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Zweig

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[45] **Dec. 25, 1973**

[54] **PERISTALIC PUMP WITH ADJUSTABLE TENSIONING MEANS**

[75] Inventor: **Leon A. Zweig,** North Bellmore, N.Y.

[73] Assignee: **Flow Technology Corp.,** Farmingdale, N.Y.

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[52] **U.S. Cl.** **417/477,** 117/94, 417/234

[51] **Int. Cl.** .. **F04b 43/08,** F04b 43/12, F04b 45/06

[58] **Field of Search** 417/475, 476, 477, 417/412, 413, 234

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Primary Examiner—Carlton R. Croyle
Assistant Examiner—Richard E. Gluck
Attorney—Leonard W. Suroff

[57] **ABSTRACT**

The construction of a pumping system adapted for utilization in transfering fluids primarily in the graphic art. The pumping system includes housing means having an inlet opening and an outlet opening extending therethrough with pumping means mounted within the housing means and operatively connected with the inlet and outlet openings to receive a fluid in the inlet opening and pumping same through the pumping means to exit through the outlet opening, the said pumping means including, a rotary structure rotatably mounted within the housing means and having a plurality of spaced rotary members mounted thereupon for rotation therewith and independent rotation thereto and a fluid conducting tube positioned in relationship to said rollers as to be sequencially engaged, and rotating means coupled to said rotary structure. Coupling means are provided at each end of the fluid conducting tube for operatively connecting to the inlet and outlet openings, with regulating means associated with the fluid and movement relative to the rotary members wherein the tension in the conducting tube may be regulated. Guide means is associated with the regulating means to control the direction of movement thereof during adjustment, the guide means includes a pair of spaced apart supports secured to the housing means and confining the regulating means so that the latter may ride freely with respect thereto.

26 Claims, 7 Drawing Figures

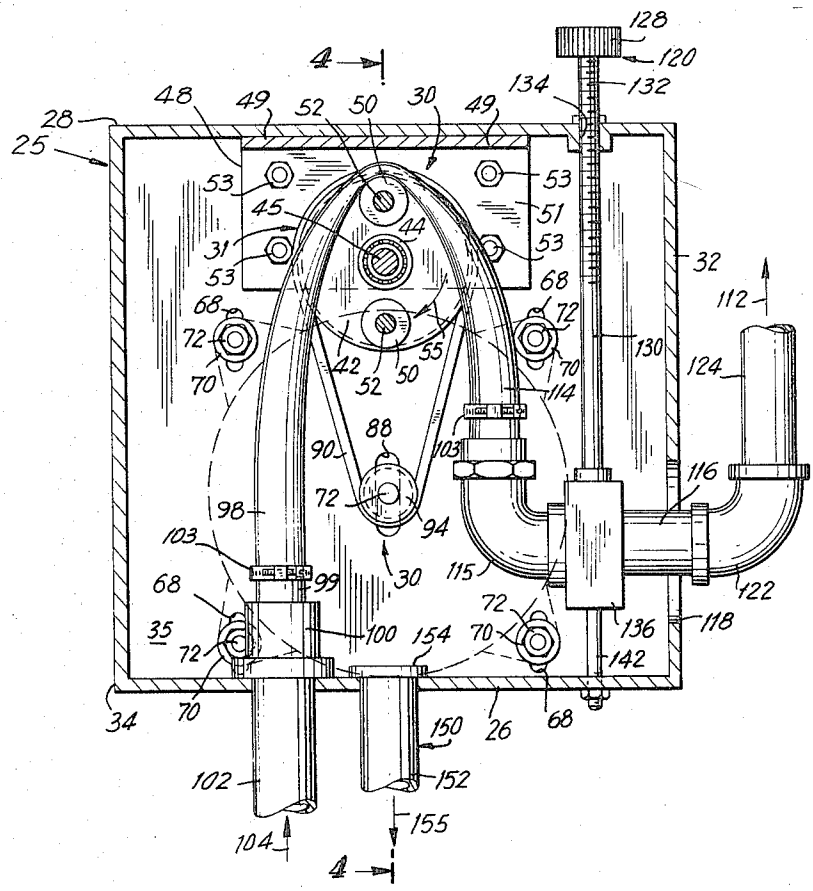

FIG. 1

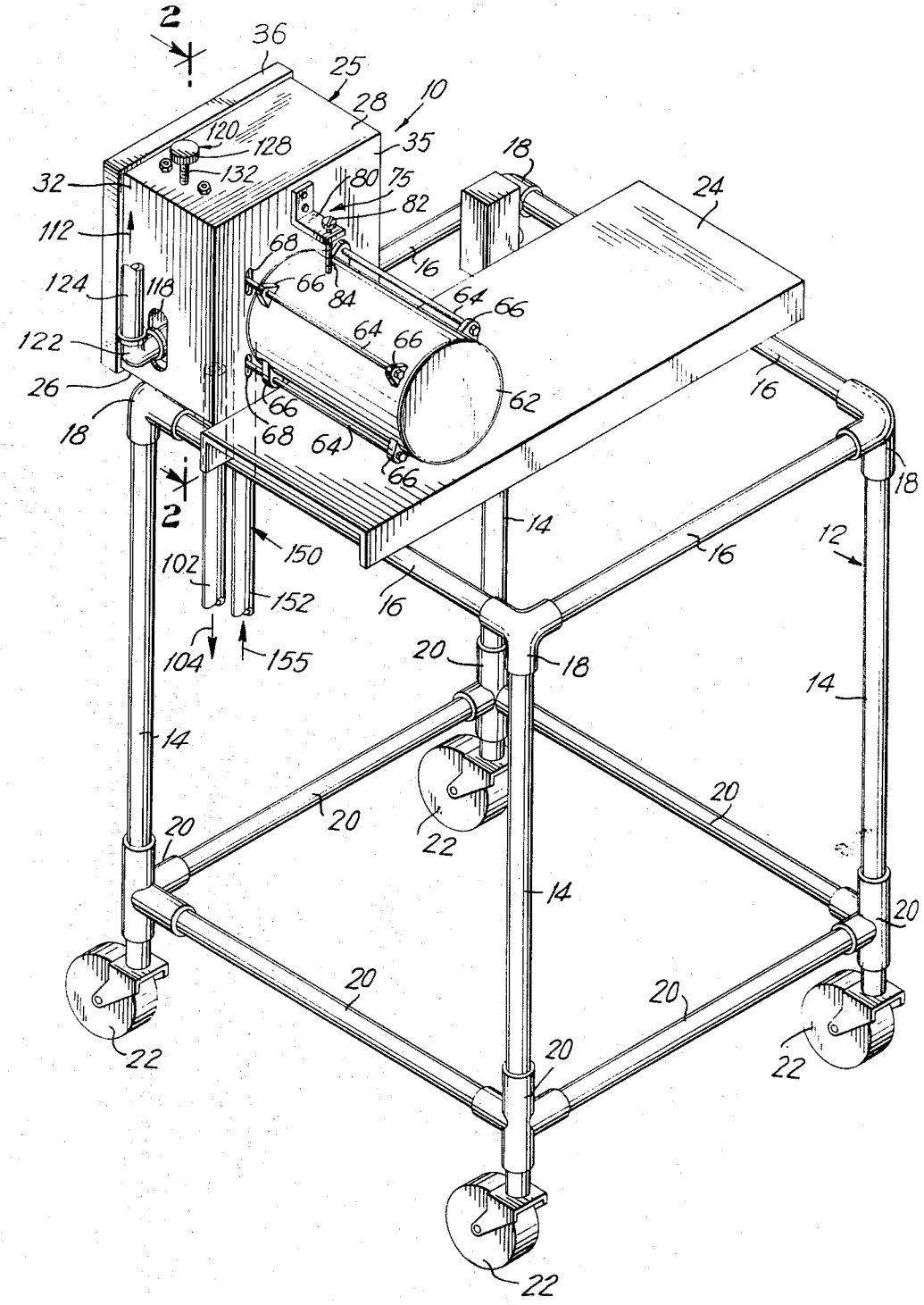
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FIG. 2

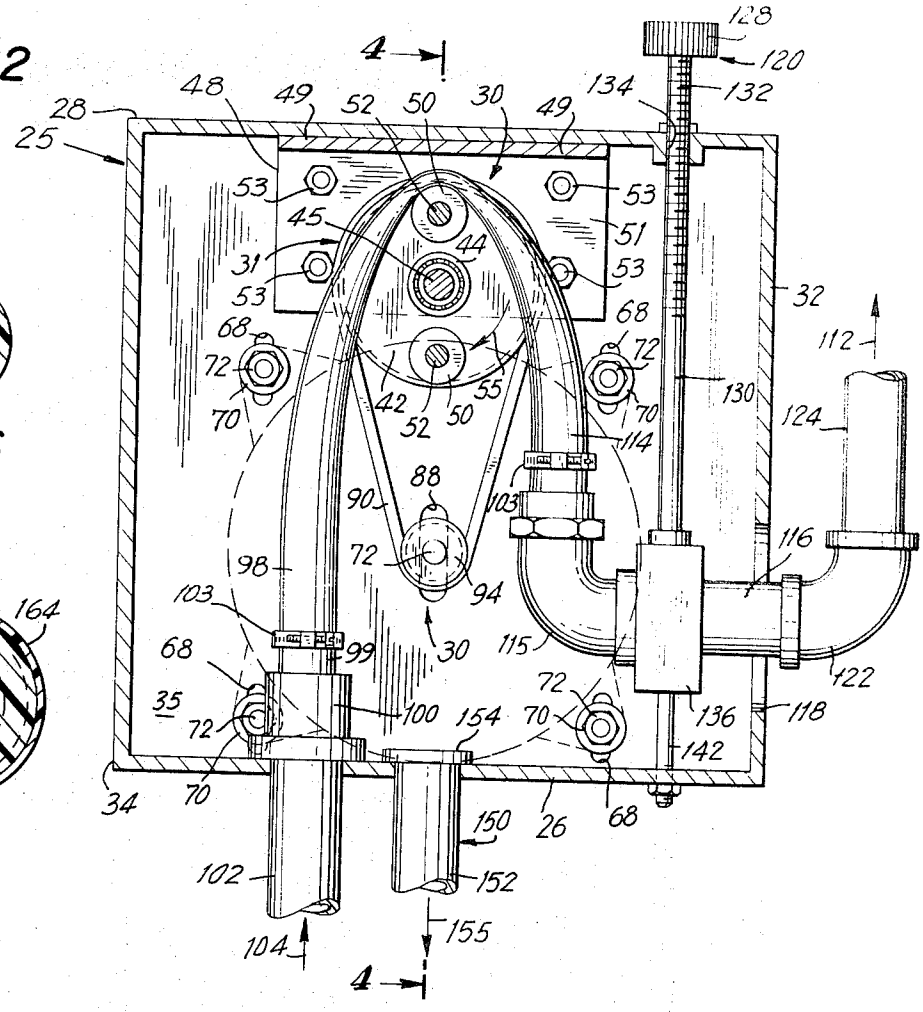

FIG. 6

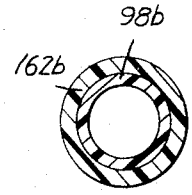

FIG. 7

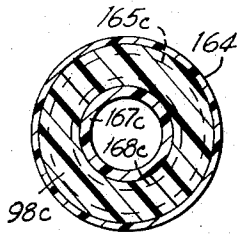

FIG. 3

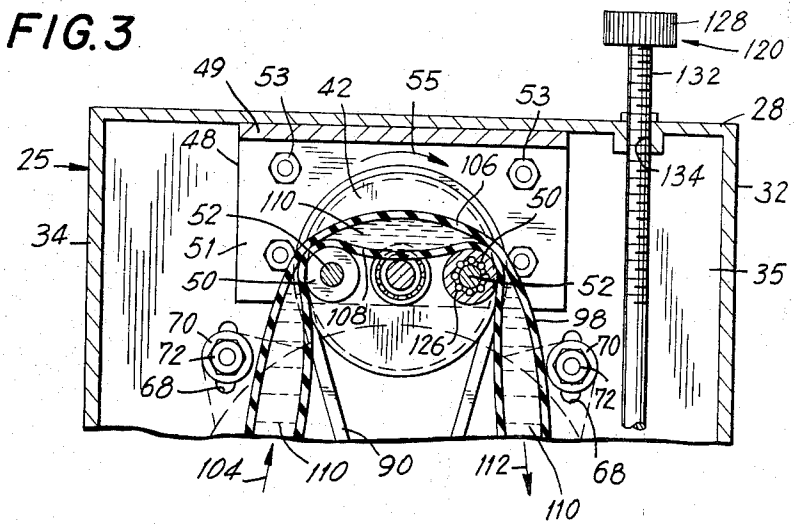

FIG. 4

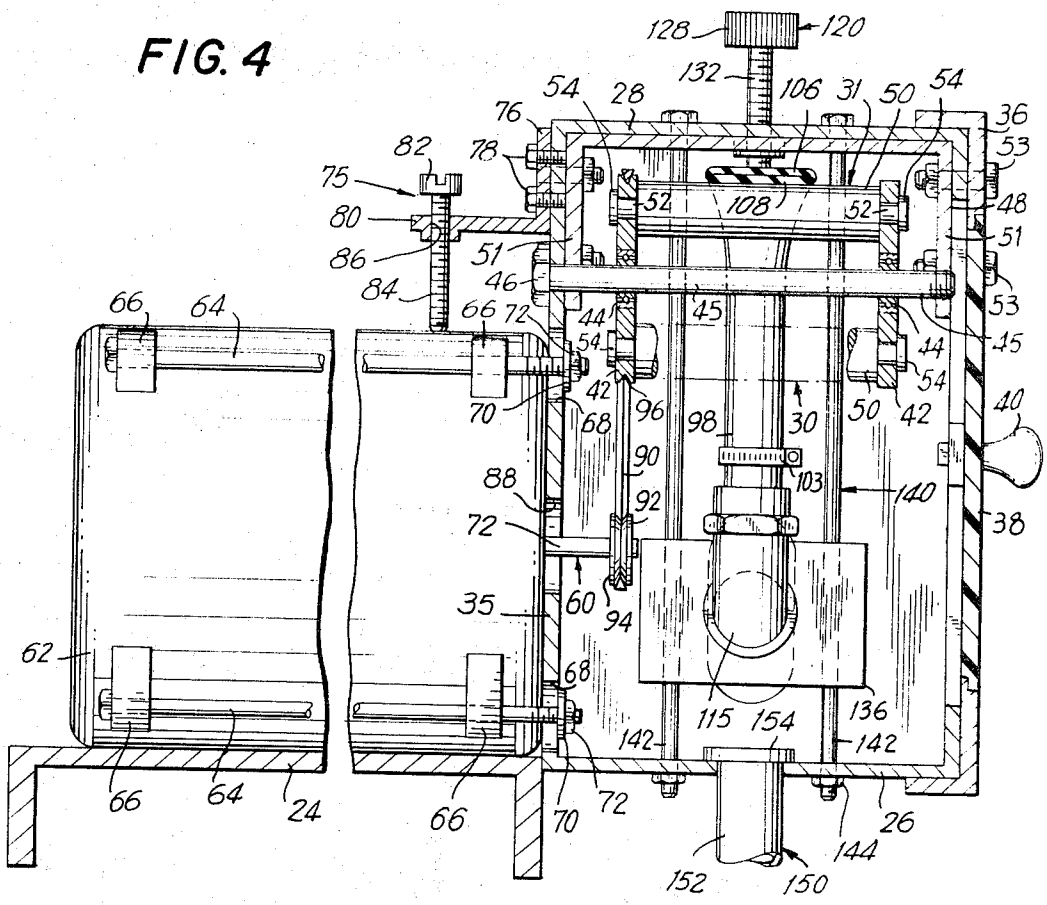
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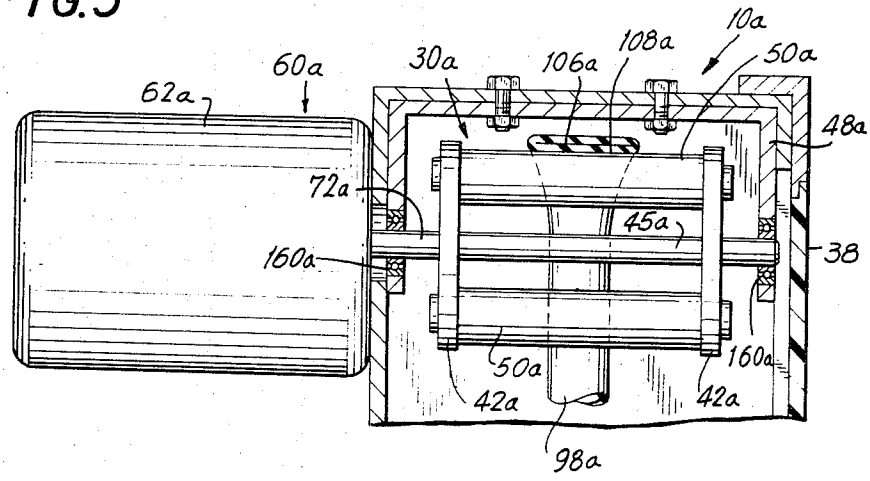
FIG. 5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PERISTALIC PUMP WITH ADJUSTABLE TENSIONING MEANS

BACKGROUND OF THE INVENTION

This invention relates broadly to the transfer by pumping means, active solvents and liquids, of various viscosities, either individually or in combination with other materials and particularly as it applies to the pumping of inks, adhesives, lacquers, paints and cleaning fluids in the graphic arts field.

Heretofore there have been utilized in the graphic arts field, various types of pumping systems for the transfer of inks, adhesives and other fluids from reservoirs to fountains or transfer stations or applicator stations or printing presses and other equipment. Generally these pumps are of rotary, impeller or piston design and composed of rigid materials which are resistant to chemical attack by the materials being pumped. These conventional pumps however are subject to a high rate of attrition due to the exposure of wear surfaces to the materials being pumped and require a high degree of expensive maintainance. Additionally, when changes are made of materials to be pumped for differences in color or other reasons, a delay factor in the operation is encountered either for cleaning and decontamination of the exposed pump surfaces or for replacement with another pump. In certain types of operations where numerous changeovers occur, no pumps are used at all and the materials are introduced into the system by manual means. In all cases where pumps are used, substantially large amounts of solvents or cleaning compounds are required to achieve satisfactory decontamination of the pumps resulting in a high continuous cost for materials as well as storage space. The clean up time for the pumps represents a significantly costly downtime factor of the press or other equipment which is dependent upon the utilization of the pump and for reasons of reducing the down time factor, many plants maintain a reserve supply of pumps for change over and clean the pumps at a later time.

OBJECTS OF THE INVENTION

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of the objections to prior art practices by the provision of a pump that utilizes a principle of squeezing an elastomeric tube whereby the only part of the apparatus which is contacted by the material being pumped is the inside of the tube, the connecting conduit and the coupling means.

Another object of the present invention is to provide a method and apparatus for adjusting the flow characterisitics as necessary to meet the requirements for a varied range of materials and viscosities.

Another object of the present invention is to provide a fluid pump with quick interchangability of the elastic portion of minimize down time in production procedures.

Another object of the present invention is the new method of pumping a fluid and in a novel construction and the adaption and combination of parts.

SUMMARY OF THE INVENTION

The aforesaid objects of the present invention and other objects which will become apparent as the description proceeds are achieved by providing a series of features, steps and elements assembled and working together in interrelated combination to provide the effects of the present invention.

Actual tests have shown that by the application of the pumping method and apparatus of the invention, the effective results obtainable in reduction of down time for cleaning, the amount of solution required as compared to heretofore known or practiced methods of pumping are substantially great enough to completely replace existing pumping apparatus with the apparatus of this invention.

In accordance with one essential embodiment of the invention, the tube through which the material is pumped must be elastomeric in nature and yet resistant to the solvency action of such solvents as methyl ethyl keytone, toluene, xylene, ethyl acetate and other esters, and various alcohols either individually or in various combinations.

A survey of the chemical, rubber and plastic manufacturers revealed that no material is commercially available capable of meeting the performance specifications required for practical utilization of this method of pumping the heretofore mentioned formulation.

One essential embodiment of this invention is the development of an elastromer material which does meet the required performance specifications and has proven to be commerically practicable.

The elastomer is produced by effecting a polymerization of poly vinyl alcohol and a monomer such as methylmeracrylate. The polymerization is accomplished by immersion of the basic poly vinyl alcohol material in the monomer and subsequent exposure to radiation.

Poly vinyl alcohol is hydroscopic in nature and normally subject to rapid deterioration by exposure to water or water soluble solvents. When subject to the described processing treatment, the end result is highly resistant to water as well as being inert when subject to contact with the previously described solvent materials.

An additional embodiment of this invention is the use of an outer tube or jacket which is also elastomeric and may be composed of the same or a dissimilar material, such as P.V.C. The outer tube insulates the inner tube from the abrasion and friction caused by the roller, thus extending the life of the inner tube.

The apparatus as embodied in this invention has been run for continuous extended periods before tube failure necessitated a change and this has exceeded the requirements for commercial justification and approval.

In accordance with one preferred embodiment of the invention, a housing is provided that contains substantially all of the various integrated assemblies of the invention which permit the proper control of the fluid being pumped therethrough.

BRIEF DESCRIPTION OF THE DRAWINGS

Although the characteristic features of this invention will be particularly pointed out in the claims, the invention itself, and the manner in which it may be made and used, may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part hereof wherein like reference numerals refer to like parts throughout the several views and in which:

FIG. 1 is a perspective view showing the pumping system of the present invention;

FIG. 2 is a sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view of the pumping action;

FIG. 4 is a sectional view through the housing means;

FIG. 5 is a sectional view illustrating another embodiment of the invention;

FIG. 6 is a sectional view illustrating the utilization of concentric tubing; and

FIG. 7 is a sectional view illustrating the tubing with a coating thereon.

DISCUSSION OF PREFERRED EMBODIMENTS

The present invention as herein illustrated with respect to FIG. 1 is generally indicated by the reference numeral **10** and seen to include supporting means **12** that has positioned thereon housing means **25** which contains therein pumping means **30** adapted to pump fluid at controlled rates and with positioning means **75** extending from the housing means to permit proper regulation of the pumping means. In addition the housing means **25** contains regulating means **120** which properly controls the tension applied to flexible tubing through which the fluid is pumped through the pump for the proper control of the rate of flow, which regulating means extends from housing means **25.** Further associated with system **10** is draining means **150** which includes an exit through the housing means **25** such that any spillage or overflow of fluid therein drains out and may be collected. The interrelationship of the various elements of the invention will become apparent as the disclosure proceeds.

SUPPORTING MEANS

The supporting means **12** is in the form of a stand having four vertically extending posts **14** interconnected by horizontally extending bars **16** at the upper end thereof, which bars are interconnected with the respective posts **14** by fittings **18** at the upper end of the posts **14.** At the lower end **14** we similarly have spaced part horizontally extending bars **16** that are coupled to posts **14** through fittings **20** in a conventional manner. Extending from the bottom of each post **14** is a caster **22** with wheels thereon to permit portability of the support means **12** to various locations to which the pumping system might be utilized at various locations with a plant. On the spaced apart bars **16** is platform means **24** which may be secured to the bars **16** in any conventional manner.

HOUSING MEANS

Housing means **25** is provided to substantially enclose a pumping means **30** and as seen particularly with respect to FIGS. 2–4 includes a bottom wall **26,** a top spaced apart wall **28,** spaced apart side walls **32** and **34,** with a rear wall **35** interconnected to each other in a conventional manner. The bottom wall **26** of the housing may be secured in a conventional manner (not shown) to the supporting means **12** such that it is rigidly coupled thereto. The housing means **25** further includes access to the pumping means **30** contained within the housing means **25** by a front panel **36** provided having a removable access door **38** with a handle or knob **40** extending outwardly therefrom in a conventional manner. The access door **38** may be hinged or in some other manner removably secured to the front panel **36,** and may be of plastic or glass that is transparent. This permits a visual inspection of the internal workings of the housing. Various openings and cutouts are provided in the housing means **25** to gain the necessary access to permit the elements of the system to function with respect to each other as will hereinafter be more fully explained.

PUMPING MEANS

The pumping means **30** includes a peristaltic pump designed to pump the various fluids of the present invention therethrough and to permit the control of various forces required to control the pumping forces necessary with the change of tubular material as well as consistency of the fluids pumped therethrough. The pumping means **30** has a rotary structure **31** seen to include a pair of support members or discs **42** mounted in spaced apart relationship to each other, as seen particularly in FIG. **4,** and having central bearings **44** in axial alignment with each other and supported within the housing by a shaft **45** that has a headed portion **46** at one end thereof with the shaft **45** extending through the rear wall **35** and through the respective bearings **44** and terminating at the opposite end of the housing in a support channel **48** by threads or some other means. The discs **42** are maintained in three spaced-part relationship to each other by means of rotary members or rollers **50** which extend between the inner surfaces of the pair of axially aligned discs **42** with a head enlarged portion **54** to maintain the fixed position of the discs **42.** The channel **48** has a base **49** that abuts the upper wall **28** and downwardly extending arms **51.** The arms **51** are secured to housing walls by means of fasteners **53.** The discs **42** are fixed to permit them to act as a rotary assembly and for angular rotation about shaft **45.**

To obtain rotation of the rotary structure **31** in the direciton of arrow **55** rotating means **60** is provided and coupled to the rotary structure **31.** The rotating means **60** includes a conventional rotary motor **62** that may be electrically powered and situated adjacent the platform **24** and secured to the rear wall **35** of the housing means by fasteners **64** that extend through bosses or neck portions **66** that extend from the motor housing with the fasteners **64** extending therethrough as seen particularly in FIG. **4,** such that the threaded section extends through fastener openings **68** such that a washer **70** abuts the inner surface of wall **35** and retained by means of nut **72** thereagainst. By having a clearance opening **68** in the wall **35** a fine adjustment of the physical relationship of the motor to rotating means **60** may be established by positioning means **75.** The positioning means **75** is provided for the fine control and positionment of the motor **62** so that the shaft **72** may be properly positioned for the reasons to be hereinafter explained.

POSITIONING MEANS

Positioning means **75** as seen in FIG. **4** includes a bracket **76** secured to the rear wall **35** by means of fasteners **78** and having a substantially horizontal arm **80** extending therefrom to accommodate a positioning screw **82** having a threaded portion **84** which extends through a mating threaded portion **84** which extends through a mating threaded portion **86** in the arm **80** to the motor casing **62** in such a manner that a clock-wise rotation of the screw **82** will help position motor shaft **72** through the opening **88.** The shaft **72** extends through the rear wall **35** and in turn rotation of the screw **82** will vary the tension in the driving connection between the motor **62** and disc **42.**

Obviously various drive means may be utilized for the coupling of rotary motor shaft 72 to drive the rotary structure 31. As seen in FIGS. 2 and 4 the drive means includes a pulley belt 90 that extends within a groove 92 on pulley 94 and a complimentary groove 96 extends on the outer periphery on disc 42. The positioning means 75 permits the proper tensioning of the belt 90 such that it might be easily placed between the grooves 92 and 96 and adjusted for whatever wear results as the continued use of the belt occurs.

REGULATING MEANS

The regulating means 120 is provided to control the tension in the tube 98 as the rollers 50 continuously engage it to get the peristaltic pumping action as illustrated in FIG. 3. Each roller 50 is supported by means of metal bearing 126 to permit free rotation of the rollers 50 around the respective axis formed by the shaft 52 in response to rotation of shaft 45 by the driving means hereabove discussed. Accordingly when the roller 50 is in the left hand portion of the cavity it will operate to compress the tube 98 and flatten tube 98 out as is shown in cross-section in FIG. 4. This forces fluid ahead of the compressed region. When the tube 98 returns to its normal shape once the roller 50 has passed by, a vacuum will be produced in the tube tending to draw fluid therethrough in the desired direction with the repetition of this procedure the fluid is pumped from its inlet conduit 102 to its outlet conduit 124 on a continuous basis. To control the tension in the conduit 92 the regulating means 120 is provided and is seen to include a controlknob 128 extending above the housing means 25 with a control shaft 130 extending within the housing means 25 and having a threaded portion 132 which mates with a complimentary threaded portion 134 in the housing wall 138 such that angular rotation of the control knob 128 produces vertical movement of the shaft 130 which in turn is coupled to the fluid block 136.

Peristaltic action of the pump is obtained by fluid passing through a conducting tube 98 which is deformable and has a memory, that is, it will return to its original shape after being deformed. As is well known in the art of peristaltic pumps, if a moving region or movng regions of compression are provided along the length of the tube 98, the action of the compressed regions pushing the fluid ahead and the action of the tube in returning to its original uncompressed shape provide a vacuum to cause fluid flow in the tube according to the direction of movement of the regions of compression. Tube 98 is connected at its inlet end 99 by clamp 103 to a quick disconnect coupling means 100 which coupling means may be one of those well known in the art and which in turn is connected to inlet conduit 102 that extends through the rear wall of the housing means 25 and has the fluid entering therein in the direction of the arrow 104. The tube 98 is then draped over the rotary structure 31 such that it engages roller 50 and as compressed the wall essentially forms an upper section 106 and lower section 108 with the fluid 110 contained in the various sections thereof as seen particularly in FIG. 3 as peristaltic action of the pump occurs during the pumping thereof with the fluid entering in the direction of the arrow 112 as the pump means operates in the direction of the arrow 55.

The exiting section 114 of tube 98 similarly has connected by clamp 103 to quick disconnecting means 115, which extends through regulating means 120 and through a conduit 116 which extends through an opening 118 in the side wall 32 and through an elbow fitting 122 which in turn is connected to a conduit 124 so that the fluid may exit in the direction of arrow 112. Obviously a positionment of exiting conduit 124 as well as the positionment of quick disconnecting couplings might vary as to their relationship either within or without the housing means or positionment in some other manner that is desirable for the user.

GUIDE MEANS

Guide means 140 is provided to permit vertical movement of the regulating means 120 and one form thereof is illustrated in FIG. 4 and is seen to include a pair of spaced-apart supports or columns 142 that are secured to and extend from the upper wall 128 to the lower wall 126, and may be in the form of fasteners having nuts 144 at each end to maintain the necessary tension. The supports or columns 142 extends through the support body 136 such that the support body may ride freely on the two columns 142 as the necessary adjustment of the regulating means is made by rotation of knob 128.

DRAINING MEANS

Draining means 150 is provided in association with the housing means 25 to permit an overflow or other escape of fluid 110 to easily exit from housing means 25. The draining means 150 is illustrated in FIGS. 2 and 4 in the form of a conduit 152 secured to the lower wall 26 and having a head portion contained within the housing means such that if any escaping fluid reaches the height of head 154 it will automatically exit through conduit in the direction of the arrow 55.

FIG. 5 illustrates another embodiment of the invention 10*a* in which the rotating means 68*a* is mounted in relationship to to the pumping means 38*a* such that the motor 62*a* has its shaft 72*a* extending in longitudinal axial alignment, or forms part of the shaft 42*a* such that there is a direct drive relationship and no pulley belt or other means is required. The discs 42*a* are mounted on shaft 45*a* in the means discussed above with the rollers 50*a* engaging the conducting tube 98*a* and compressing it to form upper section 106*a* and lower section 108*a*. The shaft 45*a* may be integrally formed with the motor shaft 72*a* or coupled thereto in a mechanical fashion, and supported in ball bearings 160a that are situated in support channel 48*a*.

FIG. 6 illustrates an aspect of the invention which the conducting tube 98*b* is formed of two concentric tubular members positioned one within the other. As seen we have the inner conduit tube 98*b* and an outer conducting tube 162*b*. It has been found that the utilization of concentric tubes whether of plastic or other materials, provides certain advantages in the pumping process as well as adding a degree of insurance in that if the inner tube 98*b* was to rupture or in some other way break then the outer tube 162*b* acts as a protective sleeve yet at the same time will permit the unit to continue to function since the respective tubes at there free ends are clamped and held in place. Thus even if the inner tube 98*b* was defective due to manufacturing, and rupturing at one point occured it is unlikely that the outer tube 162*b* would have a weakened wall at the same point. Furthermore, if a rupture did occur, the outer tube 162*b* would retain the fluid. Accordingly,

inspection unit from time to time, or decreases in pumping efficiency that might be noticeable, would permit an operator to shut the equipment in time to avoid any spillage.

FIG. 7 illustrates an aspect of the invention in which the tube 98c has an outer coating or layer 164c and an inner coating or layer 167c formed by polymerization. The outer coating 164c during the process hereinafter explained actually penetrates the wall of the tube 98c to a depth of penetration indicated by the phantom line 165c and in a similar manner on the inner side of the wall to a depth indicated by the phantom line 168c.

One example of the polymerization procedure involves the bundling of the tubes 98c in a container which is evacuated and filled with an inert gas, such as nitrogen, and then filled with the monomer material, such as methylmeracrylate which is in a liquid form, thereby surrounding the inner and outer surfaces of the tubing 98c. A period of soaking is performed, as for example, 24 hours, allows an effective penetration of the poly vinyl alcohol tubing by the monomer. The entire container is then subjected to exposure by a radiation source, such as cobalt 60, for a period of time to produce the desired polymerization. The time period may vary up to 24 hours and obviously is dependent upon a number of variables. The period of time necessary for the soaking may be reduced by the introduction of ultrasonic energy into the monomer fluid. The frequency of vibration may be in the range of 20 Kc to 100 Kc. The time may also be varied depending on the monomer. This process may be applied to sheet material or other forms with the same end results. The tubing diameter is about one-half inch inside diameter to 5 inches inside diameter, and a wall thickness of 0.02 inch to 0.50 inch. The above resultant tubing has been found most suitable for use in the transmission of fluids, such as the inks described herein, in accordance with the present invention.

Accordingly, the fluid conducting tube to be used in the present invention may be formed by various means and, as another example, the underlying tube may be coated with a polymerizing material such as tri allyl iso cyanurate, as by immersing the tube 98c within a container and then creating a vacuum within the container in which it is placed equivalent to 3 milimeters of mercury and then filling the vacuum container with nitrogen. The polymerizing material is then added to the container for a time period of say four hours. The tube 98c is subjected to exposure by a radiation source such as cobalt 60. In this manner a core of plastic material may be formed into an object for various commercial uses. The core may be in tube form or of sheet material.

Although illustrative embodiments of the invention have been described in detail herein with reference to the accompanying drawing, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

I claim:

1. A pumping system comprising:

A. housing means having an inlet opening and an outlet opening extending therethrough,

B. pumping means mounted within said housing means and operatively connected with said inlet and outlet openings to receive a fluid in said inlet opening and pumping same through said puming means to exit through said outlet opening, said pumping means including:

1. a rotary structure rotatably mounted within said housing means and having a plurality of spaced rotary members mounted thereupon for rotation therewith and independent rotation relative thereto,

2. a fluid conducting tube positioned and relationship to said rollers as to be sequencially engaged, and

3. rotating means coupled to said rotary structure,

C. coupling means at each end of said fluid conducting tube for operatively connecting to said inlet and outlet openings,

D. regulating means associated with said fluid conducting tube at substantially one end thereof for movement relative to said rotary members wherein the tension in the conducting tube may be regulated,

E. said regulating means further including guide means associated therewith to control the direction of movement thereof during adjustment, said guide means includes means to continuously and linearly adjust said regulating means, said guide means further includes a pair of spaced apart supports secured to the housing means and confining the regulating means so the latter may ride freely thereon,

F. draining means associated with said housing means to permit the dispensing of any fluid therefrom, said draining means being provided on the bottom of said housing means, and

G. supporting means coupled to said housing means.

H. said housing means further including an access opening to visual inspection thereof.

2. A pumping system comprising:

A. housing means having an inlet opening and an outlet opening extending therethrough,

B. pumping means mounted within said housing means and operatively connected with said inlet and outlet openings to receive a fluid in said inlet opening and pumping same through said pumping means to exit through said outlet opening, said pumping means including:

1. a rotary structure rotatably mounted within said housing means and having a plurality of spaced rotary members mounted thereupon for rotation therewith and independent rotation thereto,

2. a fluid conducting tube positioned in relationship to said rollers as to be sequencially engaged, and

3. rotating means coupled to said rotary structure

C. coupling means at each end of said fluid conducting tube for operatively connecting to said inlet and outlet openings,

D. regulating means associated with said fluid conducting tube at substantially one end thereof for movement relative to said rotary members wherein the tension in the conducting tube may be regulated,

E. said regulating means further includes guide means associated therewith to control the direction of movement thereof during adjustment, said guide means includes means to continuously and linearly adjust said regulating means, said guide means further includes a pair of spaced apart supports secured to the housing means and confining the regu-

lating means so that the latter may ride freely with respect thereto.

3. A pumping system comprising:

A. housing means having an inlet opening and an outlet opening extending therethrough,

B. pumping means mounted within said housing means and operatively connected with said inlet and outlet openings to receive a fluid in said inlet opening and pumping same through said pumping means to exit through said outlet opening, said pumping means including:

1. a rotary structure rotatably mounted within said housing means and having a plurality of spaced rotary members mounted thereupon for rotation therewith and independent rotation relative thereto,

2. a fluid conducting tube positioned in relationship to said rotary members as to be sequencially engaged, and

3. rotating means coupled to said rotary structure,

C. coupling means at each end of said fluid conducting tube for operatively connecting to said inlet and outlet openings, and

D. regulating means associated with said fluid conducting tube at substantially one end thereof for movement relative to said rotary members wherein the tension in the conducting tube may be regulated, and wherein said regulating means includes:

a. a support body to which one end of said fluid conducting tube is connected,

b. a shaft extending from said support body and rotatably mounted with respect thereof, and said shaft extending at its opposite end in rotatable manner relative to the housing, wherein rotation of said shaft relative to the housing effects linear movement of said support body and controls the tension in said conducting tube.

4. A pumping system as defined in claim 3,

a. wherein said shaft extends exteriorly of said housing means and has a threaded portion thereon and said housing means has a complimentary threaded portion for receiving said shaft, and

b. and further including a control knob mounted on said shaft at its free end.

5. A pumping system as defined in claim 3, wherein said fluid conducting tube is comprised of an inner and outer concentric tube.

6. A pumping system as defined in claim 3, and further including supporting means coupled to said housing means.

7. A pumping system as defined in claim 6, wherein said supporting means has casters thereon for movement of said pumping system.

8. A pumping system as defined in claim 3, wherein said fluid conducting tube is comprised of:

a. a plastic tube, and

b. an inner coating formed thereon having a resistance to the fluid pumped therethrough.

9. A pumping system as defined in claim 8, wherein said tube is of poly vinyl alcohol.

10. A pumping system as defined in claim 8, wherein said inner coating is a polymerizing material.

11. A pumping system as defined in claim 10, wherein said polymerizing material is tri allyl iso cyanurate.

12. A pumping system as defined in claim 3, wherein said housing means further includes an access opening to facilitate visual inspection therein.

13. A pumping system comprising:

A. housing means having an inlet opening and an outlet opening extending therethrough,

B. pumping means mounted within said housing means and operatively connected with said inlet and outlet openings to receive a fluid in said inlet opening and pumping same through said pumping means to exit through said outlet opening, said pumping means including:

1. a rotary structure rotatably mounted within said housing means and having a plurality of spaced rotary members mounted thereupon for rotation therewith and independent rotation relative thereto,

2. a fluid conducting tube positioned in relationship to said members as to be sequencially engaged, and

3. rotating means coupled to said rotary structure and including a rotary motor,

C. coupling means at each end of said fluid conducting tube for operatively connecting to said inlet and outlet openings,

D. regulating means associated with said fluid conducting tube at substantially one end thereof for movement relative to said rotary members wherein the tension in the conducting tube may be regulated, said regulating means including:

1. a support body to which one end of said fluid conducting tube is connected,

2. a shaft extending from said supporting body and rotatably mounted with respect thereto at one end thereof, and said shaft extending at its opposite end in rotatable manner relative to the housing, wherein rotation of said shaft relative to said housing effects linear movement of said support body and controls the tension in said conducting tube, and

E. guide means associated with such regulating means to control the direction of movement thereof during adjustment, and including at least one column secured to the housing means and extending through the regulating means so that the latter may ride freely thereon,

F. positioning means to adjust the position of said rotary motor relative to said rotary structure, and

G. supporting means coupled to said housing means.

14. A pumping system as defined in claim 13, and further including draining means provided on the bottom of said housing means to permit the dispensing of any fluid therefrom.

15. A pumping system as defined in claim 13,

a. wherein said shaft extends exteriorly of said housing means and has a threaded portion thereon and said housing means has a complimentary threaded portion for receiving said shaft,

b. and further including a control knob mounted on said shaft at its free end.

16. A pumping system as defined in claim 13, wherein said rotary structure includes:

a. a shaft mounted relative to said housing means,

b. a pair of spaced apart support members mounted in spaced apart relation to each other on said shaft for rotation thereon,

c. said plurality of spaced rotary members mounted on said support members, and

d. a belt connecting said rotary motor to one of said support members.

17. A pumping system as defined in claim **16,** wherein said positioning means includes:

a. a bracket secured to said housing means in spaced relation to said rotary motor,

b. a positioning screw extending through said bracket to abut said motor, wherein rotation of said screw repositions said motor to control the tension in said belt.

18. A pumping system as defined in claim **13,** wherein said fluid conducting tube is comprised of an inner and outer concentric tube.

19. A pumping system as defined in claim **13,** wherein said supporting means has casters thereon for movement of said pumping system.

20. A pumping system as defined in claim **13,** wherein said fluid conducting tube is comprised of:

a. a plastic tube, and

b. an inner coating formed thereon having a resistance to the fluid pumped therethrough.

21. A pumping system as defined in claim **20,** wherein said tube is of poly vinyl alcohol.

22. A pumping system as defined in claim **20,** wherein said inner coating is a polymerizing material.

23. A pumping system as defined in claim **22,** wherein said polymerizing material is tri allyl iso cyanurate.

24. A pumping system as defined in claim **13,** wherein said housing means further includes an access opening to facilitate visual inspection therein.

25. A pumping system as defined in claim **13,** wherein said rotary structure includes:

a. a shaft mounted relative to said housing means,

b. a pair of spaced apart support members mounted in spaced apart relation to each other on said shaft for rotation thereon,

c. said plurality of spaced rotary members mounted on said support members, and

d. means coupling said rotary motor directly to said shaft and in axial alignment therewith.

26. A pumping system as defined in claim **13,** wherein

a. said housing means includes a bottom wall, top wall, side walls, rear wall and front panel in spaced apart relation to each other,

b. a door mounted on said front panel to obtain access to said pumping means, and

c. said rotary motor mounted on said rear wall with its shaft extending therethrough.

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