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J. MYLO

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PUMP MIXER

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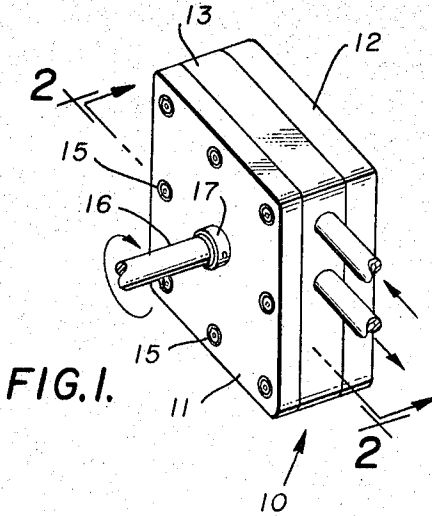


FIG. 1.

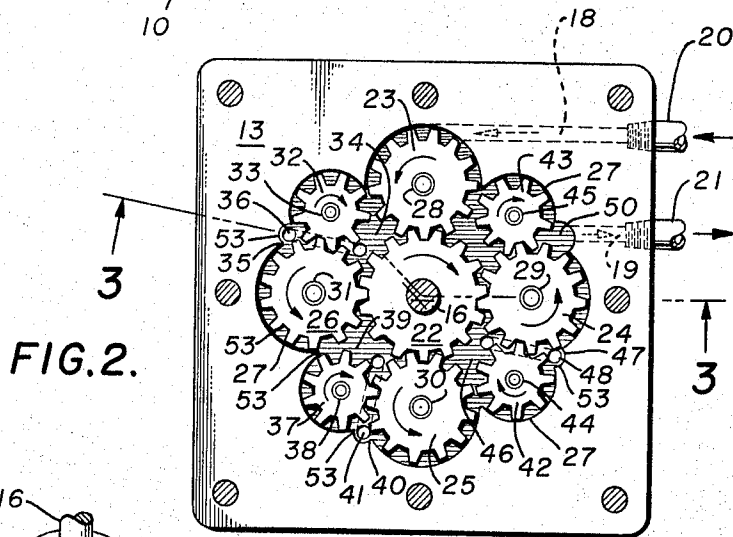


FIG. 2.

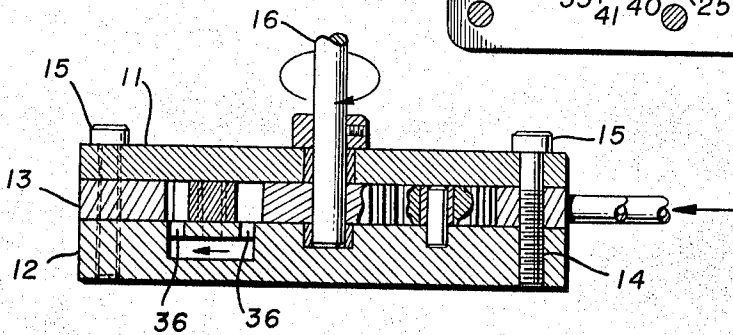


FIG. 3.

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This invention relates to a rotary gear pump, and more particularly, to means for mixing viscous liquids and metering the same.

During the polymerization and extrusion of some synthetic fibers, it is desirable on occasion to color the fiber by adding a pigment thereto. The mixing of pigment with a dope (the solution to be extruded through spinnerettes which is solidified into fibrous form by being subjected to the action of a coagulation fluid) eliminates the dyeing process and the problems related thereto. It also gives a fiber a uniform color through the cross section thereof which is advantageous for when a fiber is severed, the color differential between the fiber core and the outer extremities is eliminated. Thus, where a fiber is in fabric form and is associated with an abrasive force, some of the fibers fibrillate thereby exposing its core; however, since the core is colored the same as the surface, the fabric does not look worn.

The textile industry has experienced difficulty in obtaining a fiber which is not streaked, the streaking being due to a nonhomogeneous mixing of the dope and the pigment. Also, it is presently necessary to mix and pump the pigmented dope in two separate steps for the present day dope pumping apparatuses are not designed to mix a plurality of viscous fluids so as to obtain a homogeneous aggregation. A conventional Zenith pump (a three gear pump) is used for forcing the dope through the spinnerette holes and a conventional mixer having impellers therein is used to mix the plurality of constituents. In the mixing of dopes, care must be taken not to overheat for a high temperature at the wrong time causes imperfections in the spun fiber; therefore, a mixing apparatus must be used which does not heat the dope. It is to these and related problems that the attention of this invention is directed. Therefore, an object of this invention is to provide an apparatus for mixing fluids.

Another object of this invention is to provide an apparatus which will accurately meter the flow of a fluid through a line.

A further object of this invention is to provide an apparatus for pumping fluids from a source to a depository.

A still further object of this invention is to provide an apparatus which simultaneously pumps, mixes a plurality of and meters fluids while passing through an enclosed area.

The above and other features of the invention and novel combinations of parts will be herein described in connection with the accompanying drawings which show one good, practical form of the invention.

In the drawings:

FIGURE 1 is a perspective view of the assembled gear pump;

FIGURE 2 is an elevational, sectional view taken along line A-A of FIGURE 1 showing the novel arrangement of the gears as herein employed; and

FIGURE 3 is a sectional view taken along line B-B of FIGURE 2 showing the spatial relationship of the bypass passageways.

In one embodiment of the invention shown in the drawings, the mixing pump consists of a housing having an opening therein with supply and exhaust lines connecting the opening with a source and a depository, respectively. A sun gear is mounted on a shaft which is positively rotated by any convenient driving means (the driv-

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ing means is not shown) and is located approximately in the center of the housing. The sun gear directly drives four intermediate gears which are intermeshing therewith and disposed at 90° intervals about the periphery thereof.

Two of the intermediate gears each drive a smaller planetary gear which intermeshes with it while a third intermediate gear drives two smaller planetary gears which intermesh therewith. The planetary gears are located around the sun gear between the intermediate gears so together with the adjacent intermediate gears there is a cavity formed by the cooperation of these three gears and the sun gear. Several of the cavities are connected by lateral passages which are located in the back wall of the housing to locations outward of the meshed intermediate and planetary gears. This permits fluid to pass from a cavity through the housing then to be picked up and passed around an intermediate gear to another cavity. This sequence continues to the point of discharge. In so passing, a part of the fluid is also recirculated back to a cavity by the smaller gear at the same time that a part of the fluid is advanced around the gear system toward the outlet.

This invention is illustrated in connection with the accompanying drawings in which the figures are illustrative of the preferred embodiment of the invention. It is to be understood that this invention is applicable to other fabrics than that generally described.

A housing 10 consists of a front wall 11, a back wall 12 and a central plate 13 having an opening therein being defined by arcuated walls 53 which contains the working elements of the apparatus. These three elements which comprise the housing are tightly held together by any conventional means, such as, a threaded hole and screw arrangement as shown in FIGURE 3 and given the reference numerals 14 and 15. A shaft 16 having a collar 17 thereon is journaled in and extends through front wall 11 and extends into back wall 12. Central plate 13 has drilled therein, a suction line 18 and a discharge line 19 which threadably connect to a supply pipe 20 which extends from a source (not shown) and an exhaust pipe 21 which leads to a depository (not shown), respectively.

Fixedly mounted on shaft 16 is a sun gear 22 which positively drives the remainder of the gears. It can be easily seen that by varying the speed of this gear, the amount of fluid mixed and pumped by this apparatus is varied proportionately. Around sun gear 22 and in an intermeshing arrangement therewith are located intermediate gears 23, 24, 25, and 26. These intermeshing gears are equidistantly positioned every 90° around the periphery of the sun gear 22. Each intermediate gear, while meshing with the sun gear 22, continuously has a number of its peripheral gear teeth which move in a contiguous engagement with a portion of the arcuated walls 53 of gear-receiving pockets 27. The intermediate gears 23, 24, 25, and 26 are mounted rotatably on shafts 28, 29, 30, and 31, respectively. The shafts 28, 29, 30 and 31 securely position their respective intermediate gear against its gear-receiving pocket so as to make the void between two adjacent gear fluid carrying and advancing receptacles. A planetary gear 32 which is rotatably mounted on shaft 33 meshes with intermediate gear 26 and receives motion therefrom. Sun gear 22, planetary gear 32 and intermediate gears 26 and 23 are so positioned relative to each other and the arcuated walls 53 of the opening in central plate 13 that they cooperate to form a fluid-containing cavity 34 in housing 10. A small pocket 35 is formed by planetary gear 32, intermediate gear 26 and a portion of arcuated wall 53 and is connected to cavity 34 by means of passage 36 which is located in back wall 12. Intermediate gear 25 meshes with planetary gear 37 which is rotatably mounted on shaft 38 and combines therewith and with sun gear 22

and intermediate gear 26 to form a second fluid-containing cavity 39 which is connected with a pocket 40 by means of passage 41. Intermediate gear 24 meshes with planetary gears 42 and 43 which are mounted on shafts 44 and 45, respectively, and cooperate with planetary gear 42, sun gear 22 and intermediate gear 25 to form a third fluid-containing cavity 46 which is connected to a pocket 47, by means of a passage 48. Pocket 47 is bound by intermediate gear 24, planetary gear 42 and a portion of arcuated wall 53 of central plate 13 in the vertical plane and front plate 11 and back plate 12 in the horizontal plane.

In operation, the sun gear 22 is positively rotated by some external means (not shown) and drives intermediate gears 23, 24, 25, and 26. Intermediate gear 23 draws the fluid into the apparatus from suction line 18, conveys it to cavity 34 and forces the same through passage 36 to pocket 35 whereupon a quantity of fluid is conveyed by planetary gear 32 back to cavity 34. The quantity of fluid not recirculated to cavity 34 is conveyed by intermediate gear 26 to cavity 39. It can be readily seen that the proportion recirculated can be varied thereby increasing or decreasing the amount of mixing by enlarging or reducing the diameters of intermediate gear 26 and planetary gear 32 relative to each other. The sequence of conveying, mixing, and recirculating the fluid is continued until the fluid is deposited in a hollow 50 to which discharge port 19 is connected. Planetary gear 43 which meshes with intermediate gear 24 prevents the fluid from being reintroduced into the apparatus by intermediate gear 23. It is understood that all gears, cavities, pockets and the like which reside in the opening in central plate 13 are flanked on one side or the other either by front wall 11 or back wall 12.

Many different embodiments of this invention may be made without departing from the scope and spirit thereof. It is contemplated that extra gears may be used to form the above-mentioned cavities. Therefore, it is to be understood that this invention is not to be limited to the specific embodiment shown and described herein, except as defined in the appended claims.

I claim:

1. An apparatus for continuously mixing and pumping a plurality of fluids comprising

- (a) a housing having a front wall, a back wall and a central plate having an opening therein, said opening being enclosed by arcuated walls, said housing being provided with an inlet and an outlet for connecting said opening to a fluid source and a fluid depository,
- (b) a sun gear located in said opening and being positively rotated by a rotation inducing means, the sides of said sun gear being in engagement with said front wall and said back wall,
- (c) a first intermediate gear rotatably mounted in said housing and meshing with said sun gear, said intermediate gear being adapted for conveying said fluid from said inlet into said housing,
- (d) a second intermediate gear rotatably mounted in said housing and meshing with said sun gear,
- (e) a first planetary gear rotatably mounted in said housing and meshing with said second intermediate gear, said planetary gear cooperating with said first intermediate gear, said second intermediate gear and said sun gear to form a fluid containing cavity and cooperating with said second intermediate gear and a portion of said arcuated wall to form a pocket, said pocket and said cavity being connected by a passage in said back wall,
- (f) a third intermediate gear rotatably mounted in said housing and meshing with said sun gear,
- (g) a second planetary gear rotatably mounted in said housing and meshing with said third intermediate gear, said second planetary gear cooperating with said third intermediate gear, said second planetary

gear and said sun gear to form a cavity and cooperating with said third intermediate gear and a portion of said arcuated wall to form a pocket, said pocket and said cavity being connected by a passage being located in said back wall,

- (h) a fourth intermediate gear rotatably mounted in said housing and meshing with said sun gear,
 - (i) a third planetary gear rotatably mounted in said housing and meshing with said fourth intermediate gear, said third planetary gear cooperating with said fourth intermediate gear, said third intermediate gear and said sun gear to form a cavity and cooperating with said fourth intermediate gear and a portion of said arcuated wall to form a pocket, said pocket and said chamber being connected by a passage being located in said back wall,
 - (j) a fourth planetary gear rotatably mounted in said housing and meshing with said fourth intermediate gear, said fourth planetary gear cooperating with said fourth intermediate gear and a portion of said arcuated wall to form a hollow, said hollow being a depository for fluid entering said outlet.
2. Apparatus for mixing a plurality of fluids comprising:
- (a) a housing having an inlet adapted to be connected to a fluid source, an outlet adapted to be connected to a depository, and a hollow interior defined by a shaped outer wall and substantially planar side walls, said inlet and outlet opening into said interior;
 - (b) a sun gear disposed in said housing interior;
 - (c) a first intermediate gear meshing with said sun gear and disposed in movable, contiguous relationship with a first arcuate portion of said outer wall;
 - (d) a second intermediate gear meshing with said sun gear along a portion of the periphery of said sun gear spaced from the portion of said periphery with which said first intermediate gear meshes, said second intermediate gear disposed in movable, contiguous relationship with a second arcuate portion of said outer wall;
 - (e) a planetary gear rotatably mounted in said interior in a position between said first and second intermediate gears so as to be spaced from said first intermediate gear and said sun gear but meshing with said second intermediate gear, said planetary gear further disposed in movable, contiguous relationship with a third arcuate portion of said outer wall;
 - (f) means for supplying a fluid to said first intermediate gear whereby said fluid will be moved into said interior;
 - (g) said sun gear, said first and second intermediate gears, said planetary gear and a portion of said outer wall defining in combination a cavity adapted to receive said fluid from said first intermediate gear;
 - (h) a pocket defined by a portion of said outer wall, said second intermediate gear, and said planetary gear;
 - (i) a conduit interconnecting said cavity and said pocket whereby fluid received in said cavity will be forced, by the action of said first intermediate gear, through said conduit to said pocket from which a portion of said fluid will be returned to said cavity by said planetary gear and subjected to further mixing while another portion of said fluid will be moved toward said housing outlet along said second arcuate portion of said outer wall by said second intermediate gear.

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