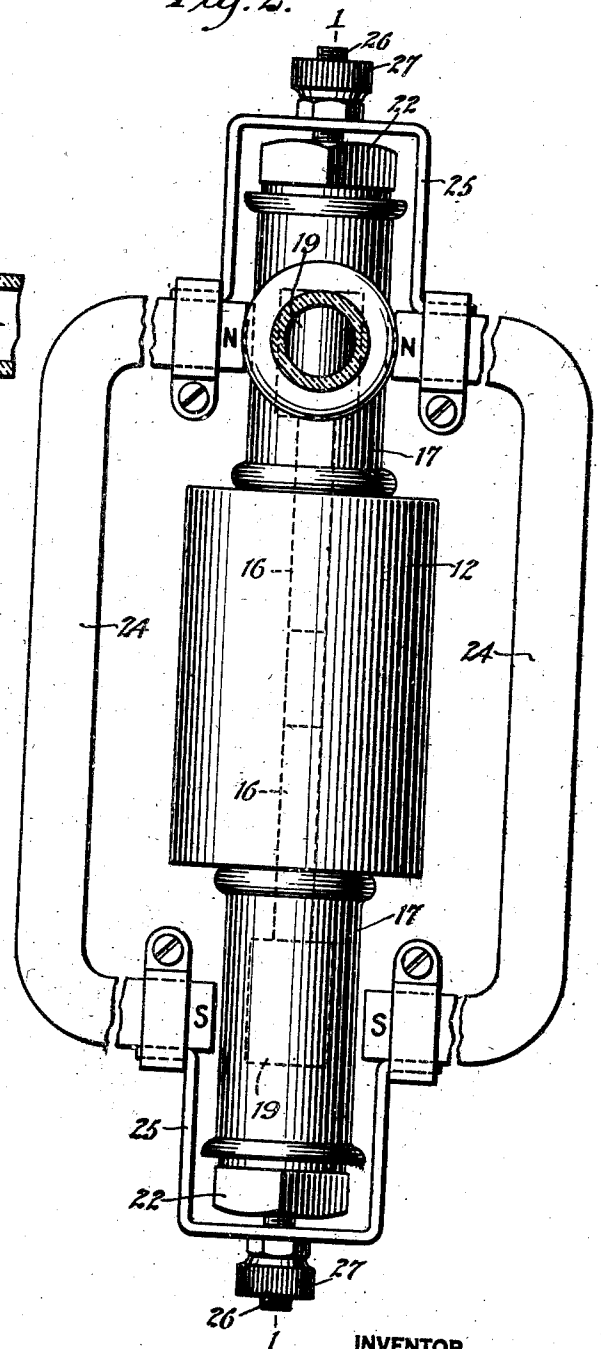


Fig. 2.



WITNESSES

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ELECTROMAGNETIC PUMP

Application filed January 8, 1931. Serial No. 507,477.

This invention relates to electromagnetic pumps of the type disclosed in United States Letters Patent No. 1,790,547 granted to me.

It is among the prime objects of the present invention to provide an electromagnetic pump operable by alternating current energization.

A further object of the present invention is to provide an electromagnetic pump in which the cycles of applied alternating current will provide for responsive reciprocations of the pump plunger, thus avoiding the necessity of utilizing a circuit maker-and-breaker in connection with the pump.

A further object of the present invention is to provide an alternating current electromagnetic pump including a pair of plungers respectively movable under the influence of variations in the cycle of applied alternating current.

Other objects of the present invention are to provide a novel, simple and improved construction particularly adapted to meet the demands of economic manufacture.

Numerous other objects and features of the present invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawings, in which

Figure 1 is a vertical sectional view illustrating one form of the present invention, the section being taken as illustrated on the line 1—1 of Fig. 2;

Fig. 2 is a side elevation of that form of the invention shown in Fig. 1.

Referring more particularly to the drawings, the form of the invention therein illustrated by way of illustration, includes a central cylinder 10, about which is centrally wound alternating current electromagnetic windings 11. The windings 11 are enclosed within a suitable casing 12, the ends of which engage the terminal ends of the cylinder 10 and to which binding posts 13 are associated for electrical connection by conductors 14 of an alternating source of potential (not shown).

Centrally positioned within the cylinder 10, an expansion spring 15 is provided, the ends of which abut tubular plungers 16. The outer ends of the plungers 16 extend into T connections 17, threadedly engaged with the externally threaded ends of the cylinder 10, as at 18. Within the T connections 17, the outer ends of the tubular plungers 16 are provided with magnetic heads 19. The side outlets of the lower and upper T's 17 are provided with inlet and outlet pipes, respectively, the direction of flow being indicated by the arrows.

For disassembling the pump, the magnetic heads 19 are removably associated with the tubular plungers 16 by removable pins 20. The assembly is retained in resiliently balanced position by terminal springs 21 which are seated within recesses of removable terminal plugs 22 of the T's 17, the arrangement being such that the plungers are arranged for respective movement against the tension of the balancing springs which include the central spring 15, whereby reciprocation of the plungers is provided to cause the flow of liquid therethrough. Both of the plungers are provided with simple check valves 23 positioned within extensions of their bores at the upper end, the arrangement being such that liquid may pass only upwardly through the tubular plungers.

For providing opposite magnetic fields for the upper and lower magnetic heads, permanent magnets 24 are positioned externally of the pump, the like poles of the magnets being positioned on either side of the T 17, whereby a strong magnetic field is provided through the magnetic heads. The magnets 24 are here shown as being the permanent magnet type. They may, however, be energized by suitable electric windings, if desired. The magnets are supported in the assembly by yokes 25 adjustably secured to central externally threaded pins 26 carried by the closure plugs 22 of the T's. Nuts 27 are provided on the pins 26, whereby adjustment of the position of the terminal ends of the magnets with respect to the T's may be provided.

In the invention as here shown, the north poles of the magnets 24 are arranged on either side of the upper T 17, while the south poles are arranged to provide a strong south magnetic field through the lower T 17.

As shown by the dotted lines in Figure 2 it will be seen that the ends of the poles of the permanent magnets are in line with the outer ends of the heads 19, thus the heads 19 will form corresponding magnets by magnetic induction whereby the inner end of the upper head 19 will constitute a north pole and the inner end of the lower head 19 will constitute a south pole.

In the operation of the device alternating current is supplied through the binding posts 13 to provide alternating current through the electromagnet windings 11, thus, by virtue of the windings the cylinder 10 will be magnetized in accordance with cycles of the applied current so that for instance, when the cycle is positive the upper end of the cylinder 10 will be formed into a north pole, thus repelling the upper head 19, the lower end of which is maintained as a north pole through its relationship to north poles of the magnets 24. Simultaneously therewith, the lower head 19 will be repulsed due to the fact that the positive cycle has formed the lower end of the cylinder 10 into a south pole. Both plungers are thus simultaneously repulsed and move outwardly against the tension of the springs 21. Upon reversal of the current cycle the upper and lower ends of the cylinder 10 are formed into south and north poles respectively, thus attracting the heads 19 which move together against the tension of the central spring 15. By this simultaneous reciprocation of the plungers 16 it will be seen that the liquid is, upon outward movement of the plungers, forced past the valve 23 of the lower plunger, and upon inward movement of the plungers the liquid is forced past the upper valve 23. Liquid from the supply pipe associated with the lower T will thus be caused to flow upwardly through the lower tubular plunger and therefrom through the upper plunger and through the valve of the upper plunger to the outlet associated with the upper T.

By the provision of the springs 21 and 15 it will be seen that the tubular members are normally retained in balanced position and that fluctuation of the alternating current will at all times provide their respective simultaneous movement. It is obvious that it is within the scope of the present invention that both the upper and lower tubular members be formed by an intergral construction. It has been found, however, that the intermediate spring 15 provides balancing between the movements, thus to compensate for variations in the pressure of the fluid at the admission pipe and at the discharge pipe. It is also within the scope of the invention to provide only a single plunger. Both valves may be carried thereby or a simple fixed valve cage will be provided in place of the separate valved plunger as shown in the form of the invention here presented or, if desired, the construction may be as here shown with one of the plungers locked against movement through the influence of the varying current applied.

In connection with the present invention, it will readily be understood that the invention is not specifically confined to the structural details herein presented. Various changes, modifications and the full use of equivalents may be resorted to; thus the particular structural assembly, the use of springs, and the use of permanent magnets may be altered without departing from the spirit or scope of the present invention as outlined in the appended claims.

What is claimed is:

1. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a tubular plunger mounted within said cylinder for attraction and repulsion in response to variations of the cycle of energization of said windings, and magnetic means on said plunger for attraction and repulsion by the energization of said windings.

2. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, and a tubular plunger mounted within said cylinder for attraction and repulsion in response to variations of the cycle of energization of said windings, said plunger having a magnetic head mounted externally of said cylinder for attraction and repulsion by the energization of said windings.

3. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, and a tubular plunger mounted within said cylinder for attraction and repulsion in response to variations of the cycle of energization of said windings, said plunger having a magnetic head mounted externally of said cylinder for attraction and repulsion by the energization of said windings, said head being retained at a single magnetic polarization.

4. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a tubular plunger mounted within said cylinder for attraction and repulsion in response to variations of the cycle of energization of said windings, said plunger having a magnetic head mounted externally of said cylinder for attraction and repulsion by the energization of said windings, said head being retained at a single magnetic polarization, and means for providing a magnetic field for said head to retain it at said polarization.

5. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a tubular plunger mounted within said cylinder for attraction and repulsion in response to

variations of the cycle of energization of said windings, said plunger having a magnetic head mounted externally of said cylinder for attraction and repulsion by the energization of said windings, said head being retained at a single magnetic polarization, and means for providing a magnetic field for said head to retain it at said polarization, said means comprising a pair of magnets having like polarized ends on either side of said head.

6. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a pair of plungers mounted within said cylinder and extending therefrom, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, and oppositely magnetized heads respectively on said plungers, whereby opposite energization of said windings will attract and repulse said heads, whereby reciprocations of said plungers is provided.

7. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a pair of plungers mounted within said cylinder and extending therefrom, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, and oppositely magnetized heads respectively on said plungers, whereby opposite energization of said windings will attract and repulse said heads, whereby reciprocations of said plunger is provided, said plungers being maintained at opposite magnetic potentials by the provision of means for subjecting said heads to opposite magnetic fields.

8. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a pair of plungers mounted within said cylinder and extending therefrom, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, and oppositely magnetized heads respectively on said plungers, whereby opposite energization of said windings will attract and repulse said heads, whereby reciprocations of said plunger is provided, said plungers being maintained at opposite magnetic potentials by the provision of means for subjecting said heads to opposite magnetic fields, said means including magnets associated with said pump, like poles of said magnets being mounted on either side of said heads.

9. An electromagnetic pump, including a cylinder, alternating current electromagnetic windings associated with said cylinder, a pair of plungers mounted within said cylinder and extending therefrom, each of said plungers having a passage extending therethrough and a check valve for controlling said passage; oppositely magnetized heads respectively on said plungers, whereby opposite energization of said windings will attract and repulse said heads, whereby reciprocations of said plunger is provided, said plungers being maintained at opposite magnetic potentials by the provision of means for subjecting said heads to opposite magnetic fields, said means including magnets associated with said pump, like poles of said magnets being mounted on either side of said heads, and adjustable means supporting said magnets.

10. An electromagnetic pump including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, the external terminal ends of said plungers being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings, and for opposite attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinder.

11. An electromagnetic pump, including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, external terminal ends being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings, and for opposite attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinder, said plungers including magnetic heads within said T's.

12. An electromagnetic pump, including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, the external terminal ends being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings, and for opposite attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinder, said plungers including magnetic heads within said T's, and means for

retaining said heads at opposite magnetic potential.

13. An electromagnetic pump, including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, each of said plungers having a passage extending therethrough and a check valve for controlling said passage, the external terminal ends being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings, and for opposite attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinders, said plungers including magnetic heads within said T's, and means for retaining said heads at opposite magnetic potential, said means including a pair of fixed magnets carried by said T's, like poles of said magnets being mounted on either side of said heads.

14. An electromagnetic pump, including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, their external terminal ends being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings and for opposite respective attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinder, said plungers including magnetic heads within said T's, means for rotating said heads at opposite magnetic potential, said means including a pair of fixed magnets carried by said T's, like poles of said magnets being mounted on either side of said heads, and valves mounted within the upper ends of said plungers, both of said valves being arranged to permit movement of fluid therethrough in one direction and to prevent opposite flow of fluid.

15. An electromagnetic pump, including an externally threaded cylinder, alternating current electromagnetic windings associated with said cylinder, T's threadedly associated with the terminal ends of said cylinder, plungers extending within said cylinder, their external terminal ends being positioned within said T's, said plungers being arranged for respective repulsion and attraction by positive energization of said windings and for opposite respective attraction and repulsion upon negative energization of said windings, whereby the alternating current cycle will effect vertical movement of said plungers within said cylinder, said plungers including magnetic heads within said T's, means for retaining said heads at opposite magnetic potential, said means including a pair of fixed magnets carried by said T's, like poles of said magnets being mounted on either side of said heads, valves mounted within the upper ends of said plungers, both of said valves being arranged to permit movement of fluid therethrough in one direction and to prevent opposite flow of fluid, and spring balancing means associated with said plungers for permitting respective movement thereof against the tension of said balancing means.

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