

[72] Inventor **Yuma K. Kretschmer**
Farrar, Ga.
 [21] Appl. No. **12,232**
 [22] Filed **Feb. 18, 1970**
 [45] Patented **July 27, 1971**
 [73] Assignees **Eugene T. Dykes;**
W. Barrett Howell; William B. Dykes,
Atlanta, Ga.; , William B. Dykes as trustee
for the grandchildren now living and
hereafter born of William B. Dykes, part
interest to each

[56]

References Cited

UNITED STATES PATENTS

1,605,484	11/1926	Thompson.....	60/30
2,837,169	6/1958	Sawyer.....	60/30
3,460,916	8/1969	Aronsohn.....	60/30
3,485,039	12/1969	Wehinger.....	60/30

Primary Examiner—Douglas Hart
Attorney—Jones & Thomas

[54] **EXHAUST GAS TREATMENT MEANS**
3 Claims, 3 Drawing Figs.

[52] U.S. Cl..... **60/30,**
23/277 C
 [51] Int. Cl..... **F01n 3/10**
 [50] Field of Search..... **60/29, 30;**
23/277 C, 2 C

ABSTRACT: A method and apparatus for treating exhaust gases from an internal combustion engine wherein air is mixed with the exhaust gases and the mixture is ignited. The exhaust gases are flowed in a stream through a housing, air is added to the stream to create an air-gas stream, and a portion of the air-gas stream is diverted and flowed in the opposite direction within the housing in a path surrounding the air-gas stream. The diverted portion of the air-gas stream is ignited and added back into the main air-gas stream.

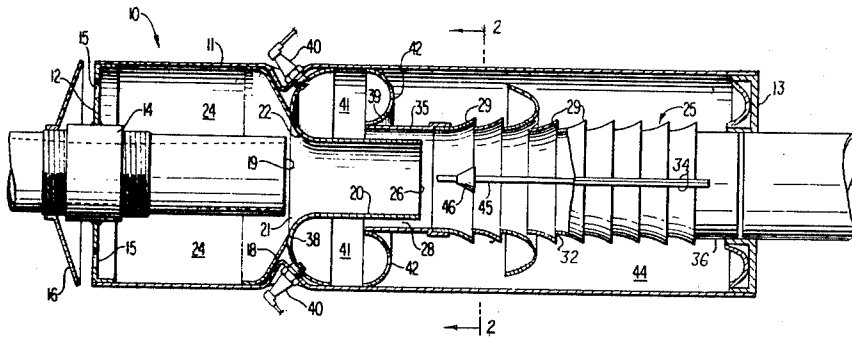


FIG 1

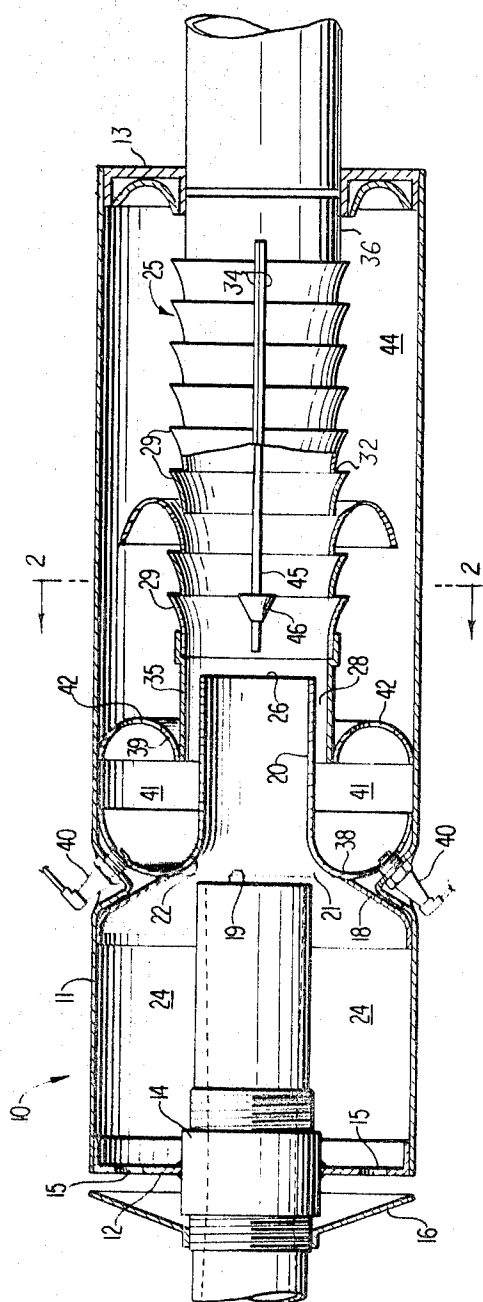


FIG 3

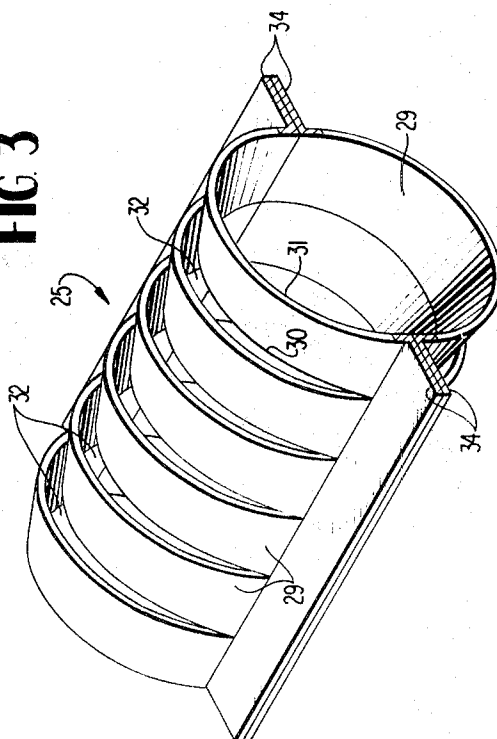
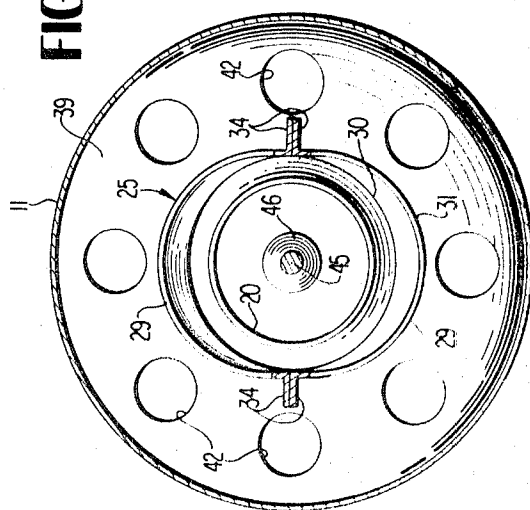


FIG 2



INVENTOR
YUMA K. KRETSCHMER

BY

Jones & Thomas

ATTORNEYS

EXHAUST GAS TREATMENT MEANS

BACKGROUND OF THE INVENTION

It is well known that the exhaust gases emitted from an internal combustion engine are noxious due to the incomplete combustion of the fuel in the engine. The exhausted gases contain carbon monoxide and unburned hydrocarbons which pollute the atmosphere and cause "smog" which is irritating to the human respiratory system, eyes and skin. While many attempts have been made to eliminate the noxious gases from the engine exhausts of automobiles, trucks, etc., the devices developed have been expensive, or have failed to work effectively, or have required replacement or repair from time to time.

One of the typical devices developed is the after burner placed in the vehicle exhaust system which reignites the exhaust gases in an attempt to reburn the gases before exhausted to the atmosphere. The more effective after burners have included a maze of baffles and chambers for the purpose of slowing down the exhaust stream and mixing air with the exhaust stream and igniting the air-gas mixture. The more effective devices of this type have been so expensive to construct that they have been found unacceptable to the automobile industry. The lesser complicated and lesser expensive devices have not effectively burned the exhaust gases since the proper mixture of air with the gases and the ignition of the air-gas mixture has not been attained.

Another typical exhaust treatment means is the use of a catalyst placed in a housing in the vehicle exhaust stream for absorbing the unburned hydrocarbons, carbon monoxide and other objectional emissions. However, it is necessary to replace the catalyst from time to time, and large quantities of the catalyst must be utilized in the system to make the system effective. Thus, the use of a catalyst "after burner" has not been acceptable to the industry.

SUMMARY OF THE INVENTION

Briefly described, the present invention comprises an exhaust gas treatment means for use with automobiles, trucks, or similar self-propelled vehicles. A tubular housing is provided for placement as a section in the exhaust pipe of the vehicle. Air from the atmosphere is mixed with the exhaust gases flowing through the housing, a portion of the air-gas stream is slowed and flowed in the direction opposite to the direction of the entering exhaust gases in a path which surrounds the stream of entering exhaust gases, the portion of the air-gas mixture is ignited, and the ignited mixture is then flowed back into the initial air-gas stream. The structure comprises a simplified conduit system within a tubular housing.

Thus, it is an object of this invention to provide an exhaust gas treatment means for an internal combustion engine that effectively burns the exhaust gases before the exhaust gases are allowed to enter the atmosphere.

Another object of this invention is to provide an inexpensive and effective exhaust gas treatment means for automotive vehicles and the like.

Other objects, features and advantages of the present invention will become apparent upon reading the following specification when taken into conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a side cross-sectional view of the exhaust gas treatment apparatus.

FIG. 2 is an end cross-sectional view of the exhaust gas treatment apparatus taken along the lines 2-2 of FIG. 1.

FIG. 3 is a perspective view of the diffusion conduit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in more detail to the drawing, in which like numerals indicate like parts through the several views, FIG. 1

shows exhaust gas treatment apparatus 10 which is generally known as an after burner and which comprises tubular housing 11 which is closed at its exhaust gas inlet end by front wall 12 and at its gas outlet end by rear wall 13. Exhaust gas inlet conduit 14 extends through front wall 12. Tubular housing 11 is generally cylindrical and exhaust gas inlet conduit 14 extends coaxially into tubular housing 11. Front wall 12 defines a plurality of air inlet openings 15 circumferentially spaced about exhaust gas inlet conduit 14. Conically shaped shield 16 extends from the outer surface of exhaust gas inlet conduit 14 outside housing 11 toward front wall 12 to protect air inlet openings 15 from receiving foreign objects.

Annular partition or inner wall member 18 is substantially conically shaped and extends from the inside surface of tubular housing 11 inwardly toward the end 19 of exhaust gas inlet conduit 14. Extension conduit 20 is substantially coextensive with conduit 14 and merges with annular partition 18. Annular opening 21 is therefore defined between the end 19 of conduit 14 and the rounded area 22 between extension conduit 20 and annular partition 18. With this arrangement the outer surface of exhaust gas inlet conduit 14, the inner surface of tubular housing 11 which surrounds conduit 14, and annular partition 18 define an annular air inlet chamber 24 with air inlet openings 15 and annular air exhaust opening 21.

A second extension conduit or diffusion conduit 25 opens through rear wall 13 of housing 11 and projects inwardly along the centerline of the housing and overlaps the end 26 of extension conduit 20. Diffusion conduit 25 of a larger diameter than extension conduit 20 and defines an annular flow conduit 28 about the outer surface of extension conduit 20. As is best illustrated in FIG. 3, diffusion conduit 25 comprises a series of diffusion rings 29 placed in alignment with each other in a scalloped arrangement; that is, diffusion rings 29 are each of smaller diameter at one end 30 and of a larger diameter at the other end 31 so that each ring defines a crescent shaped opening 32 with the next adjacent rings. The rings 29 are fabricated in halves and the halves of the series of rings are placed together by means of abutting flanges 34. As is best shown in FIG. 1, the first diffusion ring 29 is surrounded by socket 35 which overlaps the end 26 of extension conduit 20. The other end of diffusion conduit 25 comprises insert 36 which extends in to the last one of diffusion rings 29 and projects through rear wall 13 of housing 11.

Annular combustion chamber partition 38 surrounds extension conduit 20 adjacent partition 18 while annular combustion chamber partition 39 surrounds socket 35. Spark plugs 40 project through the wall of tubular housing 11 and through annular partition 38. The annular space 41 defined between partitions 38 and 39, the inner wall surface of tubular housing 11 and the outer surface of extension conduit 20 functions as a combustion chamber. The annular space 44 between annular partition 42 and rear wall 13 and which is outside diffusion conduit 25 and within tubular housing 11 functions as a mixing chamber. Baffle or diffusion pin 45 is located within diffusion conduit 25 and extends along its centerline through a major portion of its length. Diffusion pin 45 includes a plurality of protrusions 46 along its length which function to urge the flow of gas along the length of diffusion pin 45 in an outward direction toward diffusion rings 29. Protrusions 46 are slightly larger in size along the length of diffusion pin 46 toward rear wall 13. A spider (not shown) is connected between diffusion pin 45 and the inner surface of diffusion conduit 25 to properly support diffusion pin.

OPERATION

The exhaust gas treatment apparatus 10 is placed in the exhaust conduit of a vehicle as a section of the exhaust conduit. When a flow of gas is received from the internal combustion engine through inlet conduit 14 into tubular housing 11, the stream of the exhaust gas is at a relatively high velocity out of the end 19 of the conduit 14 and into extension conduit 20 and causes a pressure drop in annular opening 21. This causes

a corresponding low pressure within annular air inlet chamber 24 adjacent front wall 12 and causes air to flow around the edges of shield 16, through air inlet opening 15, into annular chamber 24 and through annular opening 21 into the exhaust gas stream. At this point, a mixture of air and gas is created, and the air-gas mixture continues as an air-gas stream through housing 11.

The air-gas stream emerging from extension conduit 20 flows through diffusion conduit 25 toward rear wall 13. The air-gas stream is diverted to some extent by protrusions 46 on diffusion pin 45 toward diffusion rings 29, and a portion of the air-gas mixture emerges through the crescent shaped openings 32 between diffusion rings 29. As the air-gas stream flows from the end 26 of extension conduit 20, a low pressure is created in the annular flow conduit 28 between extension conduit 20 and socket 35, which creates a low pressure in annular combustion chamber 41. The low pressure is transmitted through the plurality of openings 42 in annular partition 39 so that a flow of air-gas mixture is created from mixing chamber 44 in a direction opposite to that of the direction of the air-gas stream from mixing chamber 44 into combustion chamber 41 and from combustion chamber 41 through annular flow conduit 28.

As the air-gas mixture passes through combustion chamber 41, it is ignited by spark plugs 40 and burned. The ignited air-gas mixture continues to flow through annular flow conduit 28 and mixes back in with the air-gas stream within diffusion conduit 25. This causes a substantial portion of the air-gas mixture in the air-gas stream to ignite and burn as it passes through diffusion conduit 25.

While a portion of the air-gas mixture from the air-gas stream flowing through diffusion conduit 25 is diverted through diffusion conduit 25 into mixing chamber 44, the remaining portion of the air-gas mixture continues to travel through diffusion conduit 25 and rear wall 13. Before the air-gas stream reaches rear wall 13, it is substantially reburned and its noxious carbon monoxide and hydrocarbon content will have been significantly reduced.

Conduits 14, 20 and 25 are all in alignment with each other and generally define the boundary for a high velocity stream which is an exhaust gas stream until the stream passes end 19 of conduit 14, at which point air is mixed with the stream. The air admixture to the exhaust gas stream creates a combustible mixture suitable for "reburning" or "after burning." In order to ignite the combustible mixture, it is slowed down when it is diffused from diffusion conduit 25 into mixing chamber 44 and passed in this larger volume chamber toward combustion chamber 41. When the mixture is ignited in combustion chamber 41, it reenters the high velocity stream near the middle of housing 11 and functions to ignite a substantial amount of the mixture flowing from the end of extension conduit 20.

The ignition of the mixture causes the rapid expansion of the gases in the vicinity of diffusion conduit 25 and mixing chamber 44, with the hottest gases being contained primarily within diffusion conduit 25. Thus, a substantial amount of turbulence and burning is experienced within the device before the exhaust gases reach rear wall 13 and are expelled from the housing.

While this invention has been described in detail with particular reference to a preferred embodiment thereof, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinbefore.

I claim:

1. Apparatus for treating exhaust gases from an internal combustion engine comprising a generally closed tubular housing having a gas inlet end and a gas outlet end, and exhaust gas inlet conduit having its inner end projecting through said gas inlet end and into said housing, a first converging generally annular wall member spaced from said gas inlet end and extending inwardly from the inner wall surfaces of said housing toward the end of said exhaust gas inlet conduit to form an opening about the inner end of said exhaust gas inlet conduit, said housing, gas inlet conduit and first wall member defining an air inlet chamber, at least one air port defined in said housing opening into said air inlet chamber, a first conduit extension connected to said annular wall member and aligned with said exhaust gas inlet conduit and extending through a portion of said housing, said first conduit extension forming with said housing a substantially annular combustion chamber surrounding said first conduit extension, ignition means positioned in said combustion chamber, a second conduit extension aligned with said first conduit extension and extending through said gas outlet end of said housing, said second conduit extension defining a plurality of openings along its length and forming with said housing a substantially annular mixing chamber surrounding said second conduit extension, and a second converging substantially annular wall member spaced from said first wall member and extending inwardly from the inner wall surfaces of said housing to said second conduit extension to separate said combustion chamber from said mixing chamber, said second wall member defining a plurality of openings therein for the passage of gas from said mixing chamber to said combustion chamber.

2. The invention of claim 1 and further comprising a gas dispersing baffle member positioned within said second conduit extension.

3. The invention of claim 1 and wherein said tubular housing is cylindrical and said second conduit extension is of larger diameter than said first conduit extension and surrounds a portion of said first conduit extension.

55

60

65

70

75