Jan. 6, 1970 R. E. LAWRENCE 3,487,795

SECTIONALIZED EXPANSIBLE SMOKESTACK

Filed April 16, 1968 6 Sheets-Sheet 1

Fig. 8

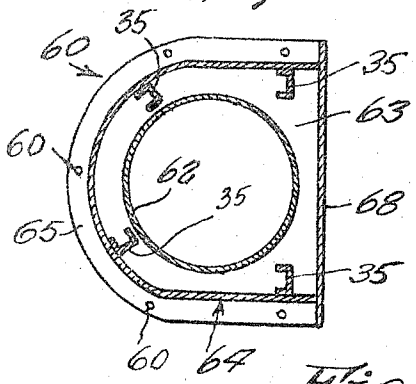


Fig. 9

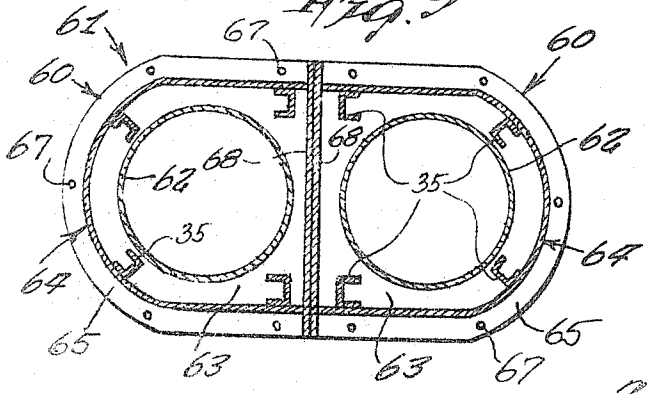


Fig. 2

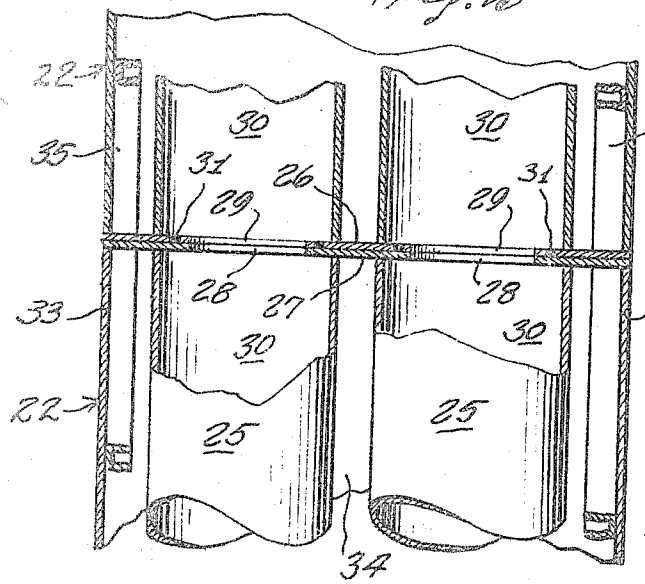
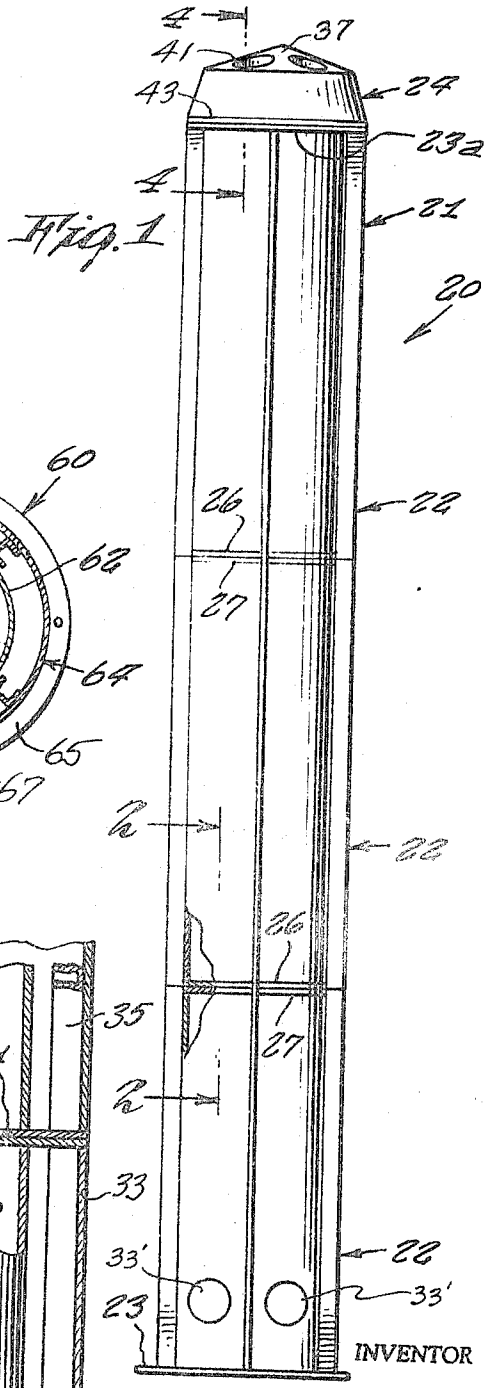


Fig. 1



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SECTIONALIZED EXPANSIBLE SMOKESTACK

Filed April 16, 1968 6 Sheets-Sheet 2

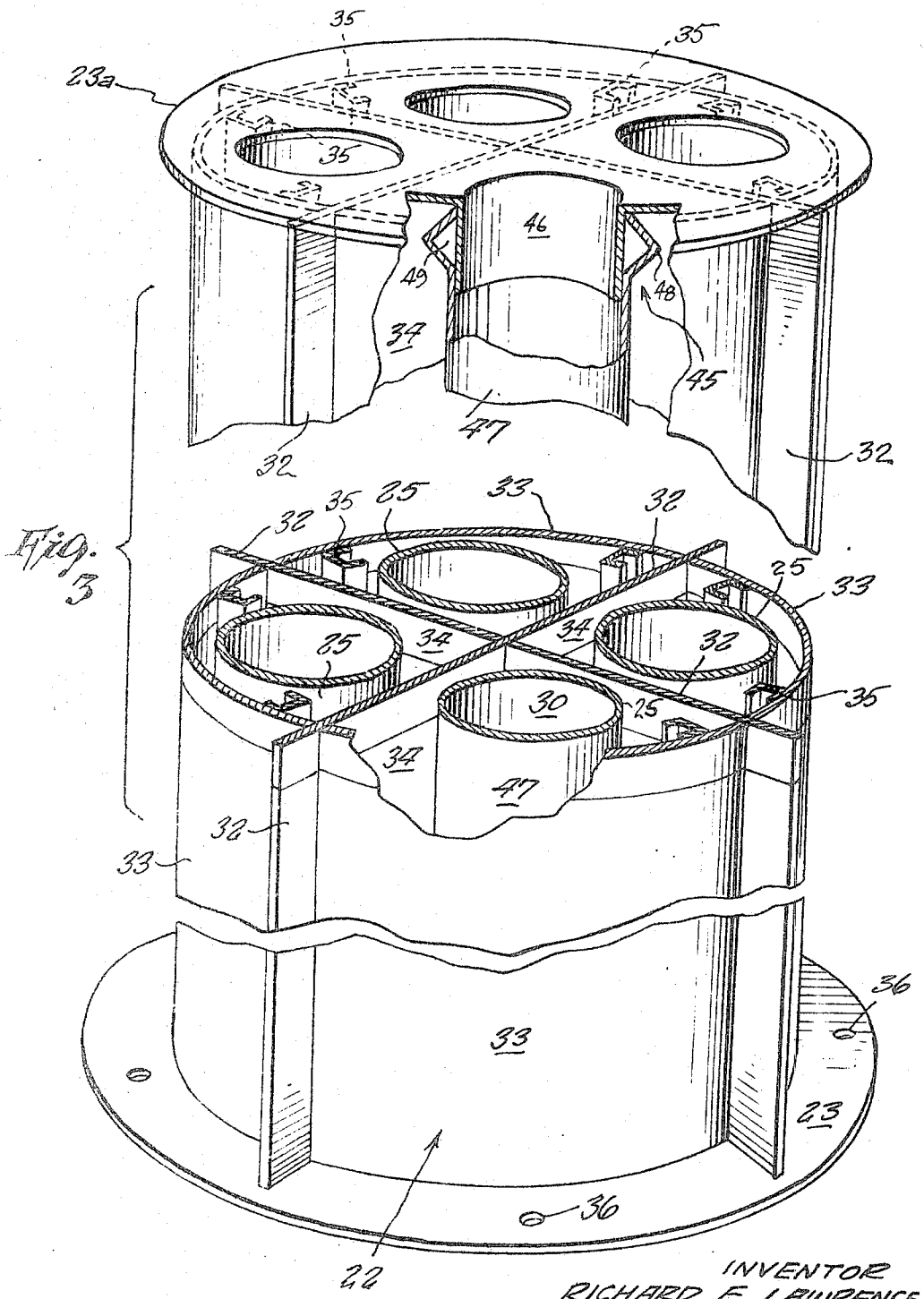


Fig. 3

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SECTIONALIZED EXPANSIBLE SMOKESTACK

Filed April 16, 1968 6 Sheets-Sheet 3

Fig. 1a

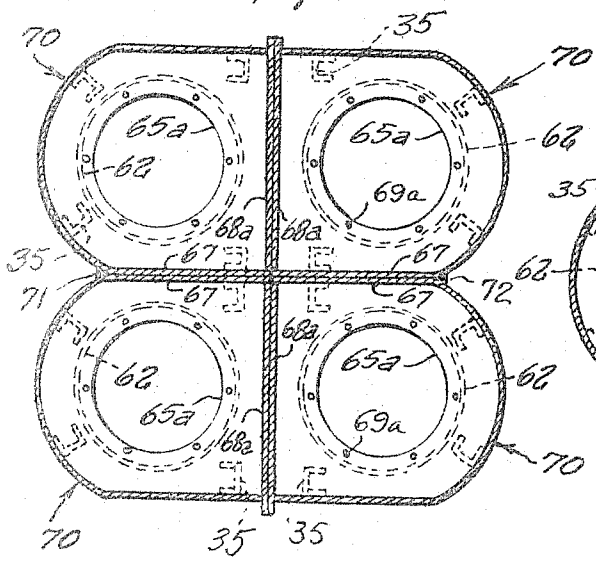


Fig. 11

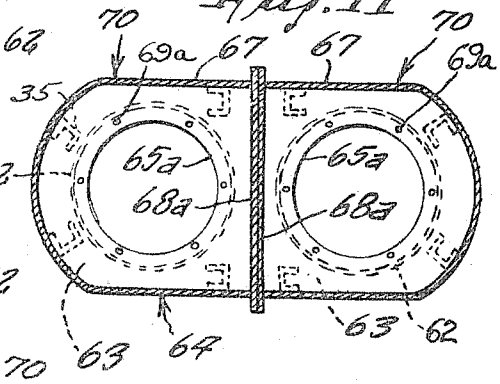
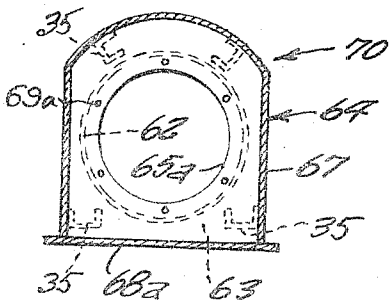


Fig. 10



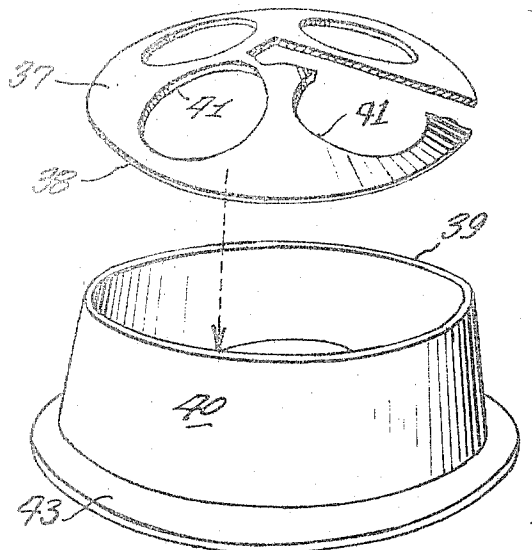
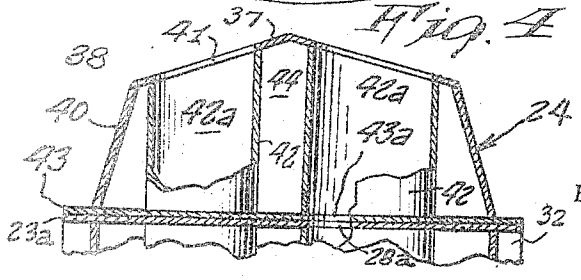


Fig. 5

Fig. 4



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SECTIONALIZED EXPANSIBLE SMOKESTACK

Filed April 16, 1968 6 Sheets-Sheet 4

Fig. 6

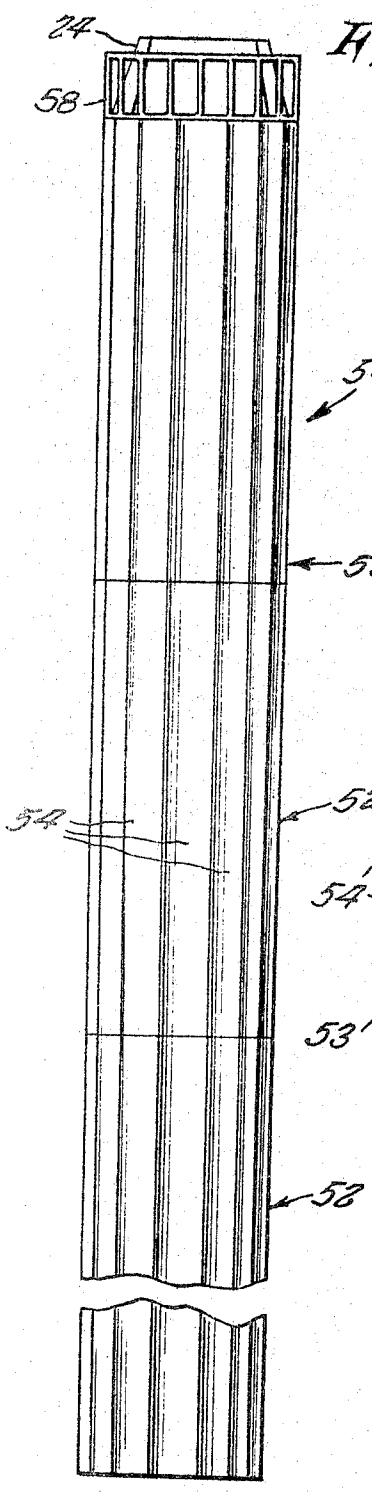
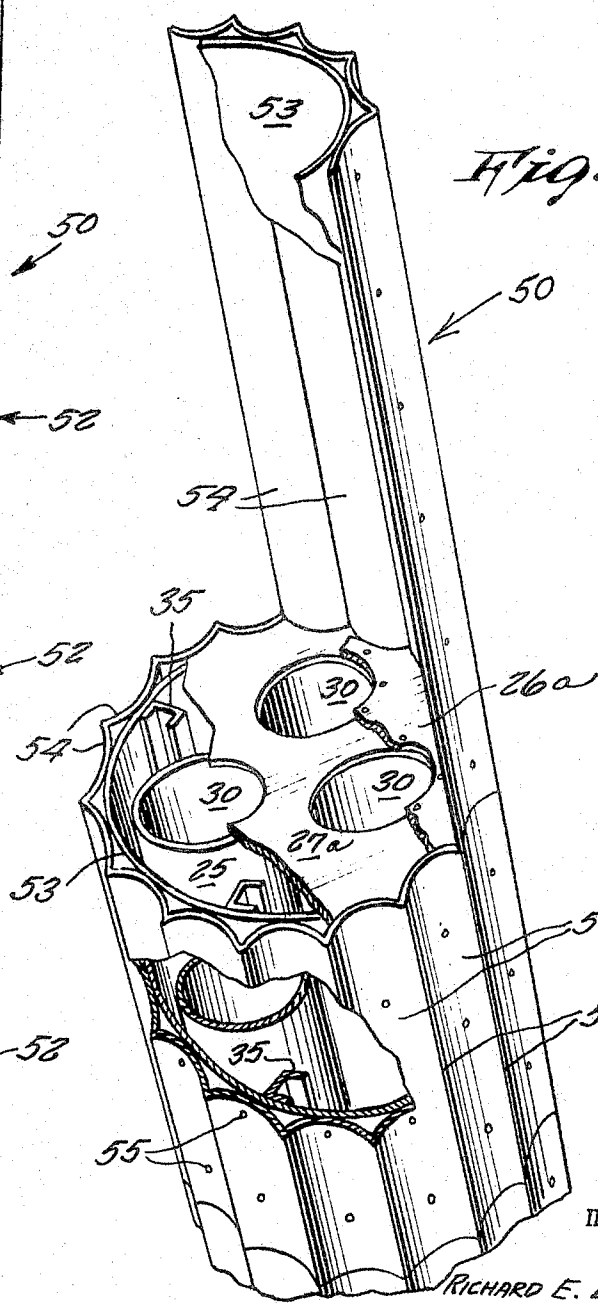


Fig. 7

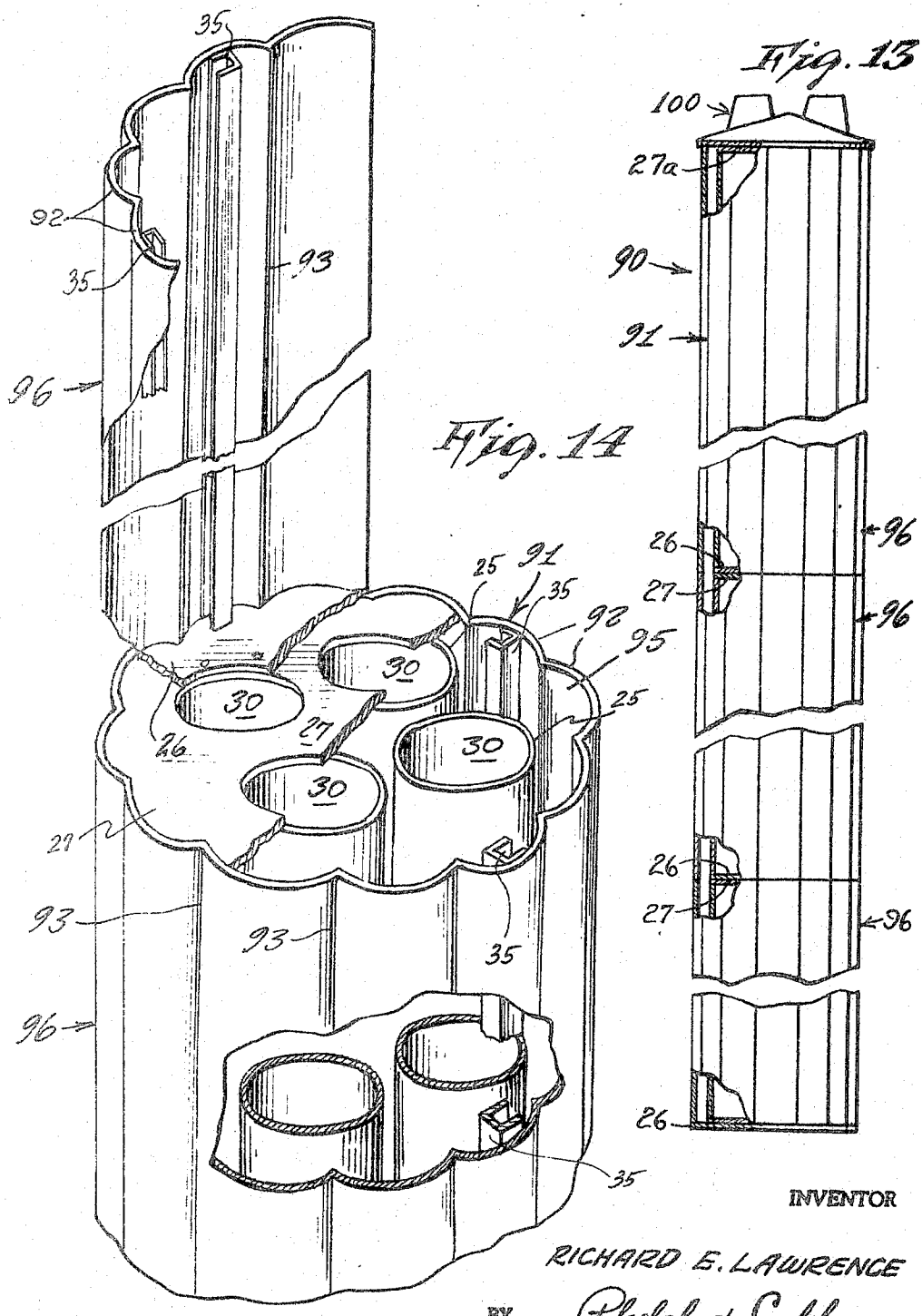


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SECTIONALIZED EXPANSIBLE SMOKESTACK

Filed April 16, 1968

6 Sheets-Sheet 6

Fig. 15

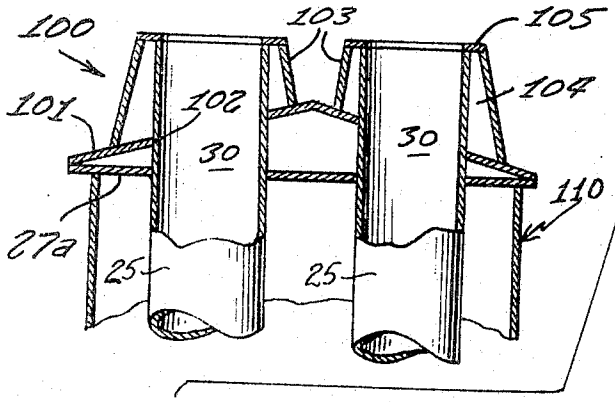
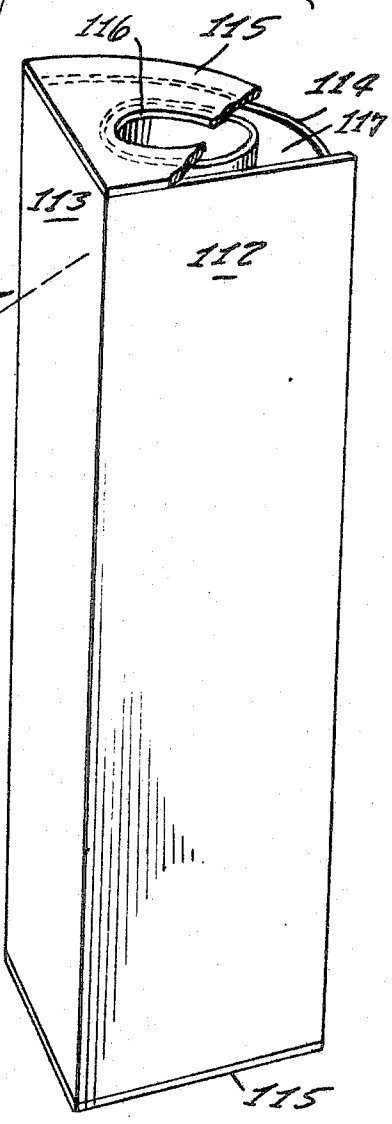
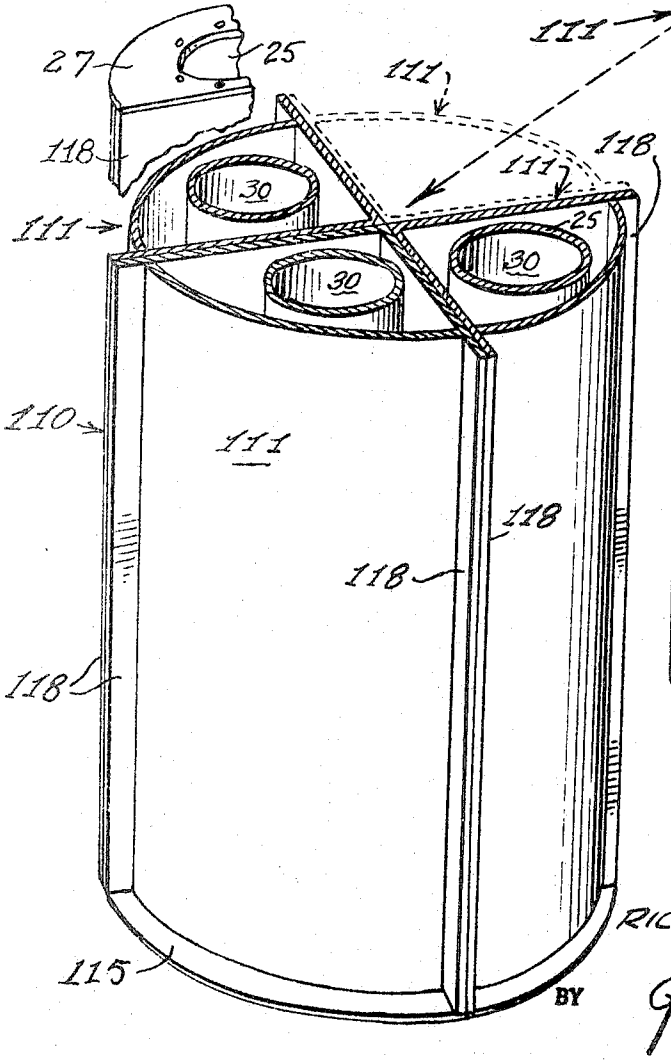


Fig. 16





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United States Patent Office 3,487,795
Patented Jan. 6, 1970

3,487,795

SECTIONALIZED EXPANSIBLE SMOKESTACK

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Filed Apr. 16, 1968, Ser. No. 721,829
Int. Cl. F23j 11/00; F23l 17/02
U.S. Cl. 110—184 12 Claims

ABSTRACT OF THE DISCLOSURE

A smokestack comprised of several individual chimneys secured together, the chimneys comprising either individual units having self-contained enclosures around a central flue to define a hermetically-sealed space, or the flues being contained within a common singular enclosure to form the hermetically-sealed space, the chimneys being in side by side arrangement with concealed expansion and contraction devices and forming assemblies which are placed end to end to form a complete smokestack topped by a rain and snow shedding cap assembly, with individual tapered truncated cones at the top of each separate flue.

This invention relates generally to smokestacks made of steel plate, for use with breeching construction and is an improvement over my U.S. Letters Patent 3,363,591.

It is well known to those skilled in the art that condensation of moisture upon the inner side of steel smokestacks is a major factor in the corrosive deterioration of the steel plates and welding or bolting means used in its construction. Sulphurous compounds in the condensation chemically destroy the steel causing the same to become pitted and flaked away. Accordingly as described in my Patent 3,363,591, the enclosure of the smokestack within a protective enclosure has been shown for preventing destruction of the smokestack, enclosure compressing an outer wall that encloses in spaced relation thereto an inner wall which forms a smokestack duct or flue. The space between the inner and outer walls is hermetically sealed so as to develop an insulation preventing the entry of condensation from below ambient temperature changes between the atmosphere and the inner wall of the inner flue of the smokestack.

It is a principal object of the present invention to provide an improved sectionalized, expansible, insulated smokestack wherein the smokestack may be comprised of a plurality of flues or separate chimneys, all of which are enclosed within a common singular outer enclosure forming a spaced-apart outer wall for hermetically sealing an airspace between the outer wall and the chimneys so to prevent condensate action on the inner wall of the inner flue by the insulant valve created retaining temperatures above ambient.

It is another object of the invention to provide a smokestack wherein the individual chimney units are designed to be readily fitted and welded together so as to form smokestacks of either two or more units.

It is still another object of the invention to provide a smokestack wherein the smokestack may be decoratively trimmed upon its outer side such as by fluting so as to resemble a Grecian column or a Roman column.

It is a further object of the invention to provide a smokestack wherein the reinforcing structure of the smokestack is internally contained so as to not visually detract from the decorative outer trim.

It is a further object of the invention to provide a top structure for the smokestack that can be assembled as a unit upon and welded to the assembled smokestack assemblies and which is of decorative design.

Other objects of the invention are to provide a decorative smokestack construction which is simple in design,

inexpensive to manufacture, rugged in construction, easy to use and efficient in operation.

These and other objects will be readily apparent upon a study of the following specification and the accompanying drawings wherein:

FIG. 1 is a side elevational view of a smokestack, showing one form of the present invention, parts being shown broken away.

FIG. 2 is an enlarged vertical sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is an enlarged fragmentary perspective view of the smokestack illustrated in FIG. 1, shown partly in cross section, parts being shown broken away.

FIG. 4 is an enlarged vertical sectional view taken on line 4—4 of FIG. 1 showing the smokestack cap structure.

FIG. 5 is an exploded perspective view, showing elements of the cap structure, parts being shown broken away.

FIG. 6 is a side elevational view of a modified form of smokestack incorporating decorative outer trim.

FIG. 7 is an enlarged fragmentary perspective view thereof, parts being shown broken away.

FIG. 8 is a transverse cross-sectional view of one form of chimney unit used for construction of a multi-chimney, non-decorative smokestack.

FIG. 9 is a similar view showing a pair of the units illustrated in FIG. 8 secured together to form a multi-chimney non-decorative smokestack.

FIG. 10 is a transverse cross sectional view of another form of chimney unit used for construction of a multi-chimney decorative smokestack.

FIG. 11 is a similar view showing a pair of the units illustrated in FIG. 10 secured together to form a two chimney decorative smokestack.

FIG. 12 is a similar view showing four of the units illustrated in FIG. 10 secured together to form a four chimney decorative smokestack.

FIG. 13 is a side elevational view of a modified smokestack incorporating a reverse Roman column, and shown partly in cross section.

FIG. 14 is an enlarged fragmentary perspective view thereof shown partly in cross section.

FIG. 15 is an enlarged cross sectional view of a modified smokestack cap structure.

FIG. 16 is a perspective view of yet another form of smokestack comprised of quarter cylinder sections.

Referring now to the drawings in detail and more particularly to FIGS. 1–5, inclusive, the reference numeral **20** represents an improved smokestack and breeching made according to the present invention wherein there is a smokestack structure **21** comprised of a plurality of vertically adjacent smokestack assemblies **22** located between a bottom plate **23** and a top plate **23***a* adjacent a cap assembly **24**.

Each of the assemblies **22** is composed of a plurality of parallel, spaced apart chimney flues **25** formed of steel plates welded together, the lower ends of the flues rest upon a lower plate **26** to which they are welded. The upper ends of the flues rest below an upper plate **27** to which they are also welded. Relatively smaller openings **28** and **29** are cutout in plates **26** and **27**, respectively, for aligning with a relatively larger opening **30** extending through each of the flues, as shown in FIG. 2. It is understood that the diameters of the various flues may be alike or different as required for a particular job. The plates **26** and **27** are rigidly secured together by plug welds **31** made within the flues, around the openings **28** and **29**, thus securing the assemblies together.

Each assembly also includes a plurality of radially extending, vertical, flat plates **32** enjoined by welding, the

plates likewise being in abutment at their lower edges to the upper side of plate **26**, and at their upper edges to the under side of plate **27** to which they are welded, thus providing structural strength to the assembly.

An arcuate, vertical plate **33** is fitted between adjoining flat plates **32**, thus enclosing the flue within a sealed space **34**, therearound. The plate **33** is welded along its side edges, to the flat plates **32**, and at its lower and upper edges to the plates **26** and **27** thus hermetically sealing the air within the space **34** so as to prevent entry of moisture laden air thereinto, as shown in FIG. 3. The radially outward ends of the flat plates **32** may protrude beyond the arcuate plates to afford an outer corner therebetween which may receive a corner weld.

A plurality of channel configurated braces **35** may be secured to the inner sides of the arcuate plates before assembling, the braces thus strengthening the outer wall **36** thus formed by the arcuate plates **33**.

The bottom plate **23** may be provided with openings **36** for receiving mounting bolts for securement upon a masonry or other supporting base, not shown. Breeching openings **33'** are provided in the bottom assembly **22** for connecting horizontal breeching to the respective internal flues **25**.

The cap assembly **24** mounted upon the uppermost assembly comprises a rain and snow deflective device that directs the same away from the center toward the edges thereof. The cap assembly is comprised of a conical dome **37** secured at its peripheral edge **38** to upper edge **39** of conical side wall **40**. The dome includes openings **41** for alignment with the upper ends of relatively short chimney flue extensions **42** secured by welding between dome **37** and a cap bottom plate **43** secured to adjacent upper plate **27**. A hermetically-sealed space **44** is thus formed around extensions **42** within the cap assembly. Openings **43***a* in plate **43** communicate between openings **28***a* in place **23***a* and openings **42** of the extensions.

As shown in FIG. 3, an expansion joint **45** may be provided for a flue which carries greater heat than the other flues of the smokestack, such as incinerator flues which becomes much hotter than the other flues and thus requiring a means to allow for expansion thereof without stressing the remaining welded assembly. The expansion joint includes a short collar **46** welded to the underside of upper plate **23***a* or **27**. The incinerator flue **47** is rigidly welded to the lower plate **26**, and has an accordion type fold **48** providing a space **49** adjacent the upper end to allow for expansion. In order to maintain the space **34** hermetically sealed, the upper end of flue **47** adjacent the fold is fitted slidably free around the collar **46**.

In FIGS. 6 and 7, a modified smokestack **50** is shown which includes decorative trim, which in the present case is shown resembling a Grecian column. In the present form, all reinforcing structure is internally confined so as not to disturb or detract from the decorative exterior. The smokestack structure **50** is made of assemblies **52** generally similar to assemblies **22** and including flues **25**, braces **35** and flat scalloped end plates **26***a* and **27***a*. In the present form, a fully cylindrical member **53** uninterrupted by the protruding ends of flat plates and provides the principal outer shell. In the present construction, a plurality of vertical plates **54**, of transversely arcuate configuration, are plug welded to the outer side of member **53** as shown at **55**, the plug welds **55** being thereafter ground down to form a smooth flush finish. The abutting side edges **56** of the plate **54** are then seam welded together. The lower and upper edges of adjacent plates **54** on vertically adjacent assemblies **52** are welded to the scalloped edges of the plates **26***a* and **27***a* to form an integral structure. The assemblies **52** are secured together by spot or plug welding the internally-extending flanges within the flues **25** as indicated at **57** in FIG. 7. A decorative annular group **58** is supported on the smokestack and about the cap assembly **24** at the top thereof.

In FIGS. 8 and 9, a further modified construction of the invention is shown wherein a smokestack is formed by assembling a number of individual chimney units **60**. Thus, two of the individual chimney units shown in FIG. 8 are used to form a smokestack **61** shown in FIG. 9. A novel feature of the chimney unit **60** comprises an inner flue **62** separated by a hermetically sealed space **63** from a U-shaped section outer side wall plate **64**, the unit including flange cover end plates **65** at each opposite end, each of which has a central opening **66** therethrough aligned with the flue **62**. In this construction, the U-shaped outer side wall plate **64** is enjoined at its ends to a flange flat wall plate **68**. Braces **35** may be incorporated on the inner side of the U-shaped wall plates. When assembled to form a multi-chimney smokestack, the flat flange wall plates **64** are placed in abutting relation and seam welded at their edges. It is to be noted that the end plates **65** project outwardly beyond the U-shaped wall plate **64** and that this form of the invention is for utility purposes and not for receiving a decorative Grecian or Roman column trim. The individual units **60** are assembled one upon the other by welding the flange end plates **65** together at **69**. To provide the assembly **61** of FIG. 9 the vertical flange wall plates **68** will be similarly welded together at their vertical outside edges.

In a further modified form of the invention shown in FIGS. 10 to 12, inclusive, a chimney unit **70** is shown for assembly of a multi chimney smokestack, the unit **70** being designed to receive, if desired, outer trim for decorative purposes. The unit **70** likewise includes flue **62** separated by hermetically sealed space **63** from an outer wall **64** comprised of U-shaped section and flange flat wall plates or elements, **67** and **68***a*. The wall element **68***a* extends at its sides beyond the junction with wall element **67** as in the former modification. However, opposite end plates **65***a* do not project at their peripheries beyond the wall edge, thus readily adapting the unit for receiving decorative trim, but do extend inwardly of the flues **62** from within which the unit **70** can be plug welded together as indicated at **69***a*. As shown in FIG. 12, the smokestack may be comprised of four units **70**. A smokestack comprised of two units **70**, welded along the joined flat side plates **68***a* shown in FIG. 11 could likewise be made to incorporate the trim if preferred. It will be noted that in the construction shown in FIG. 12, the wall elements **68***a* of each unit **70** is slightly modified by not extending along one vertical side beyond the junction with wall element **67** so to form a square corner and thus allow the four units **70** to closely fit together with the wall element **67** of one unit being in abutment with a wall element **67** of an adjacent unit, and welded at their apices **71** and **72**.

In still another modified form of the invention illustrated in FIGS. 13 and 14, a smokestack **90** is shown incorporating a decorative trim **91** which is of reverse Roman column design, and forming in itself the outer wall of the smokestack **90**. This outer trim wall **91** is comprised of a plurality of vertically elongated panels **92**, each of which is transversely arched, and having vertical edges **93** which are radially inwardly turned respective to the smokestack, the edges **93** of one panel being enjoined by a seam weld to the corresponding edges of adjacent panels. The channel braces **35** will be attached to the elongated panels **92**. The smokestack **90** includes a plurality of individual chimneys **30** and supporting channels **35** mounted within the outer trim wall in a similar manner as the smokestack illustrated in FIG. 7. Likewise, end plates **26** and **27**, such as shown in FIG. 7 are used to enjoin assemblies **96**. The end plates **26** and **27** are flanged inwardly of the flues **30** to afford welding **69***a* from therewithin to join the assemblies **96** into a stack.

In FIG. 15, a modified cap structure **100** is shown to comprise a conical configurated canopy **101** enjoined at its periphery by a weld to a top end plate **27***a* of an uppermost assembly. A plurality of chimneys **30** have their upper ends extending up through openings **102** in the

conical canopy **101**, each chimney's upper end being enclosed within individual conical configurated enclosure **103** forming space **104** therebetween which is enclosed at its upper end by an annular top plate **105**.

In FIG. 16, a further modified multiple chimney smokestack **110** is shown wherein there are a plurality of quarter cylinder sections **111**, which in an assembled position form a cylindrical smokestack. Each quarter section includes flat vertical panels **112** and **113** welded at right angles to each other, and an arcuate vertical panel **114** between opposite end plates **115** each having a central opening **116** between which a chimney **30** is affixed and of less internal diameter to permit internal welding of the plates together when stacked one upon the other. A space **117** is thus formed between the chimney and vertical panels for insulating purposes.

It is to be noted that the panels **112** and **113** have a vertical side edge **18** that extends radially outward beyond the panel **114** for the purpose of being welded to adjacent side edges of adjacent quarter sections **111**. The outer periphery of adjacent end plates **115** may be welded together.

Thus, there has been provided an improved, sectionalized insulated smokestack and breeching comprised of a plurality of individual flues grouped to form a smokestack, one of which may be longitudinally expansible relative to the other flues, and wherein the flues are hermetically sealed around their other side by either a common enclosing outer wall or each flue is hermetically enclosed by its own outer wall.

While various changes may be made in the details of construction, it is understood that such changes will be within the spirit and scope of the present invention as is defined in the appended claims.

What is claimed is:

1. In an improved sectionalized, expansible, insulated smokestack, the combination of an elongated smokestack comprised of a plurality of welded assemblies in end to end relationship, the lowermost of said assemblies being mounted upon a bottom plate, the uppermost of said assemblies having a top plate thereabove, a cap assembly upon said top plate, each of said assemblies having means for containing a plurality of individual chimneys and comprises a plurality of individual flues defining said chimneys, enclosure means around said flues, said enclosure means comprising opposite end plates adjacent the ends of said flues and side walls in spaced relation thereto so as to define a hermetically sealed space between said side walls and said flues, and said end plates having openings therein in alignment with said flues.

2. The combination as set forth in claim **1**, wherein one of said flues comprises a duct secured at one end to one of said end plates, the opposite end of said duct being in spaced relation with the opposite ends of said end plates, a collar secured to said opposite end plate, said collar being fitted into said spaced end of said duct, and said spaced end of said duct having an accordion type fold therearound, said duct being longitudinally expansible relative to the other said flues of said smokestack.

3. The combination as set forth in claim **2** wherein said assemblies further includes a plurality of longitudinal upstanding flat plates in radial arrangement, one of said flues positioned between each of said plates, and a vertical arcuate plate between said flat plates forming said side walls.

4. The combination as set forth in claim **3** wherein a plurality of longitudinally extending, transversely arcuate plates are welded in side edge abutment to the outer side of said side wall to form a decorative appearance resembling a Grecian column.

5. In an improved sectionalized, expansible, insulated smokestack, the combination of an elongated smokestack comprised of a plurality of welded assemblies in end to end relationship, the lowermost of said assembiles being mounted upon a bottom plate, the uppermost of said assemblies having a top plate thereabove, a cap assembly upon said top plate, each of said assemblies having means for containing a plurality of individual chimneys and comprises a plurality of individual flues defining said chimneys, enclosure means around said flues, said enclosure means comprising opposite end plates adjacent the ends of said flues and side walls in spaced relation thereto so as to define a hermetically sealed space between said side walls and said flues, and said end plates having openings therein in alignment with said flues.

6. The combination as set forth in claim **5** wherein said chimney unit side wall comprises a transversely U-shaped wall element having parallel opposite legs between a semi-cylindrical portion, and a flat wall element secured across the ends of said opposite legs.

7. The combination as set forth in claim **6**, wherein said flat wall element has side portions which extend beyond the side edges of said U-shaped wall element.

8. The combination as set forth in claim **6**, wherein said flat wall element has one side portion which extends beyond one side edge of said U-shaped wall element, the other side portion of said flat wall element having a side edge in abutment with the other side edge of said U-shaped wall element so to form a square corner.

9. The combination as set forth in claim **6** wherein said openings in said end plates are relatively smaller than said flue central opening so as to form inward extending flanges in the path of said flue opening, said flanges receiving securement together means.

10. The combination as set forth in claim **9**, wherein said cap assembly comprises a conical side wall secured between a conical dome and a base plate, a plurality of flue extensions between said dome and base plate, a hermetically sealed space between said flue extensions and said side wall, and openings in said dome and base plate in alignment with each other said flue extensions.

11. The combination as set forth in claim **2**, wherein each said assembly is comprised of a plurality of quarter cylinder sections interfitted together, each said section including a pair of flat side walls at right angle to each other, and an arcuate wall therebetween to form a tubular opening through which one of said chimneys extends, and said flat walls of one section being secured to an adjacent flat wall of an adjacent section.

12. The combination as set forth in claim **3**, wherein a plurality of longitudinally-extending, transversely-arcuate plates are welded in longitudinal edge abutment to each other in a ring configurated arrangement with the transverse arc of each plate extending radially-inwardly so as to form an inverted Roman column, said inverted column being in spaced apart relation with said side wall.

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KENNETH W. SPRAGUE, Primary Examiner

U.S. Cl. X.R.

98—60