Feb. 24, 1953 I. N. MELINE 2,629,330

MOTOR-DRIVEN ROTARY PUMP

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FIG. 1.

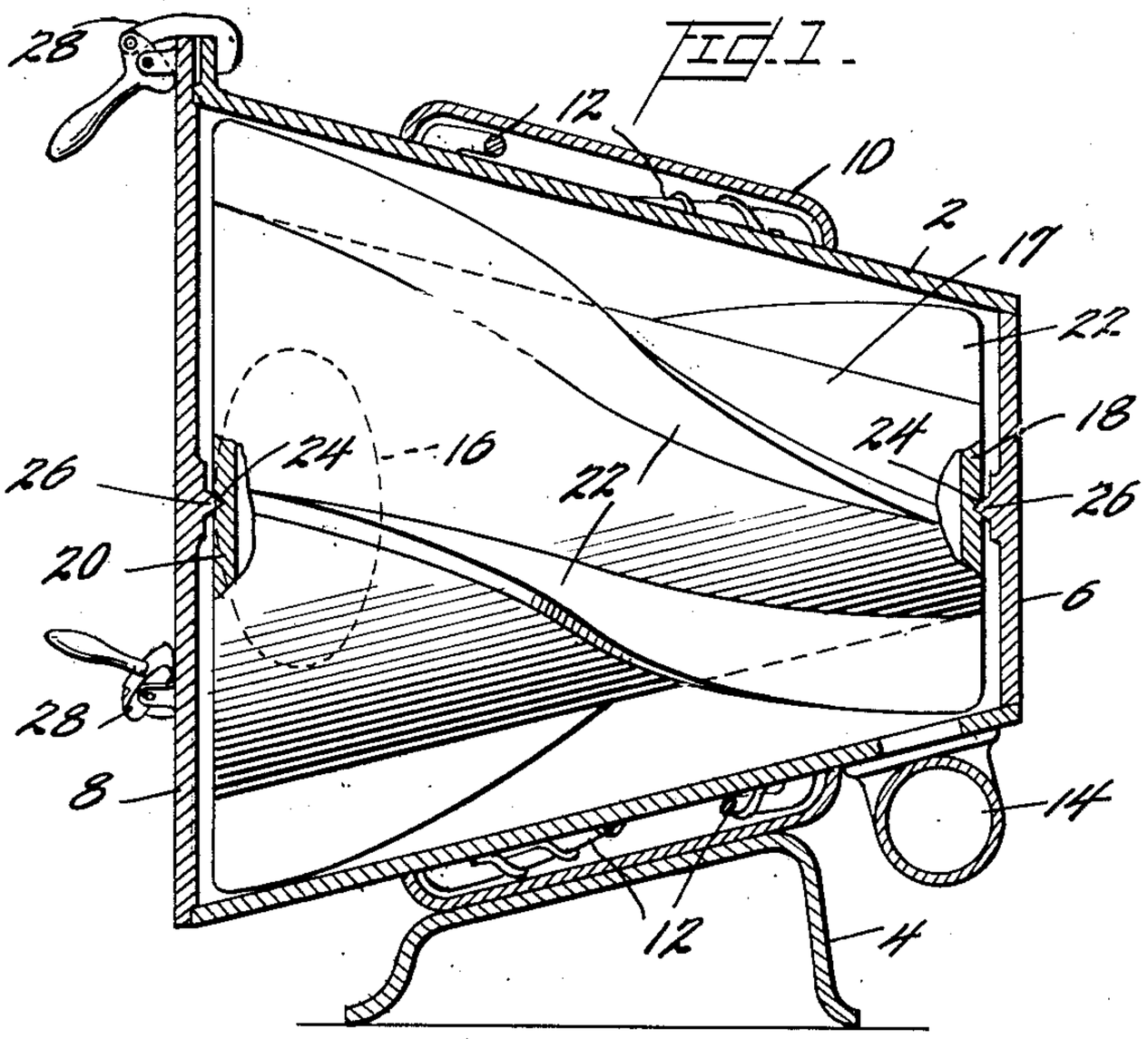
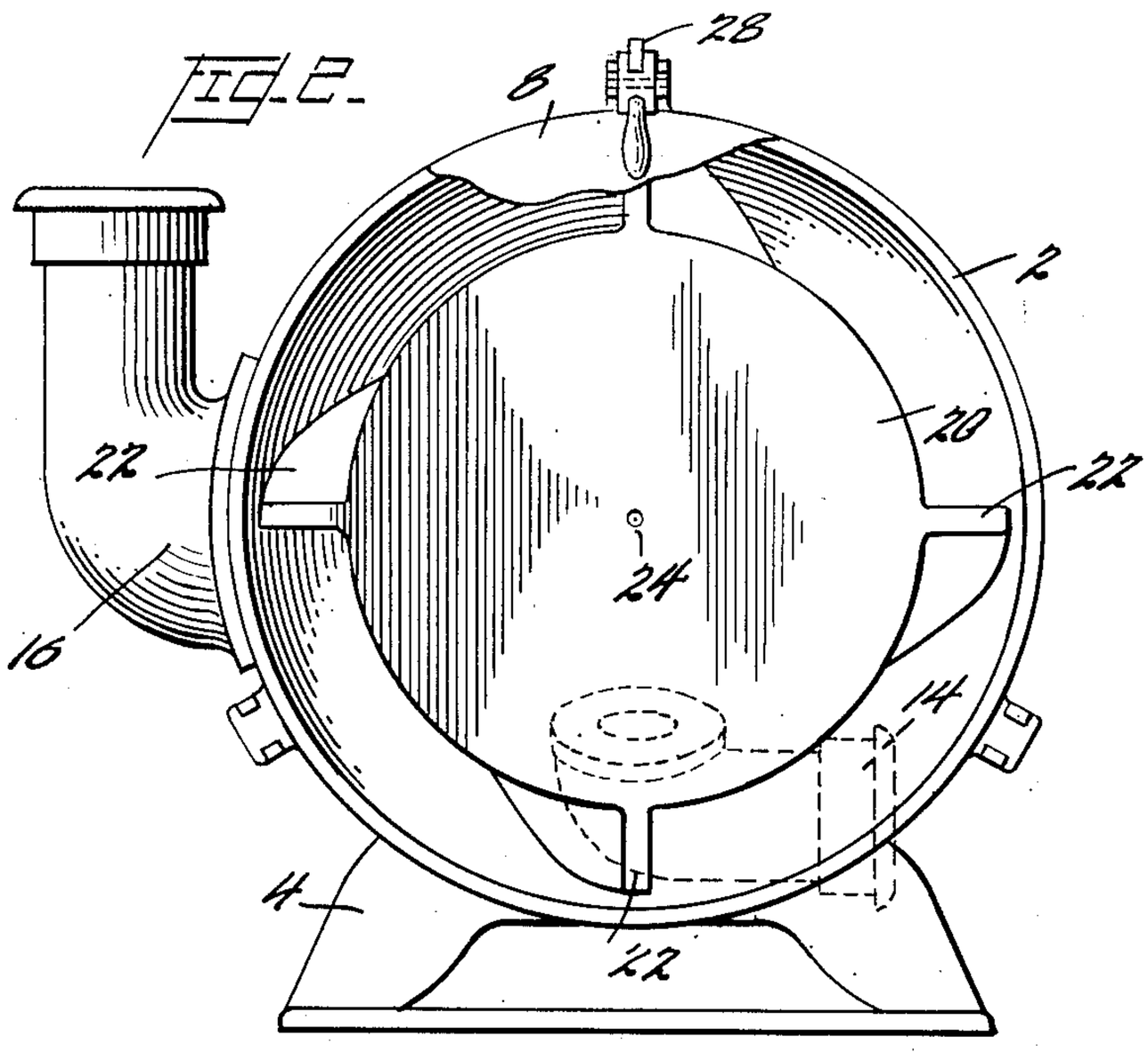


FIG. 2.



Inventor

Irving N. Meline

By Chas. Silver

Attorney

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FIG. 3.

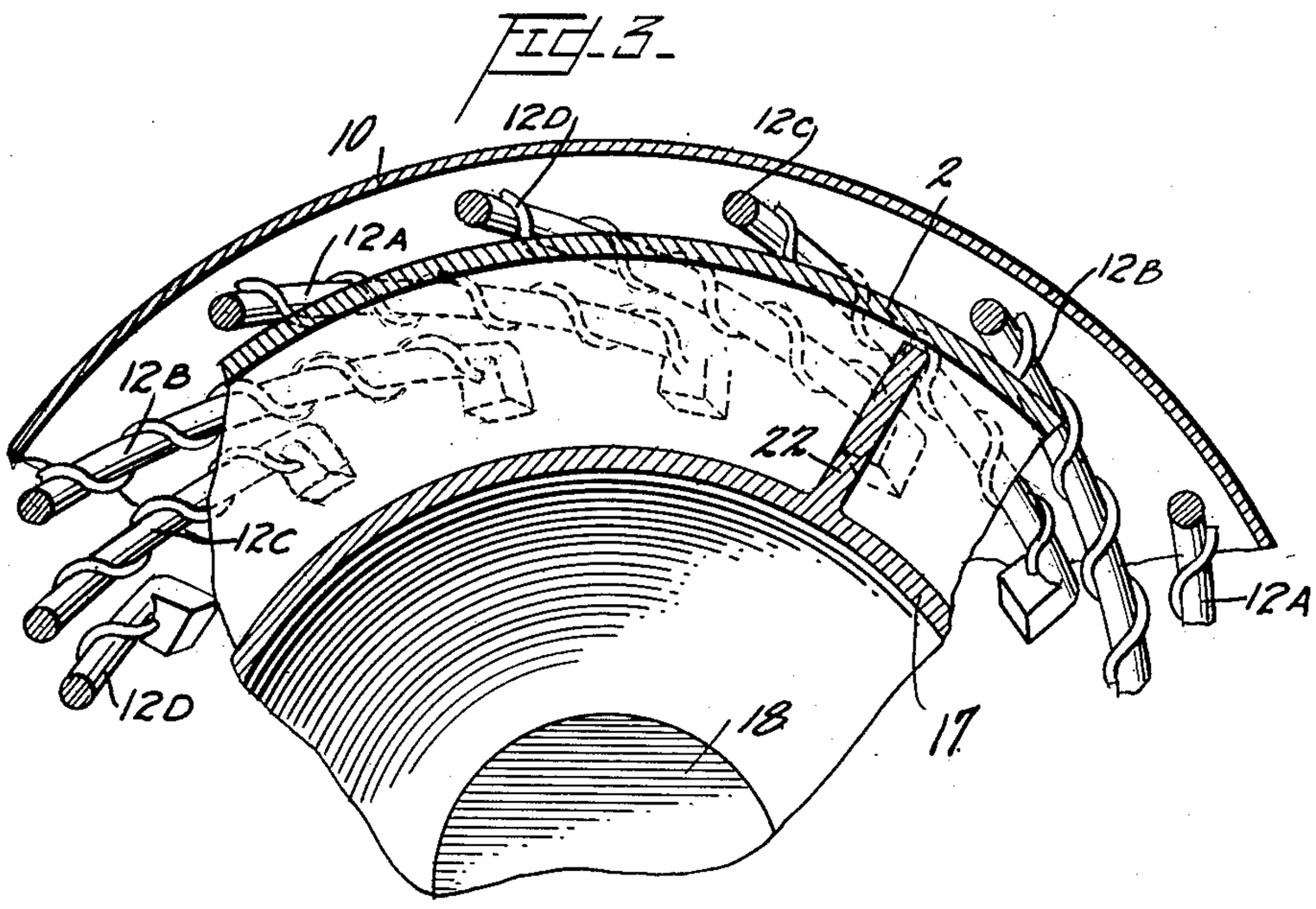


FIG. 4.

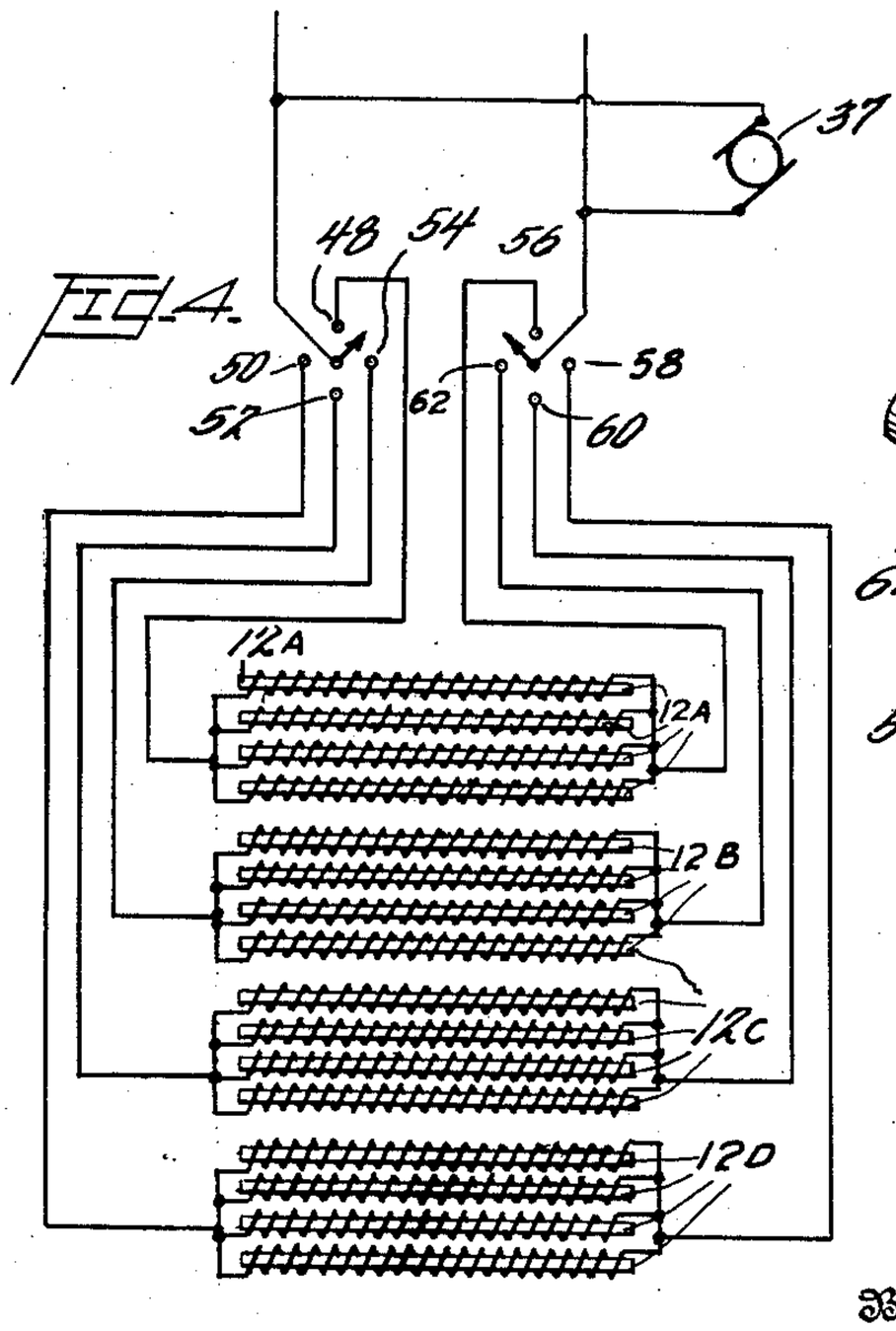
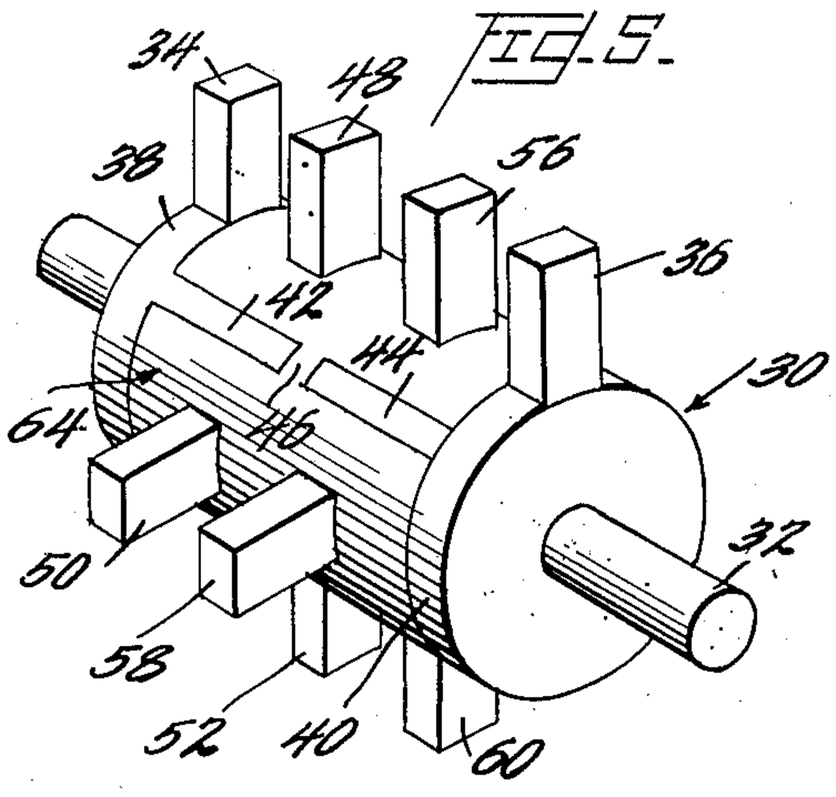


FIG. 5.



Inventor

Irving N. Meline

By Chas. Silver

Attorney

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FIG. 6.

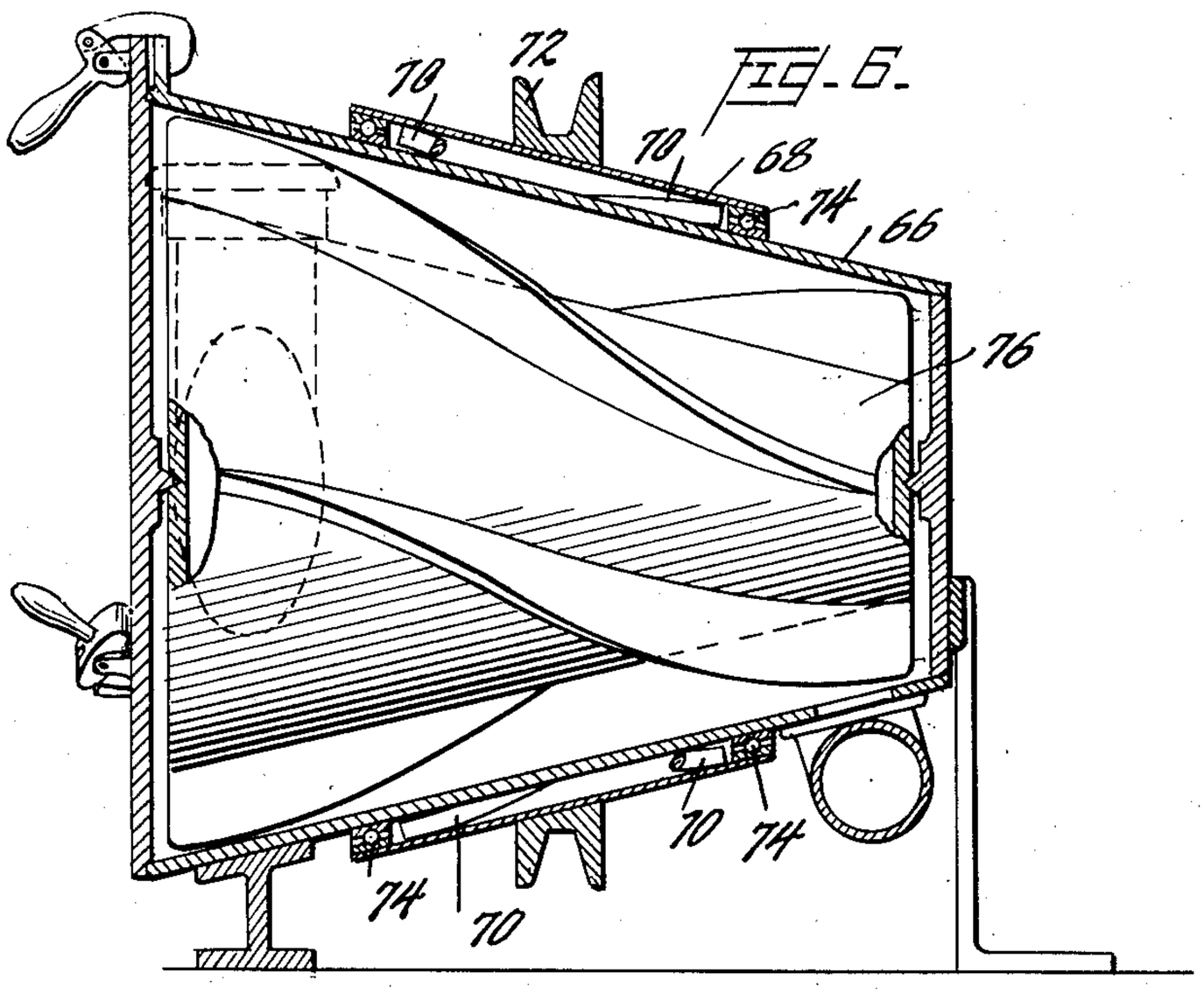
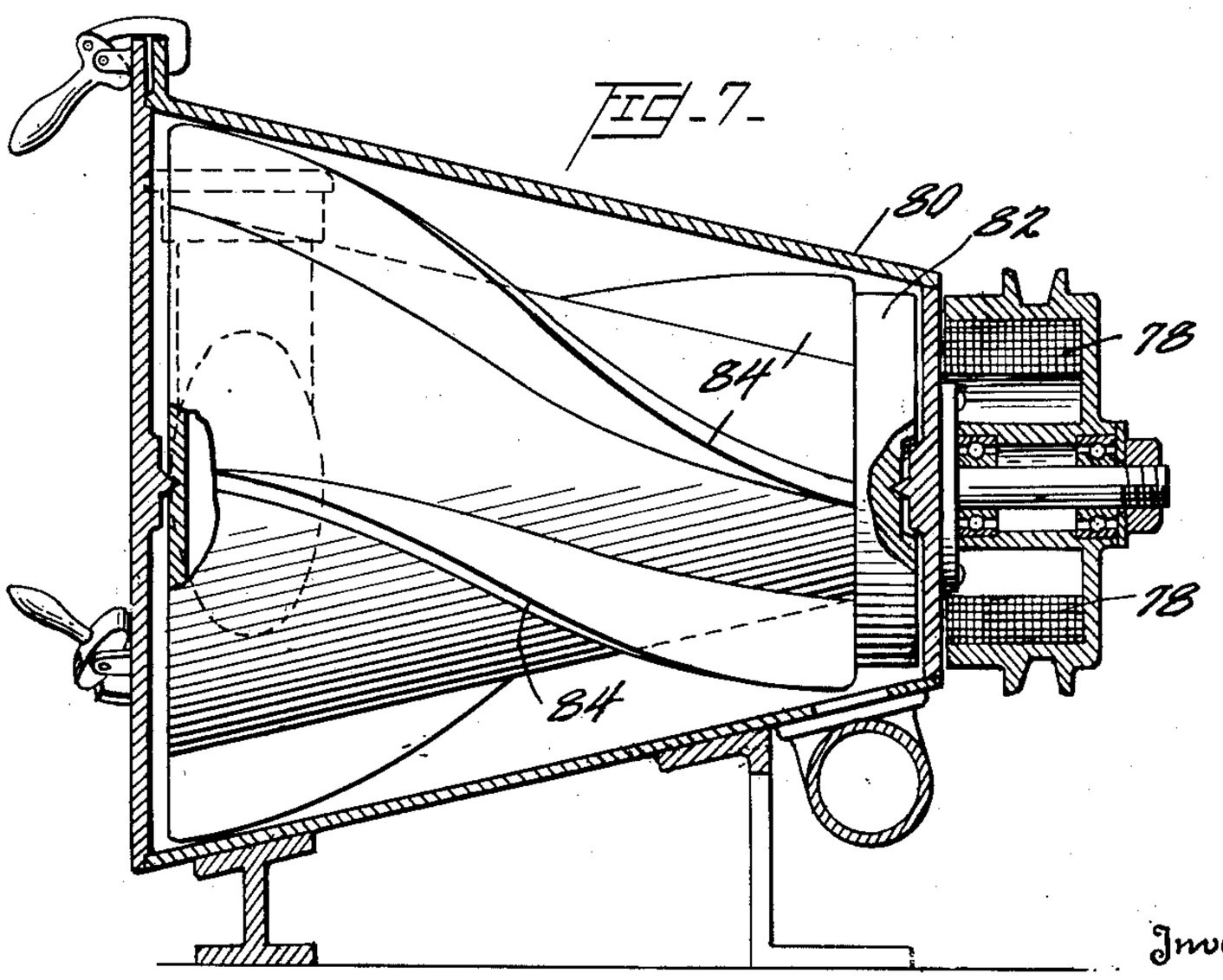


FIG. 7.



Inventor

Irving N. Meline

By

Chas. Silver

Attorney

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MOTOR-DRIVEN ROTARY PUMP

Irving Nels Meline, Elma, N. Y.

Application May 6, 1948, Serial No. 25,439

4 Claims. (Cl. 103—87)

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This invention relates to pumping devices and has particular application to centrifugal apparatus for pumping and drawing liquids which admit of ready and thorough washing and cleansing.

In the handling and processing of liquid foods, such as dairy products, it is necessary to meet and comply with the requirements of the health departments of city, State and Federal governments regarding sanitation and prevention of contamination of the foodstuffs and beverages. It is also of advantage to the operator and processor to effectively carry out such regulations, which invariably require frequent and thorough washing of the equipment used in the operations, such as the pumping devices. Prior equipment employed for this purpose has been found difficult to wash thoroughly and properly, thus needlessly adding labor and expense to the operation.

Among the objects of this invention is the provision of a pumping device, operated centrifugally, which may be readily and thoroughly cleaned internally and freed of contaminating extraneous material often lodged in prior apparatus at locations not readily accessible for cleaning.

A further object of this invention is the provision of a centrifugal pump for drawing milk and other liquid food products, wherein the internal rotor is readily removable so that the interior of the shell of the pump may be quickly and thoroughly washed and cleansed.

A more specific object of this invention is the provision of a centrifugal pump wherein the rotor is revolved by electrical impulse from a magnetic field about its periphery, the rotor being supported in the shell of the pump by end bearings, thereby dispensing with the usual central shaft extending through the pump.

Other, further and more specific objects of this invention will become readily apparent to persons skilled in the art from a consideration of the following description when taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a vertical section through a centrifugal pump, illustrating the preferred embodiment of my invention.

Fig. 2 is an elevation of the outlet end of the pump shown in Fig. 1, portions of the end cover being broken away to illustrate the interior.

Fig. 3 is a detail fragmental section showing the locations of the magnets relative to the rotor and its blades.

Fig. 4 is a wiring diagram of the electric circuits from the distributor brushes to the magnets.

Fig. 5 is a perspective view of the distributor and shows the relative positions of the brushes.

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Figs. 6 and 7 are vertical sections through centrifugal pumps, illustrating modified forms of my invention.

In the preferred form of my invention, the frusto-conical shell 2 is mounted on the base 4 and has the covers 6 and 8 at the small and large ends, respectively. A housing 10 is secured about the periphery of the shell and within this housing 10 are disposed the magnets 12A, 12B, 12C and 12D. Fluid enters the shell 2 through the fitting 14 and is discharged through the outlet 16.

A rotor having a frusto-conical inner core 17 with the end closures 18 and 20 supports a plurality of spiral outwardly projecting blades 22 possessing magnetic quality, and is disposed within the shell 2. These blades 22 extend spirally from the small end of the core 17 at the inlet end to the large end of the core 17 at the outlet end. Each of these closures 18 and 20 has a central bearing support 24, preferably conical, which cooperates with a conjugate bearing support 26 in the adjacent cover of the shell 2. I prefer to have the male bearing member on each of the covers 6 and 8, as illustrated, but it is to be understood that the male member may be on either or both of the closures 18 and 20 instead.

The cover 8 at the large end of the shell 2 should be disposed relative to the shell 2 so that this cover may be moved from the closed position sufficiently to permit withdrawal of the rotor from the shell 2 before the pump is washed and cleaned, and in my preferred construction this large cover 8 is detachable. The detachable cover 8 is held against the shell 2 by the clamps 28. It will be obvious that the small end cover 6 may likewise be made detachable.

Direct current is delivered to the magnets 12 from a suitable distributor 30 which is disposed to rotate with its shaft 32 upon a suitable bearing, not shown. The distributor is provided with the stationary brushes 34 and 36 that are connected to a source 37 of direct current electricity. These brushes 34 and 36 are always in contact with the circular conducting plates 38 and 40, respectively, as the distributor is revolved. The conductor plates 38 and 40 have inwardly projecting fingers 42 and 44, respectively, of electrically conducting material, preferably integral with their respective conductor plates. These fingers 42 and 44 extend to the periphery of the distributor and are separated from each other by electrical insulation 46 which also lies between the conductor plates 38 and 40.

Current is delivered to and from the distributor

through the magnets by the four positive brushes **48**, **50**, **52** and **54** and the four negative brushes **56**, **58**, **60** and **62**. The brushes in each set are spaced quadrantly about the distributor cylinder **64**. By aligning these brushes so that a positive brush is always in contact with the finger **42** while a negative brush is in contact with finger **44**, the electric circuit is closed at each quarter turn of the distributor.

The current from each positive brush and to the negative brush in alignment therewith is passed through a plurality of spiral windings about the magnets **12A**, **12B**, **12C** and **12D**. These magnets have the same spiral curvature as the spiral blades **22** of the rotor and the electric circuits of the spiral windings connected to the same brushes are in parallel. As shown in Fig. 4, the electric circuits of the magnets **12A** are in the same group and in parallel. Likewise, the electric circuits of magnets **12B** are in the same group and in parallel, the electric circuits of magnets **12C** are in the same group and in parallel and the electric circuits of magnets **12D** are in the same group and in parallel. The magnets are thus arranged in groups wherein the electric circuits of each group are in parallel.

The magnets in the housing **10** are located about the entire periphery of the shell **2** and are disposed so that the magnets of each of the groups are spaced in regular sequence and distance from adjacent magnets of the other groups. Thus, as shown in Fig. 3, a magnet **12A** is followed in sequence and equal spacing by magnets **12B**, **12C** and **12D**, and the same sequence and equal spacing are continued by other magnets **12A**, **12B**, **12C** and **12D**. By this arrangement the spiral rotor blades **22** are given successive electrical impulses from the magnetic field as the distributor **30** is rotated, thus causing the rotor to revolve in its bearings and serve to pump liquid through the shell **2**. The magnets are held in position by means of suitable insulation (not shown) between adjacent magnets and also by the housing **10** which fits snugly over the magnets and insulation.

The rotor is preferably in axial alignment with the shell **2**, while the closures or plates **18** and **20** are also preferably in axial alignment with each other. I provide small clearances between the rotor and the shell and its covers. The apparatus is constructed of suitable non-corrosive structural material, preferably stainless steel.

The spiral blades **22** are of metal possessing magnetic quality; i. e., the property of being attracted or repelled by magnets. I prefer to use iron for this purpose. When my apparatus is used for handling milk or other liquid foods, I prefer to plate or coat the iron with nickel. Coatings of cobalt or tin may also be used.

The core **17** of the rotor may be hollow, as shown in the drawings, or solid. The bearings are of suitable wear-resisting materials employed for this purpose.

In the modification illustrated in Fig. 6, the shell **66** is stationary but a portion **68** of the housing and the magnets **70** connected thereto are revolved by means of power applied at the pulley **72**. To avoid needless friction, the ball bearings **74** are provided. The magnets **70** are apposite the spiral blades on the rotor **76** and by their attraction carry the rotor along as they are revolved. The magnets **70** may be either permanent or electro-magnets.

In the modification shown in Fig. 7, the rotatable magnetic field **78** is located adjacent to one

end of the shell **80** of the pump. As this magnetic field **78** revolves, the rotor **82**, comprising a thick plate of metal possessing magnetic quality, and the spiral blades **84** connected thereto also turn. In this construction, either permanent or electro-magnets may be used.

The present invention is not limited to the specific details set forth in the foregoing examples which should be construed as illustrative and not by way of limitation and, in view of the numerous modifications which may be effected therein without departing from the spirit and scope of this invention, it is desired that only such limitations be imposed as are indicated in the appended claims.

I claim as my invention:

1. A pumping apparatus comprising a frusto-conical shell with a cover at each end having an inner conical bearing, a rotor removably supported within said shell, the cover at the larger end of the frusto-conical shell being movable from the closed position sufficiently to permit withdrawal of said rotor from said shell, said rotor having an inner core with conical end bearings conjugate to the bearings of said covers and in axial alignment for support of the rotor on said bearings and a plurality of spiral blades possessing magnetic quality projecting outwardly from said inner core, an annular housing secured on the outside of said shell, a plurality of electro-magnets in said housing having windings and conforming in curvature with the spiral blades on said rotor, said magnets being disposed in groups wherein the magnets of each of said groups are uniformly spaced in regular sequence and distance from adjacent magnets of the other groups, means for connecting the windings of each group of said electro-magnets in parallel and an electric distributor having electric connection to a source of electric current, said distributor having brushes for successively connecting each group of electro-magnets with said source of electric current.

2. A pumping apparatus comprising a shell, bearing supports at each end of said shell, a rotor within said shell, said rotor having an inner core with end bearings conjugate to the bearing supports in said shell for support of the rotor on said bearing supports and a plurality of spiral blades possessing magnetic quality projecting outwardly from said inner core, an annular housing secured on the outside of said shell, a plurality of electro-magnets having windings and in said housing conforming in curvature with the spiral blades on said rotor, said magnets being disposed in groups wherein the magnets of each of said groups are uniformly spaced in regular sequence and distance from adjacent magnets of the other groups, means for connnecting the windings of each group of said electro-magnets in parallel and an electric distributor having electric connection to a source of electric current, said distributor having brushes for successively connecting each group of electro-magnets with said source of electric current.

3. A pumping apparatus comprising a shell, bearing supports at each end of said shell, a rotor within said shell, said rotor having an inner core with end bearings in axial alignment for support of the rotor on said bearing supports and a plurality of spiral blades possessing magnetic quality projecting outwardly from said inner core, an annular housing secured on the outside of said shell, a plurality of electro-magnets having windings and in said housing conforming in curva-

ture with the spiral blades on said rotor, said magnets being disposed in groups wherein the magnets of each of said groups are uniformly spaced in regular sequence and distance from adjacent magnets of the other groups, means for connecting the windings of each group of said electro-magnets in parallel and an electric distributor having electric connection to a source of electric current, said distributor having brushes for successively connecting each group of electro-magnets with said source of electric current.

4. A pumping apparatus comprising a shell, a rotor within said shell, said rotor having an inner core with end bearings in axial alignment for support of the rotor in said shell and a plurality of spiral blades possessing magnetic quality projecting outwardly from said inner core, an annular housing secured on the outside of said shell, a plurality of electro-magnets having windings and in said housing conforming in curvature with the spiral blades on said rotor, said magnets being disposed in groups wherein the magnets of each of said groups are uniformly spaced in regular sequence and distance from adjacent magnets of the other groups, means for connecting the windings of each group of said electro-magnets in parallel and an electric distributor having electric connection to a source of electric current, said distributor having brushes for successively connecting each group of electro-magnets with said source of electric current.

IRVING NELS MELINE.

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