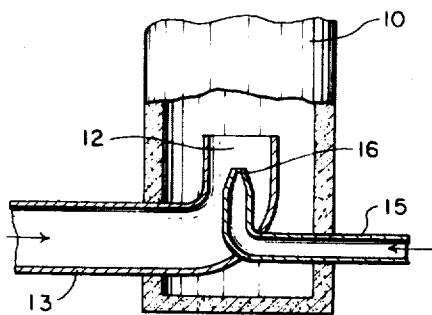


[54]	POLLUTION CONTROL DEVICE	3,372,873	3/1968	Weiss et al.....	46/9 X
[72]	Inventor: Earl K. Stigger, 202 S. Reater Drive, 202 S. Reuter Drive, Ill. 60005	2,788,607	4/1957	Ward.....	46/9
		3,362,318	1/1968	Tait.....	98/58
[22]	Filed: July 20, 1970			Primary Examiner—M. Henson Wood, Jr.	
[21]	Appl. No.: 56,446			Assistant Examiner—Thomas C. Culp, Jr.	
				Attorney—Milton C. Hansen and Donnie Rudd	
[52]	U.S. Cl.	239/423, 46/9, 98/58, 239/11	[57]	ABSTRACT	
[51]	Int. Cl.....	F23d 11/10		An apparatus and method for using the same are disclosed wherein smoke is dispersed by forcing the smoke out of a smoke stack in the form of smoke rings.	
[58]	Field of Search.....	239/1, 11, 291, 423, 424, 424.5, 239/425, 548; 46/9; 124/1; 198/58, 59, 60			
[56]	References Cited				
	UNITED STATES PATENTS			7 Claims, 5 Drawing Figures	
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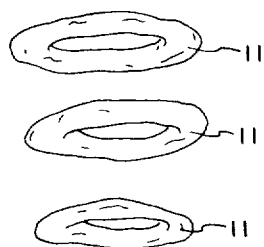


FIG 1

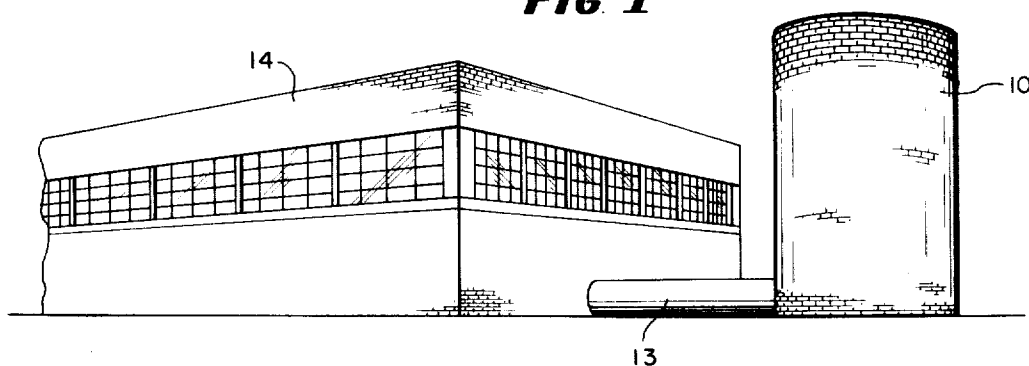


FIG 2

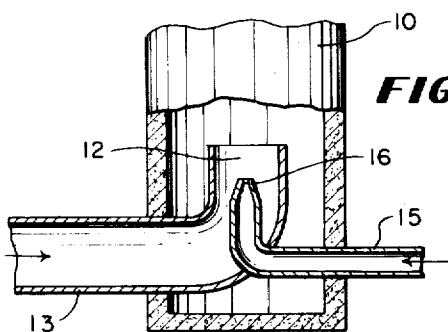


FIG 3

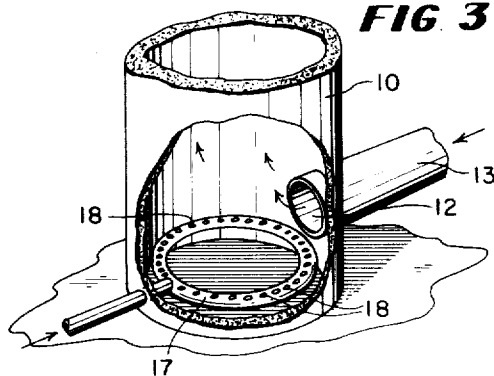


FIG 4

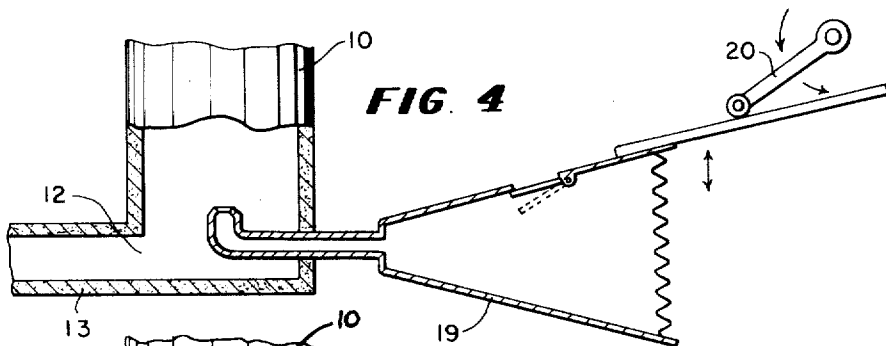
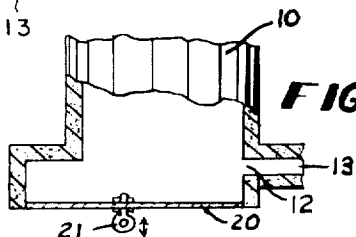


FIG 5



INVENTOR:
EARL K. STIGGER
BY *Donnie Rudd*
ATTORNEY

POLLUTION CONTROL DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method of dispersing smoke from smoke stacks.

2. Description of the Prior Art

For many years smoke stacks have been used to disperse smoke into the atmosphere. While it is becoming increasingly less desirable to disperse any type of material into the atmosphere, there are still occasions where proper atmospheric conditions and geographical location make practical the use of smoke stacks to disperse smoke. One of the primary objectives in a smoke stack is to elevate the smoke well above ground level in order that it may be dispersed to an extent that it is not harmful to the general population by the time it eventually reaches ground level.

One of the drawbacks of smoke stacks is their excessive cost. In many locations it is necessary for a smoke stack to be several hundred feet high. If a smoke stack is this high and has a large diameter such as 20 feet or more, then cost of construction is very high. The height of smoke stacks can be reduced to as much as one-fourth their normal required height by causing the smoke stacks to emit smoke rings rather than a continuous plume of smoke.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an apparatus which significantly reduces the cost of constructing smoke stacks.

It is another object of this invention to provide a low cost method of dispersing smoke.

The objects of this invention are accomplished by a method for dispersing smoke and the like from smoke stacks comprising injecting smoke into the smoke stack and then forcing the smoke out of the stack in pulsed intervals thereby forming smoke rings as the smoke exits from the smoke stack.

The objects of this invention are further accomplished by an apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow and thereby forming smoke rings.

Any number of different means of construction may be utilized to form smoke rings from the smoke as it exits from the smoke stack. One very good method of creating smoke rings is to inject properly timed slugs of an explosive gas mixture into the stack and cause it to explode and thereby create a pulsed flow. Another method of creating a pulsed flow is to merely attach the exhaust of a diesel engine to an already existent non-pulsating stack. Still another way of creating the pulsed flow is to have a flexible membrane on a wall or in the bottom of the smoke stack and pulsate the membrane by slowly pulling on it and then rapidly releasing it. However, I generally prefer that this be by forcing the smoke stream into a pulsed interrupted flow which in conjunction with the exit end of the smoke stack creates smoke rings. One such apparatus can be a nozzle in the lower portion of the smoke stack which forces

a stream of a gaseous material into the smoke that is already entering the smoke stack thereby forming a pulsed stream of smoke. The gaseous material may either be a portion of the smoke that is diverted from the entrance stream or air or some other gaseous material which can either be inert or which gives a desired reaction with the smoke.

Another such construction which can be used for this invention is a sparge ring in the bottom of the smoke stack which also emits a pulsed stream of a gaseous material into the smoke. Again, the pulsed stream of gaseous material may be either diverted smoke or air or some other gaseous material. By use of the term "sparge ring" I merely intend to mean cavity which has a plurality of openings through which the gaseous material may be emitted in a pulsed flow.

The method of this invention is new and novel and provides a solution in that smoke is emitted in the form of smoke rings which have the tendency to rise upward and this upward rise can replace previous construction of additional height of smoke stack.

BRIEF DESCRIPTION OF THE DRAWING

I have used the accompanying drawings to more fully explain and illustrate my invention although the invention is by no means limited to the specific embodiments illustrated in the drawings.

I have used

FIG. 1 to illustrate a smoke stack in use which is emitting smoke rings;

FIG. 2 is a cross section of a smoke stack in accordance with this invention wherein the smoke entrance is shown having a nozzle therein which injects into the smoke an interrupted pulsed stream of gaseous material;

FIG. 3 is a cut-away view of a smoke stack in accordance with this invention illustrating a sparge ring for use in injecting the interrupted pulsed gaseous material into the smoke stack;

FIG. 4 is one illustration of a rather simple method of supplying a pulsed interrupted flow of gaseous material into a smoke stack; and

FIG. 5 is another illustration of a rather simple method of causing the smoke to exit from the stack in a pulsed flow.

In the drawings, I have used the numeral 10 to illustrate a smoke stack with smoke rings 11 being emitted therefrom. The smoke stack is supplied with smoke through an entrance port 12 which is connected to a smoke supply means 13. The smoke supply means receives its smoke from an incinerator or burning device such as illustrated by the building 14. With relation to FIG. 2, I have shown the smoke supply pipe coming into the bottom of the smoke stack and turning upward into the smoke stack. A pulsed gaseous supply means 15 is shown supplying a pulsed gas through nozzle 16 into the smoke stack. This causes the smoke to have an interrupted pulsed flow and thereby form smoke rings as it exits from the top of the smoke stack.

With reference to FIG. 3 of the drawings I have shown in the smoke entrance at the bottom of the smoke stack and a sparge ring 17 being located immediately below the smoke entrance and supplying a pulsed interrupted flow of gaseous material to the smoke stack. The sparge ring is nothing more than a

circular piece of pipe with a plurality of holes 18 therein. In each of the examples illustrated, the gaseous supply may be either smoke that has been diverted from the original smoke supply means or air or an inert or combustible or reactive gas to give some other desired effect.

In FIG. 4 I have illustrated a very simple device for supplying a pulsed interrupted gas flow to the smoke stack. In this Figure, the gaseous supply means is nothing more than a bellows 19 which is moved up and down by a pulsating arm 20. In FIG. 4 I have shown another embodiment of this invention wherein the nozzle is merely placed in the bottom of a conventional smoke stack and an interrupted pulsed gaseous supply delivered to the nozzle.

While I have illustrated a very simple and well known method of supplying a pulsed interrupted gas to the smoke stack in FIG. 4, this invention is by no means limited to the use of bellows as the sole means for supplying a pulsed interrupted flow of gas. Any of the more modern and conventional pieces of equipment that are well known for these functions can be used as a substitute for the bellows illustrated in FIG. 4.

FIG. 5 illustrates another method of causing smoke to exit from the smoke stack in pulsed flow. FIG. 5 illustrates a flexible membrane 20 in the bottom of the stack which has a connection attachment 21 for connecting to a means for causing the membrane to move up and down. Preferably, the membrane is consecutively pulled slowly downward and then rapidly released thereby causing a pulsating flow.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 2, 3, and 5 illustrate preferred embodiments of my invention although the invention is not limited thereto, and the invention encompasses all configurations which produce smoke rings in a smoke stack.

Having thus described this new and unique invention and illustrated how it significantly advances the state of the art, I claim:

1. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stack in pulsed interrupted flow thereby forming smoke rings comprises a nozzle in the lower portion of the smoke stack and means for forcing a pulsed stream of gaseous material through the nozzle.

2. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stack in pulsed interrupted flow thereby forming smoke rings comprising a nozzle in the lower portion of the smoke

stack and means for forcing a pulsed stream of gaseous material through the nozzle; and wherein the pulsed stream of a gaseous material is a pulsed stream of the smoke.

3. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into port stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stack in pulsed interrupted flow thereby forming smoke rings comprising a nozzle in the lower portion of the smoke stack and means for forcing a pulsed stream of gaseous material through the nozzle; and wherein the pulsed stream of a gaseous material is a pulsed stream of air.

4. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stack in pulsed interrupted flow thereby forming smoke rings comprises a sparge ring in the lower portion of the smoke stack and means for forcing pulsed stream of a gaseous material through the sparge ring.

5. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stake in pulsed interrupted flow thereby forming smoke rings comprises a sparge ring in the lower portion of the smoke stack and means for forcing pulsed stream of a gaseous material through the sparge ring; and wherein the pulsed stream of a gaseous material is a pulsed stream of the smoke.

6. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the smoke stack in pulsed interrupted flow thereby forming smoke rings comprises a sparge ring in the lower portion of the smoke stack and means for forcing pulsed stream of a gaseous material through the sparge ring; and wherein the pulsed stream of a gaseous material is a pulsed stream of air.

7. An apparatus for dispersing smoke and the like, said apparatus comprising a vertical smoke stack having an exit opening at the top thereof and an entrance port at the bottom thereof; means for introducing

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smoke into the entrance port of the smoke stack and means for causing the smoke to exit from the exit opening of the smoke stack in pulsed interrupted flow thereby forming smoke rings; and wherein the means for causing the smoke to exit from the exit opening of

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the smoke stack in pulsed interrupted flow thereby forming smoke rings comprises injecting into a previously non-pulsating flow of smoke the discharge from a diesel engine.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,693,883 Dated September 26, 1972

Inventor(s) Earl K. Stigger

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

[In the list of inventors on the cover sheet insert --assignors to The Quaker Oats Company, Chicago, Illinois, a Corporation of New Jersey--. Claim 1, column 3, line 54 "comprising" should read --comprises--; Claim 2, column 3, line 68 "comprising" should read --comprises--. Claim 3, column 4, line 14, "comprising" should read --comprises--; Claim 3, column 4, line 9, after into insert --the entrance--; Claim 3, column 4, line 9, after port insert --of the smoke--; Claim 5, column 4, line -2 "stake" should read --stack--.]

Signed and sealed this 1st day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents