March 14, 1967 J. P. REX, JR 3,308,870

OIL BURNER AIR CONE

Filed Sept. 30, 1964

FIG. 1

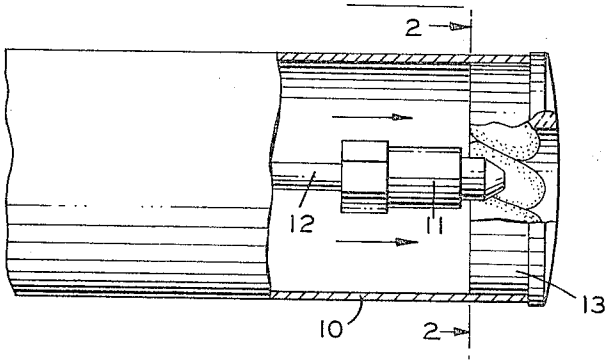



FIG. 4

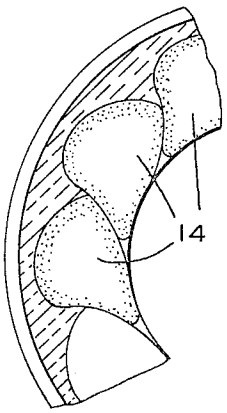



FIG. 2

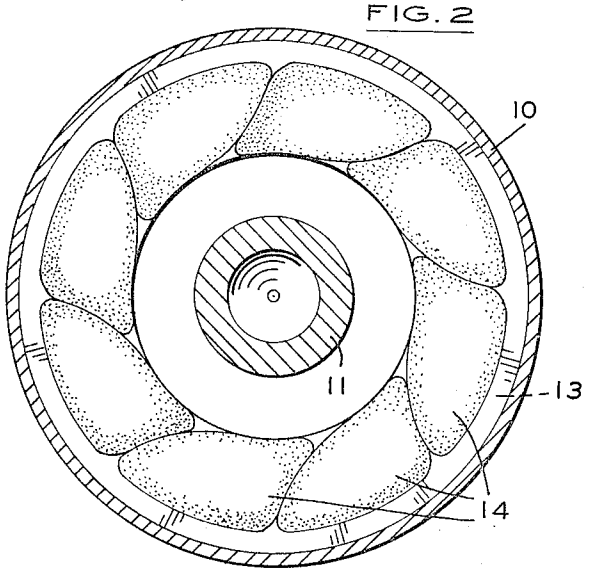
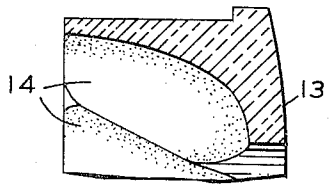



FIG. 5



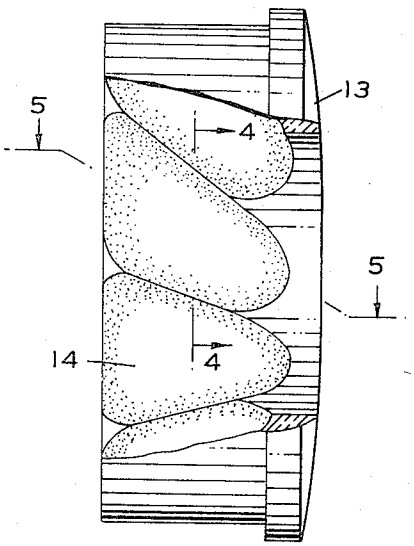




FIG. 3

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# OIL BURNER AIR CONE

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1 Claim. (Cl. 158—76)

This invention relates to the discovery that oil burner "coking" with resultant inefficiency and smoking result primarily from radiant and convective heat flow into the nozzle after the furnace is off and the cooling oil flow has stopped and that such coking can be entirely or substantially eliminated through the provision of an air cone which minimizes heat absorption and storage during operation of the furnace and insulates the nozzle from heat transfer when the burner shuts off.

In accordance with the present invention an air cone as hereinafter described in detail is constructed with a refractory insulating material capable of withstanding operating temperatures combined with properties of minimum mass, heat conductivity and storage capacity.

The objects of the invention may best be understood from the following detailed description of a preferred embodiment as illustrated in the drawings wherein:

FIG. 1 is a side elevation of a gun-type oil burner nozzle partially sectioned to show the nose cone installation;

FIG. 2 is an enlarged rear elevation of the nose cone per se as seen along the line **2**—**2** of FIG. 1;

FIG. 3 is a side elevation of the nose cone per se shown in FIG. 2 partially sectioned to show interior air passage construction;

FIG. 4 is a fragmentary sectional view taken along the line **4**—**4** of FIG. 3; and

FIG. 5 is a fragmentary sectional view taken along the line **5**—**5** of FIG. 3.

As shown in FIG. **1** the gun-type burner housing **10** encloses an oil nozzle **11** fed by tube **12** and discharging oil spray into a furnace combustion chamber through air cone **13**, mounted within the housing **10**. Such air cone, frequently referred to as a nose cone or stabilizer, includes a plurality of fluted passages **14** around the internal wall thereof adapted to induce a swirling action to the air flow surrounding the oil nozzle to assist in atomizing the oil spray for as rapid and complete combustion as possible.

It is conventional practice to construct such air cone as a cast iron or stamped steel element which during operation absorbs a considerable amount of heat from the furnace combustion chamber producing in many cases a radiant temperature reflected onto the nozzle and heating the same to a substantial temperature notwithstanding the internal cooling oil flow and surrounding air flow. Upon shut-off of the nozzle immediately following firing the stored heat radiating and passing by convection from a cast iron or stamped steel air cone to the nozzle, in the absence of the cooling oil and air flow, may substantially elevate the temperature of the nozzle and oil therein, as well as back somewhat into the feed line **12**, to a coking temperature. The progressive build-up of deposit layers within the feed tube and nozzle with successive firings gradually restricts the oil passage to a progressively smaller effective orifice upsetting the proper air fuel mixture ratio, producing a reduction in heat, heat efficiency and eventual smoking of the oil burner from incomplete combustion.

I have discovered that a lightweight, fibrous refractory air cone may reduce operating temperatures in the order of 100° to 150° below metal cone operating temperatures, will substantially eleminate heat retention and storage, and solves the problem of nozzle coking substantially if not



entirely. The preferred materials employed in manufacturing such air cones are aluminum silicate fibers and a colloidal silica binder.

A typical specification for the aluminum silicate fiber is as follows:

| | |
|---|---|
| Color | White. |
| Fiber length | Short to 1½ inches. |
| Fiber diameter | Submicron to 10 microns, mean of 2½ microns. |
| Specific gravity | 2.73. |
| Bulk density | 20 lbs. per cubic foot. |

The approximate chemical analysis of this material in percentage by weight is as follows: $Al_2O_3$, 51.2%; $SiO_2$, 47.4%; $B_2O_3$, 0.7%; $Na_2O$, 0.7%.

The fibrous material is preferably molded with an inorganic binder having the following properties:

| | |
|---|---|
| Percent colloidal silica as $SiO_2$ | 30.0. |
| Ratio, wt., $SiO_2/Na_2O$ | 95. |
| Chloride as NaCl | 0.04%. |
| Sulfate as $Na_2SO_4$ | 0.05%. |
| Viscosity at 25° C., cps. | 3.6. |
| pH at 25° C. | 9.8. |
| Surface area B.E.T. method $m.^2$ g. | 210. |
| Approximate particle diameter | 15 mu. |
| Turbidity | 21. |
| Stability | Stable, except toward freezing, which causes irreversible precipitation. Freezing point 32° F. |

A 20 lb. per cubic foot fiber density bonded with 20 to 50% by weight of binder and resulting in a 25 lb. to 40 lb. per cubic foot density has been found after considerable experimentation to provide a range within which desired balance of durability, lightweight, minimum operating temperature and heat retention characteristics may be obtained.

While a preferred embodiment of the present invention has been described in detail it will be understood that certain modifications thereto may be resorted to without departing from the scope of the invention as defined in the following claim.

I claim:

An oil burner nozzle air nose cone comprising a molded fibrous refractory ring, said ring being held in a stable nose cone form by an inorganic refractory binder, said ring being adapted for retention in an air tube surrounding an oil burner nozzle, said ring having a plurality of flutes molded in its internal surface adapted to induce a swirling movement of incoming air in order to mix incoming combustion air with an oil spray ejected from said nozzle, and said internal surface forming the most immediate adjacent element surrounding said oil burner nozzle.

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