June 24, 1969 D. J. WYROUGH 3,451,365

CLOSURE ASSEMBLY FOR HEATED CHAMBER

Filed March 18, 1968

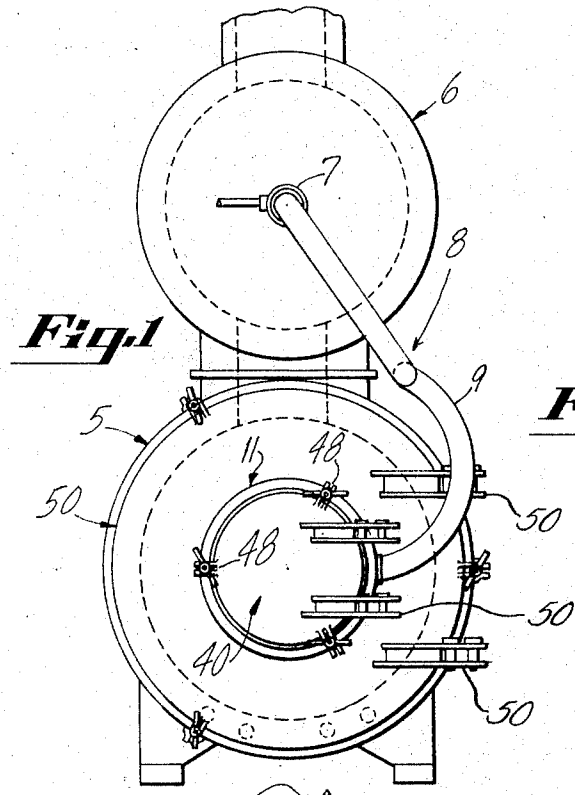

Fig. 1

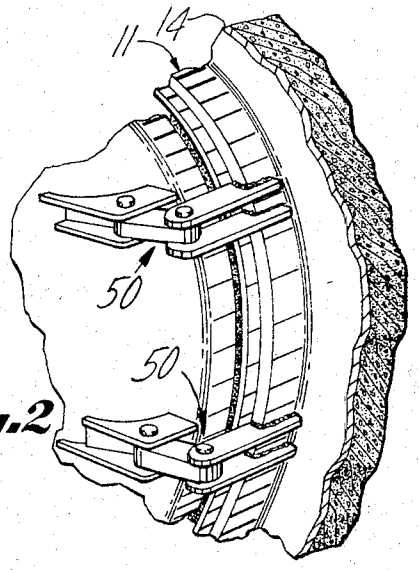

Fig. 2

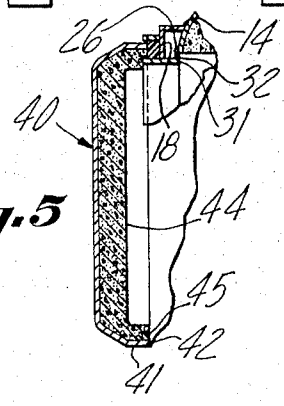

Fig. 5

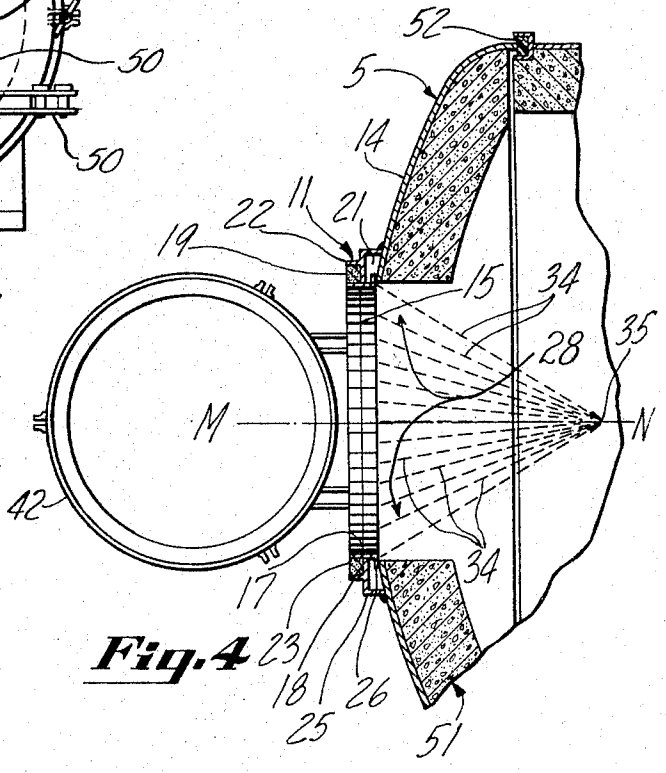

Fig. 4

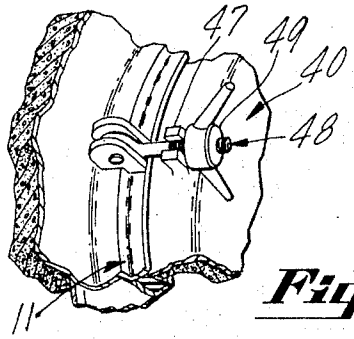

Fig. 3

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United States Patent Office 3,451,365
Patented June 24, 1969

3,451,365

CLOSURE ASSEMBLY FOR HEATED CHAMBER

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Filed Mar. 18, 1968, Ser. No. 713,667
Int. Cl. F23m 7/00
U.S. Cl. 110—175 4 Claims

ABSTRACT OF THE DISCLOSURE

A closure assembly, especially a door frame, for an incinerator or other chamber subject to high interior temperatures and higher than atmospheric pressures. The frame forms a space from which air is discharged into the heated chamber in the form of a curtain of desired shape, and the front face of the frame is formed at least partly of a resilient material which would otherwise be subject to degeneration by heat but is protected from heat by air cooling of the frame.

The operation of incinerators, furnaces, and the like under draft induced by pressure entails the use of closure equipment which enables tight closing of the combustion chamber on which it is provided. For example, the escape of hot gases from an incinerator through a doorway causes leakage which not only defeats the air anti-pollution function of such burning equipment but causes local overheating and, hence, accelerated deterioration of parts of the closure structure or other parts of the burning equipment appurtenant thereto. Sealing of closing devices in the absence of heat is readily achieved by incorporating resilient seal strips or molding between relatively movable elements of closure mechanism. In general, resilient materials that are suitable for sealing closures decompose or at least deteriorate at an impractical rate in the presence of temperature such as is encountered in furnace or incinerator structure unless protected in some manner.

A important object of this invention is to provide furnace or incinerator structure, particularly door frame construction, affording a tight seal which may be achieved in the use of a normally heat-degradable resilient material incorporated, for example, within a door frame.

Another object ancillary to the foregoing object is to provide a door frame for a combustion chamber which may function as an air dispenser in the formation of an air curtain capable of preventing a discharge of hot gases when the combustion chamber is operated at pressures above atmospheric pressure.

Still another object is to provide a door and door frame combination wherein both are designed to inhibit the transfer of heat to an extent that will protect a degradable sealing material supported in the frame at the interface of the door and the frame.

These objects are achieved primarily in a door frame intended for use as a portion of a closure for a chamber operated at a temperature similar to those obtained in combustion chambers.

In the most common application of the invention contemplated, the door frame (1) circulates and dispenses air to an extent that results in cooling of the frame sufficient to protect a heat degradable sealant material supported therein against heat deterioration and the metal of the frame against warping, (2) provides a continuous supply of air for combustion, and (3) forms an air curtain inward of a chamber on which the frame is mounted resisting any outward flow of gases from the chamber. The general configuration of the door frame is circumambient, e.g., annular, with respect to a main opening

and its axis. The wall structure of the frame is such as to define a gasket-receiving recess which opens in the front face of the frame substantially along the full circumambient length of the frame, and an air-receiving space along the inner or rear face of the frame. The wall structure extends in an axial direction sufficiently to provide the axial extent of both the recess and the air space and comprises an axially intermediate partition for separating the recess and the air space and further defines an inlet port adapted for being connected with an air supply, and a plurality of perforations which extend through a wall portion from the air-receiving space to open along an inner face portion of the frame. The perforations are aligned for directing air lengthwise of the axis in a desired air curtain pattern, such as a cone.

In the drawing with respect to which the invention is described below:

FIG. 1 is an end elevation, minor portions omitted, of an incinerator on which the closure apparatus of the present invention is mounted;

FIG. 2 is a fragmentary perspective view illustrating primarily hinge construction for supporting a door on a frame therefor according to the invention;

FIG. 3 is a fragmentary perspective view of hinge bolt and handle nut mechanism for obtaining full engagement of a door with a door frame;

FIG. 4 is a fragmentary elevation in section of the lower chamber of the apparatus shown in FIG. 1 with a door thereto ajar; and

FIG. 5 is a fragmentary view in section showing primarily the door of FIG. 4 in diametral section and a fragment of the door frame in engaged relation therewith.

FIG. 1 is generally illustrative of a pressurized gas incinerator in which the invention, i.e., a sealed closure mechanism, is incorporated. In principle, the trash is consumed in a lower chamber **5** and any unburnt gases discharged from chamber **5** are consumed in the upper chamber **6**, if necessary, in an atmosphere of excess air and flame issuing from an auxiliary fuel burner **7** receiving air through a duct system **8** having a supply tube **9** connected also with a door frame **11**.

The door frame **11**, as shown in FIG. 4 is attached to the outer shell **14** of the chamber **5**. In the embodiment herein shown, the frame is of annular configuration with all portions of the wall elements thereof conforming concentrically to the central opening **15** therethrough and an axis M–N. For example, the frame comprises in part a wall portion **17** in the form of a band or collar, and partition **18** attached to a radially outer surface of the collar **17**. The partition extends radially outward from an axially intermediate portion of the collar to divide a recess **19** from an air-receiving space **21**. Cooperating with the band **17** and the partition **18** in forming the recess **19** is an axially extending web **22** which, in normal use, extends to the same vertical plane as that containing the outer edge of the band **17**. Received in the recess **19** is a gasket of any rubber-like resilient material capable of withstanding temperatures to about 300° F. The axially facing edges of the web **22** and a band **17** and the exposed surface of the gasket **23** provide the front or outward face of the door frame.

The air-receiving space **21** is also partly defined by partition **18**, an axially inward portion of the band **17**, a band shaped web **25** joined continuously with an outer end of the circular partition **18**, and an annular flange **26** joined continuously with an axially inner edge portion of band **17**. The flange **26** extends radially from the band **17** into overlapping relation with a circular portion the outer shell **14**, usually of steel, of the chamber **5** forming an opening through the shell as a portion of the charging apparatus **28** through the end wall portion or end door **51** of the chamber **5**. The flange **26** is of narrow width

in a radial direction to an extent allowing it merely to overlap the shell **14**. Optionally, it may be extended and continuously joined with the band-like web **25** to completely enclose the air-receiving space **21** independently of the chamber shell **14**. However, in the embodiment shown, a surface of the shell **14** between the web **25** and the edge of the flange **26** cooperates with other wall portions of the frame **11** to enclose the air space **21**. Obviously, as FIG. 4 shows, the door frame **11** is constructed and arranged to fit along, and be attached to, the outer surface of the shell **14** without any portion of the frame necessarily having to extend inwardly of the aperture **28**.

As an important feature of the invention, the overlapping relationship of the shell **14** and the flange **26** is not so complete as to completely cover a surface **31** of the flange which faces axially inwardly of the chamber **5**. The portion of the flange defining said exposed portion of the surface **31** has a plurality of perforations **32** distributed generally uniformly along the entire circumference of the exposed face area of the flange **26**. The apertures **31** are aligned along paths **34** extending lengthwise of the axis M–N and inwardly of the chamber **5** away from the side of the frame. The paths may converge, as shown, approximately at a point **35**. The apertures **31** are thus arranged to cause air provided in the air-receiving space **21** under pressure to form a conically shaped air curtain within the chamber **5**. If the door is opened as during loading of the incinerator, such a curtain effectively counteracts any tendency of gas, fumes, smoke, etc. to be forced outwardly through the main opening **15** under a condition of above atmospheric pressure within the chamber **5**.

In the operation of a heat-producing device such as the incinerator illustrated, it is necessary to maintain the temperature of the frame below about 300 to 400° F. for most materials which are used in the recess **19**. Cooling of the frame, hence, will be dependent to a considerable degree upon the amount of air supplied to the air-receiving space **21** and the velocity of the air achieved in circulating within this space. The velocity of air discharged therefrom and the related capacity of the air curtain to resist passage of gases outwardly of the opening **15** is dependent, of course, upon the number and size of the perforations **32** and the pressure of air developed within the air-receiving space **21**. Adjustment of all these factors is a matter of adaptation to the conditions under which the heating device incorporating the invention is operated.

The success in the use of the door frame **11** is dependent to a substantial extent upon the design of a door **40** connected thereto by hinges or other devices enabling the door to be seated properly on the gasket **23** when sealed closure of a heated chamber, such as chamber **5**, is to be effected. As shown, the door **40** is preferably of concavo-convex configuration and comprises a shell **41** usually of steel providing an annular end surface **42** properly diametrically related to the outer and inner diameters of the gasket **23**. Since the door is subject to intense radiation from burning material, it is essential in most instances that the shell **41** be lined with a thermally resistant lining constructed to a substantial thickness, e.g., one or two inches, from a material such as one of the commercially available insulating cements.

In the embodiments shown, the lining **44** follows generally the inner contour of the shell **41** but is adjacent the end surface **42** of the shell in order that the liner may form an end surface **45** which substantially covers and shields, if not actually engages, the front face surface of the gasket **23**. Preferably the door liner covers the end surface of band **17** of the frame. If desired, the liner may be constructed so that it protrudes in an axial direction toward the frame slightly beyond the end surface **42** of the shell in order to interrupt direct contact of the door shell **41** with the gasket **23**.

Continuous engagement of the end surfaces **42** and **45** of the door **40** with the gasket **23** may be obtained by an arrangement such as shown wherein three eye bolt and handle-nut assemblies **48** in hinged relation with the frame **11** are received between pairs of lugs **47** on the door in the manner shown in FIG. 3. The nuts **49** of the assemblies may be adjusted to secure the desired engagement between the door and the gasket **23**. FIG. 2 illustrates a type of link hinge **50** of known design which provides support for the door **40** in a manner facilitating the use of the present invention. That is to say, the hinges enable all portions of the periphery of the door to be adjusted with respect to the door frame. As shown in FIG. 1, the door **40** is supported by the hinges **50** on a larger door **51** which constitutes an apertured end-wall portion of the chamber **5** engaged with the cylindrical wall of the chamber **5** by direct contact with a circular gasket **52** accommodated within a channel portion of the cylindrical wall along its outer diameter.

A principal use of the closure apparatus obvious from the above description of the invention is in conjunction with any chamber operated at elevated temperatures wherein a constant supply of air at a substantially lower temperature may be utilized to promote the essential purpose of the chamber and also to prevent the door frame, particularly a gasket material included therein, from being heated to destructive temperatures. The invention is actually embodied in certain types of incinerators and thus has been described as a component of one type of incinerators but without any limitation intended with respect to other types of heated equipment.

What is claimed is:

1. A door frame for a normally sealed combustion chamber of which a wall portion defines an opening closable by said frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

wall means defining a recess opening in said front face and at least partially defining an air-receiving space along the axially inward side of the frame, said wall means extending in circumambient relation with a main opening of the frame and an axis therefor, and including an axially intermediate partition coextensive with, and separating said recess and said space;

said wall means also defining an inlet port for said space, and a perforated wall portion extending circumambiently relative to said axis along an inner face portion of the wall means, any perforations of said wall portion being aligned for directing air from said space in a desired pattern lengthwise of said axis;

and a resilient material received in, and filling, said recess to an extent adapting it to engage a door cooperating therewith to seal said aperture.

2. A door frame for a normally sealed combustion chamber which has a wall portion defining an opening closable by said frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

an inner collar in generally circumambient relation with a central axis and a main opening of the frame;

a web in continuous connection and circumambient relation with an axially inward portion of the collar, said web extending outwardly from the collar and said axis, said web having perforations spaced substantially uniformly around the collar and adapted to direct air in a direction lengthwise of said axis;

a partition in continuous connection, and circumambient relation with, an axially intermediate portion of the collar, said web extending radially outwardly from the collar and said axis in axially spaced relation with the web, said collar, said web, and said partition at least partially defining an air-receiving space;

first wall means extending around the collar in spaced relation therewith and in continuous connection with said partition, said wall means extending axially in

a direction away from said front face and relative to the collar and the web to further define said air space;

said wall means adapting the frame to be joined to said chamber wall portion with said air space completely enclosed except for said perforations and an air inlet;

second wall means joined to said wall in spaced relation with said collar and extending axially toward said front face to define in cooperation with the collar and the bulkhead wall a recess in circumambient relation with the axis; and

a resilient material received in said recess along the full circuit thereof and having a front surface substantially providing said front face.

3. A closure for a normally sealed combustion chamber comprising a door frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

wall means defining a recess which opens in said front face and at least partially defining an air-receiving space within the axially inward side of the frame, said wall means extending in circumambient relation with a main opening of the frame and an axis therefor, and including an axially intermediate partition coextensive with, and separating said recess and said space;

said wall means also defining an inlet port for said space, and a plurality of perforations distributed in circumambient relation to said axis along an inward facing portion of the wall means, said perforations being aligned for directing air from said space in a desired pattern lengthwise of said axis; and

a resilient material substantially filling said recess;

said door being of concavo-convex configuration defining a peripheral inturned edge portion adapted to continuously engage said resilient material.

4. The closure of claim 3 wherein:

said door comprises an outer shell and a liner of heat-insulating material covering the inner concave side of the shell, said liner overlapping the radially inward portion of said wall means forming said recess.

References Cited

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KENNETH W. SPRAGUE, *Primary Examiner.*

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,451,365 Dated June 24, 1969

Inventor(s) D. J. Wyrough

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

Delete matter from Column 4, line 30 through Column 4, line 51, and substitute therefor:

1. A door frame for a normally sealed combustion chamber of which a wall portion having an exterior surface and defines an aperture closable by said frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

wall means defining a recess opening in said front face and at least partially defining an air-receiving space along the axially inward side of the frame, said wall means extending in circumambient relation with a main opening of the frame and an axis therefor and in an axial direction to establish the axial extent of said recess and said space, and including an axially intermediate partition coextensive with, and separating, said recess and said space;

said wall means also defining an inlet port for said space, and a perforated wall portion extending circumambiently relative to said axis along an inner face portion of the wall means, any perforations of said wall portion being aligned for directing air from said space in a desired pattern lengthwise of said axis; said frame being constructed and arranged along the axially inward side of said wall means defining said space to fit, and attach to, the exterior surface of the chamber wall portion without any portion of said frame necessarily extending into said aperture; and

a resilient material received in, and filling, said recess to an extent adapting it to engage a door cooperating therewith to seal said aperture.

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,451,365 Dated June 24, 1969

Inventor(s) D. J. Wyrough

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

Delete matter from Column 4, line 52 through Column 5, line 6 and substitute therefor:

2. A door frame for a normally sealed combustion chamber which has a wall portion defining an aperture closable by said frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

an inner collar in generally circumambient relation with a central axis and a main opening of the frame;

a web in continuous connection and circumambient relation with an axially inward portion of the collar, said web extending outwardly from the collar and said axis, said web having perforations spaced substantially uniformly around the collar and adapted to direct air in a direction lengthwise of said axis;

a partition in continuous connection, and circumambient relation with, an axially intermediate portion of the collar, said web extending radially outwardly from the collar and said axis in axially spaced relation with the partition, said collar, said web, and said partition at least partially defining an air-receiving space;

first wall means extending around the collar in spaced relation therewith and in continuous connection with said partition, said wall means extending axially in a direction away from said front face and relative to the collar and the web to further define said air space;

said wall means adapting the frame to be joined said chamber wall portion with said air space completely enclosed except for said perforations and an air inlet;

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,451,365 Dated June 24, 1969

Inventor(s) D. J. Wyrough

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

Delete matter from Column 5, line 7 through Column 6, line 6 and substitute therefor:

second wall means joined to said partition in spaced relation with said collar and extending axially toward said front face to define in cooperation with the collar and the partition a recess in circumambient relation with the axis; said frame being constructed and arranged to fit, and attach to, the exterior surface of said wall portion without any portion of the frame necessarily extending into said aperture; and

a resilient material received in said recess along the full circuit thereof and having a front surface substantially providing said front face.

3. A closure for a normally sealed combustion chamber comprising a door frame and a door peripherally conforming to a front face of the frame adapted to face outwardly from the chamber, said frame comprising:

wall means defining a recess which opens in said front face and at least partially defining an air-receiving space within the axially inward side of the frame, said wall means extending in circumambient relation with a main opening of the frame and an axis therefor, and including an axially intermediate partition coextensive with and separating said recess and said space;

said wall means also defining an inlet port for said space, and a plurality of perforations distributed in circumambient relation to said axis along an inward facing portion of the wall means, said perforations being aligned for directing air from said space in a desired pattern lengthwise of said axis; said frame being constructed and arranged to fit,

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,451,365 Dated June 24, 1969

Inventor(s) D. J. Wyrough

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

Delete matter from Column 6, line 7 through line 10 and substitute therefor:

and attach to, the exterior surface of said chamber wall portion without any portion of the frame necessarily extending into said aperture; and

a resilient material substantially filling said recess;

said door being of concavo-convex configuration defining a peripheral inturned edge portion adapted to continuously engage said resilient material.

SIGNED
SEALED
NOV 3 1970

(SEAL)
Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents