United States Patent [19]

Lawrence

[11] **3,752,091**

[45] **Aug. 14, 1973**

[54] **SECTIONALIZED STACK**

[76] Inventor: **Eillen M. Lawrence,** 22 Glenwood Rd., Roslyn, N.Y. 11576

[22] Filed: **May 10, 1972**

[21] Appl. No.: **252,083**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 27,355, April 10, 1970, Pat. No. 3,669,042.

[52] **U.S. Cl.** **110/184,** 98/48, 98/60

[51] **Int. Cl.** **F23j 11/00**

[58] **Field of Search** 110/184; 98/46, 60; 126/307

[56] **References Cited**

UNITED STATES PATENTS

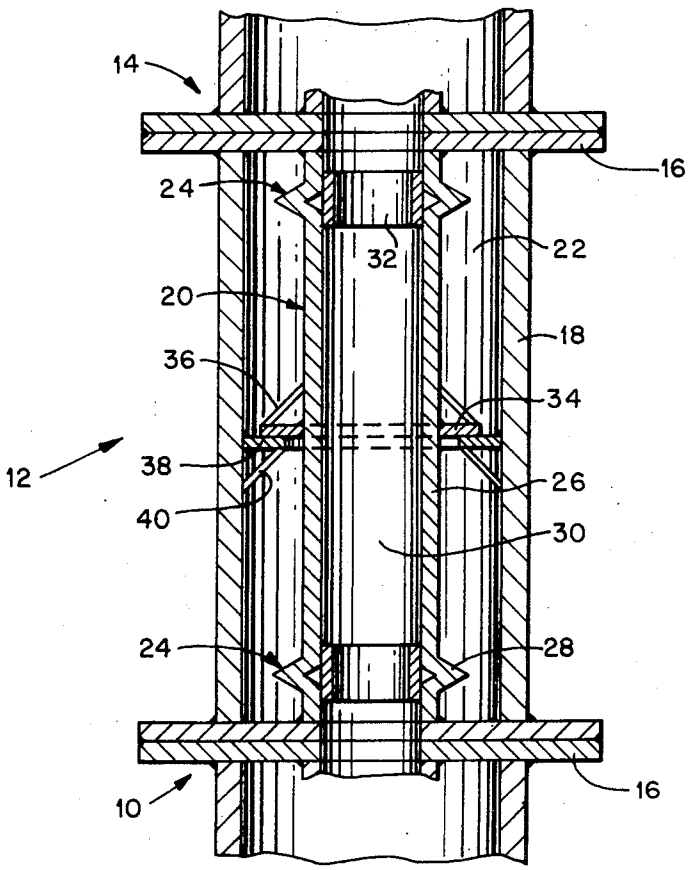
3,363,591 1/1968 Lawrence 110/184

Primary Examiner—Kenneth W. Sprague
Assistant Examiner—James C. Yeung
Attorney—Kurt Kelman, Hans Berman et al.

[57] **ABSTRACT**

A sectionalized stack in which each vertical section has outer and inner upright walls and annular, horizontal flanges connecting the upper and lower ends of the walls to bound an air-filled, insulating chamber is provided with two accordion-like circumferential folds in the inner wall adjacent the respective flanges. The inner wall has a main portion of uniform cross section connecting the folds. The folds being somewhat resilient, the connecting portion can expand vertically and horizontally at a rate different from the rate of expansion of the outer wall when very hot gases rise in the conduit bounded by the inner wall. Distortion of the folds by the weight of the connecting portion is prevented by transferring most of the weight of the connecting portion to the outer wall by means of slidably engaged abutments on the two walls in the insulating chamber.

5 Claims, 2 Drawing Figures



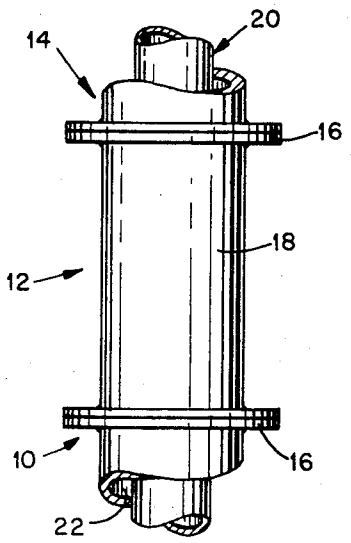

14
20
16
18
12
10
16
22

FIG. 1

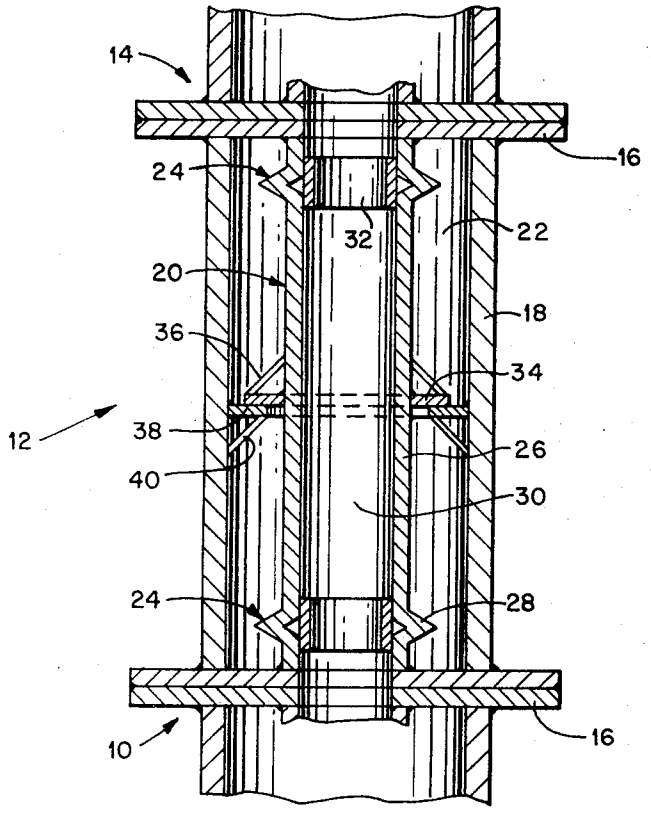

14
16
24
32
22
20
18
36
34
12
38
26
40
30
24
28
10
16

FIG. 2

SECTIONALIZED STACK

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of the copending application Ser. No. 27,355, filed on Apr. 10, 1970 now U.S. Pat. No. 3,669,042.

BACKGROUND OF THE INVENTION

The copending aplication discloses a sectionalized smoke stack having an upright, longitudinal axis in which each axial section has an outer, tubular, upright wall, an inner, tubular, upright wall, an upper annular flange, and a lower annular flange. The flanges connect the walls, and the flanges and walls jointly bound a chamber normally filled with air which thermally insulates the exposed outer surface of the outer wall from the heat of gases rising in the conduit bounded by the inner wall.

To compensate for the difference in vertical, thermal expansion between the inner and outer walls, the inner wall is provided with at least one accordeon-like, circumferential fold which is somewhat resilient and absorbs the difference in length changes of the inner and outer walls. When the stack gases are very much hotter than the ambient atmosphere, the difference in radial expansion of the two walls cannot be disregarded, and it was proposed in the earlier application to provide the flanges with accordeon-like folds extending in a closed loop about the stack axis between the two walls.

SUMMARY OF THE INVENTION

It has now been found that differential thermal expansion between the outer and inner walls in a direction transverse to the stack axis can be compensated for adequately, and a stack of greater mechanical strength can be obtained without increase in the weight of the same, by providing the inner wall with two circumferential, accordeon-like folds respectively adjacent the upper and lower flanges, and by directly transmitting at least a portion of the weight of the inner wall portion connecting the two folds to the outer wall so as to hold deformation of the resilient folds by the weight of the connecting portion to a minimum.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary, elevational view of a sectionalized stack of the invention; and

FIG. 2 shows a portion of the device of FIG. 1 in elevational section on its upright, longitudinal axis.

DETAILED DESCRIPTION

Referring initially to FIG. 1, there are seen three vertically consecutive, identical sections **10, 12, 14** of a stack of the invention essentially consisting of welded steel plates. The several sections are connected to each other by axially terminal flanges **16**, the upper flange of each section being fixedly fastened to the lower flange of the next higher section, as by welding.

Each section has a tubular outer wall **18** and a tubular inner wall **20**. As is better seen in FIG. **2**, the flanges **16** are annular, horizontal discs which connect the inner and outer walls **18, 20** so as to define therewith a sealed chamber **22** in each section.

An accordeon-like circumferential fold **24** is formed in the inner wall **20** closely adjacent each of the associated flanges **16**, and the two folds **24** are connected by a portion **26** of the wall **20** which is of uniform cross

section and of an axial length greater than one half of the total axial height of the section. Each fold **24** constitutes an annular rib **28** projecting from the inner wall **20** into the chamber **22**, and an annular groove open toward the central conduit **30** defined by the inner wall and equal in cross section to the opening in each flange **16**. The open side of the groove is covered by a curtain wall **32** fastened to the inner wall **20** between the fold and the adjacent flange **16** and freely slidable on the connecting wall portion **26**. The curtain wall **32** prevents the accumulation in the fold **24** of particulate matter suspended in the risng gas and minimizes turbulence in the gas that would be caused by an annular gap in the inner wall surface.

As is shown in FIG. **2**, the connecting portion **26** of the inner wall **20** is provided with a fixedly attached, annular disc **34** projecting horizontally into the chamber **22**. It is backed by struts **36** distributed about the circumference of the disc **34** and extending obliquely from the outer edge of the disc **34** to a part of the connecting wall portion **26** above the disc **34**. The outer wall **18** is provided with a corresponding, fixedly attached, annular, horizontal disc **38** projecting into the chamber **22** and backed by struts **40** extending from the inner circumference of the disc **38** obliquely downward toward the outer wall **18** to which they are fixedly fastened.

The dimensions of the discs **34, 38** are such that the outer rim of the disc **34** movably abuts from above against the inner rim of the disc **38**, thereby transmitting a major portion of the weight of the inner wall portion **26** to the outer wall **18**.

When hot gases rise in the central conduit **30** of the illustrated stack section, the inner wall portion **26** becomes much hotter than the outer wall **18** which is cooled by ambient air. The inner wall portion **26** also becomes hotter than the flanges **16** which transmit some of their heat by conduction to the outer wall **18**. The inner wall portion **26** may expand in an axial and radial direction by causing resilient deformation of the folds **24**, yet, the folds do not have to support much of the weight of the wall portion **26** which is transferred to the outer wall by the abuttingly engaged discs **34, 38**. The discs are normally held in vertical abutting engagement by the weight of the wall portion **26**, but are freely movable relative to each other in a horizontal direction.

Abutments which do not extend about the vertical stack axis in a closed loop may be substitued for the illustrated discs **34, 38**, but the latter are preferred where applicable because of the uniform distribution of the weight of the wall portion **26** about the circumference of the wall **18**, and because of the strengthening effect which the discs have on the respective walls **18, 20**. The amount of heat transferred by the discs **34, 38** from the inner to the outer wall is insignificant because of the relatively small thickness of the discs. Moreover, the flow of heat is impeded at the abuttingly engaged faces of the discs. If necessary, however, a layer of thermal insulating material may be provided between these faces.

The tubular walls **18, 20** described and illustrated are of circular cross section, but one or both walls may be of angular cross section, and the flanges and abutment discs modified accordingly. A single, tubular, outer wall may envelop more than one tubular inner wall equipped with two accordeon-like folds in the manner

illustrated in FIG. 2, and the supporting elements transferring the weight of the connecting portion of each inner tube to the common outer tube are modified in the manner described above.

Other modifications and variations of the illustrated embodiment of the invention will readily suggest themselves to those skilled in the art, and it should be understood that, within the scope and spirit of the appended claims, this invention may be practiced otherwise than as specifically disclosed.

What is claimed is:

1. A stack for the conveyance of hot gases comprising, in combination:

a. a plurality of sections having each a vertical axis,

1. each section having an outer, upright, axial wall, an inner, upright, axial wall, an upper annular flange, and a lower annular flange, said flanges connecting said walls transversely to said axis, said walls and flanges jointly bounding a chamber therebetween, and said inner wall bounding a conduit alignedly communicating with respective conduits in other sections,

2. each of said inner walls being formed with two resiliently deformable accordeon-like folds axially spaced from each other and respectively adjacent said upper and lower flanges, said folds permitting thermal expansion and contraction of said inner wall at a rate different from the rate of expansion and contraction of said outer wall,

3. a portion of said inner wall axially connecting said two spaced folds;

b. supporting means in each of said plurality of sections for directly transmitting at least a major portion of the weight of said connecting portion of the inner wall to said outer wall; and

c. fastening means fixedly fastening respective flanges of adjacent sections to each other.

2. A stack as set forth in claim 1, wherein said supporting means include a first abutment member fixedly fastened to said connecting portion of said inner wall in said chamber, and a second abutment member fixedly fastened to said outer wall in said chamber and engaging said first abutment member for limiting downward movement of said connecting portion while permitting relative horizontal movement of said connecting portion and of said outer wall.

3. A stack as set forth in claim 2, wherein said abutment members are annular and substantially disc-shaped in respective planes transverse to said axis.

4. A stack as set forth in claim 3, wherein said connecting portion is of substantially uniform cross section from one of said folds to the other fold.

5. A stack as set forth in claim 4, wherein the axial length of said connecting portion is greater than one half the total axial height of said section.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,752,091 Dated August 14, 1973

Inventor(s) EILEEN M. LAWRENCE

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

In the heading, line 767, change "Eillen" to -- Eileen --

Signed and sealed this 20th day of November 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

RENE D. TEGTMEYER
Acting Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.