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(54) **HEAT REACTOR**

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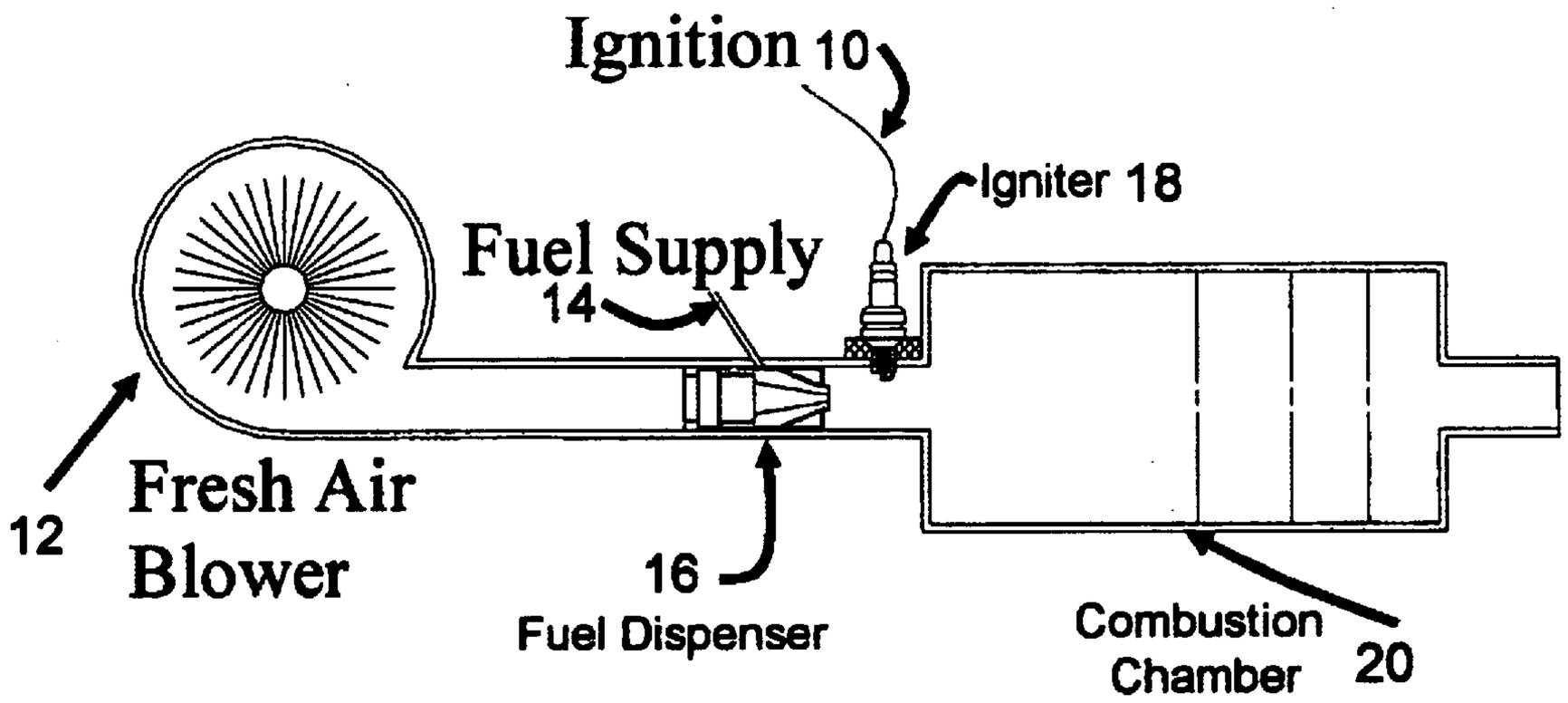
(57) **ABSTRACT**

A new and improved heat reactor system which when installed onto a pollution source provides elimination and/or complete combustion of harmful emissions generated there from. The system is of simple construction and may be formed from one integrally formed elongated high heat resistant tube that is internally partitioned into a combustion chamber and at least one reactor compartment which are separated by a novel flow conditioner having no moving parts.



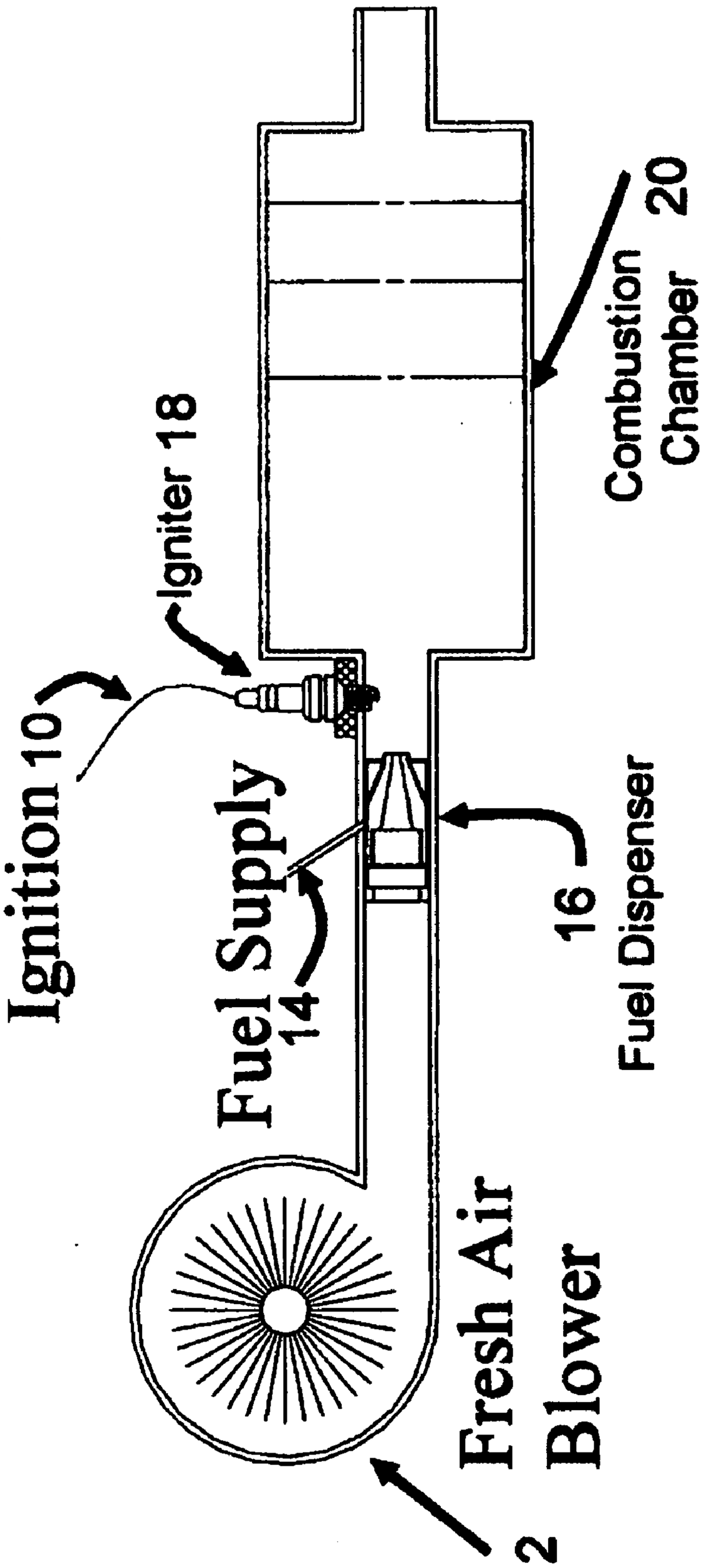

Ignition 10
Igniter 18
Fuel Supply 14
16 Fuel Dispenser
Combustion Chamber 20
12 Fresh Air Blower

FIGURE 1

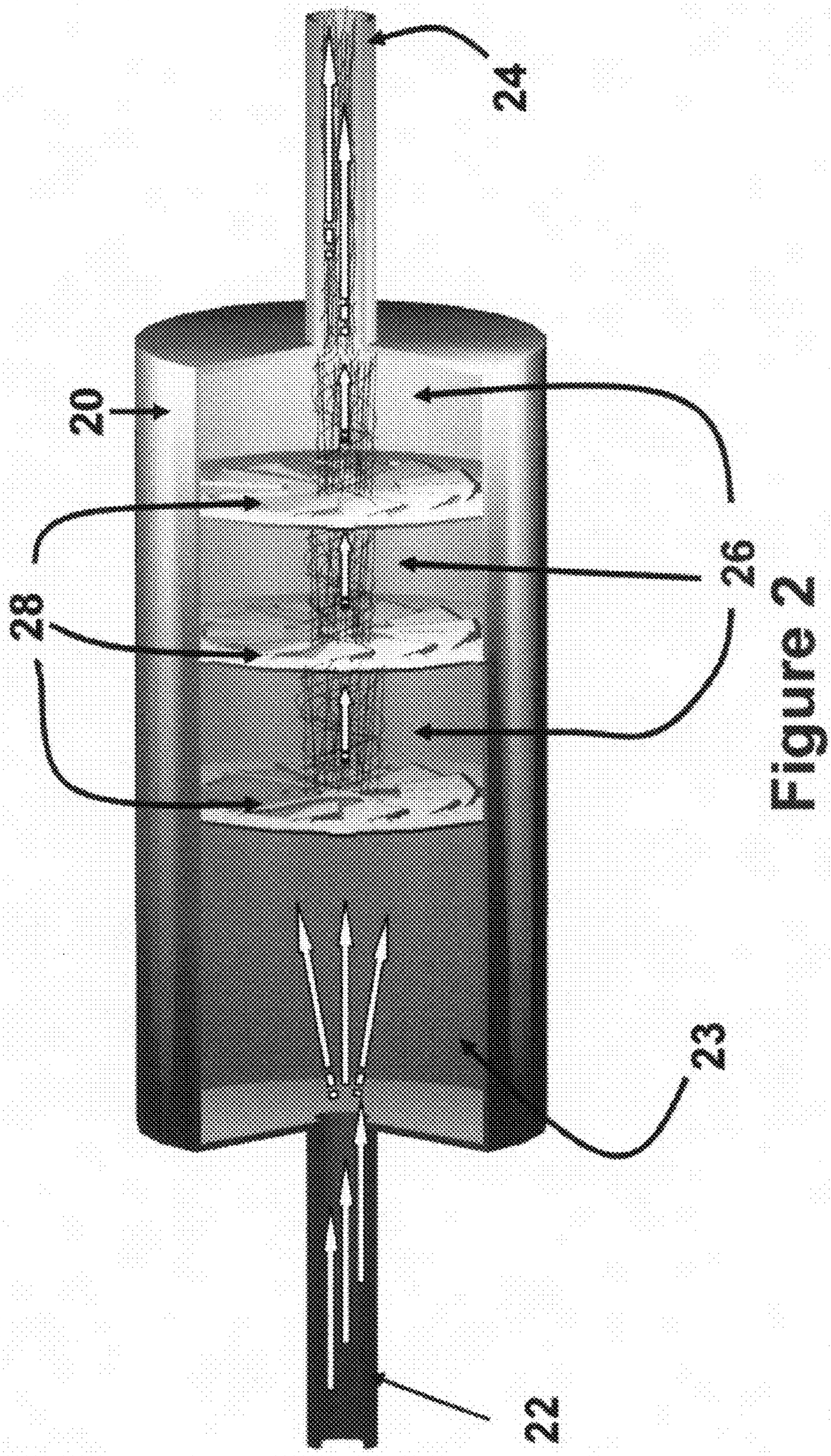


Figure 2

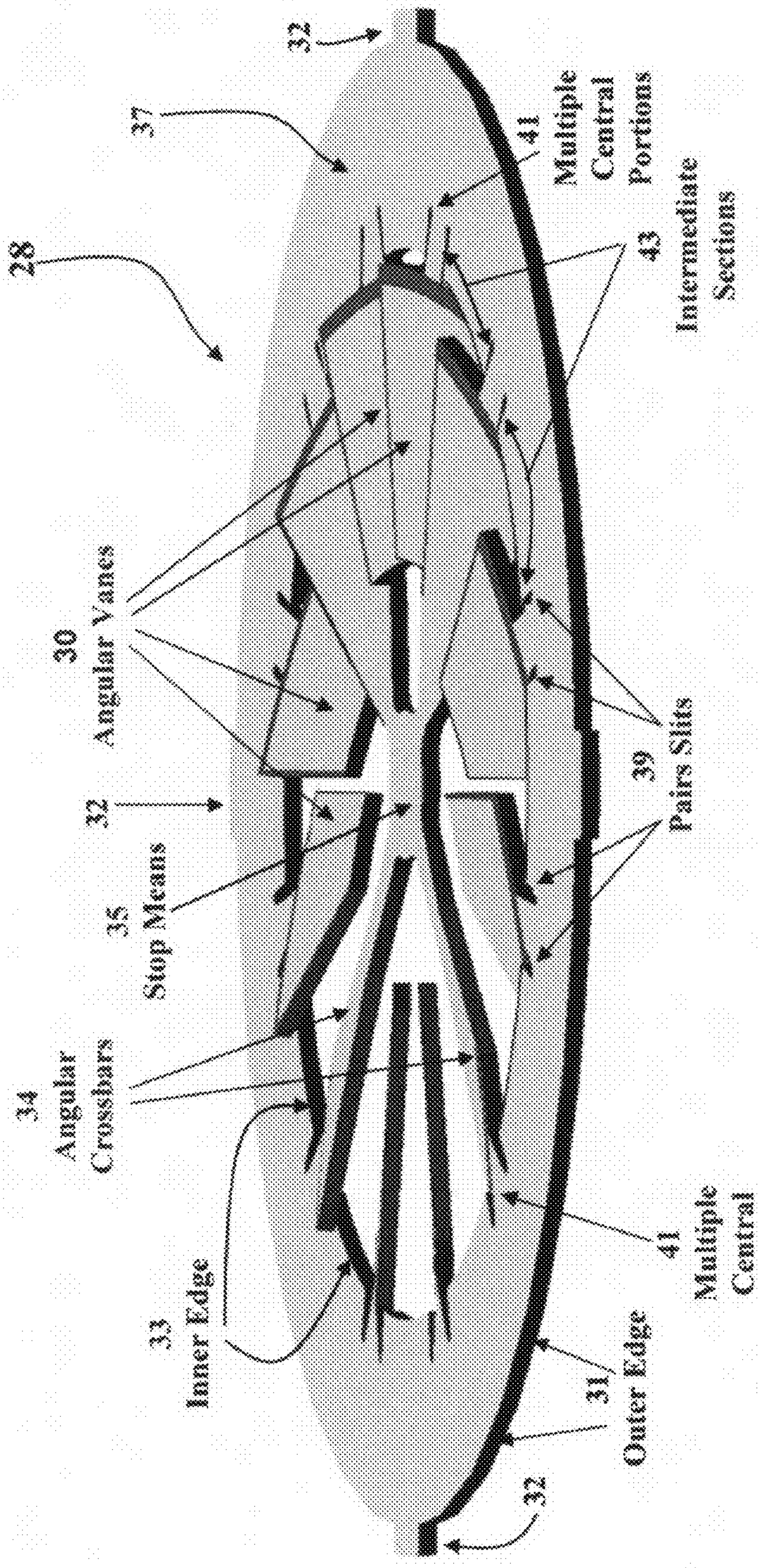

37
41
Multiple Central Portions
43
Intermediate Sections
28
34
Angular Crossbars
35
Stop Means
32
30
Angular Vanes
39
Pairs Slits
33
Inner Edge
31
Outer Edge
32
41
Multiple Central Portions

FIGURE 3

HEAT REACTOR

RELATED APPLICATION

[0001] This continuation in part application is derived from my Provisional application Ser. No. 60/534,509, which was filed on Jan. 3, 2004, converted into Utility application filed Feb. 2, 2004 Ser. No. 10/770,884 currently pending, all are in the name of the current inventor.

FIELD OF THE INVENTION

[0002] This invention relates in general to new and improved devices used for reducing air pollution but more particularly pertains to a heat reactor, respectively, which when installed onto a pollution source provides elimination and/or complete combustion of harmful emissions generated there from, including compounds such as oxides of nitrogen, hydrocarbons, carbon monoxide, odour and organic and inorganic particulates. The reactor is of very simple construction as it is basically formed from one elongated tube having internal compartments partitioned by novel flow conditioners. The heat reactor is extremely energy efficient and does not require any moving parts or maintenance.

BACKGROUND OF THE INVENTION

[0003] Reducing air pollution, particularly emissions from heating devices, including harmful fuel odours and particulates, has become a strong environmental objective and is of extreme concern throughout the world. As a result, because of worldwide tightening of pollution emission standards, inventors have and are continuously trying to invent devices and/or methods that will comply with these increasingly stringent standards. However, heretofore such attempts have not been successful as they are much too costly to produce, are very complicated requiring numerous parts and/or are simply inefficient.

[0004] Within the known prior art, there have been numerous devices and/or systems presented, but still there remains a great need for improvement pertaining to "heat reactors" in general especially those used for eliminating pollutants from home and commercial heating applications. The present invention has developed over the years as a result of building and testing numerous Thermal Oxidizer and heater unites since 1993. These types of units or systems, when originally considered and tested to destroy automotive and diesel engine exhaust pollution proved to be somewhat effective for their intended use. The general theory in an altered embodiment has since proven to be an excellent source of heating with low pollution emissions when modified, respectively. Thus, the same basic design has proven to be an energy efficient and economical way to eliminate pollutants from home and commercial heating applications. However, such technology has not as yet been incorporated for use within heat reactors, or the like.

[0005] Exemplary prior art pertaining to the general field of the present invention includes the following U.S. Pat. No. 3,683,625 entitled "Smog Reducer" is a very old yet addresses the concept of improving the pollutants associated with engine exhaust. The '625 reference incorporates an elongated tube having an internal lengthwise baffle that directs airflow throughout the entire tube with the baffle being in the form of a screw thread. It is suggested therein that the device is also functional as a muffler. U.S. Pat. No. 5,584,178 entitled "Exhaust Gas Combustor" that teaches use of an elongated tube having an internal flame holder combined with an igniter. More recent prior art includes U.S. Pat. Nos. 7,273,366 and 7,249,946. The '366 reference entitled "Method And Apparatus For Destruction Of Vapors and Waste Streams" is somewhat novel as it utilizes solid or perforated cones for increased mixing. The '946 reference entitled "Thermal Generator And Combustion Method For Limiting Nitrogen Oxides Emissions By Re-Combustion Of Fumes" is also unique as it utilizes a different structure or housing. Although these devices are related to purification of exhaust gases they still are not completely functional as is the present invention.

[0006] Several types of mufflers exist and heretofore have not achieved the unusual new results of the present invention which actually results in intense heat usable for energy purposes of which is 99.99% pollution free. Prior art mufflers include U.S. Pat. Nos. 1,157,256, 1,745,632, 3,393,767 and 4,109,753. All of these mufflers are similar in that they include some type of baffle means for controlling the directional flow of the exhaust gas. It is known that a spiralling motion is most desirable and produces the best results. However, even though the noted prior art produces some type of spiralling motion via the baffle means each are not functional as they do not also include a centralized stop means which is extremely important. All of the noted prior art excluding the '753 reference have a centralized open passageway for the gases to flow there through and this proves to be most inefficient. It is further important that the baffle means is of simple construction and in the form of a circular disc that is easily installed. The '753 baffle includes some type of a central stop means but it is not a circular disc, in fact it is substantially constructed as a propeller. The baffle is limited as it must include at least one of the blades being in the form of a tangential tab that is perpendicular to the other blades. Whereby, the tab is then slid ably engaged into the side wall of the housing for a press fit. Thus, the baffle thereof is not a disc or the like as the outward end of the blades are not attached to a circular outer circumferential edge forming a rim. This is the most important feature taught by the present invention and provides most novel end results heretofore not attainable. Furthermore, none of the prior art teach a baffle means that is constructed in the form or novel shape of the present invention as will be seen later herein.

[0007] Thus, there remains a great need for a device that can always eliminate virtually all compounds such as hydrocarbons, carbon monoxide, odours and organic and inorganic particulates from heating exhausted, is very energy efficient and significantly reduces oxides of nitrogen (NOx) as taught by the present invention. Therefore, the present invention produces intense heat that is now 99.99% pollution free and usable for energy purposes.

SUMMARY OF THE HEAT REACTOR

[0008] It is therefore an object of the present invention to provide a heat reactor that overcomes the drawbacks and disadvantages associated within the known prior art. For example, the present invention has been simplified and accomplishes unusual results heretofore not achieved. The reactor itself is substantially an elongated tube internally partitioned forming a combustion chamber interconnected to multiple compartments, and also includes flow conditioners that control velocity and swirling of the gases.

[0009] Another object of the present invention is to provide a heat reactor that requires little or no maintenance, as it is extremely efficient and durable.

[0010] Still another object of the present invention is to provide a heat reactor that can be easily manufactured, is extremely cost effective and marketable.

[0011] It is a very important object of the present invention to provide a heat reactor that eliminates all, or at least a very large percentage, such as 99.99% of all the fuel used, liquid or gas.

[0012] Yet another important object of the present invention is to provide a heat reactor wherein all of the typical pre-existing components, such as the fuel dispensing means, igniters, blowers, etc., can be used with the current heat reactor without the need for any modifications.

[0013] Another object of the present invention is to provide a heat reactor that can be used for any type of liquid fuel of choice, such as high-octane aviation fuel, heating oil's, kerosene, alcohol, or virtually anything that can be atomized into the chamber and ignited.

[0014] Other objects and advantages will be seen when taken into consideration with the following specification and drawings, etc.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. **1** is substantially a plan view depicting some of the standard components utilized by the present invention.

[0016] FIG. **2** is substantially a perspective overview depicting the internal construction for the preferred embodiment for the present invention.

[0017] FIG. **3** is substantially a perspective overview showing one flow conditioner of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

[0018] The present invention utilizes standard operational components including a controller mechanism (not shown) for operating the system including an ignition system (**10**), a fresh air blower mechanism (**12**), a fuel supply (**14**), associated fuel dispenser (**16**) and fuel igniter (**18**), etc, each of which are exemplified in FIG. **1**. It is to be understood such components are typical and well known within the field. Thus, their teachings are not provided herein, yet it is to be understood any type of these components maybe incorporated depending on manufacturing and/or engineering choice. It is to be further understood that each of the noted components can be installed at the point of manufacture and/or as a retrofit onto existing equipment at the work site.

[0019] The novel and unique qualities of the present invention are achieved because of the shape, size, internal structure and components of the heat reactor housing (**20**), which in combination provide unusual results heretofore not taught. For example, the preferred embodiment for the present heat reactor system as depicted in FIG. **2**, includes an elongated tubular housing (**20**) (that is made from or coated with a high heat-resistant material such as steel, inconel, hasteloy, or ceramic) having an inlet duct (**22**) and an outlet duct (**24**). Housing (**20**) is partitioned internally forming at least a first combustion chamber (**23**) and at least one or multiple reactor compartments (**26**) that are separated by multiple flow conditioners (**28**), respectively. It is to be understood the system can incorporate any number of combustion chambers (**23**), reactor compartments (**26**) and/or flow conditioners (**28**) depending on engineering design choice and the particular application at hand. Thus the system as depicted herein is only exemplary of one possible embodiment and therefore the invention is not to be limited to any particular number of either.

[0020] It is believed the noted unusual results are mainly achieved due to the construction of the flow conditioners (**28**) that are positioned between the multiple compartments (**26**). Wherein, each of the flow conditioners (**28**) are substantially in the form of a circular disc (made from a high heat resistant material) which is of a shape and size to be perpendicularly positioned along an axis within housing (**20**) thus forming the noted multiple reactor compartments (**26**) between each of the flow conditioners (**28**). It is to be understood each of the flow conditioners (**28**) can be fixedly attached in place by any suitable attachment means of choice, such as by welding or the like. Also, there are many variations for the actual construction of each of the flow conditioners, therefore the following is only exemplary of one possible configuration thus the invention is not to be limited thereto.

[0021] For more descriptive clarification of the flow conditioners, I refer now to FIG. **3** wherein each of the flow conditioners (**28**) are more clearly described as follows. Namely, each flow conditioner (**28**) is in the shape of an integrally formed circular disc having an outer edge (**31**), an inner edge (**33**), multiple angular vanes (**30**), multiple angular cross bars (**34**) and a central stop means (**35**). The outer edge (**31**) and the inner edge (**33**) in combination forming a rim (**37**) there between. The inner edge (**33**) having equally spaced apart pairs of slits (**39**). Each of the pairs of slits (**39**) defining multiple central portions (**41**) and multiple intermediate sections (**43**). The multiple central portions (**41**) protruding outwardly from within each of the pairs of slits (**39**). As depicted, each one of the multiple intermediate sections (**43**) is located on the inner edge (**33**) in between each of the pairs of slits (**39**). Some of the multiple central portions (**41**) being shaped to define the multiple angular vanes (**30**) and some of the multiple central portions (**41**) being shaped to define the multiple angular cross bars (**34**). The multiple angular-cross bars (**34**) being integrally formed with the central stop means (**35**). Thus conceptually the multiple angular vanes (**30**) direct airflow in a controlled angular manner outwardly into said reactor chamber in alignment with said axis and the multiple angular cross bars (**34**) with the stop means (**35**) in combination function to deflect, condition, and block gases from escaping from a central area of the flow conditioner (**28**). Further optional features may include upon the outer edge multiple locating tabs (**32**) thereon of which protrude laterally outward there from. The multiple locating tabs (**32**) allow the flow conditioner (**28**) to be correctly orientated within the elongated tubular housing (**20**). As can be clearly seen each of the flow conditioners (**28**) when formed do not include any centralized opening which is important as this does not allow the gases to escape there through. Rather the gases are substantially restricted which in turn provides increased dwell time. This restriction is substantially due to the multiple angular cross bars (**34**) and the stop means (**35**) in combination that function to deflect, condition and block the gases from escaping from the central area, respectively until proper dwell time has been achieved.

[0022] It can now be seen due to flow conditioners, the air, gases and pollution when transferred from one compartment to another are forced into a spiral motion that in turn provides the unusual results. For example, when the polluted air, etc., is forced into the next compartment via the vanes of the flow conditioner, cross bars and stop means, the noted spiral

motion thereof causes the heavier materials i.e. hydrocarbons, carbon and any other heavy molecules of fuel therein to be directed to the outermost area of the associated compartment because of centrifugal force, respectively, and are retained in the outermost area until converted by combustion to a lighter substance, namely a gaseous flame having helical motion between the multiple compartments. Thereafter, once converted into a gaseous form it is then light enough to migrate back to the center area of the associated compartment and onto the next compartment via the next flow conditioner. Whereby, due to use of the flow conditioners (**28**), the system provides highly increased dwell and/or burn time and this is the key or secret to total combustion. This is easily accomplished due to the variable angle of the vanes on the flow conditioners that set the direction and velocity of the swirling helical gases. This allows the heated gases to be retained inside each of the compartments and elevated to a high temperature for a period of time instead of being immediately exhausted throughout the outlet duct (**24**). This process is continued throughout each of the compartments (**26**) until there is nothing left but gases, thus no Cx Hx fuels, etc. Thereafter the heated gases are expelled from within housing (**20**) via outlet duct (**24**) respectively. Thus the now 80 to 99.99% pollution free hot gases and/or air may be used for energy purposes in an environmentally friendly manner, such as for heating or the like.

[0023] It will now be seen the Heat Reactor system as taught herein causes hydrocarbon compounds (C.sub.xH. sub.x Fuel) to be reduced to their base atomic elements by the application of intense steady heat and retaining them inside a confined area under controlled conditions with just the correct amounts of fuel and air. Thus, the heat reactor system of the present invention virtually eliminates all pollution such as hydrocarbons, particulates (such as carbon particles in the form of soot from diesel engines), and offensive fuel odours while being very energy efficient.

[0024] It will further be seen that in operation, when the systems controller and other noted components are activated and the correct amount of fuel and air is injected into the combustion chamber (**23**) via inlet duct (**22**), a primary turbulence zone such as depicted in FIG. **2** is established therein and within this zone the mixture will be ignited and combusted. The ignited fuel and air mixture in the center of the turbulence zone produces sufficient heat to cause the incoming fuel to instantaneously combust and start to decompose back into its natural elements, whereby releasing energy in the form of intense heat.

[0025] It will also be seen that the amount of time for combustion and decomposition of the polluted material until it transforms into a gaseous state is variable depending on the size of the heat reactor system, the type of pollutant, the amount, the velocity of the gases, etc, all of which can be adjusted for ultimate performance at the point of operation.

[0026] It will also be seen I have herein provided a heat reactor system wherein the combustion chamber and the compartments increase the energy efficiency of the system through the orderly mixing of fuel and fresh air making it greater than 99.99% total combustion with any liquid fuel or gaseous fuel. At the proper operating temperatures, fewer oxides of nitrogen are formed and carbon based compounds are reduced to their base elements. The selection of the most effective temperature for the virtual elimination of fuels is dependent upon the type of fuel selected. The amount of fuel to air ratio will also have an important impact on the efficiency of the heat reactor system and the lack of carbon based pollution and a reduction in NOx.

[0027] As previously noted the liquid fuel injector system is the same mechanical device presently used in the industry to convert any liquid fuel to an atomized gaseous fuel prior to being injected into the combustion chamber. However, when the fuel to be used in the combustion chamber is already in a gaseous state, a prior art liquid fuel atomizer system is not needed which is most advantageous. Also, the fuel injector system can be selectable between the liquid and gaseous fuels depending on the fuel of choice.

[0028] Also previously noted, the standard controller devices now used in the home and within the heating industry are adaptable to this system. Whereby, any controller that can control the startup sequence by initializing the fuel injection system, the blower, ignition mechanism and the fuel supply to maintain the proper operating temperatures within the heat reactor system may be used. It will also be seen that all of the current components now used in the home or within the heating industry can be used. No change in the supporting infrastructure is required other than the addition of the heat reactor system.

[0029] It will now be seen that overall I have herein provided a heat reactor system that is novel and unique because it can be easily made from one stainless steel tube or any other high heat resistant material of engineering choice. No additional maintenance is required, produces extremely low pollution output, it accomplishes almost total combustion (greater than 99.99%) of any fuel used, liquid or gaseous, and all components, fuel dispensing, igniters, and blowers, currently used in the home and industrial heating industry can be used with this heat reactor system. Also, any liquid fuel from "high octane" aviation fuel to heating oil's, butane, propane, natural gas, kerosene, alcohol, and virtually anything that can be atomized info the combustion chamber and ignited can be used.

[0030] Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made there from within the scope and spirit of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatuses.

1. A heat reactor system comprising in combination: an elongated tubular housing having an: inlet duct for receiving injected fuel and air and an outlet duct for expelling heated gases, said elongated tubular housing being partitioned internally by at least one flow conditioner, said flow conditioner being perpendicularly positioned along an axis of said elongated tubular housing thus forming at least a first combustion chamber and at least one reactor compartment having no moving parts, said flow conditioner comprising: an integrally formed circular disc having an outer edge; an inner edge; multiple angular vanes; multiple angular cross bars and a central stop means; said outer edge and said inner edge in combination forming a rim there between, said inner edge having equally spaced apart pairs of slits, each of said pairs of slits defining multiple central portions and multiple intermediate sections, said multiple central portions protruding outwardly from within each said pairs of slits, each one of said multiple intermediate sections being located on said inner edge in between each said pairs of slits, some of said multiple central portions being shaped to define said multiple angular vanes, some of said multiple central portions being shaped to

define said multiple angular cross bars, said multiple angular cross bars being integrally formed with said central stop means, said multiple angular vanes directing airflow in a controlled angular manner outwardly into said reactor chamber in alignment with said axis, said multiple angular cross bars and said stop means in combination function to deflect, condition, and block gases from escaping from a central area of said flow conditioner,

whereby:

when said fuel and air is injected into said first combustion chamber via said inlet duct, a primary turbulence zone is established wherein the mixture is ignited and combusted thus producing sufficient heat to cause said fuel to instantaneously combust and start to decompose back into its natural elements which in turn releases energy in the form of intense heat, thereafter once said mixture is converted into a gaseous flame having a helical motion, said mixture is forced into a spiral motion and then forced into said reactor compartment via said flow conditioner, said spiral motion provides increased dwell time for total combustion, thereafter said intense heat that is now free from harmful emissions including, hydrocarbons, carbon monoxide, odours, organic and inorganic particulates is expelled from within said elongated tubular housing via said outlet duct and can be used for energy purposes in an environmentally friendly manner.

2. The heat reactor system of claim **1** wherein said elongated tubular housing is made from a high heat-resistant material capable of withstanding heat in excess of 2500 degrees Fahrenheit, including stainless steel, inconel, hasteloy or ceramic.

3. The heat reactor system of claim **1** wherein said elongated tubular housing is coated such as by lamination with a high heat-resistant material capable of withstanding heat in excess of 2500 degrees Fahrenheit, including stainless steel, inconel, hasteloy or ceramic.

4. The heat reactor system of claim **1** wherein said flow conditioner is made from a high heat-resistant material capable of withstanding heat in excess of 2500 degrees Fahrenheit, including stainless steel, inconel, hasteloy or ceramic.

5. The heat reactor system of claim **1** wherein said flow conditioner is coated with a high heat-resistant material capable of withstanding heat in excess of 2500 degrees Fahrenheit, including stainless steel, inconel, hasteloy or ceramic.

6. The heat reactor system of claim **1** further includes multiple reactor compartments that are separated by multiple flow conditioners.

7. The heat reactor system of claim **1** wherein said outer edge further includes multiple locating tabs thereon of which protrude laterally outward there from, said multiple locating tabs allow said flow conditioner to be correctly orientated within said elongated tubular housing.

8. The heat reactor system of claim **1** wherein said fuel is either in the form of aviation fuel, oil, propane, butane, natural gas, kerosene, gas, or alcohol.

9. The heat reactor system of claim **1** wherein said multiple intermediate sections function as a dam for further increased directional air flow.

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