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[54] **METHOD OF AND MIXER BLOCK FOR FEEDING A STREAM OF VISCOUS MATERIAL**

[76] Inventors: **Henry A. Phillips,** 1340 New Brunswick Avenue, Piscataway; **Reynold E. Minnich,** 1309 Washington Valley Road, Martinsville, both of N.J.

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[52] **U.S. Cl.** **259/4**

[51] **Int. Cl.** **B01f 15/02**

[58] **Field of Search** 259/4, 18, 36; 137/3, 4

[56] **References Cited**

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Primary Examiner—Robert W. Jenkins

Attorney—Lawrence I. Lerner, Sidney David and Joseph S. Littenberg

[57] **ABSTRACT**

A method of and mixer block for feeding a stream of viscous material into a mixer employing not rotating parts is disclosed. The mixer block has a cavity therein terminating in an outlet which feeds the raid mixer. A first inlet is provided into the cavity at a point displaced from the outlet end for introduction of a first viscous material while a second inlet is provided between the first inlet and the outlet to introduce the second viscous material into the interior of the flow of the first viscous material thereby presenting a coaxial stream of viscous material to the said mixer.

9 Claims, 3 Drawing Figures

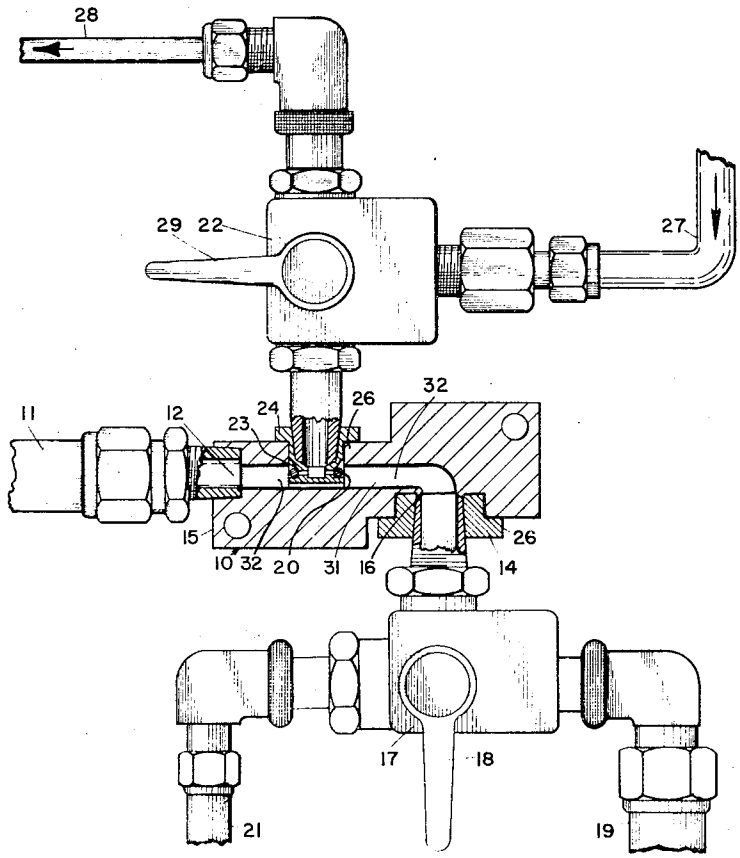
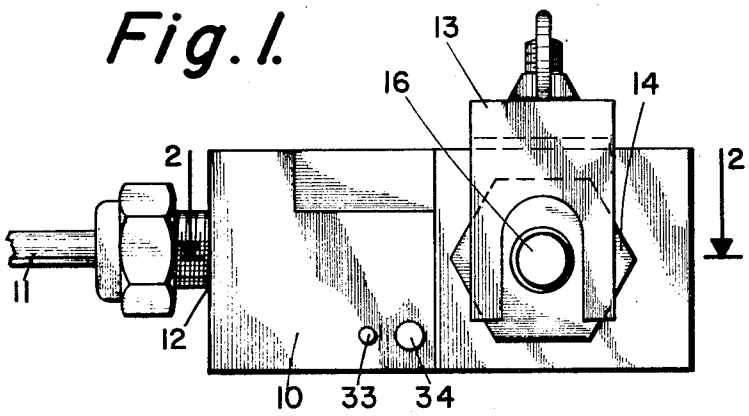


Fig. 1.



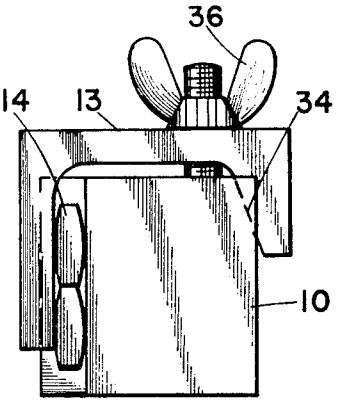


Fig. 3.

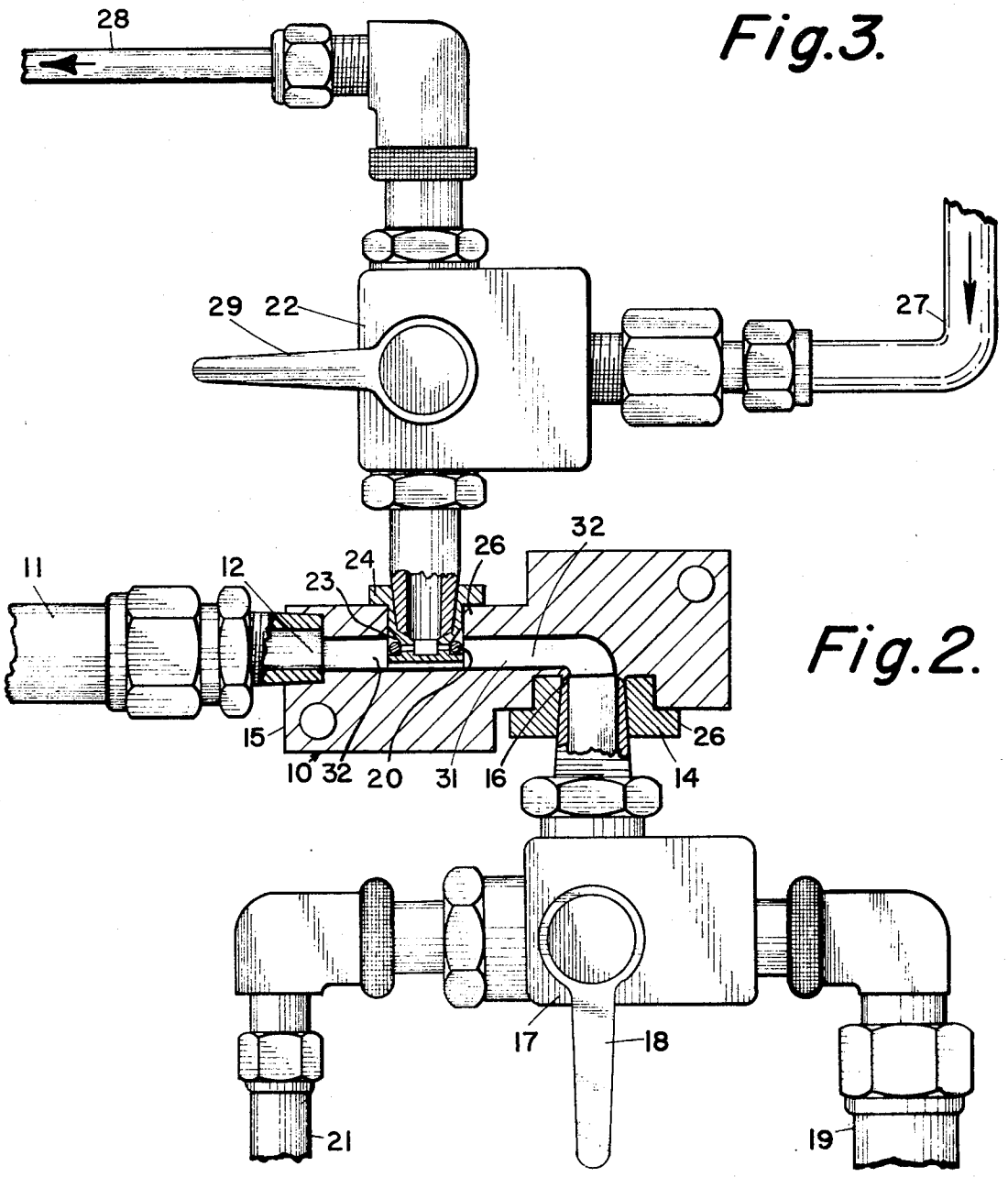


Fig. 2.

METHOD OF AND MIXER BLOCK FOR FEEDING A STREAM OF VISCOUS MATERIAL

FIELD OF THE INVENTION

This invention relates to metering and mixing devices and machines and the like, and particularly to a method and apparatus for feeding of materials to be mixed to such machines.

BACKGROUND OF THE INVENTION

Mixing devices and the like are well known as evidenced by U.S. Pat. No. 3,286,992 granted Nov. 22, 1966 to C. D. Armeniades et al. The patented device is a static type mixer, that is, a mixer which does not employ any rotating parts. Such a mixer generally receives the materials to be mixed at one end and delivers it out of the other end after it has gone through a number of mixing stages.

Though the patented device has proved to be quite efficient and successful, it has certain drawbacks. Perhaps the most serious drawback is due to the fact that unless the materials to be mixed are fed to the static mixer in the right proportions over short time intervals, a completely homogenous mass is not formed at the outlet end. It will be appreciated that the mixing takes place as the materials are moving from the inlet to the outlet and therefore there is no possibility of correcting the ratio of materials to be mixed over a time interval as is possible with a rotating mixing device. The ratio of materials fed in at the inlet will be substantially the ratio of materials in the mixture provided when the materials reach the output end.

Rotating mixing devices are not as efficient as they could be when the materials fed thereto themselves are not in the proper proportions. When an improper ratio of materials is supplied to a rotating mixer over short time intervals and the proper proportions are supplied thereafter the mixing time must be increased beyond the mixing time which may be employed when the proper proportions are fed continuously.

In certain mixing operations where the mixed materials chemically react over short time intervals, the longer time intervals for averaging input ratios may deleteriously affect the resultant product and the product may then have properties which make it unacceptable.

BRIEF DESCRIPTION OF THE INVENTION

In accordance with this invention, a method is provided for operating a mixer which includes the steps of combining first and second viscous materials into a combined stream of viscous material wherein measured amounts of the first and second viscous material flow, and applying the combined stream of viscous material to the mixer.

It has been found that the method is particularly suitable for use with a mixer employing no rotating parts and, particularly, when the first viscous material is surrounded in the combined stream by the second viscous material.

A mixer block is also provided for practicing the method of this invention. The mixer block includes a mixing chamber in the mixing block which is defined by an inner guiding wall. The mixing chamber terminates in an opening at an output end thereof. The mixer block has a first inlet for introducing the first viscous material into the mixing chamber located at a point in the mixing block displaced from the outlet end and a second inlet for introducing the second viscous material into the mixing chamber. The second inlet is located at a point in the mixing chamber between the first inlet and the outlet end.

DESCRIPTION OF THE FIGURES

FIG. 1 is a side elevational view of a mixer block constructed in accordance with the teachings of this invention connected to a mixer;

FIG. 2 is a sectional view of the mixer block and mixer taken along the line 2—2 in FIG. 1; and

FIG. 3 is a side view of FIG. 1 particularly showing a quick disconnect clamp for holding fixtures on the mixing block.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, we see a mixer block **10** having a mixer **11** employing no rotating parts connected to an outlet end **15** of the mixer block **10.** The mixer block **10** together with the mixer **11** form a mixer unit which may be employed for mixing chemicals which react with each other. For example, in the embodiment shown the mixer unit formed by the mixer block **10** and the static mixer **11** are employed to combine a resin and catalyst which harden a predetermined time interval after mixing. It should be noted that mixing of this type presents problems which the mixing of inert materials does not present. For example, if the mixed material was allowed to remain in either the mixing block **10** or mixer **11,** it would harden thereby rendering the devices inoperable. Therefore, it should be noted that the cavity **31** (see FIG. **2**) in the mixing block **10** provides a smooth path therethrough so that no corners or crevices are provided for the resting of the mixed materials. This configuration is also particularly suitable for resin or solvent purging.

A quick disconnect clamp **13** secures an adapter pipe **14** to a first inlet **16** of the mixer block **10.** An outlet **12** is positioned downstream from first inlet **16** substantially adjacent to outlet end **15.** The material introduced through first inlet **16** will flow to the outlet **12** through a cavity **31** (see FIG. **2**) in the mixing block **10.** The mixer **11** may be of the types shown or referred to in U.S. Pat. No. 3,286,992. It should be understood that any mixer can be employed with the mixing block and method of this invention and that greatly improved performance has been achieved with mixers employing no rotating parts when used therewith.

Referring now to FIG. **2,** we see a three-way valve **17** which may be actuated by a control member **18** to connect the first inlet **16** to either a source of resin through a pipe **19** or a source of solvent through a pipe **21.** The control member **18** may also be positioned to prevent either the resin or solvent from entering the first inlet **16.**

A second three-way valve **22** is connected to the mixing block **10** at a second inlet **23** by a check valve **24.** It should be noted that the check valve **24** and the adapter pipe **14** each have an "O" ring **26** for normal sealing purposes. The three-way valve **22** is connected to a source of catalyst by a pipe **27** to an outlet pipe **28.** The control member **29** of the valve **22** can connect the pipe **27** to the second inlet **23** to the ratio check tube **28.** The control member **29** can also be positioned to isolate the pipe **27.**

It should be noted that the check valve **24** extends into the cavity **31** in the mixing block **10.** The cavity **31**

has a smooth inner guiding wall **32.** The check valve **24** is adapted to introduce material approximately centrally of the interior of the cavity **31.** In particular, check valve **24** comprises an "O" ring **20** which seals outlet openings (not shown) disposed in annular configuration. Material passes through check valve **24** when pressure is applied to the material forcing the "O" ring **20** from its sealing position to an extended open position. When the pressure is removed, "O" ring **20** snaps back to its sealing position. This type of check valve has been found to be particularly advantageously employed when practicing the present invention because the resin or solvent purge has been found to effectively clean the check valve. In particular, when resin is employed, it does not harden within cavity **31.** Further, the resin does not enter the check valve and harden therein.

When resin is being introduced into the cavity **31** through the three-way valve **17,** it flows therefrom through the cavity to the outlet **12** and from there into the mixer **11.** As noted, the check valve **24** introduces catalyst into the interior of the stream of resin producing a coaxial linear flow.

Referring now to FIG. **3,** we see in particular the quick disconnect clamp **13** holding the adapter **14** against the mixing block **10.** The tapered back end **34** thereof should be particularly noted which draws the clamp **13** against the adapter **14** as the wing nut **36** is tightened drawing the clamp **13** against the mixing block **10.**

Mixer blocks normally employ a check valve at each inlet. In accordance with the present invention, the adapter **14,** which is substantially an open pipe, may be, and preferably is, employed. This is possible because first inlet **16** is dispose upstream of second inlet **23** and the purging material, be it a solvent such as acetone or the resin itself, is introduced through the upstream inlet **16.** Thus, the purging stream itself prevents catalyst from entering inelt **16** and the purging stream is more effective in that it is introduced directly and need not clean the check valve which would otherwise be employed and which would be difficult to clean since the purging material would be introduced through it and material may stick in back of it.

It should be noted that the size of the cavity **31** and the mass of the mixer block **10** have been kept to a minimum. The fact that the size of the cavity **31** has been kept to a minimum insures that a minimal amount of material is wasted at the end of a cycle. This is particularly important where expensive materials are being used and cycles or runs are relatively short.

After a run is complete, the control member **18** on the three-way valve **17** is switched from a position which allows the resin to enter the cavity **31** to the position which allows the solvent from the pipe **21** to be forced through the cavity **31** and then the mixer **11.** The control member **29** is placed in a neutral position so that the catalyst no longer is entering the chamber **31.** In this way, solvent can immediately be sent through the system clearing out the mixer of resin and catalyst which would otherwise harden therein. It should be understood, of course, that by merely turning off the catalyst and continuing running resin through the system, a resin purge can be achieved.

It should be noted that provisions are made in the mixer block **10** (see FIG. **1**) for a thermistor **33** and a thermocouple **34** to be mounted therein. The thermistor **33** is employed in a control circuit (not shown) which regulates the temperature of the block **10.** Since the mass of the block **10** is low, the temperature thereof can be controlled rapidly. This insures fast heat up and fast cool down for stable heat control when required. The thermocouple **34** may be connected to a pyrometer (not shown) for visual indications of the temperature of the block **10.**

It should be understood that the present description has been by way of example only, it has not been intended as a limitation to the scope of the invention, and that while the invention has been disclosed with respect to a particular embodiment thereof, numerous others will become obvious to those of ordinary skill in the art in light hereof.

What is claimed is:

1. A mixer block for producing a stream of two or more viscous materials, comprising a mixing chamber in said mixing block, said mixing chamber being defined by an inner guiding wall in said block, said mixing chamber terminating in an opening at an outlet end;

first inlet means for introducing a stream of a first viscous material into said mixing chamber, located at a point in said mixing block displaced from said outlet end;

second inlet means for introducing a second viscous material into said mixing chamber, said second inlet means being located at a point in said mixing chamber between said first inlet means and said outlet end, a portion of said second inlet means extending into said mixing chamber;

a check valve in communication with said portion of said second inlet means extending into said mixing chamber, said check valve extending into said mixing chamber and adapted to control the amount of and to introduce said second viscous material into the interior of said mixing chamber away from said guide wall thereof and into the interior of a stream of said first viscous material introduced via said first inlet means, thereby producing a coaxial linear flow of said first and second viscous materials.

2. In combination with the mixer block as defined in claim **1:**

a mixer connected to said outlet end, said mixer employing no rotating parts.

3. In combination with a mixer block as defined in claim **1:**

first means for supplying said first viscous material to said first inlet means so that said first viscous material tends to fill said mixing chamber and flow towards said outlet end;

second means for supplying said second viscous material to said second inlet means;

said mixer block being further characterized in that said second viscous material is introduced into the interior of said mixing chamber so as to be surrounded by the flow of said first viscous material.

4. The combination as defined in claim **3** in which said first inlet means introduces a greater quantity of said first viscous material into said mixing chamber than said second inlet means introduces of said second viscous material.

5. The combination as defined in claim **4** in which said first viscous material flows to said outlet end along a path unencumbered by blocking surfaces so that said mixing chamber can be purged of said first and second viscous materials.

6. The combination as defined in claim 4 in which said first inlet means comprises an open pipe and purging means for purging said mixing chamber are selectively connected to said open pipe for feeding of purging materials therethrough into said mixing chamber.

7. The combination as defined in claim 6 in which said open pipe terminates flush with said inner guiding wall.

8. The method as defined in claim 1 wherein said first viscous material is surrounded in said combined stream by said second viscous material.

9. A method of operating a mixer, which mixer employs no rotating parts, which comprises flowing a measured amount of a second viscous material into the interior of a stream of a measured amount of a first viscous material thereby establishing linear flow of said combined streams of first and second viscous materials;

controlling the flow of said second viscous material into said stream of first viscous material, said control being effected immediately prior to the point at which said second viscous material flows into the interior of said first viscous material; and

applying said combined stream of viscous material under linear flow to said mixer.

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