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Mueller

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[54] **MIXING NOZZLE**

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[52] **U.S. Cl.**..... **239/417.3,** 239/432, 239/434.5

[51] **Int. Cl.**..... **B05b 7/00**

[58] **Field of Search**..... 239/417.3, 414, 10, 239/420, 432, 434.5

[56] **References Cited**

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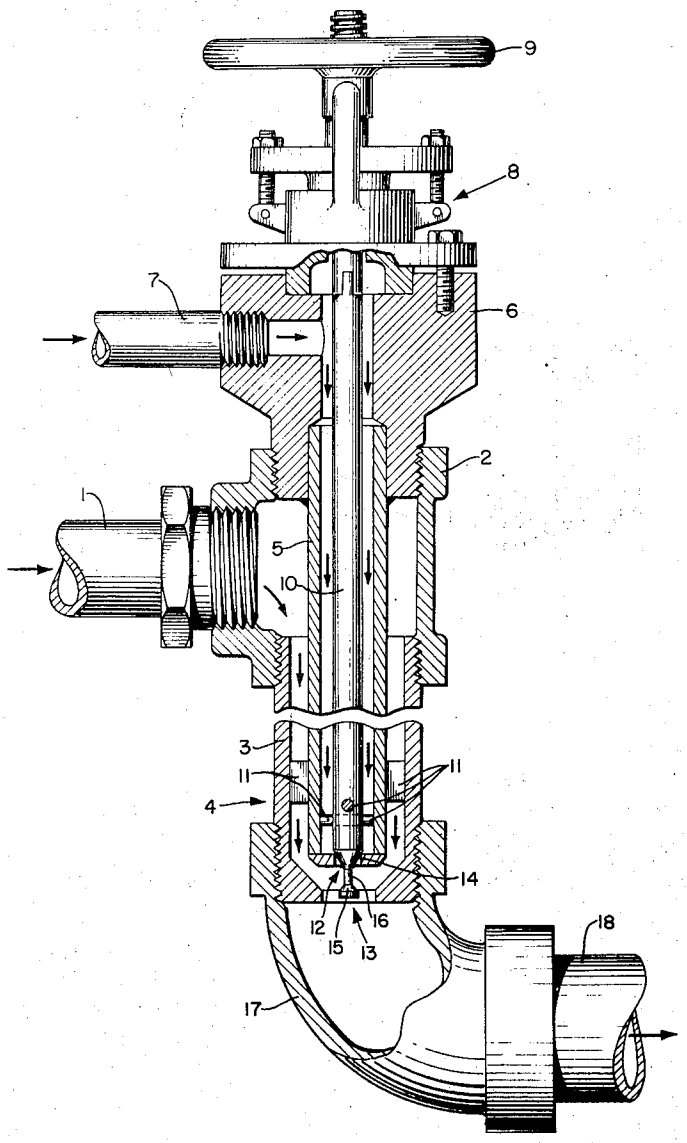
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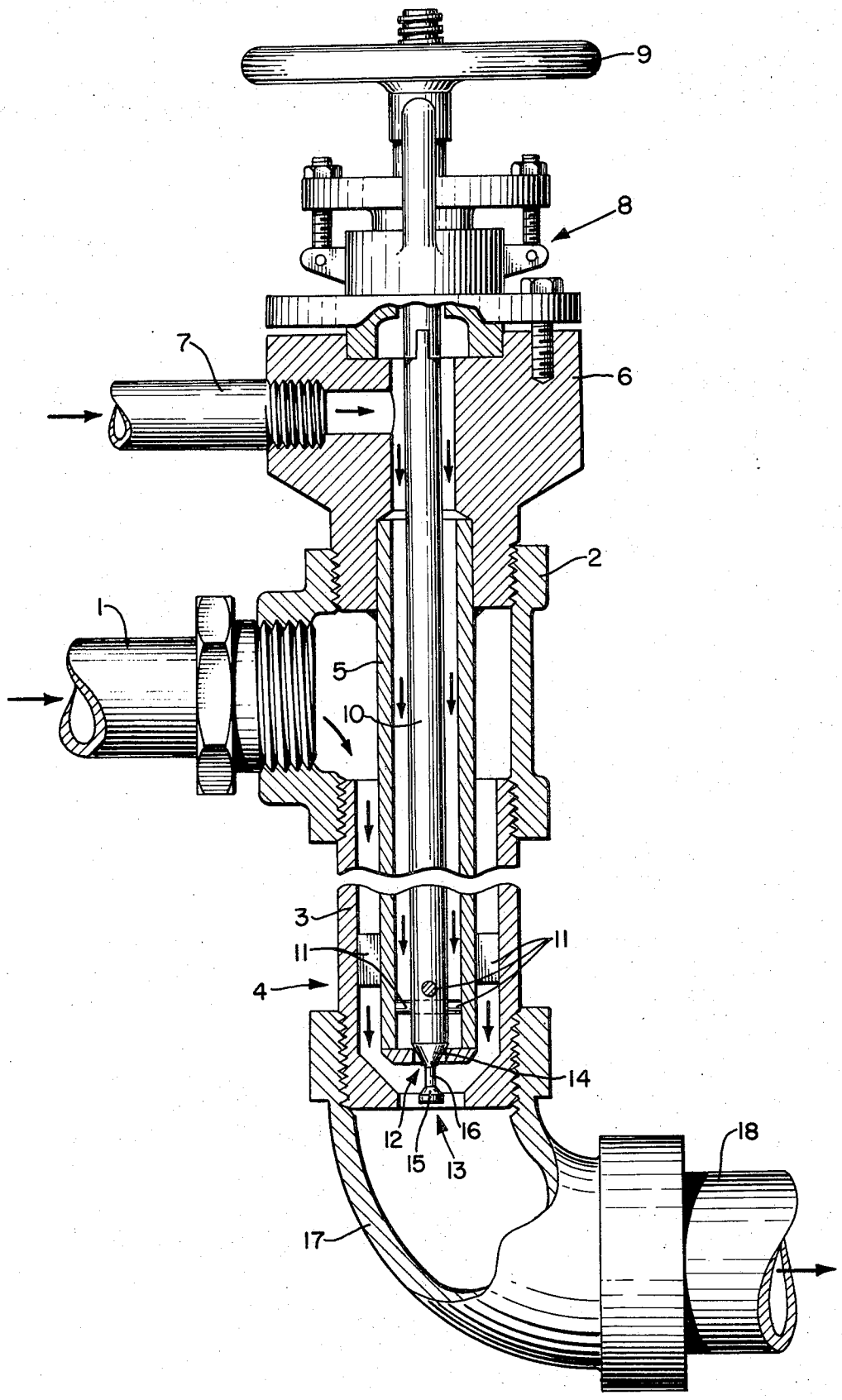
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[57] **ABSTRACT**

A process and apparatus for mixing two liquid streams by locating a variable area nozzle for one stream inside the noxxle for another stream and deflecting the stream from the inside nozzle in a spray pattern into the throat of the outside nozzle.

5 Claims, 1 Drawing Figure




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MIXING NOZZLE

BACKGROUND OF THE INVENTION

The present invention finds broad utility in a large number of processes wherein it is desirable to thoroughly mix two liquid streams. But, in particular, it has been found invaluable in one specific environment — the hydrolysis of heavy ends from a process for the manufacture of a halogenated hydrocarbon, such as ethyl chloride by the reaction of ethylene and hydrogen chloride, in the presence of a metal halide catalyst, such as aluminum chloride. The referred to heavy ends are a by-product residue typically having a composition in the ethyl chloride process of 1 to 5 percent chlorinated hydrocarbons and 30 to 40 percent aluminum chloride, the balance being a polymer oil. The referred to heavy ends present disposal problems in that accidental contact with moisture, whether by splashing with water or simply exposure to moist air, results in the formation of a gummy, tar-like material and the copious liberation of toxic, corrosive, hydrochloric acid fumes. By completely treating heavy ends residue with water (hydrolysis) in a process designed for the task, a more easily handled oily waste material results.

The only known workable hydrolysis method in the above-described environment requires the injection of heavy ends and water by separate pipes into an open vessel. While hydrolysis is satisfactory, a high ratio of water to heavy ends is required, and it is necessary to separately scrub all hydrogen chloride released during the process.

By contrast, the present invention accomplishes both hydrolysis of the catalyst and dissolution of all generated hydrogen chloride in one step in the most complete fashion and in the shortest possible time. In addition, problems with pluggage requiring the use of separate pipes in the commercially known procedure have been overcome by the unique design of the apparatus of the present invention.

SUMMARY OF THE INVENTION

The present invention provides an apparatus for mixing two liquid streams, comprising, in combination, a first nozzle, means for introducing a first stream to said first nozzle, a variable area second nozzle concentrically located within said first nozzle, and having its throat at least closely adjacent to the throat of said first nozzle and means for introducing a second stream to said second nozzle. The apparatus includes means for controlling the flow of said second stream located within said second nozzle.

Additionally, the present invention provides a process for mixing two liquid streams, comprising, in combination, passing a first stream through a first nozzle, passing a second stream through a second nozzle concentrically located within said first nozzle and having its throat at least closely adjacent to the throat of said first nozzle and thoroughly mixing the two streams within said throat of said second nozzle.

BRIEF DESCRIPTION OF THE DRAWING

A perspective view of the present invention with a cutaway section disclosing key features is shown in the drawing.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

This invention provides a process and apparatus for thoroughly mixing two liquid streams. It is especially adaptable to the hydrolysis of heavy ends residue from processes for the manufacture of halogenated hydrocarbons utilizing metal halide catalysts. The referred to heavy ends present disposal problems in that accidental contact with moisture, whether by splashing with water or somply exposure to moist air, results in the formation of a gummy, tar-like material and the copious liberation of toxic, corrosive, hydrochloric acid fumes. By completely treating heavy ends residue with water (hydrolysis) in a process designed for the task, a more easily handled oily waste material results.

The drawing discloses a feed mix valve. Water, or another liquid, enters the valve through pipe **1**. Tee **2** connects pipe **1** with outside pipe **3** through which the water flows into valve mix section **4**. Heavy ends, or another liquid, flow into the mix section through inside pipe **5** which passes through the center of tee **2** and connects with valve bonnet assembly mount **6**. The mount also serves to connect heavy ends inlet pipe **7** with inside pipe **5**. Bonnet assembly **8** supports valve handle **9**. By rotating or turning handle **9**, valve stem **10**, which is inside pipe **5**, is raised or lowered by means not shown but known in the art. Stem **10** is centered in pipe **5** and pipe **5** is centered in pipe **3** by centering means **11** which may be rods, pins, lugs, blocks, etc. which are of such configurations as cause minimal flow obstruction.

The lower ends of both outside pipe **3** and inside pipe **5** are constricted to form nozzles which act as a mix section. Inside nozzle throat **12** is located closely adjacent to outside nozzle throat **13**. The strategic location of the two nozzle throats ensures thorough mixing of the two streams.

Flow control for the heavy ends feed is located at nozzle throat **12**. This location allows utilization of the full available pressure drop to break up the heavy ends stream. Control is exercised by raising or lowering stem **10**, as above described, so that tapered end **14** approaches an abutting relationship with the inside walls of throat **12**. As the heavy ends vary in consistency, the nozzle opening has to be sufficiently sized to pass larger particles.

Cone **15** is connected with tapered end **14** by means of neck **16**. The cone deflects the heavy ends stream into a spray pattern. The spray further adds to efficiency in mixing the two streams. In addition, the cone can be raised to aid in clearing either nozzle in the event of pluggage.

Once the two feed streams are mixed, the mixed stream can be passed through outlet elbow **17** and outlet pipe **18** on to further processing or simply discharged directly from outside nozzle throat **13** into the next process container. The hydrolyzing unit as described does not require vent gas disposal facilities, since there is no evolution of hydrogen chloride fumes, and presents no waste disposal prlblems.

In order that those skilled in the art can thus appreciate the process of this invention, the following example is given by way of description and not by way of limitation.

EXAMPLE

A feed mix valve corresponding to the above description was constructed. From the top of the valve stem to the bottom of the spray cone measured 22 ⅝ inches. The inside heavy ends pipe measured three-fourths inch inside diameter while the outside water pipe measured 1 ½ inches outside diameter. The throat of the inside nozzle was nine thirty-seconds inch diameter while the outside nozzle throat was three-fourths inch diameter. The cone had a 90° flare, and the end of the valve stem tapered 60°. The neck connecting the tapered end to the cone measured one-eighth inch diameter by three-sixteenths inch length. A minimum clearance of one-eighth inch was provided between the lower ends of the inside and outside pipes. To this apparatus was passed a heavy ends feed of 1.5 IGPM and a water flow of 8.0 IGPM. The water temperature in measured 52°F and the mixed liquid temperature out measured 86°F. Heavy ends temperature was 65°F. At these flow rates no hydrogen chloride fuming was evident and hydrolysis appeared complete.

It is to be understood that the present invention is not limited by the specific embodiment described hereinabove, but includes such changes and modifications as may be apparent to one skilled in the art upon reading the appended claims.

I claim:

1. An apparatus for mixing two liquid streams comprising:

a. a first nozzle;

b. means for introducing a first stream to said first nozzle;

c. a second nozzle concentrically located within faid first nozzle and having its throat at least closely adjacent to the throat of said first nozzle;

d. means for introducing a second stream to said second nozzle;

e. a tapered flow control means concentrically located within and axially movable with respect to said throat of said second nozzle whereby the nozzle opening area is adjustable to increase or decrease the flow of said second stream through said second nozzle upon axial movement of said flow control means; and

f. a deflecting means located outside of said second nozzle but at least closely adjacent thereto for outwardly deflecting said second stream flowing from said second nozzle into a diverging spray pattern into said throat of said first nozzle, said deflecting means being connected to said flow control means whereby upon axial movement of said flow control means away from said throat of said second nozzle said deflecting means moves more closely adjacent to said opening of said second nozzle.

2. The apparatus of claim **1** wherein said flow control means is an elongated stem extending into said second nozzle and having a tapered end.

3. The apparatus of claim **2** wherein said deflecting means comprises a neck and a cone, said neck being of smaller diameter than said stem and connecting said tapered end of said stem to said cone, said cone being concentrically mounted on said neck and said cone being axially aligned with said stem and flared towards said tapered end.

4. The apparatus of claim **3** wherein the means for introducing the first and second streams are pipes and the pipe for the second stream is concentrically located within the pipe for the first stream and said stem is concentrically located within said pipe for said second stream.

5. The apparatus of claim **4** wherein said first stream is water and said second stream is a heavy ends residue stream from an ethyl chloride process which contains some metal halide catalyst.

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