April 9, 1963 J. A. FALER ET AL 3,084,868

SONIC NOZZLES

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Fig. 1

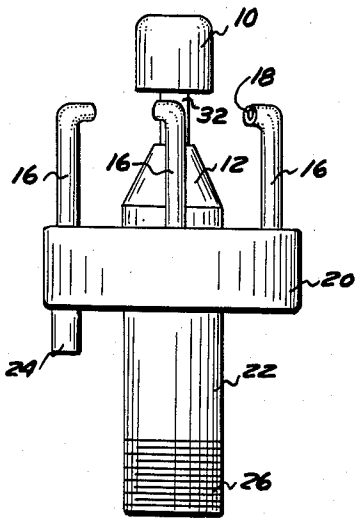


Fig. 2

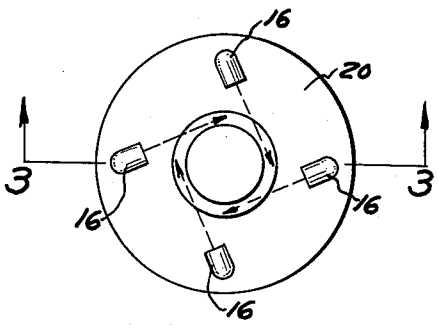
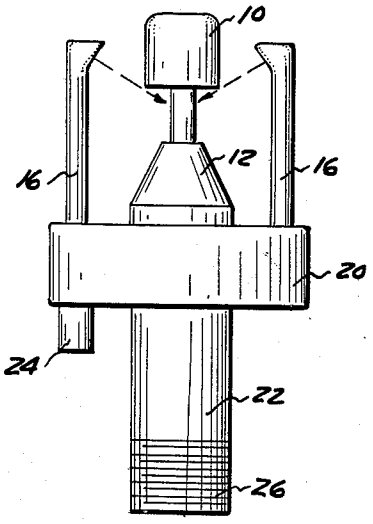


Fig. 5



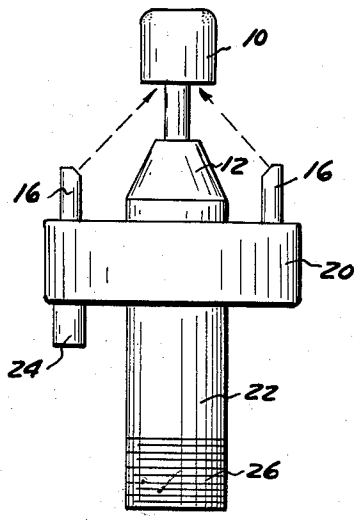


Fig. 4

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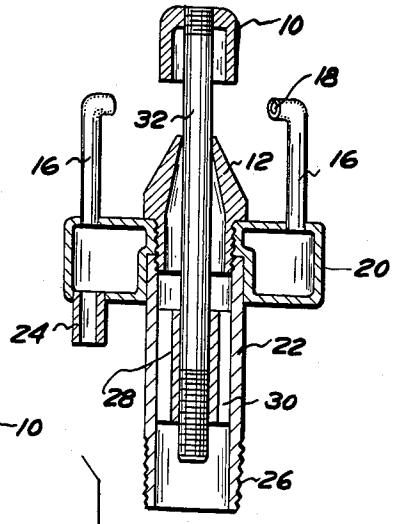
Fig. 3



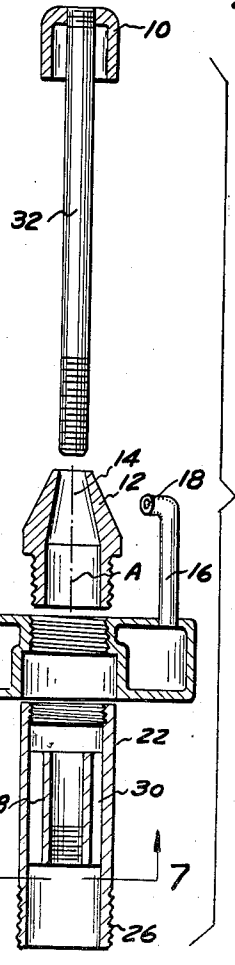
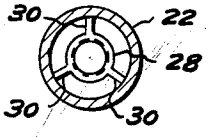


Fig. 6

Fig. 7



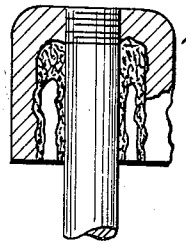


Fig. 8

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SONIC NOZZLES

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Filed July 9, 1962, Ser. No. 208,388
6 Claims. (Cl. 239—102)

This application relates to sonic nozzles and particularly to a sonic nozzle improved in a manner to minimize wear on a resonator part of such nozzle, particularly where such nozzle is used for mixing and dispersing molten salt and steam.

Sonic nozzles are known. One form of such nozzle is described in the September 4, 1961, issue of Chemical Engineering under the title, "Sound Waves Form Uniform Drops in Spray Nozzle." The nozzle shown in that publication is characterized by the fact that side jets thereof have openings arranged for discharging liquid streams towards a resonator thereof but along and parallel to the axis of the nozzle with the result that the liquid streams, particularly when in the form of molten salt, impinge upon the resonator and cause excessive wear. It is to reduce wear of the resonator that the improvements hereof have been provided and these will now best be understood upon reference to the specification which follows and to the attached drawings.

In these drawings:

FIG. 1 is an elevation view of an improved nozzle with liquid stream jets having their openings located in a plane somewhere between the open end of the gas discharging nozzle and the resonator.

FIG. 2 is a plan view of the nozzle of FIG. 1.

FIG. 3 is a cross-section view of the nozzle of FIG. 1 in assembled form, on line 3—3 of FIG. 2.

FIG. 4 is a view like FIG. 1 but showing the jet openings in a plane more remote from the resonator than from the open end of the nozzle.

FIG. 5 is a view like FIG. 1 but showing the liquid stream jet openings in a plane more remote from the open end of the nozzle than from the resonator.

FIG. 6 is a cross-section view in exploded form of the parts according to the modification of FIG. 4.

FIG. 7 is a section view of a barrel part of the nozzle, per se.

FIG. 8 is a diagram showing wear of the resonator when subjected to the action of a conventional nozzle feeding a mixture of steam and molten salt.

Referring to the drawings, it will be observed that these show a sonic nozzle of the character described in the publication referred to above, and including a cup shaped resonator **10**, a nozzle **12** having an open end **14** facing the resonator for discharging gas, such as steam, axially towards the resonator, and side jets **16***a*—**16***b*—**16***c*—**16***d* having openings **18** arranged for discharging liquid streams, such as molten salt, not only towards the resonator but also to one side of the axis A of the nozzle, and also tangentially outside of the resonator, as best shown in FIG. 2.

In combination with the foregoing parts, there are provided a reservoir **20** for supplying liquid in the form of molten salt to the jets **16** as well as means in the form of a barrel **22** for supplying gas in the form of steam to the nozzle, when the parts are assembled. The reservoir **20** is supplied from a molten salt feed line through an inlet pipe **24**. A steam line may be connected at **26** to the barrel for supplying steam.

The barrel itself is formed with a tubular internal part **28** supported therein by spider legs **30**, and part **28** is internally threaded to receive and support the lower end of a stem **32** on whose upper end is the resonator.

When the parts are properly assembled as shown, the open end of the nozzle discharges gas or steam into the resonator and the jets discharge liquid, such as molten salt, through their openings towards the resonator.

In conventional construction shown in the publication referred to, molten salt discharges into the reservoir causing considerable erosion or corrosion of the resonator and thus causing a substantial wear and loss of dimension of the resonator and a consequent loss of resonator material and resonator function.

In the construction herein shown, the side jet openings **18** are arranged for discharging the liquid streams not only towards the resonator and also to one side of the axis A of the nozzle but also tangentially outside of the resonator with the result that there is no impingement of molten salt against the inside wall of the resonator and thus is minimized corrosion and erosion of the resonator, wear and loss of dimension of the resonator, and loss of resonator function.

In the drawings, three alternate arrangements are shown for the dimensioning of the jets **16** and the positioning of the openings **18**. In FIG. 1, the jet openings are between the nozzle and the resonator. In FIG. 4, which at the moment seems to be the preferred embodiment, the openings are more remote from the resonator than from the open end of the nozzle. In FIG. 5, the openings **18** are more remote from the open end of the nozzle than from the resonator.

In all arrangements shown, the jet streams, when viewed in plan, are tangentially outside of the resonator rather than impinging upon or into or against the resonator and the jet streams clear the resonator tangentially by a predetermined dimension which may be in the neighborhood of ⅛ inch or so. When viewed in elevation, however, the jet streams are angled so that all streams appear to cross the axis of the nozzle at the nozzle facing open side of the resonator, but actually, however, the streams do not impinge upon the resonator as mentioned above but are tangential of the resonator when viewed in plan.

FIG. 8 shows in diagram the kind of wear that takes place in a sonic nozzle of conventional jet stream arrangements when used with molten salt and steam and where the molten salt streams impinge into the resonator. The internal surface of the resonator has been substantially eroded and worn away and the configuration and dimensioning of the resonator as a whole has been substantially altered with the result that the nozzle is considerably reduced in function and value. It is to prevent just this sort of thing that the improvements described in this application have been provided.

Now having described the sonic nozzle herein disclosed in its preferred embodiments, reference should be had to the claims that follow.

We claim:

1. In a sonic nozzle of the character described; a cup shaped resonator; a nozzle connected thereto and having an open end facing the open side of the resonator for discharging gas axially towards the resonator; and side jets connected to the nozzle and having openings for discharging liquid streams towards the resonator; said side jet openings being arranged for discharging their liquid streams not only towards the resonator but also to one side of the axis of the nozzle and also tangentially outside of the resonator.

2. In a nozzle according to claim 1, means for supplying liquid in the form of molten salt to the jets and means for supplying gas in the form of steam through the nozzle.

3. In a nozzle according to claim 1, the side jet openings facing to one side of the axis of the nozzle.

4. In a nozzle according to claim 1, the side jet openings facing to one side of the axis of the nozzle and located in a plane between the open end of the nozzle and the open side of the resonator.

5. In a nozzle according to claim 1, the side jet openings facing to one side of the axis of the nozzle and located in a plane more remote from the open end of the nozzle than from the open side of the reservoir.

6. In a nozzle according to claim 1, the side jet openings facing to one side of the axis of the nozzle and located in a plane more remote from the open side of the resonator than from the open end of the nozzle.

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