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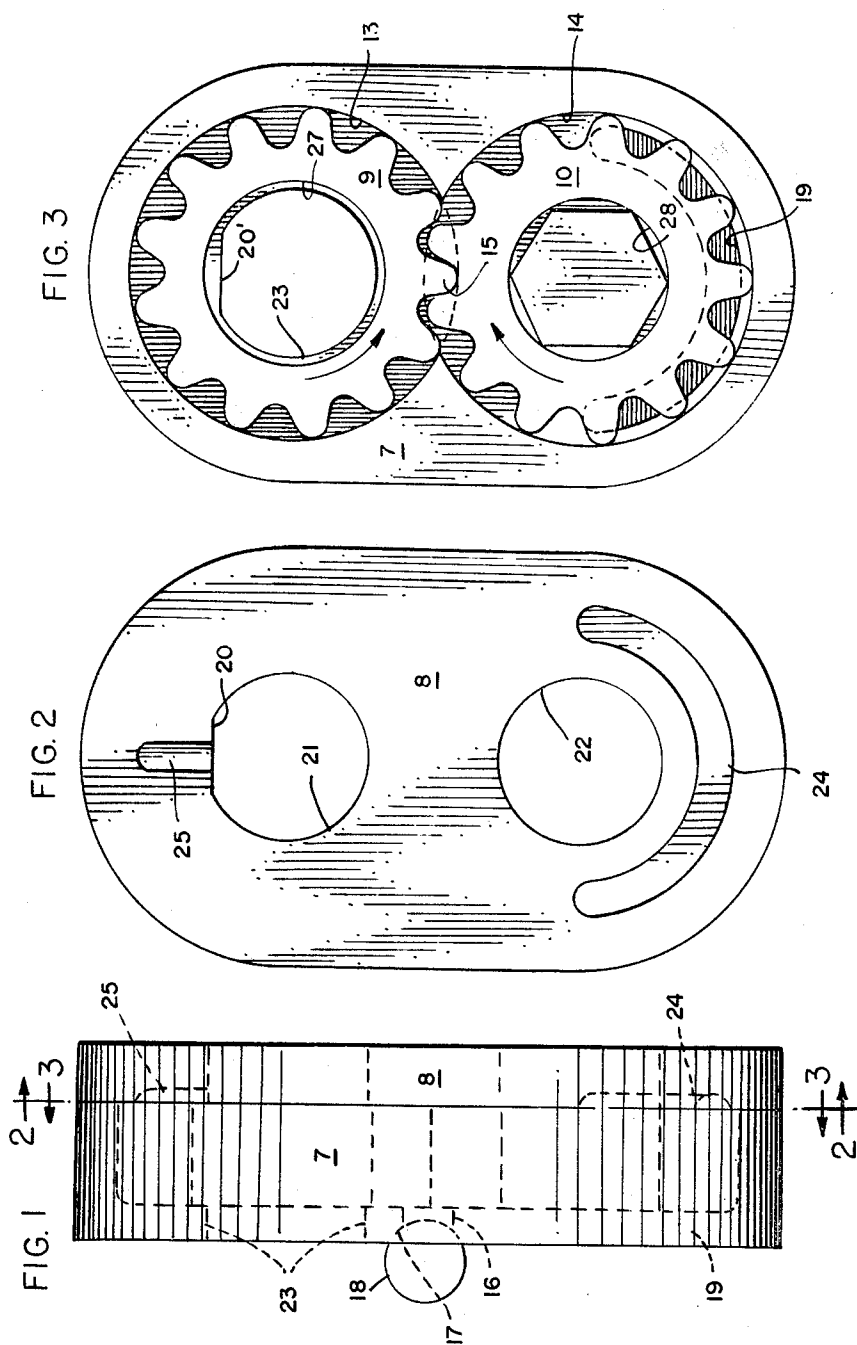
H. O. CADMAN

3,479,961

PUMP

Filed Sept. 22, 1967

2 Sheets-Sheet 1



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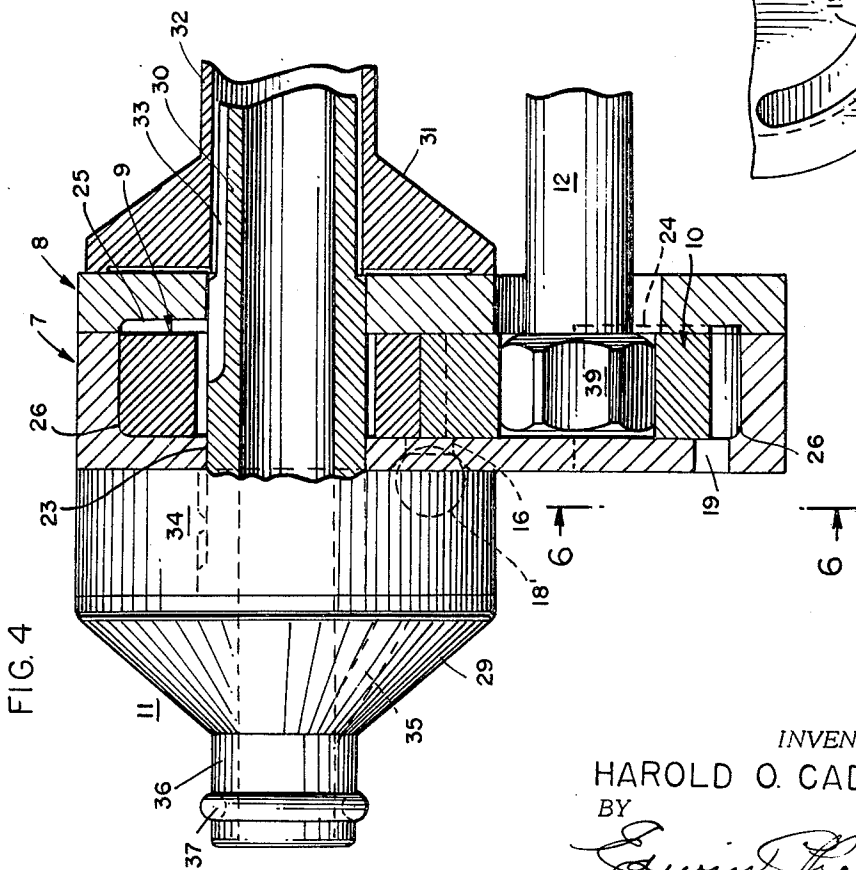
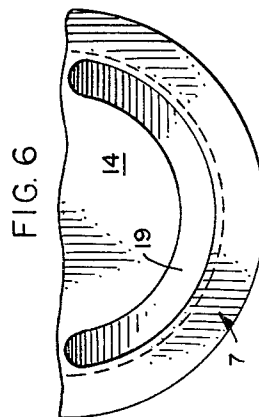
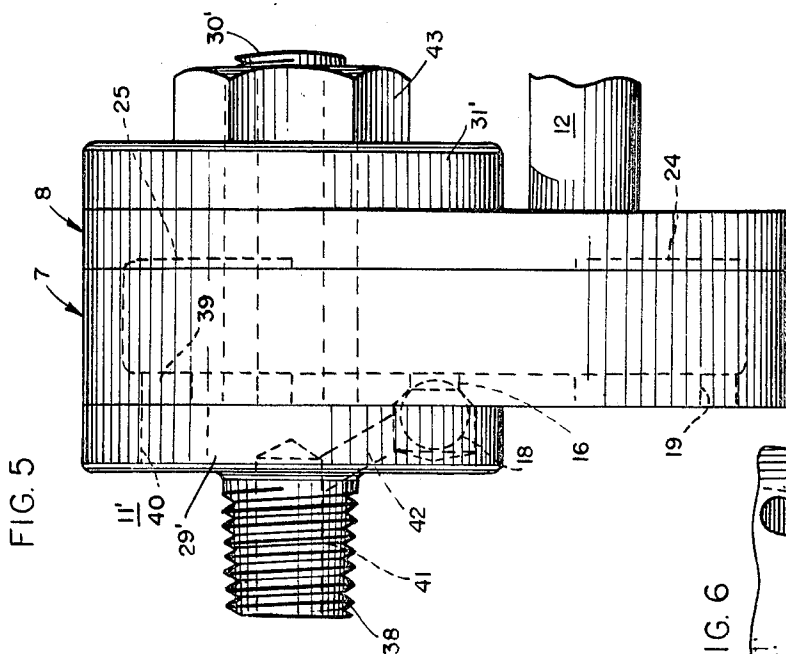
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4 Claims

ABSTRACT OF THE DISCLOSURE

The essential concept of this invention involves the structuring of a pump having a pair of housing parts and a pair of meshing gears formed of special high wear-resistant and low expansion-coefficient material with the gears peripherally journaled in the two-piece housing and all secured in operative assembly by a pair of housing-clamping and gear-driving elements. The pump is adapted for use in various situations requiring either the intimate mixing of two different types of fluid or the processing of a single fluid for constant flow against high-resistive pressures.

This invention relates to a new type of pump for processing substances free of any impurities demanded by the most stringent requirements.

Among the uses for which this pump has been developed, are the processing of inherently pure products. One such class of product is a wide range of comestibles for human and/or animal consumption. Other types of immiscible product are such as required for heating equipment or for operating a plain fluid-pressure equipment such as rams.

The main objects of this invention are; to provide an improved pump wherein a pair of meshing gears are peripherally-journaled in overlapping circular housing cavities; to provide a pump of this kind wherein the housing is structured in two main sections, in one of which section is formed the gear cavities and one or more ingredient inlets and the product outlet and in the other section is formed openings for the insertion of the elements for securing the parts assembled and driving the gears; to provide a pump of this kind wherein the several parts thereof are formed from a special composition of material that ensures a high resistance to in-use wear and a minimum of expansion coefficient; to provide specially-formed and arranged elements for clamping such a pair of parts in functioning relationship and effecting the driving of one of the gears; to provide incorporating in the clamping element, when required a fluid-flow inlet; to provide a pump of this kind for mixing two different types of fluids into thoroughly integrated products required for different uses; to provide a pump of this kind especially adapted for use in producing products for human and/or animal consumption; to provide a pump of this structure which in use for comestibles complies with the most stringent sanitary requirements of any community; and to provide a pump of this kind of such simple and practical structure as to make relatively economical the manufacturing and marketing thereof and its use extremely effective and gratifying.

In the adaptation shown in the accompanying drawings;

FIG. 1 is a side elevational view of a pair of housing parts assembled but with the gears not indicated therein;

FIG. 2 is an elevational view of the inside face of the one housing part taken on the plane of the line 2—2 of FIG. 1;

FIG. 3 is an elevational view from the inside face of the other housing part, taken on the plane of the line 3—3 of FIG. 1, with the gears in operating position;

FIG. 4 is a side elevation and partly-sectional view of

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the pump showing the two elements which, respectively, serve to clamp the two housing parts in their assembled operative relationship and effect the driving of the gears;

FIG. 5 is a side elevation of a slightly modified arrangement of a clamping element when the pump is to be used for processing a product different from that for which the arrangement in FIG. 4 is especially adapted for use; and

FIG. 6 is a fragmentary, exterior, side-elevational view of the pump housing taken on the plane of the line 6—6 of FIG. 4.

In pumps heretofore structured, the meshing gears are keyed to shafts which are journaled on the housing. The housing and the gears are formed of types of material which are subject to such wear as to risk unacceptable contamination of the products which are required for special purposes.

A pump embodying the foregoing concept and objects comprises two housing parts 7 and 8, two gears 9 and 10 and a clamping element 11 or 11' and a driving element 12.

The housing part 7 is recessed to provide a pair of circular cavities 13 and 14 with their centers so relatively located as to form a figure "8" and provide an elliptical-shaped overlapping area 15, defined by the two short arcuate broken lines in FIG. 3. Registering with this overlapping area 15 is a circular opening 16 with a bevelled extension 17 seating a ball 18 for the controlled discharge of the liquid air mixture from the pump, as presently will be explained more fully.

Below the outlet port 16 is a crescent-shaped opening 19 (FIG. 6) constituting an inlet for one of the ingredients to be processed through the pump.

The housing part 8 is shown herein as of planar form. It is somewhat less in thickness than the part 7, since that part 8 serves as a closure for the cavities 12 and 13 and for securing the gears 9 and 10 operatively in place. In production, the contrasting faces of these two parts 7 and 8 are so highly lapped that when superimposed, as shown in FIGS. 1, 4 and 5, they require only the single clamping element 11 to secure them in fluid tight relationship, as will be pointed out later herein. In this housing part 8 also are two openings 21 and 22 in axial alignment with the respective cavities 13 and 14 of the housing part 7. These openings 21 and 22 here are shown of the same diameter. The plate opening 21 is aligned with a similar-size opening 23 (FIG. 4) in the housing part 7. However, the openings 21 and 23 have flat portions 20 and 20' defined by a segment line. These flat portions serve to key, against rotation, a hereinafter-described clamp element 11.

This housing part 8 also has a crescent-shaped depression 24 formed in the inner face thereof, concentrically of and spaced radially from the opening 22. This is in axial alignment and of the same contour as the crescent-shaped opening 19 in the part 7 (FIG. 6). This depression serves as a means of equalizing the flat contact areas of the gear with the housing parts 7 and 8. Hence, there is an equalizing of the pressures of the lubricating films against the gear.

In the same face of the part 8 is shown a full line radial depression 25. This is for the entrance of air (or a gas) into the pockets formed between the teeth of the gear 9 and their crown contact with the wall of the defining cavity 13 for direct flow of air into the mixing area 15.

It should be noted that in FIG. 4 the juncture 26 of the internal axial and radial portions of the housing part 7, the defining cavities 13 and 14, are curved. This is to avoid sharp, right-angle areas of these surfaces. Such a curved juncture makes for more facile and cleaner

washing of these internal areas of the pump. Obviously, the extreme outer areas of the gear teeth are shaped complementarily to these curved areas 26 of the housing part 7. This is highly imperative when the pump is used for the processing of any kind of food product. In many areas health ordinances preclude the use of equipment having internal right-angle areas.

The gears 9 and 10, as herein shown, are substantially identical in form and dimension. In fact one could be substituted for the other without any change in functioning of the pump. The gear teeth, as clearly indicated in FIG. 3, have their crowns and depressions of substantially the same arcuate circular contour.

Although the drawing shows the crown of the gear teeth in contact with the defining wall of the respective cavity it should be understood that there is a clearance of something like .00005 of an inch. This is sufficient to permit a film of the fluids to close that tolerance gap as it serves to lubricate the gears for their rotative journalling in the respective cavities 13 and 14'. Thus, the wear on these gear teeth practically does not exist. Actual tests afford ample reason to assert that the gears and housing could operate over an indefinite period of time before there was a need for replacement. Even then if a replacement were made, it would be more for caution's sake than for a detectable lack of operation efficiency.

As will be noted from FIG. 3, the gears 9 and 10 are formed with an axial circular opening, 27 and a hexagonal opening 28 respectively. The opening 27 of the gear 9 is circular and is slightly larger than the openings 21 and 23 of the parts 7 and 8. This permits for free rotation of the gears 9 relative to the respective, and presently-described, forms of clamping element 11 and 11' of FIGS. 4 and 5 respectively. However, the opening 28 in the gear 10 is shown of polygonal form—specifically, hexagonal. This is to effect a keying of the driving element 12 to the gear 10.

Two forms of clamping element 11 and 11', shown in FIGS. 4 and 5 respectively, are to provide such a pump for two different uses. The FIG. 4 illustration is for processing the integration of two different fluids. The FIG. 5 illustration is for processing similar fluids or a single fluid for special uses.

Each clamping element 11 and 11' is formed with a head 29 or 29' integrated with a stem 30 or 30' embraced by axially-spaced washer 31 or 31' of particular form.

In FIG. 4 the head 29 and washer 31 are of frusto-conical form. Each is integrated with a respective hollow stem 30 and 32. In FIG. 5, however, the head 29 is disk-shaped and the washer 31' also is disk-shaped. These respective parts are held in their clamped relationship by some suitable form of nut, one that draws the respective pairs of washers 29-31 or 29'-31' firmly against the opposite exterior faces of the pump parts 7 and 8. In FIG. 5 a nut 43 is shown for that purpose. For the adaptation shown in FIG. 4 a suitable form of clamping nut would be arranged at the outer terminals of these stems 30 and 32.

The driving element 12 is identical for use with either of these illustrated adaptations of FIGS. 4 and 5. This comprises a conventional section of shafting formed with a polygonal-shaped knob 39 (FIG. 4). As here shown, the knob is hexagonal and is shaped to snugly telescope into the similarly-shaped opening 28 of the gear 10.

The assembly shown in FIG. 4 is structured for use in processing the integration of two fluids, such as are involved in the apparatus of Patent No. 3,317,198. The stems 30 and 32, of this FIG. 4, are parts of an improved structure for that apparatus. These provide for the supply of air to the gear 9 through the channel groove 33 at the same time that liquid is being drawn into through the inlet port 19. These two fluids are mixed initially in the overlapping area 15 of the gears 9 and 10 and

the housing cavities 13 and 14 (FIG. 3). The mixture of these two fluids, being initiated in this area 15, is pressured through the ball-valve-controlled port 16 (FIG. 4) for integrated processing through a converter 34 such as is illustrated and described in the aforesaid patent.

The clamp head 29 has a channel 35 for directing the completely-integrated mixture from the converter 34 for its discharge into a congealing receptacle such as shown in the above-noted patent. The pump, so used, is submerged in the liquid tank and the concentric stems 30 and 32 are disposed vertically upward with their upper ends above the open end of the tank. Here these stems are connected to operation-control facilities similar to those illustrated and explained in the specification of the indicated patent. When so located, a nipple 36 on the head 29 extends down through a port in the tank with the O-ring 37 sealing the tank port.

The assembly shown in FIG. 5 is structured for use with equipment for either integrating two liquids or processing one liquid with certain types of equipment involving high-pressure resistance. One example of two-liquid use would be processing the ingredients for margarines or areated beverages. For that purpose the inlet 39 also would be crescent shape and a depression would be formed in the housing part 8 (FIG. 5).

An example of the latter use, processing one liquid, would be a hydraulic ram. In this adoption (FIG. 5), the clamp element 11' is in the form of a disk with a threaded nipple 38 for connection to sump pump. For certain uses with this type of equipment of FIG. 5 the housing part 7 has a crescent shaped liquid inlet 39 for the gear 9 as well as the inlet 19 for the gear 10. The inlet 39 registers with an opening 40 in the head 29'. A dotted line indicates a channel 41 for the pressured flow from the outlet port 16 through a channel 42 through the nipple 38.

In the operative use of this pump, the gears 9 and 10 are driven at the required speeds, generally, at a 4-pole motor speed. The fluids, for the requisite mixture, are drawn simultaneously through the respective inlets (19 and 33) in FIG. 4; (19 and 40-39) in FIG. 5 and into the lower and upper gear-formed pockets of the respective cavities 13 and 14. Such gears 9 and 10, rotating in the directions indicated by the respective arrows of FIG. 3, directs an initial mixture of the two fluids in the gear-formed pockets in the mixing area 15 (FIG. 3). The thusly initially-mixed fluids are pressured through the ball-controlled outlet port 16 into the channel 35 (FIG. 4) or the channel 41-42 (FIG. 5) in the respective clamp elements 11 and 11'.

The fluid entering the inlet 19 (for either adaptation of FIGS. 4 and 5) flows through the gear pockets in the lower portion of the cavity 10 for a pressured filling of the depression 24 in the housing 8. This ensures the fluid filling the gear-defined pockets of approximately half the circumference of the gear 10. Thereupon, the fluid is carried around to the initial mixing area 15 (FIG. 3).

The fluid entering the channel 33, in FIG. 4, passes radially outward along the depression 25 to successively fill the gear-defined pockets of gear 9, as they pass the depression 25, from whence the fluid is carried into the mixing area 15.

These initially-mixed fluids are pressured out through the ball-controlled port 16. For the adaptation of FIG. 4, these mixed fluids are pressured into and through a converter 34, as explained in the previously-identified Patent 3,317,198. From the converter 34 the thoroughly-integrated mixture is pressured out through the channel 35 into the nipple 36 for its intended use.

For the adaptation of FIG. 5 the second fluid enters the opening 40 and is directed into the depression 25 to successively fill the gear pockets, as above described, and thence to the mixing area 15. The thusly-initiated mixture of these fluids is discharged through the ball-controlled

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port 16 and into the channel 41-42 in the nipple 38 to its intended use.

Variations and modifications in the details of structure and arrangement of the parts may be resorted to within the spirit and coverage of the appended claims.

I claim:

1. A pump for the pressured-processing of fluids comprising, a two-part housing, one of the housing parts having only two radially-spaced circular cavities formed therein with the peripheral portion thereof overlapping medially of the housing parts for the initial mixing of fluids, the other housing part being of planar form, one pair of annular-shaped meshing gears peripherally journaled in the respective cavities, radially-spaced, axially disposed fluid inlets in one side of the housing communicating with the respective cavities, an axially-disposed fluid outlet-port in the housing registering with the overlapping portions of the housing cavities, a clamp extending axially through one of the gears for securing the two housing parts together to close the cavities, and a keyed driving shaft for driving the other gear.

2. A pump for processing fluids as set forth in claim 1 wherein the clamping element extends axially through the housing parts and the respective gear, members embracing the clamping element and respectively abutting the exterior faces of the housing parts with means on the clamping member for drawing the members to secure the housing parts in their assembled functioning relationship, and the driving means is shaft extending axially through the other housing part and is keyed to the respective gear.

3. A pump for processing fluids as set forth in claim 2 wherein the fluid-inlet in the one housing part is crescent

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shaped in concentric registration with the teeth of the respective gear, the other housing part having a similar crescent-shaped depression in the face thereof opposed to the one housing part and concentric with inlet in the one housing part, the other housing part also having formed therein a radial depression in the face opposed to the gear in the housing and extending outwardly from the clamping element to a point registering with the teeth of the other gear.

4. A pump for processing fluids as set forth in claim 2 wherein the members on the clamping element are in the nature of washers and a nut on one end of the clamping element draws the members firmly against the two housing members to secure the pump parts in functioning relationship, the interior of the one gear is of polygonal contour and the driving means is a shaft the end of which is contoured for telescopic insertion into the one gear interior.

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