Dec. 1, 1970 J. BATTIGELLI 3,544,254

BURNERS FOR PRODUCING GASEOUS MIXTURES IN CENTRIFUGAL FIBER ATTENUATING APPARATUS

Filed July 3, 1967 3 Sheets-Sheet 1

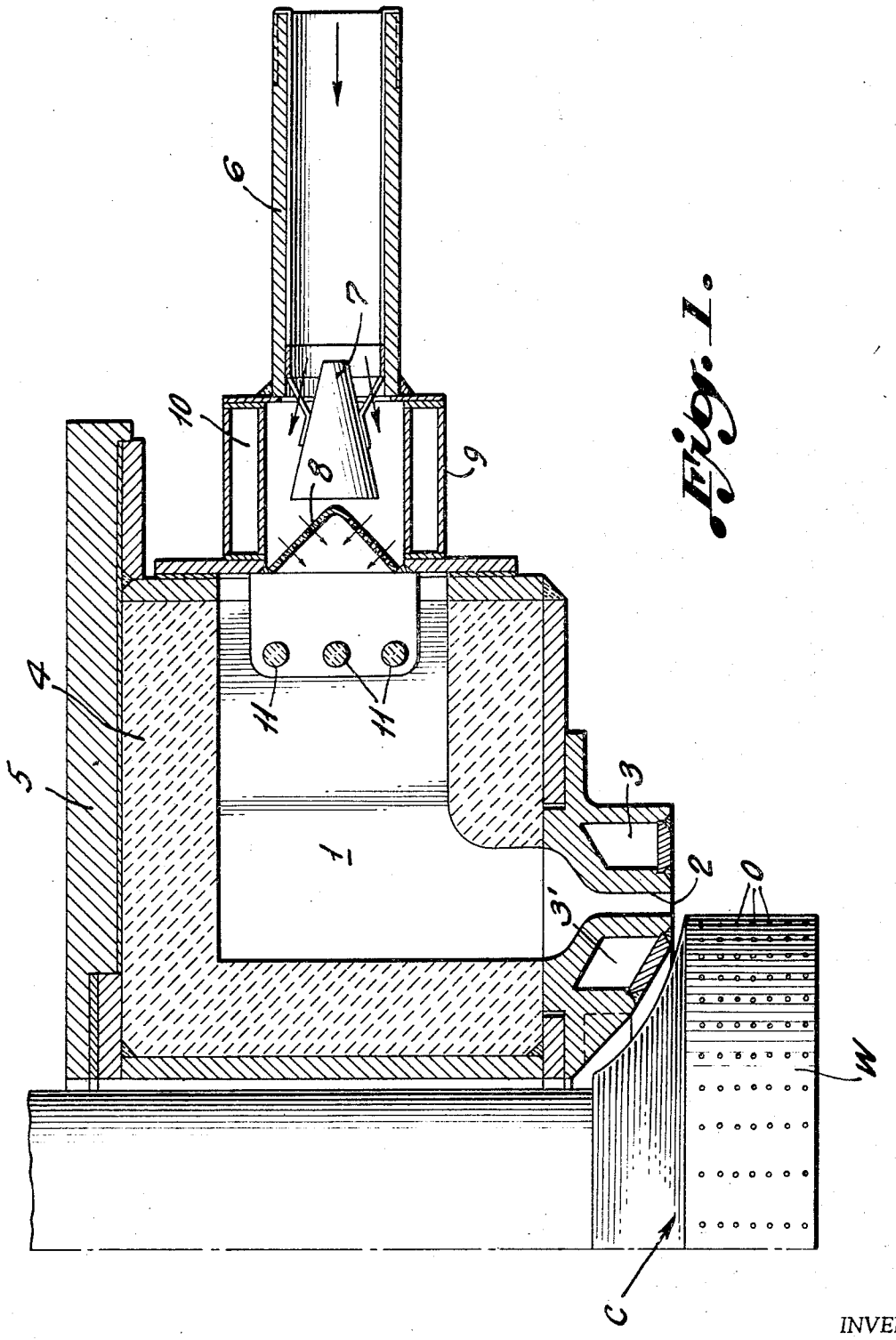

Fig. 1.

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Filed July 3, 1967 3 Sheets-Sheet 2

Fig. 2.

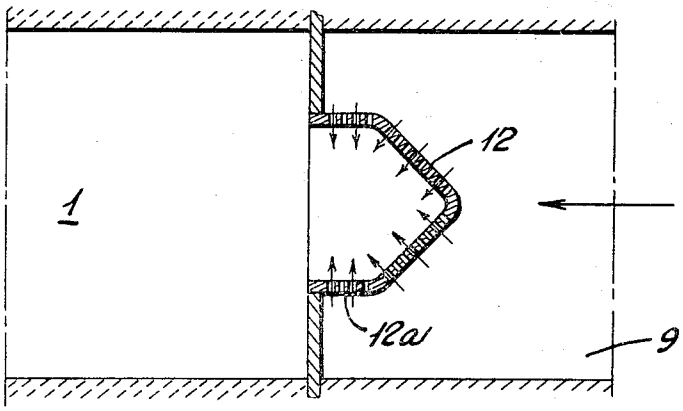


Fig. 3.

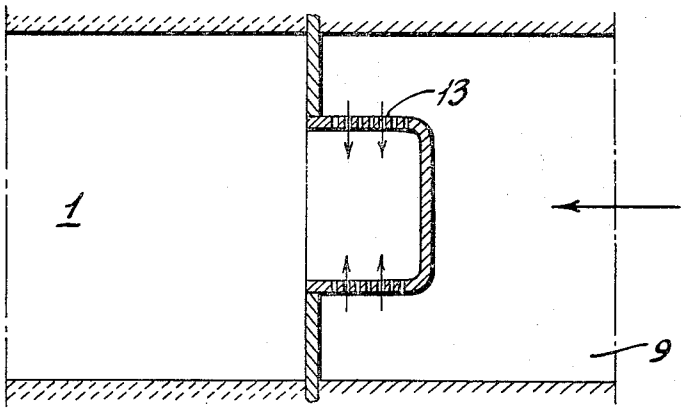
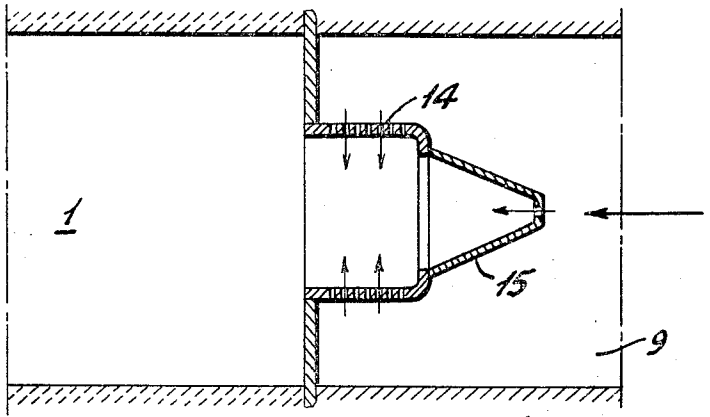


Fig. 4.



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Filed July 3, 1967 3 Sheets-Sheet 3

Fig. 5.

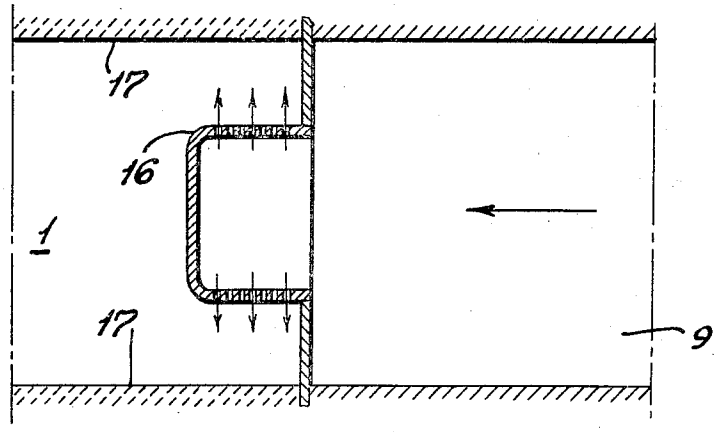


Fig. 6.

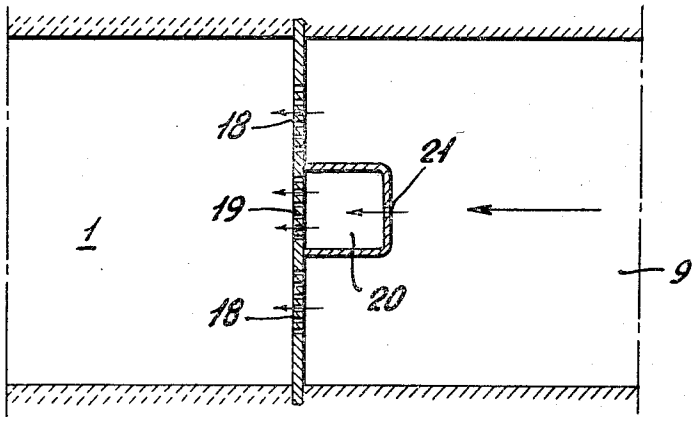
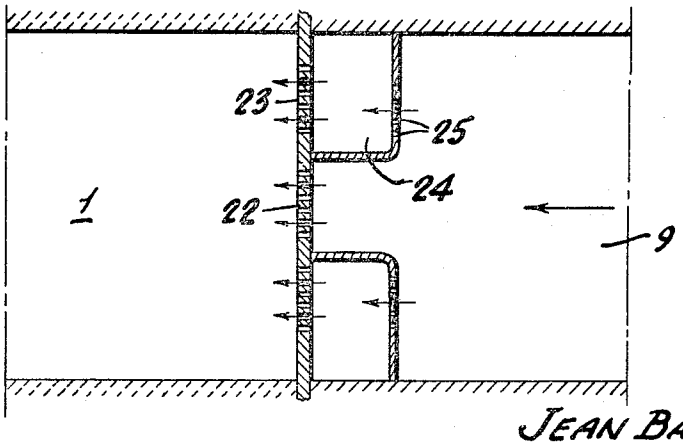


Fig. 7.



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Patented Dec. 1, 1970

3,544,254

BURNERS FOR PRODUCING GASEOUS MIXTURES IN CENTRIFUGAL FIBER ATTENUATING APPARATUS

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Claims priority, application France, July 20, 1966, 70,069
Int. Cl. C03b 19/04
U.S. Cl. 431—350 11 Claims

ABSTRACT OF THE DISCLOSURE

The invention concerns the improvement of internal combustion burners used in conjunction with rotary centrifuges for attenuating the filaments of molten material issuing from the orifices in the peripheral wall of the centrifuge. Such burners have two grids or gratings behind each other at the inlet end of the burner for stabilizing the flame in the burner in this zone. The instant invention seeks to increase the calorific power of the burner without increasing its size by modifying the first grid and the openings therein so that the kinetic energy of the jets issuing therefrom is reduced. Thereby, flame stability may be maintained despite an increase in the quantity in combustible factors which are fed to the burner.

The instant invention concerns the improvement of internal combustion burners of the type disclosed in U.S. Pat. No. 3,251,666, May 17, 1966. In such burners there is provided two gratings at the inlet for the combustible-comburent or combustible gaseous mixtures in the combustion chamber. One of these gratings, which is located at the side of the gas intake, is similar to the known type of grating, and the other, placed inside the combustion chamber, is located near the first.

It is the object of the present invention to provide a particular arrangement of the first grid, or the grid located at the side of the gas intake, which permits especially the increase of the calorific power of the burner without increasing its dimensions.

In accordance with the invention, the jets of the gaseous mixture issuing from the first grid are directed in such a way that the kinetic energy which they possess, or leaving the orifices of said grid, is lessened before their entry into the combustion chamber.

This results in the admission of the volume or mass of the combustible mixture into the combustion chamber without being projected too rapidly into the interior thereof, so that combustion takes place upon its entry, which results in an excellent utilization of the volume or space of this chamber.

According to one characteristic of the invention, the axes of the orifices of the first grid are directed toward one another, the kinetic energy of the jets of the gaseous mixture being thus broken through the mutual encounter or collision of these jets.

According to one embodiment of the invention, a V-shape is given to the first grid, with the point directed toward the intake of the gaseous mixture.

According to another embodiment, the grid assumes a cylindrical shape, with the orifices being provided on the lateral surface.

Such devices have the advantage of causing a decrease in initial speed of the jets by reason, on the one hand, of the angle that the axes of the orifices make with the direction of the movement of the gaseous mixture arriving at the grid and, on the other hand, of the increase in the

total number of orifices and consequently of the total section offered to the passage of the mixture. This decrease in speed of the gases at the outlet of the orifices of the grid permits the breaking of the jets over a shorter distance and bringing still closer the combustion zone to the first grid. It has been determined that time of passage of the gases in the combustion chamber is increased in large proportions, which allows for increasing the quantity of gases burned in the chamber.

According to another characteristic of the invention, the orifices of the first grid are directed toward the walls, particularly toward the walls of the combustion chamber, the impact of the jets with said walls causing the decrease in their kinetic energy.

The improved burner according to the invention may be applied advantageously to the production of the gases utilized for the manufacture of fibers from mineral or organic materials in the viscous state, and in particular glass fibers, by the process according to which the filaments of melted material projected outwardly from the orifices provided on the periphery of a hollow body turning on its axis, are subjected to the action of the gas blast at high temperature.

The use of this burner gives rise to the following two possibilities: By maintaining the same width or size of the rims of the burner, that is, the same outlet section of the expansion orifice, the speed of the combustion gases at the outlet is increased, and if in addition, other factors are maintained the same, finer fibers are obtained. On the other hand, if the size of the rims of the burner or expansion orifice is increased, while maintaining the same exhause velocity of the gases from the expansion orifice, there results an increase in the output of fibers which are produced while maintaining the same fiber characteristics.

Other characteristics and advantages of the invention will appear from the following description of several embodiments thereof which are illustrated in the accompanying drawings by way of non-limiting examples and wherein:

FIG. 1 is a vertical longitudinal section of the burner assembly in accordance with the invention;

FIGS. 2 to 7 show sectional views of different embodiments of the first grid or grating at the inlet of the combustion chamber with the different arrangements of the orifices therein which are adapted to cooperate with a second grid or grating beyond the first grid, and which is illustrated completely only in FIG. 1.

In FIG. 1 is shown the combustion chamber **1** of the burner which is adapted to operate in conjunction with a rotary centrifuge C from which are projected molten filaments of mineral or organic materials, through orifices O in the peripheral wall W, as also clearly shown in FIG. 3 of the above-mentioned Pat. No. 3,251,666. These filaments are attenuated by the hot combustion gases issuing from the annular expansion orifice **2** of the burner. The concentric rims **3**, **3'** defining the expansion orifice are hollow and may be cooled by circulation of a liquid refrigerant therethrough. Refractory blocks **4** insulate the combustion chamber within its housing **5**.

The combustible mixture is fed to the burner through a passage **6**, this mixture encountering a diffuser **7** of frusto-conical shape, which assures its distribution over the first grid or grating assembly **8**. Conduit **9** which connects passage **6** with the inlet of the burner, comprises a double wall **10** through which may circulate a cooling agent.

Grid **8**, instead of being disposed in a single plane as shown in the above-mentioned patent, is multi-planar, and may be formed of a sheet of iron folded in the shape of a V and is pierced with holes the axes of which are indicated in the drawing. The diameter of these holes may

vary according to the calorific power of the gas utilized. Double wall **10** permits cooling this grid.

As described above, the gas jets coming out of the holes of grid **8** are directed toward one another, which breaks their kinetic energy to cause combustion to start in the vicinity of the front wall of said grid.

The burner comprises a second grid or grating **11** placed beyond the first and which is, in the example shown, made up of three bars of refractory material.

FIG. 2 shows an arrangement of the first grid formed by a multi-planar unit constituted by a conic part **12** in the front and a cylindrical part **12***a* in the back, these two parts having holes therein as indicated, for directing the gaseous jets.

FIG. 3 shows another arrangement of a multi-planar grid or grating **13** of cylindrical shape, with holes provided in its lateral surface.

In these two embodiments, the kinetic energy of the jets is also broken by their mutual encounter and collision.

In the embodiment shown in FIG. 4 grid **14** is cylindrical and the forepart thereof is connected with a hollow cone **15** at a large opening, with a small opening at the front tip of the cone. Thereby a secondary flame is obtained, the front of which is rapidly stabilized because of the widening of the cone. This flame directs the gas of combustion into the vortex of the principal jets and induces ignition of the mixture.

FIG. 5 shows an embodiment in which the jets issuing from the holes of grid **16** are no longer directed toward one another but, on the contrary, toward walls **17** of the combustion chamber. In this embodiment, the grid **16** is preferably of rectangular cross-section so that the jets issuing from the holes in the lateral walls thereof strike against the lateral walls of the combustion chamber **17** of corresponding outline spaced therefrom.

The grid or grating shown in FIG. 6 is of planar form and comprises a part **18** whose holes are supplied directly by the gaseous mixture arriving at the burner and a central part **19** whose holes are supplied through a small chamber **20** in which the pressure is reduced through the loss of the charge occasioned by the passage of the mixture through one or more suitably calibrated orifices **21**. With this arrangement jets at normal speed are obtained on the one hand and, on the other, jets at reduced speed, from which is produced a flame which is more stable, thereby controlling more uniformly the ignition of the jets of normal speed. The position of the latter is such that eddies or vortices form in front of the combustion zone of the jets of reduced speed.

The arrangement of the planar grid according to FIG. 7 provides for obtaining effects analogous to those obtained with the preceding embodiment. It comprises one central part **22** whose holes are supplied directly and a peripheral part **23** whose holes are supplied by means of a chamber **24** at reduced pressure, communicating with the intake of the gaseous mixture through the calibrated orifices **25**.

The shapes of the grids may be modified without sacrificing the advantages of the invention. Thus, for example, it is not essential that grids **12, 13** and **14** in FIGS. 2 to 4 be surfaces of revolution. They may be of rectangular section to conform more closely to the rectangular inlet to the combustion chamber.

I claim:

1. In an apparatus for projecting molten filaments from a rotary centrifuge, an internal combustion burner for combustible gaseous mixtures comprising:

(a) a combustion chamber having an inlet opening in one wall thereof and an outlet opening in another wall thereof,

(b) an inlet conduit for said combustible gaseous mixtures connected to said inlet opening,

(c) an apertured grating in proximity to said inlet opening having a plurality of openings therein for permitting the passage of said combustible gaseous mixture from said inlet conduit into said combustion chamber,

(d) a second grating within said combustion chamber spaced from said first grating,

(e) said plurality of openings in said first grating being aligned to direct the incoming jets of combustible gases into mutually colliding relation, thereby reducing the kinetic energy of the incoming gaseous mixtures beyond said apertured grating and before they reach said second grating to enhance the stability and calorific power of the gaseous mixtures.

2. An apparatus as set forth in claim **1**, wherein the apertured grating comprises a hollow cylindrical portion with the openings in the lateral surface thereof aligned to direct the jets of combustible gaseous mixtures therethrough, into colliding relation in the interior of said cylindrical portion.

3. In an apparatus for projecting molten filaments from a rotary centrifuge, an internal combustion burner for combustible gaseous mixtures comprising:

(a) a combustion chamber having an inlet opening in one wall thereof and an outlet opening in another wall thereof,

(b) an inlet conduit for said combustible gaseous mixtures connected to said inlet opening,

(c) a multi-planar apertured grating in proximity to said inlet opening having a plurality of openings therein for permitting the passage of said combustible gaseous mixture from said inlet conduit into said combustion chamber,

(d) a second grating within said combustion chamber spaced from said first grating,

(e) said plurality of openings in said first-mentioned grating being aligned to direct the incoming jets of combustible gases against an impediment to their movement along their aligned directions, thereby reducing the kinetic energy of the incoming gaseous mixtures beyond said apertured grating and before they reach said second grating to enhance the stability and calorific power of the gaseous mixtures.

4. An apparatus as set forth in claim **3**, wherein said impediment comprises jets of combustible gases directed along axes in intersecting relation to the first-mentioned incoming jets of combustible gases.

5. An apparatus as set forth in claim **3**, wherein said apertured grating consists of a hollow body with an open end facing the inlet conduit with the aligned opening in the lateral wall thereof, and said impediment comprises the wall of said combustion chamber against which the incoming jets of combustion gases are directed to reduce the kinetic energy therein.

6. An apparatus as set forth in claim **5**, wherein said apertured grating consists of a hollow body of rectangular cross-sections with the openings in the multi-planar walls thereof adapted to direct the jets of combustible gases against the walls of the combustion chamber of corresponding outline, spaced therefrom.

7. An apparatus as set forth in claim **1** wherein the apertured grating is V-shaped so that the openings in one of the divergent arms are inclined relative to the openings in the other whereby the jets of the combustible gaseous mixtures issuing therefrom are directed into colliding relation with each other.

8. An apparatus as set forth in claim **1** wherein the apertured grating includes a hollow conical portion with the apex at the forepart thereof, and the openings in the lateral wall thereof are inclined to the axis of the conical portion whereby the jets of combustible gaseous mixtures issuing therefrom are directed into colliding relation in the interior of the conical portion.

9. An apparatus as set forth in claim **8** wherein the apertured grating comprises a hollow cylindrical portion

extending rearwardly from the base of said conical portion with openings in the lateral surface thereof.

10. An apparatus as set forth in claim **2** including a flaring conical guide extending from the forepart of said cylindrical portion having a large opening, and said conical guide having a small opening at its apex to initiate a secondary flame for the ignition of the gaseous mixtures in the interior of said cylindrical portion.

11. An apparatus as set forth in claim **7** including a conically shaped diffuser in advance of the V-shaped grating to direct more effectively the incoming combustible gaseous mixtures towards the openings in said apertured grating.

References Cited

UNITED STATES PATENTS

2,736,369	2/1956	Hall	431—158
3,251,666	5/1966	Levecque et al.	65—14
3,320,999	5/1967	Stalego	431—158
3,322,180	5/1967	Perry	431—158

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