

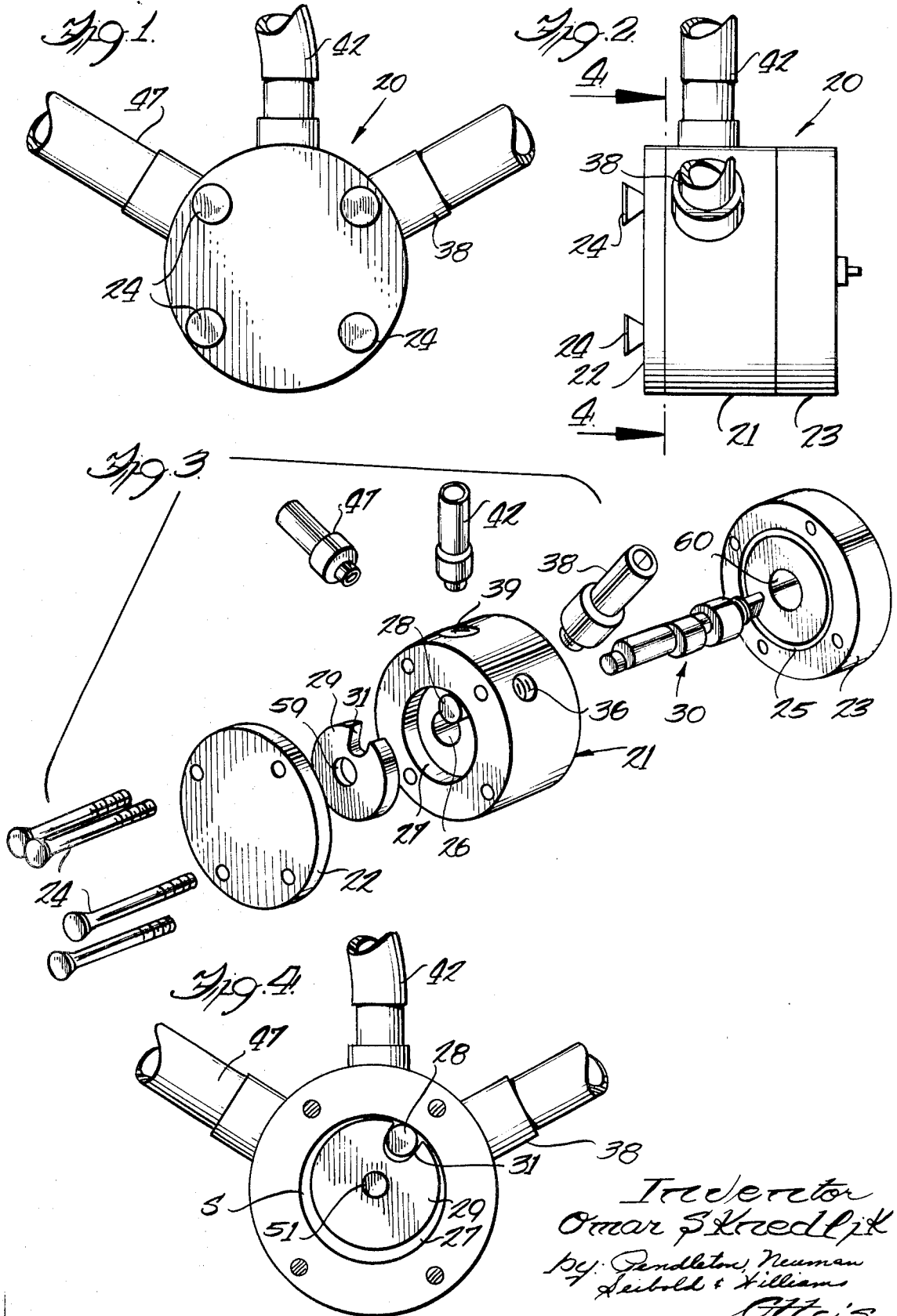
July 14, 1970

O. S. KNEDLIK  
FLUID BLENDING PUMP

3,520,518

Filed Aug. 12, 1968

2 Sheets-Sheet 1



Inventor  
Omar S. Knedlik  
by: Pendleton, Neuman  
Leibold & Williams  
Att'y's

July 14, 1970

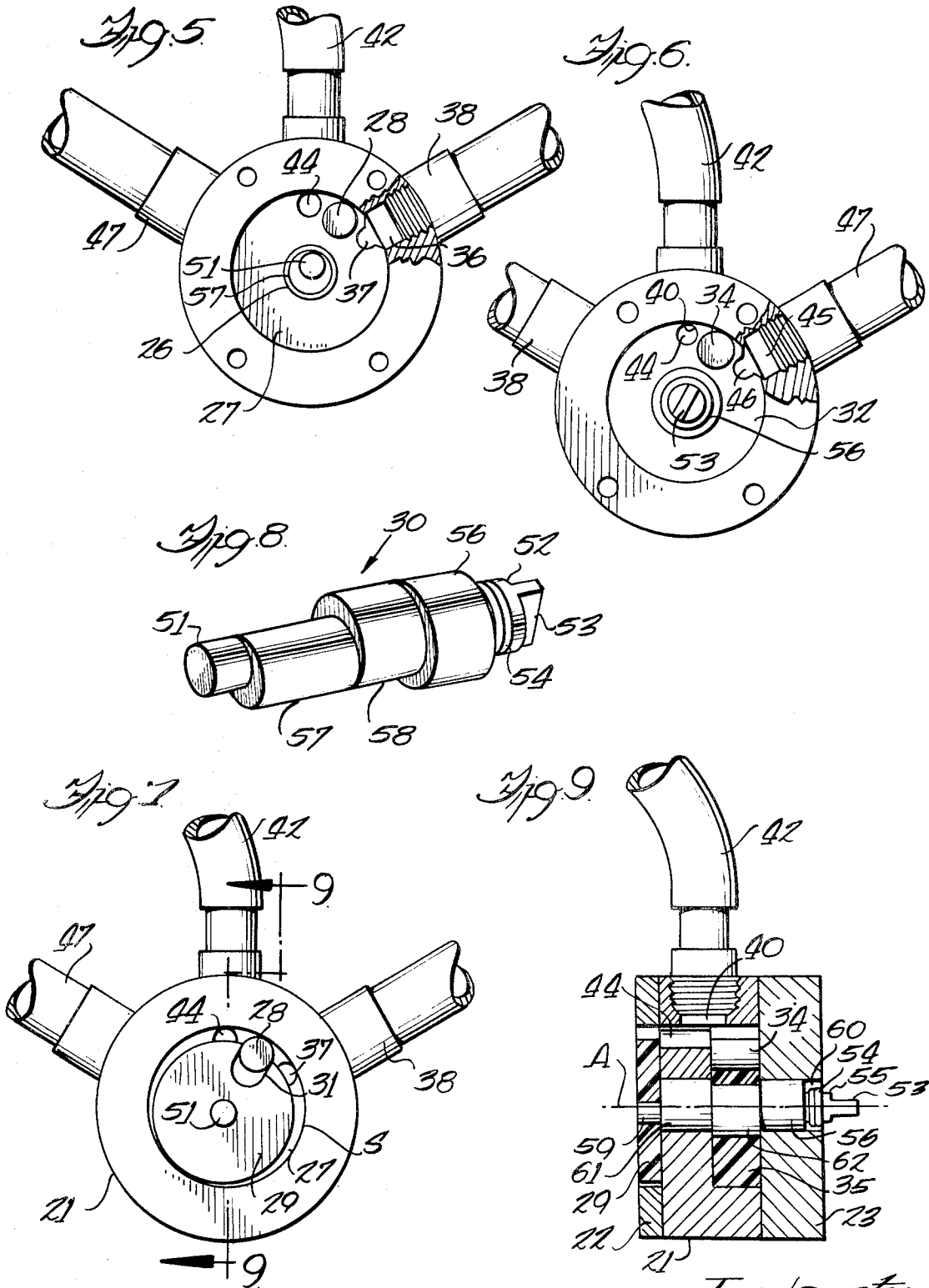
O. S. KNEDLIK

3,520,518

FLUID BLENDING PUMP

Filed Aug. 12, 1968

2 Sheets-Sheet 2



Inventor  
Omar S. Knedlik  
by: Pendleton, Neuman  
Seibold & Williams  
Attorneys

1

2

3,520,518

**FLUID BLENDING PUMP**

Omar S. Knedlik, Coffeyville, Kans., assignor to Omar Knedlik Enterprises, Inc., Montgomery County, Kans., a corporation of Kansas

Filed Aug. 12, 1968, Ser. No. 751,771

Int. Cl. B01f 7/14

U.S. Cl. 259—7

7 Claims

**ABSTRACT OF THE DISCLOSURE**

Pump apparatus for blending fluid streams including a casing with an axially extending opening therethrough and cover plates sealingly engaged therewith. The casing is provided with recesses and radial inlet and outlet ports which cooperate with the recesses. Impeller members are disposed in the recesses and a shaft slidably mounted in the axially extending opening is provided for actuating the impellers to convey the fluids from the inlet ports to the outlet port.

**BACKGROUND OF THE INVENTION**

The field of the invention relates to a pump for blending a plurality of fluids together in predetermined quantities and simultaneously pumping the blended mixture to a storage container. More particularly, the pump is useful in the production of ice cream wherein air of a predetermined quantity is blended with liquid ice cream and the resultant foamed mixture is fed into an ice cream freezing machine.

Apparatus and methods for blending fluid streams is shown in my U.S. Pats. Nos. 3,179,382 and 3,179,383. The present invention produces products similar to those produced by my earlier inventions, but the present pump is less expensive to manufacture and more versatile in use, than the pump described in the aforementioned patents.

**SUMMARY OF THE INVENTION**

It is an object of the invention to provide an improved blending pump for mixing a plurality of fluids in predetermined quantities.

A further object is to provide an improved pump which is simple in form, easy to manufacture and efficient in operation.

Other objects and advantages will become apparent from the description, drawings and claims.

One form of the invention comprises an apparatus for blending fluid streams including a casing having an axially extending opening therethrough, and cover plates on both sides of the casing sealingly engaged therewith. The casing has a first recess therein, a first and second inlet means cooperating with the first recess, and an impeller member movably mounted in said recess for limited oscillatory movement relative thereto. The thickness of the impeller member is substantially the same as the depth of the first recess and the impeller member occupies a substantial portion, but not all, of the recess so that a space exists between the impeller and the side of the recess for the metering of fluid. A second recess is provided in the casing opposite the first recess and is coaxially aligned therewith. The second inlet means cooperates with the second recess, a conduit extends between the recesses, and a second impeller member is movably mounted in the second recess for limited oscillatory movement. The thickness of the second impeller member is substantially the same as the depth of the second recess and occupies a substantial part, but not all of the recess, thereby allowing space for the metering of fluid. An outlet means cooperates with the second recess, and a shaft having eccentrically aligned surfaces thereon extends through the

axially extending opening in the casing. The shaft is driven by a power source, such as an electric motor, and actuates the impeller members for conveying the fluids from the inlet means to the outlet means and effecting the desired blending.

**BRIEF DESCRIPTION OF THE DRAWING**

FIG. 1 is a front elevational view of the pump embodying the invention;

FIG. 2 is a side elevational view of the pump embodying the invention;

FIG. 3 is an exploded perspective view of the pump;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2;

FIG. 5 is a front elevational view of the pump with certain parts removed;

FIG. 6 is a rear elevational view of the pump with certain parts removed;

FIG. 7 is another front elevational view of the pump with certain other parts removed;

FIG. 8 is a perspective view of a part of the pump embodying the invention;

FIG. 9 is a sectional view taken along line 9—9 of FIG. 7.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to the drawings, an improved pump is shown in FIGS. 1 and 2 and is generally indicated by the numeral 20. Pump 20 is cylindrical in configuration and includes a casing member 21 having cover plates 22 and 23 secured on both sides thereof. The plates are held in place by bolts 24 which extend through openings in cover plate 22 and casing 20 and threadedly engage openings in cover plate 23. A sealing ring 25 is disposed in a groove in each cover plate for providing a tight seal between the casing and the cover plates.

Casing 21 has an axially extending aperture 26, as shown in FIG. 3, and a circular recess 27 with a pivot member 28 disposed therein. The pivot member may be integral with the casing or may be a separate member secured to the casing, and is preferably circular in configuration. An impeller 29, also generally circular in configuration, is disposed in the recess and is capable of pivotal or oscillatory movement about pivot member 28 (FIG. 4) in a manner that will be described later. The impeller has a diameter which is smaller than the recess so that a space exists between the impeller and the wall of the recess. The impeller has an aperture to receive a portion of a drive shaft 30 and a U-shaped slot 31 which is adapted to cooperate with pivot member 28. The thickness of impeller 29 is substantially equal to the depth of recess 27.

On the opposite side of recess 27 is another circular recess 32 which has a greater depth than recess 27 for a purpose which will be described later. Referring to FIG. 6, recess 32 has a pivot member 34 angularly disposed with respect to pivot member 28 in recess 27. Impeller 35 is disposed in recess 32 and is of substantially the same configuration as impeller 29. Impeller 35 is smaller in diameter than recess 32, thereby leaving a space between the impeller and the recess wall. The thickness of impeller 35 is substantially equal to the depth of recess 32 (FIG. 9).

Casing 21 has a radially extending first inlet port 36 with a channel opening 37 extending into recess 27 as shown by FIG. 5. In the preferred embodiment ice cream mix would be fed through inlet conduit 38 to port 36. A second inlet port 39 is provided and has a channel opening 40 (FIG. 9) extending into recess 27. This port is adapted to receive air through inlet conduit 42. Channel opening 40 is in communication with a passage 44 which

interconnects recess 27 with recess 32 so that the blended fluid may flow from one recess to the other. In fluid communication with recess 32 is outlet port 45 which has a channel opening 46 extending into the recess. The blended mix is metered through outlet port 45 to outlet conduit 47 and from there to an ice cream freezing machine (not shown). Inlet conduits 38 and 42 and outlet conduit 47 threadedly cooperate with their respective ports in casing 21.

In order to actuate the impeller members and cause the fluids to be blended a drive shaft (FIG. 8) is provided having eccentrically aligned surfaces thereon. Drive shaft 30 has one end portion 51 axially offset with respect to the other end 52. End portion 52 is provided with a key means 53 which is adapted to engage a drive means (not shown), such as an electric motor, and adjacent the key means are ring seals 54 disposed in grooves 55 in the shaft. A nylon bushing 56 is slidably mounted on the shaft and is held in place by the ring seals 54. Interposed between bushing 56 and end portion 51 are two surfaces 57 and 58 which are eccentrically offset with respect to each other. Surface 57 is axially aligned with end portion 52 and is eccentrically offset with end portion 51.

The drive shaft contacts the interior portions of the pump in the manner in FIG. 9. End portion 51 is slidably received within an aperture 59 in impeller 29 and key means 53 with bushing 56 is slidably disposed in an aperture 60 in cover plate 23. Surface 57 has a nylon bushing 61 thereon and is slidably mounted in the axially extending aperture 26 in casing 21, and cam surface 58 is disposed in sliding engagement with an aperture 62 in impeller 35.

Rotation of drive shaft 30 causes movement of impellers 29 and 35 in the following manner. As the shaft rotates end portion 51 moves in a path around the shaft general axis A and results in a sliding and pivoting or oscillatory action about pivot member 28 by impeller 29. Two positions of impeller 29 are shown in FIGS. 4 and 7, respectively. Rotation of the shaft causes impeller 35 to move in a path about the general axis A similar to that of end portion 51.

The operation of the pump in the production of foamed ice cream will now be described with reference to FIGS. 4-7 and 9. Ice cream mix is fed through conduit 38 from an outside source and into recess 27 simultaneously with the feeding of air into the recess through port 39. Referring to FIG. 7, as mix is fed into recess 27, it fills the gap between the impeller periphery and side S of the recess. The mix is metered around the periphery of the recess as the impeller pivots about pivot member 28 until it reaches channel opening 40 and passage 44. At this point, the mix is forced into passage 44 by the impeller where it is aerated by the introduction of air through inlet port 39. Due to the movement of impellers 29 and 35 and the greater fluid capacity of the second recess 32, a suction is created which draws the mix from recess 27 through passage 44 and into the second recess. The added air is fed into port 39 with a velocity sufficient to cause the fluid ice cream to be turbulently mixed. When the foamed mix enters recess 32, it is metered around the periphery thereof by impeller 35 until it reaches outlet port 45 where it is conveyed through conduit 47 to an ice cream freezing machine.

The amount of air supplied is dependent upon the quality and quantity of the ice cream mix employed and can be varied considerably. It is to be understood that the pump may be used to blend two fluids other than air and liquid ice cream and that the preceding description is indicative of only one use of the pump.

Preferably, the pump casing and cover plates are manufactured from stainless steel, however, they may be formed from a substantially transparent tough plastic material, such as polymethyl methacrylate (Lucite) or polyoxymethylene (Delrin). The impellers are preferably manufactured from a tough plastic like Delrin to reduce the

fraction load, although other materials may be used equally as well.

It is thus seen that an improved blending pump has been provided for mixing a plurality of fluids which is simple in form, easy to manufacture and efficient in operation.

While a particular embodiment of the invention has been shown, it is to be understood that the invention is not limited thereto since many minor modifications may be made; and it is, therefore, contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

The invention having thus been described, what is claimed and desired to be secured by Letters Patent is:

1. Apparatus for the blending of two fluid streams comprising a casing having an axially extending opening therethrough, cover plates on both sides of said casing sealingly engaged therewith, said casing having a first recess therein; a first and second inlet means cooperating with said first recess, an impeller member mounted in said recess for limited oscillatory movement relative thereto, the thickness of the impeller member being substantially the same as the depth of the first recess, said impeller member occupying a substantial portion of the recess so that a space exists between the impeller and the side of the recess for the metering of fluid; a second recess in said casing opposite said first recess and coaxially aligned therewith, said second inlet means cooperating with said second recess, a conduit extending between said recesses, a second impeller member mounted in the second recess for limited oscillatory movement relative thereto, the thickness of the second impeller member being substantially the same as the depth of the second recess, said impeller member occupying a substantial portion of the recess so that a space exists between the impeller and the side of the recess for the metering of fluid; an outlet means cooperating with said second recess, and a shaft having eccentrically aligned surfaces thereon extending through said axially extending opening in the casing, said shaft adapted to actuate said impeller members for conveying the fluids from the inlet means to the outlet means and effecting blending.

2. The invention according to claim 1 wherein the second recess in the casing has a greater depth than the first recess and the second impeller member has a corresponding greater thickness than the first impeller member.

3. The invention according to claim 1 wherein the recesses in the casing are circular and the impeller members are also circular but are of less diameter than said recesses to allow the passage of the fluids.

4. The invention according to claim 1 wherein said first and second recesses have first and second pivot means therein, respectively, and the first and second impeller members have a means for cooperating with the first and second pivot means, respectively.

5. The invention according to claim 4 wherein the pivot means located in said recesses are angularly disposed with respect to each other.

6. The invention according to claim 4 wherein the conduit extending between said recesses is adjacent to said pivot means in the recesses.

7. The invention according to claim 1 wherein the impeller members are manufactured from a rigid plastic material.

#### References Cited

#### UNITED STATES PATENTS

2,559,516	7/1951	Russell	259—7
3,142,476	7/1964	Goodwin	259—95
3,179,382	4/1965	Knedlik	259—95
3,179,383	4/1965	Knedlik	259—95

ROBERT W. JENKINS, Primary Examiner

U.S. Cl. X.R.