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APPARATUS FOR UNIFORMLY MIXING AND DISTRIBUTING
DRY POWDER FIRE EXTINGUISHING CHEMICALS
Filed April 23, 1962

FIG. 1

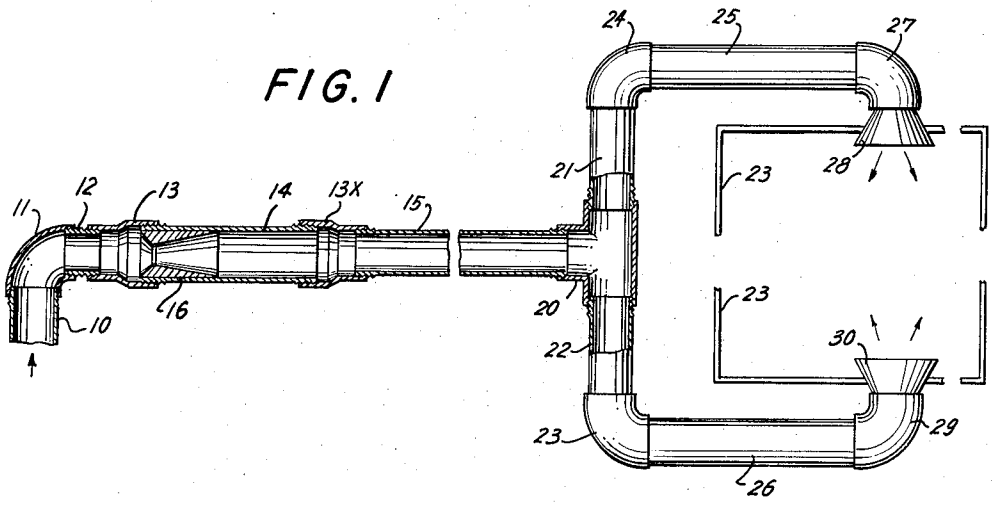


FIG. 2

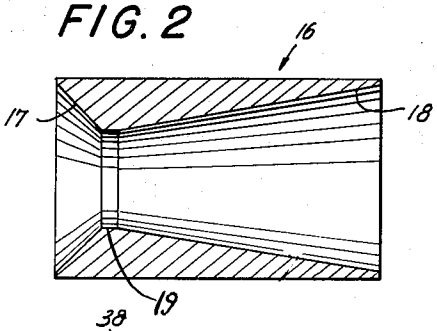
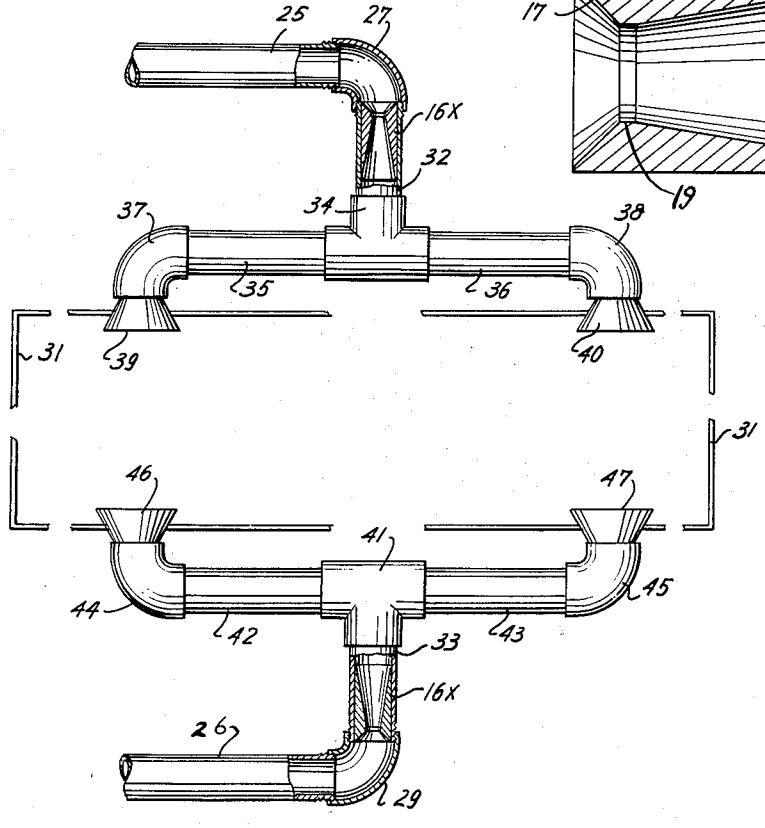


FIG. 3



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APPARATUS FOR UNIFORMLY MIXING AND DISTRIBUTING DRY POWDER FIRE EXTINGUISHING CHEMICALS

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1 Claim. (Cl. 302—64)

This invention relates to a method and apparatus for mixing and distributing dry powder fire extinguishing chemicals propelled in a closed piping system by an inert gas and more particularly to a method of conveying a uniform suspension of dry powder fire extinguising chemicals over an oil fire in order to rapidly and efficiently extinguish the fire.

A method of conveying fire extinguishing dry powder chemicals is shown in U.S. 2,708,605. This method recognizes the fact that after centrifugal separation of rapidly moving susponsoid particles at a ninety degree elbow, that a minimum linear travel is necessary before uniform mixing naturally takes place. Thus the patented method is restricted to at least the distance beyond an elbow before natural mixing takes place. Accordingly after each elbow of the proces of U.S. 2,708,605 a minimum travel distance is necessary before a T-joint in the piping may be used.

This invention is a vast improvement over Guise et al., U.S. 2,708,605 since it is not restricted or limited to any linear travel whatsoever before effecting a uniform suspension of particles and gas.

It is an object of this invention to provide a moving suspension of uniform density substantially immediately after passage beyond a right angle elbow.

It is another object to provide a means of mixing separated layers of gas and solid particles.

It is a further object to provide a method and apparatus for rapidly mixing stratified moving gases and solid particles without need for linear travel.

These and other objects of this invention will become apparent upon reading the following descriptive disclosure taken in conjunction with the accompanying drawing in which;

FIG. 1 is a schematic plan view, partly in section and showing the manner of mixing and conveying dry powder beyond a right angle bend and to a bi-furcated piping system for distribution to nozzles disposed in opposed relationship over an oil bath, such as is used for quenching glowing metal to harden it,

FIG. 2 is a horizontal section view of a venturi means used in this invention for mixing separated gases and solids, and

FIG. 3 is a plan view partly in section of a modified distribution system using a plurality of opposing nozzles.

This invention is used principally in the extinguishing of oil fires and particularly oil fires that may result when for example glowing steel is hardened by quenching in an oil bath.

Turning to the drawing, an inlet conduit **10**, connected for example to a suitably large pressure resistant tank under suitable pressure of, for example, nitrogen gas is connected to a threaded right angle pipe elbow **11**. The tank contains a syphon tube and the dry powder fire extinguishing chemical, for example, sodium bicarbonate is propelled through conduit **10** and elbow **11**. Because of the speed of travel of the suspension, the solid particles of chemicals are thrown outwardly in their travel in elbow **11** so that there is a substantial separation of the gas and the solid particles after passage through said elbow **11**.

According to this invention, means are provided that may be connected directly or indirectly to the elbow **11**, to effect a uniform mixing of the separated gas and solid

phases. The means employed is a venturi conduit (FIG. 2) inserted into the piping immediately after the ninety degree travel in the elbow **11** and the process of this means is one of venturizing or mixing of solid particles and gas by venturi action.

As shown in FIG. 1, a fully threaded conventional nipple **12** is employed and a conventional expansion joint **13**, of larger internal diameter than the nipple **12**, is secured thereto. A suitable section of large diameter pipe **14** is threaded into joint **13** near elbow **11** and a second and like expansion joint **13X** is secured to the far end of said pipe **14** in a reversed relationship to joint **13** to engage a pipe **15** of lesser diameter than pipe **14**.

Clearly, where joint **13** is provided with exterior threads adjacent to elbow or L-fitting **11**, it may be used in lieu of nipple **12**. In short, where joint **13** is suitably threaded exteriorly and away from pipe **14**, it may be connected directly to elbow **11**, thereby dispensing with the use of nipple **12**.

As shown in FIG. 2, the venturi conduit **16** is provided with a smooth walled cylindrical exterior of a suitable diameter such as to enable a tight press fit into the diameter of the coacting pipe **14**.

The venturi conduit **16** is provided with a suitable inlet cone aperture **17** having, for example, an angle of ninety degrees to the horizontal plane. The conduit is also provided with an exit cone orifice **18** having for example an angle of ten degrees to the horizontal plane. In other words, the cone angle of the extrapolated cone would be twenty degrees for the exit orifice. Preferably, a horizontal tubular and cylindrical passageway **19** is provided of a suitable length. However, venturi conduits having no tubular length **19** are operable.

In the operation of this invention, the two separated phases of rapidly moving gas and solid particles are squeezed together in the inlet cone **17** and upon expansion in the outlet cone **18** a uniform mixing of gas and solid particles is produced, due to the gas expansion in cone **18**.

Thus the suspension of solid and gas beyond the venturi conduit **16** is of uniform density per unit volume, for example, per cubic inch. Accordingly, the fire extinguishing suspension is of uniform density in conduit **15** and T-joint or T-fitting **20**. In T-joint **20** the uniformly mixed gas is uniformly divided so that half of the stream goes to conduit **21** and the other half to conduit **22**.

The moving suspension stream, both in conduits **21** and **22** thus move a like volume of suspension per unit of time to each side of the oil bath tank **23**. Elbows **23** and **24** are secured respectively to conduits **21** and **22** and respectively to conduits **25** and **26**.

An elbow **27** is secured to conduit **25** and a suitably horizontally flared conventional expansion nozzle **28** is secured directly thereto, or optionally first through an intermediate short length of conduit, if desired. Similarly, an elbow **29** is secured to conduit **26** and a conventional expansion nozzle **30** secured thereto.

Thus for small oil bath **23**, a pair of opposed expansion nozzles **28** and **30** will dispense opposed clouds of powder over the surface of the flaming oil in oil bath **23** to rapidly extinguish the fire. In conventional practice, a fire detection unit is located over the oil bath **23** so that in the event of fire the system is automatically actuated, causing the suspension to flow through the piping (FIG. 1) and thus extinguish the fire automatically.

Where a large rectangular oil bath **31** is employed, it is necessary to employ more than a single pair of opposed nozzles as shown in FIG. 1. In such cases, the elbows **27** and **29** are secured to a length of pipe or conduit **32** and **33** respectively and a suitable venturi conduit **16X** is press fitted into each of the conduits **32** and **33**. It is to be noted that conduits **25** and **32** as well as conduits **26** and

33 are of like diameter. However, conduit **14** is of greater internal diameter than is the internal diameter of nipple **12**.

However, a piping system having an expanded conduit **14** adjacent to the exit of the elbow **11** closest to the tank dispensing suspension into a conduit **10** is preferred, because of the added expansive effect given by the greater diameter of conduit **14**. However, a throughout uniform diameter piping system is operable.

As shown in FIG. 3, conduit **32** containing remixed suspension of uniform density is distributed through a T-joint **34** to lateral conduits **35** and **36** and through elbows **37** and **38** respectively to nozzles **39** and **40**. Similarly, conduit **33** leads to T-joint **41** and thence to lateral conduits **42** and **43** and connecting elbows **44** and **45** and the nozzles **46** and **47** connected respectively thereto.

Thus for small oil baths **23**, a single venturi conduit **16** suffices to obtain equal distribution of solid particles to each side of the tank (FIG. 1). But for larger tanks, other venturi conduits **16X** may be used on each side of the tank **31** to obtain equal powder distribution at the nozzles.

This invention has been illustrated by means of a plurality of embodiments but it is not to be limited to these illustrations since various inlet angles and outlet angles are operable.

I claim:

A compact piping system for uniformly distributing dry powder fire extinguishing chemicals by means of a gas over the surface of an oil bath comprising opposed inwardly directed nozzles on opposite sides of said oil bath, said nozzles being jointly connected with a source of dry powder fire extinguisher chemicals by pipe means comprising a length of pipe having a downstream T-fitting and an upstream L-fitting, said length of pipe having a press fitted venturi insert adjacent said L-fitting whereby rapid mixing of solids particles and gas is effected immediately beyond the L-fitting to provide equal discharge from the two arms of the T-fitting to said nozzles disposed on each side of the oil bath.

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