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(54) **HEATING APPARATUS, BURNER DEVICE, AND METHOD OF CONSTRUCTION**

(57) The invention provides a burner for burning gaseous fuel comprising a first, bottom, burner and at least one upper, pistol, burner. The first, bottom, burner and the at least one upper, pistol, burner are formed from a unitary tubular material and are coupled to each other by at least one fold in the tubular material.

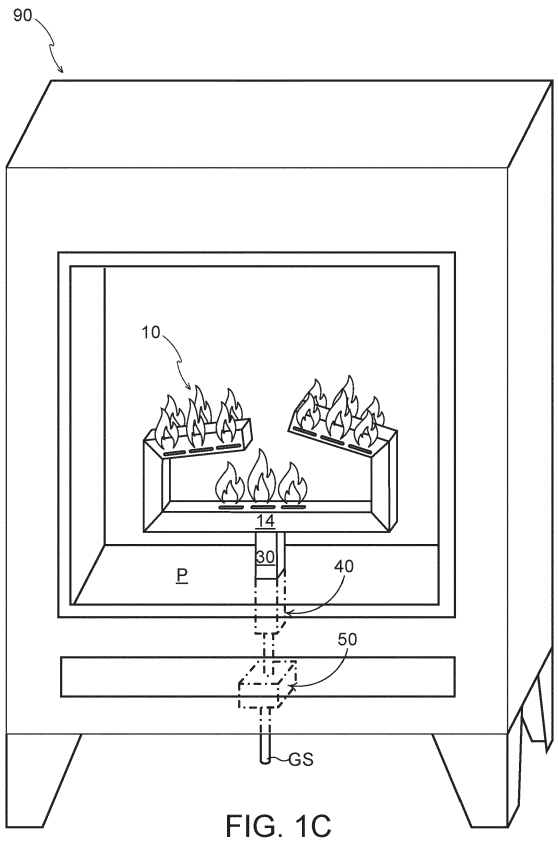

FIG. 1C

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Description

TECHNICAL FIELD

[0001] The present invention relates to a heating apparatus more specifically to a gas burner device for burning flammable gas such as natural gas or liquefied petroleum gas. The present invention also relates to a method of manufacture of the gas burner device, having a bottom burner and at least one pistol burner.

BACKGROUND

[0002] It is well known to provide a space heater for heating rooms or outdoor spaces in domestic and commercial properties. Traditionally such space heaters have been fuelled by burning fossil fuels such as natural gas or liquefied petroleum gas. It is desirable that space heaters have a pleasing aesthetic property and may have visible flames it may be desirable to provide gas fuelled space heaters which have the appearance of burning alternative fuel such as wood or coal.

[0003] The present disclosure is concerned with providing a gas burner device also known as a pistol burner which is simple to manufacture and service, and provides a method of manufacturing pistol burners of a variety of shape and configurations so as to provide a desired aesthetic design.

[0004] The present invention seeks to overcome or at least mitigate the problems of the prior art.

SUMMARY

[0005] A first aspect of the present invention provides a burner for burning gaseous fuel comprising a first, bottom, burner and at least one upper, pistol, burner wherein the first, bottom, burner and at least one upper, pistol, burner are formed from a unitary tubular material and are coupled to each other by at least one fold in the tubular material.

[0006] Optionally, the at least one upper, pistol, burner comprises an upright section coupled to an end of the first, bottom, burner by a fold in the tubular material.

[0007] Optionally, the burner comprises an upper, pistol, burner coupled to each end of the first, bottom, burner, each upper, pistol, burner having an upright section, the upright section coupled to a respective end of the first, bottom, burner by a fold in the tubular material.

[0008] Optionally, the burner comprises a single venturi for mixing air with combustion gas and supplying the same to the first, bottom, burner and the at least one upper, pistol, burner.

[0009] Optionally, at least one of the first, bottom, burner and the at least one upper, pistol, burner comprises an end cap at an end of the tubular material and coupled to thereto by at least one fold.

[0010] Optionally, the burner further comprises an inlet pipe, the inlet pipe welded to the tubular material forming the first, bottom, burner.

[0011] Optionally, the inlet pipe comprises a tab projecting from an end thereof, and the tubular material forming the first, bottom, burner comprises an alignment opening in which the tab is received, the tab and the alignment opening forming an alignment device for aligning an open end of the inlet pipe with an inlet opening in the tubular material forming the first, bottom, burner.

[0012] Optionally, the inlet pipe comprises a pair of tabs and the tubular material forming the first, bottom, burner comprises a pair of alignment openings each of the pair of alignment openings receives a respective one of the pair of tabs.

[0013] Optionally, the burner further comprises an inlet pipe, the inlet pipe coupled to an end of the first, bottom, burner by a fold in the tubular material.

[0014] Optionally, the inlet pipe comprises air inlet opening cut into a wall thereof, and wherein a plate is mounted to said wall, the plate being adjustable between a first closed position in which the plate covers the air inlet opening and a second open position in which the plate is withdrawn from covering any of the air inlet opening.

[0015] Optionally, the inlet pipe is formed from a section of tubular material similar to that which the burner is formed from.

[0016] Optionally, the tubular material is a box section having a square or rectangular cross-sectional shape.

[0017] Optionally, the plate is securable in a desired position between the first closed position and the second open position to control the flow of air into the inlet pipe.

[0018] Optionally, the burner comprises a single ignition source for igniting combustion gas vented from the first, bottom, burner and the at least one upper, pistol, burner.

[0019] A second aspect of the present invention provides a heating apparatus comprising the burner of disclosed herein.

[0020] Optionally, the heating apparatus comprises a platform to which the burner is mounted, and wherein the platform comprises at least one electrical light source mounted thereto for illuminating the burner.

[0021] A third aspect of the present invention provides a burner for burning gaseous fuel comprising a first, bottom, burner and at least one upper, pistol, burner wherein the first, bottom, burner and at least one upper, pistol, burner are formed from a unitary tubular material and comprises an upright section coupled to a second section by a fold in the tubular material.

[0022] Optionally, the second section is inclined with respect to the upright section.

[0023] A fourth aspect of the present invention provides a component for forming a burner for burning gaseous fuel comprising a tubular material having at least one cutaway defining a recess to provide a foldable region between a first section of the tubular material and a second adjacent section integral with the first section.

[0024] A fifth aspect of the present invention provides

a gaseous fuel burner comprising a tubular material including a first section coupled to a second section by a fold in the tubular material.

[0025] Optionally, the first section is a bottom burner and the second section is an end cap.

[0026] Optionally, the first section is a bottom burner and the second section is a portion of a pistol burner.

[0027] Optionally, the first section is a bottom burner and the second section is an inlet pipe to which a venturi in mounted.

[0028] Optionally, the first section is a first portion of a bottom burner and the second section is second portion of a bottom burner non-linearly disposed with respect to the first portion.

[0029] Optionally, the tubular material comprises a plurality of walls, and wherein the fold is defined in one of the plurality of walls by a cut away portion defined in the other ones of the plurality of walls.

[0030] A sixth aspect of the present invention provides a method of constructing a burner for burning gaseous fuel comprising:

providing a tubular material,
cutting a recess in the tubular material to define a foldable region between adjacently disposed first and second sections of the tubular material;
folding the first section of the tubular material with respect to the second section of the tubular material to form a joint therebetween;
welding at least a portion of walls forming the tubular material of the first section to adjacent portions of walls forming the tubular material of the second section.

[0031] Optionally, cutting a recess in the tubular material comprises laser cutting the tubular material to remove a portion of the walls forming the tubular material.

[0032] Optionally, the method further comprises cutting one or more openings in the tubular material to provide vents for escape of combustion gas from within the tubular material.

[0033] Optionally, the method further comprises cutting inlet opening in the tubular material and at least one an alignment opening adjacent thereto, the alignment opening configured to receive a tab of an inlet pipe and arranged to align the inlet opening in the tubular material with an open end of the inlet pipe.

[0034] Optionally, the method further comprises inserting a tab of an inlet pipe into the at least one alignment opening.

[0035] Optionally, the method further comprises welding the inlet pipe to the tubular material.

[0036] A seventh aspect of the present invention provides a pistol burner for burning gaseous fuel comprising being formed from a unitary tubular material and comprising an upright section coupled to a second section by a fold in the tubular material.

[0037] Optionally, the second section is inclined with respect to the upright section.

[0038] Further features and advantages of the present invention will be apparent from the specific embodiments illustrated in the drawings and discussed below.

[0039] Within the scope of this application, it is envisaged or intended that the various aspects, embodiments, examples, features and alternatives set out in the preceding paragraphs, in the claims and/or in the following description and drawings may be considered or taken independently or in any combination thereof.

[0040] Features or elements described in connection with, or relation to, one embodiment are applicable to all embodiments unless there is an incompatibility of features. One or more features or elements from one embodiment may be incorporated into, or combined with, any of the other embodiments disclosed herein, said features or elements extracted from said one embodiment may be included in addition to, or in replacement of one or more features or elements of said other embodiment.

[0041] A feature, or combination of features, of an embodiment disclosed herein may be extracted in isolation from other features of that embodiment. Alternatively, a feature, or combination of features, of an embodiment may be omitted from that embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0042] Exemplary embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Figures 1A and 1B are perspective views of a device for use in a space heater according to an embodiment of the present disclosure;
Figure 1C is a perspective view of a space heater comprising the device of Figure 1A;
Figure 2A is a top view of an intermediate component for forming the device of Figure 1A;
Figure 2B is a side view of the intermediate component of Figure 2A;
Figure 3A is a perspective view of a portion of the intermediate component of Figure 2A;
Figure 3B is a perspective view of a portion of an intermediate component according of another embodiment of the present disclosure;
Figure 4 is a plan view of a portion of an intermediate component according of yet another embodiment of the present disclosure;
Figures 5A and 5B are further perspective views of the device of Figure 1A;
Figure 5C is a perspective view of a device for use in a space heater according to a further embodiment of the present disclosure;
Figure 6A is a top view of an intermediate component for forming a device according to a yet a further embodiment of the present disclosure;
Figure 6B is a bottom view of the intermediate component of Figure 6A;

Figure 6C is a view from above of a burner device formed from the intermediate component of Figure 6A;

Figure 7A shows a further perspective view of the device of Figure 5C;

Figures 8A, 8B, and 9A are top views of devices for use in a space heater according to various embodiments of the present disclosure;

Figure 9B is a perspective view of a device for use in a space heater according to still a further embodiment of the present disclosure;

Figure 10 is a top view of an intermediate component for forming a device according to a still yet another embodiment of the present disclosure;

Figures 11A and 11B are a perspective views of devices for use in a space heater according to embodiments of the present disclosure;

Figure 12A is a perspective view of a device for use in a space heater according to an embodiment of the present disclosure;

Figures 12B, 12C, and 12D show top, side, and bottom views of an intermediate component for forming the device of Figure 12A;

Figure 12E shows a plan view of a mesh component for use with the intermediate component of Figure 12B for forming the device of Figure 12A;

Figure 13A is a perspective views of a device for use in a space heater according to an embodiment of the present disclosure;

Figure 13B, 13C, and 13D show top, side, and bottom views of an intermediate component for forming the device of Figure 13A;

Figure 14 is a perspective view of a device for use in a space heater according to an embodiment of the present disclosure;

Figure 15A is a perspective view of components forming inlet pipe for use with devices according to the present disclosure and a venturi; and

Figure 15B is a perspective view of the components of Figure 15A assembled to form an inlet pipe incorporating a venturi.

DETAILED DESCRIPTION OF EMBODIMENTS

[0043] Detailed descriptions of specific embodiments of heating apparatus, burner devices and method of manufacture are disclosed herein. It will be understood that the disclosed embodiments are merely examples of the way in which certain aspects of the invention can be implemented and do not represent an exhaustive list of all of the ways the invention may be embodied. As used herein, the word "exemplary" is used expansively to refer to embodiments that serve as illustrations, specimens, models, or patterns. Indeed, it will be understood that the heating apparatus, burner devices and method of manufacture described herein may be embodied in various and alternative forms. The Figures are not necessarily to scale and some features may be exaggerated or minimised to show details of particular components. Well-known components, materials or methods are not necessarily described in great detail in order to avoid obscuring the present disclosure. Any specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the invention.

[0044] Referring to Figure 1 there is shown a device 10 for use in a space heater 90 such as that shown in Figure 1C. The device 10 comprises a lower burner and an upper burner, the upper burner takes the form of a pistol burner, for use burning a flammable gas, such as natural gas or liquefied petroleum gas. The device 10 comprises a tubular structure folded to provide a multi-level burner. A first, lower, level 14, forming the bottom or lower burner, comprises openings 16 or through holes between an interior of the tubular structure and the exterior of the tubular structure. The openings 16 are provided in an upper surface or panel T of the tubular structure. The openings 16 in the illustrated embodiment take the form of slots, however in other embodiments other shapes may be employed depending upon a desired aesthetic quality of the flame such as but not limited to shape or height.

[0045] The device 10 comprises a generally vertical or upright section 18, 20 at each end of the first, lower, level 14. Each upright section 18, 20 is hingedly or foldable connected to the first lower level 14 portion. A portion of the joint between first lower level 14 portion and the one of the upright sections 18, 20 is welded. A portion of the joint between first, lower, level 14 portion and the one of the upright sections 18, 20 is folded, no welding is required, such that first lower level 14 portion and said one of the upright sections 18, 20 are integral or unitary.

[0046] A second, upper, level 22, 24 is connected to each of the upright sections 18, 20, in the illustrated embodiment the second, upper, levels 22, 24 are folded, inwardly towards each other, to be disposed over the first, lower level 14, each upright section 18, 20 and its associated second, upper, level 22, 24 forms a pistol burner. Each pistol burner is integral or unitary with the bottom burner. In other embodiments, one or both of the second, upper, levels 22, 24 may be folded outwardly. In the illustrated embodiment, the second, upper, level 22, 24 are disposed at an inclined angle with respect to the first, lower, level 14. In other embodiments, one or both of the second, upper, levels 22, 24 may be parallel to the first, lower, level 14, and may be generally horizontal.

[0047] The device 10 comprises an inlet pipe 30, the inlet pipe may be formed from a tubular section and welded to a lower surface or panel of portion of the tubular structure forming the first, lower, level 14 or bottom burner. In other embodiments, the inlet pipe 30 may be formed from a tubular section or pipe configured to mate with an upstream component such as but not limited to a venturi 40 (see Figure 1C). The venturi 40 comprises a narrowing

and/or a widening of the pipe carrying the gaseous fuel to the burner 10. The venturi 40 comprises at least one opening and provides for mixing of the fuel gas with atmospheric air, specifically oxygen with the gaseous fuel, the gas/air mix is carried to the burner 10 and escapes through the openings 16, 26 in the burner 10. An air inlet A4 (shown in Figures 14, 15A, and 15B) is provided in the inlet pipe 30 proximate to the venturi 40. An ignition source, as shown in Figure 14, may be provided to ignite the gas/air mix exiting the openings 16, 26 in the burner 10. The ignition source may be a conventional ignitor such as a piezoelectric spark igniter, standing pilot ignition system, match, taper, flint or torch striker, or other suitable automatic or manual ignition.

[0048] The venturi 40 is in gaseous or fluidic communication with a valve 50 which in turn is in gaseous or fluidic communication with a fuel gas supply or store GS. It will be appreciated that the fuel is gaseous when present in the burner 10, but may be liquid, under pressure, in a storage container.

[0049] The device 10 is formed from a tubular material, Figure 3A shows a box section 12, the box section may be formed from mild steel, stainless steel or other suitable metallic or non-metallic material.

[0050] The box section 12 comprises hinges or foldable regions F1, F2, F3 in which a portion of the box section 12 is removed. In the embodiment illustrated in Figure 3A portions of three of the four sides or panels 1, 2, 3, 4 of the box section 12 are removed. Triangular or "V" shaped portions are removed from a pair of opposing sides 2, 4 of the box section 12. A square or rectangular portion of a third one 3 of the sides or panels disposed between the pair of opposing sides 2, 4 and connecting the triangular portions is removed from the third side or panel 3. The triangular section removed from the pair of opposing sides 2, 4 may be an isosceles triangle such that edges of a side panel 2, 4 on each side of the hinge or fold F2, F3 are equal in length. The apex angel θ, the angle between the sides of equal length, of the isosceles triangle defines the degree or extent to which the box section 12 is folded and hence the angle between portions of the box section 12 on each side of the fold. For example, an apex angle of 90° creates a pair of adjacent box sections 12 disposed perpendicularly to each other.

[0051] In other embodiments, a tubular material 112, as shown in the second illustrated embodiment of Figure 3B, having an alternative, circular, cross section is employed. Figure 3B shows a cylindrical pipe in which a substantial portion has been removed to create a hinge or fold F4. In other embodiments, alternative cross-sectionally shaped tubing may be employed, for example hexagonal or octagonal however other polygonal shapes may be employed, in such embodiments the end caps may be formed separately from the tubular material forming the burner.

[0052] Square or rectangular box section 12 may be advantageous in that an end cap EC may be hingedly or foldable connected, by a foldable connection F1, to each end thereof.

[0053] Figures 5A, 5B show embodiments of the burner device 10 in which decorative scenery items L have been mounted to the burner device 10. The decorative scenery items L may have the appearance of a traditional fossil fuel such as, but not limited to, a log. The decorative scenery items L may be formed from a ceramic material or other suitable material as is known the art.

[0054] The decorative scenery items L may be moulded to take a desired shape so as to appear to be a combustion fuel used in traditional space heaters. The decorative scenery items L is arranged to generally conceal or hide from view portions of the burner device 10. In some embodiments, the decorative scenery items L may comprise cutaways or apertures to control or facilitate air flow to the burner device 10 particularly in the regions of the openings 16, 26 in order to efficiently burn the gaseous fuel delivered to the burner device 10. In some embodiments, the burner device 10 and decorative scenery items L are configured to give the impression of a traditional log fire, the airflow and fuel delivery is controlled to produce flames which appear to be produced by burning of the decorative scenery items L.

[0055] Referring now to Figures 4 and 5C to 14, there are shown additional embodiments of the present disclosure. In the alternative illustrated embodiments like numerals have, where possible, been used to denote like parts, albeit with the addition of the prefix "200", "300", "400", "500" and so on to indicate that these features belong to a respective subsequent embodiment. The additional embodiments share many common features with the first and second embodiments and therefore only the differences from the embodiments illustrated in Figures 1 to 3A will be described in detail.

[0056] Figure 4 shows a blank 212, according to an alternative embodiment, formed from sheet material for forming a tubular structure, the blank 212 comprises panels 201, 202, 203, 204 foldable connected to each other in series by longitudinal folds LF1, LF2, LF3. Cut outs CT1, CT2, CT3, CT4 in the side and top panel 202, 204, 203 are arranged to define transverse folds F1, F2, F3. The tubular structure can be formed by folding the blank about longitudinal folds LF1, LF2, LF3 and welding first side panel 202 to top panel 203. The tubular structure can be further assembled into a burner by folding the tubular structure about transverse folds F1, F2, F3 in the base panel 201 and welding adjacent tubular sections 14, 18, 22 to each other about the opposed side panel 202, 204 and top panel 203.

[0057] Figure 7A and 5C illustrate a third embodiment of the present disclosure in which additional opening 16 have been added to the first lower level 314, opening 16 are provided substantially below each of the second upper levels in vertical registry therewith. In Figure 5C decorative scenery items L have been mounted to the burner device 310.

[0058] Figure 6A and 6B show top and bottom views of an intermediate component for forming a two-tier burn-

er device 410 as shown in Figure 6C. In the embodiment of Figures 6A to 6C the upper tiers are arranged to be disposed at a non-zero angle, optionally an oblique angle, with respect to a tubular axis of the first lower tier 414. In this embodiment additional sections RS1 of the tubular section 412 are removed and define folds in each of the opposed side walls. A first one of the upper levels 422 is hingedly or foldably connected to a first one of the opposed side walls of the tubular section 412. A second one of the upper levels 424 is hingedly or foldably connected to a second one of the opposed side walls of the tubular section 412.

[0059] Figure 6B shows an aperture A1 in the bottom wall of the tubular section 412 to which an inlet pipe is attached in a setup burner 410. The aperture A1 being aligned with an open end of the inlet pipe.

[0060] Figures 8A and 8B are views from above of a single tier burner 510 configured to be nonlinear along its length, the intermediate component (not shown) is provided with folds in the side wall similar to that of the embodiment shown in Figure 6A. The burner 510 comprises a medial section 514 and opposed end sections 514C, 514E coupled thereto by intermediate section 514C, 514E. The intermediate and end sections 514C, 514E, 514C, 514E comprise opening in each of the opposed side walls. Optionally, each of the end sections 514C, 514E may comprise an additional opening 516' in the top wall of the tubular section proximate the end cap. In Figure 8B decorative scenery items L have been mounted to the burner device 510. Figure 9A shows a further embodiment in which the burner 610 in nonlinear and comprises a plurality of folds.

[0061] Figure 9B shows an exemplary embodiment in which a plurality of additional branches or pistol burners B1, B2, B3, B4 have been added to the burner device substantially as shown in Figure 7A. It will be appreciated that one or more of the additional branches B1, B2, B3, B4 may be omitted or substituted for a branch B1, B2, B3, B4 of an alternative design. The branches B1, B2, B3, B4 are configured from tubular box section material and may be arranged with folds configured and arranged in substantially similar manner to those described herein and illustrated.

[0062] Figure 10 shows a blank 812 according to a ninth embodiment in which a tubular box section has been pre-cut with foldable regions by removing sections thereof as described and illustrated herein. The blank 812 comprises additional branches B5, B6 which have been welded to the tubular box section in a similar manner to the inlet pipe, apertures (not shown) are cut into the side walls of the tubular box section at the location where the branches B5, B6 are attached to allow fluid (gas) flow between the main body of the burner and the branches B5, B6. In the illustrated embodiment one of the branches B5 in linear and the other branch B6 is nonlinearly configured with a foldable section welded into position. Each of the branches B5, B6 comprises an end cap folded and welded in position.

[0063] Figure 11A shows yet another embodiment in which the lower tier 914 of the burner 910 comprises downwardly folded section 914F, 914G at each end thereof, and alternative corner arrangements between the downwardly extending sections 914F, 914G and the upright sections 918, 920 coupling the upper second tiers 922, 924 thereto. In the embodiment of Figure 11A openings 926' are provided in the bottom wall of the tubular box section rather than in the top or side walls. Additional opening 926" are provided in the side walls of the upright sections 918, 920.

[0064] Figure 11B shows an eleventh embodiment of the present disclosure in which the inlet pipe 1030 is integral with the burner 1010 and is folded and welded in position by cutting and removing a section of the tubular box section to define the fold in a top wall thereof.

[0065] Figures 12A and 13a show embodiments of a single tier burner 1110, 1210, Figures 12B, 12C, 12D show top, side, and bottom views respectively of a blank 1112 for forming the burner 1110 of Figure 12A. Figures 13B, 123, 123 show top, side, and bottom views respectively of a blank 1312 for forming the burner 1310 of Figure 13A.

[0066] In the embodiment of Figure 12A the burner 1110 is symmetrically arranged about the inlet pipe 1130, the inlet pipe 1130 being formed from a separate piece of tubular box section welded to a lower panel of the burner 1110.

[0067] Figure 12E shows a mesh panel M, the mesh panel M is insert into the tubular box section before closing the end caps and is secured in position. The mesh covers the openings 16 and may prevent or inhibit blow back. In some embodiments the mesh M may be attached to an exterior surface of the tubular box section to cover the openings 16. Alternatively, the mesh M may be inserted into the openings 16 to be substantially coplanar with wall in which the opening 16 is formed.

[0068] In the embodiment of Figure 13A the burner 1110 is asymmetrically arranged with respect to the inlet pipe 1130, the inlet pipe 1130 is integral with the tubular box section of the burner 1110 and is folded and welded in position.

[0069] Figure 14 shows another embodiment according to the present disclosure and shows a burner device 1310 having a bottom or lower burner 1314 and a pair of upper or pistol burners 1322, 1324 integral or unitary with the bottom or lower burner 1314. Figure 14 shows an ignition system IS configured to ignite the fuel/air gaseous mix exiting openings 1316 in the bottom burner 1314.

[0070] Figure 14 also illustrates a portion of the venturi 40, the venturi is formed in part from the inlet pipe 1330, an aperture A4 (best shown in Figure 15A) is provided in one of the panels of the box section forming the inlet pipe 1330. A pair of mounting holes A3 are provided in said one of the panels of the box section for mounting a venturi plate V, shown in Figures 15a and 15B.

[0071] In an assembled condition, see Figure 15B, the venturi plate V is mounted to the panel of the box section

in which the aperture A4 is provided. The venturi plate comprises at least one slot SL, the illustrated embodiment comprises a pair of slots SL, for adjustably mounting the venturi plate V to the inlet pipe 30. The venturi plate V can be slidably moved over a range defined by the slots SL to adjust the extent to which the venturi plate V closes or obscures the aperture A4. In this way the amount of air drawn into the inlet pipe 30 can be adjusted. The venturi plate is mounted to the inlet pipe 30 by suitable fixing elements SC such as screw or bolts and can be secured in a desired position with respect to the aperture A4.

[0072] A lower end of the inlet pipe may comprise a reducer or adapter (not shown) to enable the inlet pipe 30 to be affixed or connected to a valve by conventional gas piping, tube or conduit. The reducer or adapter may be disposed proximate to the aperture A4.

[0073] An upper end of the inlet pipe 30 may comprise at least one tabor tongue, the illustrated embodiment comprises a pair of tabs or tongues TG. The tabs TG are configured to mate in apertures A2 provided in the base panel of the lower burner 1314; apertures A2 are best shown in Figure 12D. The apertures A2 and tabs TG provide an alignment device for alignment of the inlet pipe 30 with the bottom burner 14 and the particularly the open end of the inlet pipe 30 with the gas inlet aperture A1 in the base panel of the bottom burner 14, and may facilitate assembly or mounting of the inlet pipe 30 to the bottom burner 14 of the various embodiments of the present invention.

[0074] The present disclosure provides a space heater; gas stove, gas fire, multisided glass cassette type fire and outdoor gas heater constructed which creates the effect of angled flames and an under burner comprising a single metal part, a single venturi, single tubing and injector producing the combustion through multi gas burners within a combustion box. The gas mix is initially vented through the single venturi then to the one-piece box section or tube pistol burner through the slots in the top housing base then further onto the angled pistols. The slots can be configured in a way to dissipate the gasses vented as flat, high ends or high middle flame image. Pistols can be added to the burner to produce an added effect without adding a separate gas housing compartment. The venturi may have a dual functioning venturi ring or plate added which can be altered to the desired gas requirement, relevant to the specific gas type and / or requirements or regulation in territory or country of deployment. The shape of the venturi can differ, from round, square or rectangular. The burner may comprise any length of bottom/lower burner, any length of pistols/upper burner and configured at any angle requirement to suit a multitude of different sized appliances.

[0075] The present disclosure also provides a gas burner having a single piece burner construction. The gas burner may be constructed from a fine laser cut box section or tube of any size. The box section or tube can be laser cut in one piece, as shown in the Figures, creating a single, unitary, piece that can be folded, by hand or machine, to a predetermined angle, defined by cuts in the box section or tube. This method is advantageous for creating consistency in the product created. The sections are joined together and welded to form an airtight construction at the folds.

[0076] The present disclosure also provides a gas burner having fine laser cut slots at predetermined positions. This is advantageous in that it provides a multitude of options for allowing the gas to escape at different positions throughout the burner. The tubular sections of the pistol burners and the tubular section of the base or lower burner can have openings along some or all its respective length to allow gas to escape at various, or numerous, positions therealong, to create a desired flame pattern. In some embodiments, the flame pattern may be limited to a central or end portion of the respective burner; in other embodiments; the flame pattern may extend along the entire length of the respective burner.

[0077] The bottom burner slots can be spaced out to create the illusion of fire burning at different combustion rates. Allowing ceramic logs to be spaced in a much wider appliance.

[0078] The burner can be placed in a gas stove, cassette (built in the wall) free standing appliance or double-sided appliance.

[0079] The present disclosure is advantageous over the prior art in that it eliminates the need for a multitude of fittings to be employed from the gas valve to the burner. Conventional pistol burners have many tubes connecting the gas from the valve to the burner. The present disclosure provides a single tube from the valve outlet to the venturi which mixes the gas with air for combustion for the single construction, advantageously omitting all the extra fittings required for a pistol burner in a conventional system. Further a single venturi is provided for mixing air with gaseous fuel for the bottom or lower burner and each or any pistol burner integrally formed therewith.

[0080] A further advantage of the present inventions is that significantly less material is used in the construction of the burner, thus making it more environmentally friendly and reducing the pressures on the steel industry.

[0081] Servicing of the burner unit may be much simpler than conventional pistol gas appliances since it does not have a plurality of connected parts, fittings or gaskets. The time required to complete a burner replacement may be significantly reduced.

[0082] The burner unit may be connected or coupled to either a manual valve or remote valve as desired.

[0083] In some embodiments, a lower log carrier tray (a platform form P, see Figure 1C, which the burner 30 extends or is mounted) may remain cooler than that in a conventional design. The lower burner 14 may be spaced apart from the platform P, and suspended thereabove. This may allow the addition of additional features to the space heater apparatus such as, but not limited to, providing a location to mount lights such as multi-coloured LED's to the underbed of the unit.

[0084] It should be recognised that numerous changes may be made within the scope of the invention.

[0085] As used herein the terms stove, fireplace, log burner, and fire refer to an apparatus which has an appearance typically associated with a heat source.

[0086] It will be recognised that as used herein, directional references such as "top", "bottom", "front", "back", "end", "side", "inner", "outer", "upper" and "lower" do not limit the respective features to such orientation, but merely serve to distinguish these features from one another.

Claims

1. A burner for burning gaseous fuel comprising a first, bottom, burner and at least one upper, pistol, burner wherein the first, bottom, burner and at least one upper, pistol, burner are formed from a unitary tubular material and are coupled to each other by at least one fold in the tubular material.

2. The burner of claim 1, wherein the at least one upper, pistol, burner comprises an upright section coupled to an end of the first, bottom, burner by a fold in the tubular material.

3. The burner of claim 1, comprising an upper, pistol, burner coupled to each end of the first, bottom, burner, each upper, pistol, burner having an upright section, the upright section coupled to an end of the first, bottom, burner by a fold in the tubular material.

4. The burner of claim 1, wherein the burner comprises a single venturi for mixing air with combustion gas and supplying the same to the first, bottom, burner and the at least one upper, pistol, burner.

5. The burner of claim 1, wherein at least one of the first, bottom, burner and the at least one upper, pistol, burner comprises an end cap at an end of the tubular material and are coupled to thereto by at least one fold.

6. The burner of claim 1, further comprising an inlet pipe, wherein the inlet pipe is welded to the tubular material forming the first, bottom, burner or wherein the inlet pipe is coupled to an end of the first, bottom, burner by a fold in the tubular material.

7. The burner of claim 6, wherein the inlet pipe comprises a tab projecting from an end thereof, and the tubular material forming the first, bottom, burner comprises an alignment opening in which the tab is received, the tab and the alignment opening forming an alignment device for aligning an open end of the inlet pipe with an inlet opening in the tubular material forming the first, bottom, burner.

8. The burner of claim 7, wherein the inlet pipe comprises a pair of tabs and the tubular material forming the first, bottom, burner comprises a pair of alignment openings each of the pair of alignment openings receives a respective one of the pair of tabs.

9. The burner of claim 6, wherein the inlet pipe comprises air inlet opening cut into a wall thereof, and wherein a plate is mounted to said wall, the plate being adjustable between a first closed position in which the plate covers the air inlet opening and a second open position in which the plate is withdrawn from covering any of the air inlet opening.

10. The burner of claim 6, wherein the inlet pipe is formed from a section of tubular material similar to that which the burner is formed from.

11. The burner of claim 1, wherein the tubular material is a box section having a square cross-sectional shape.

12. The burner of claim 9, wherein the plate is securable in a desired position between the first closed position and the second open position to control the flow of air into the inlet pipe.

13. The burner of claim 1, wherein the burner comprises a single ignition source for igniting combustion gas vented from the first, bottom, burner and the at least one upper, pistol, burner.

14. The burner of claim 2, wherein a section of the unitary tubular material providing the at least one upper, pistol, burner is inclined with respect to the upright section.

15. A heating apparatus comprising the burner of any of claims 1 to 14.

16. The heating apparatus of claim 15, comprising a platform to which the burner is mounted, and wherein the platform comprises at least one electrical light source mounted thereto for illuminating the burner.

17. A component for forming a burner for burning gaseous fuel comprising a tubular material having at least one cutaway defining a recess to provide a foldable region between a first section of the tubular material and a second adjacent section integral with the first section.

18. A method of constructing a burner for burning gaseous fuel comprising:

providing a tubular material,
cutting a recess in the tubular material to define a foldable region between adjacently disposed

first and second sections of the tubular material;
folding the first section of the tubular material with respect to the second section of the tubular material to form a joint therebetween;
welding at least a portion of walls forming the tubular material of the first section to adjacent portions of walls forming the tubular material of the second section.

19. The method of claim 18, wherein cutting a recess in the tubular material comprises laser cutting the tubular material to remove a portion of the walls forming the tubular material.

20. The method of claim 18, further comprising cutting one or more openings in the tubular material to provide vents for escape of combustion gas from within the tubular material.

21. The method of claim 18, further comprising cutting inlet opening in the tubular material and at least one an alignment opening adjacent thereto, the alignment opening configured to receive a tab of an inlet pipe and arranged to align the inlet opening in the tubular material with an open end of the inlet pipe.

22. The method of claim 21, further comprising inserting a tab of an inlet pipe into the at least one alignment opening.

23. A pistol burner for burning gaseous fuel comprising being formed from a unitary tubular material and comprising an upright section coupled to a second section by a fold in the tubular material.

24. The apparatus of claim 23, wherein the second section is inclined with respect to the upright section.

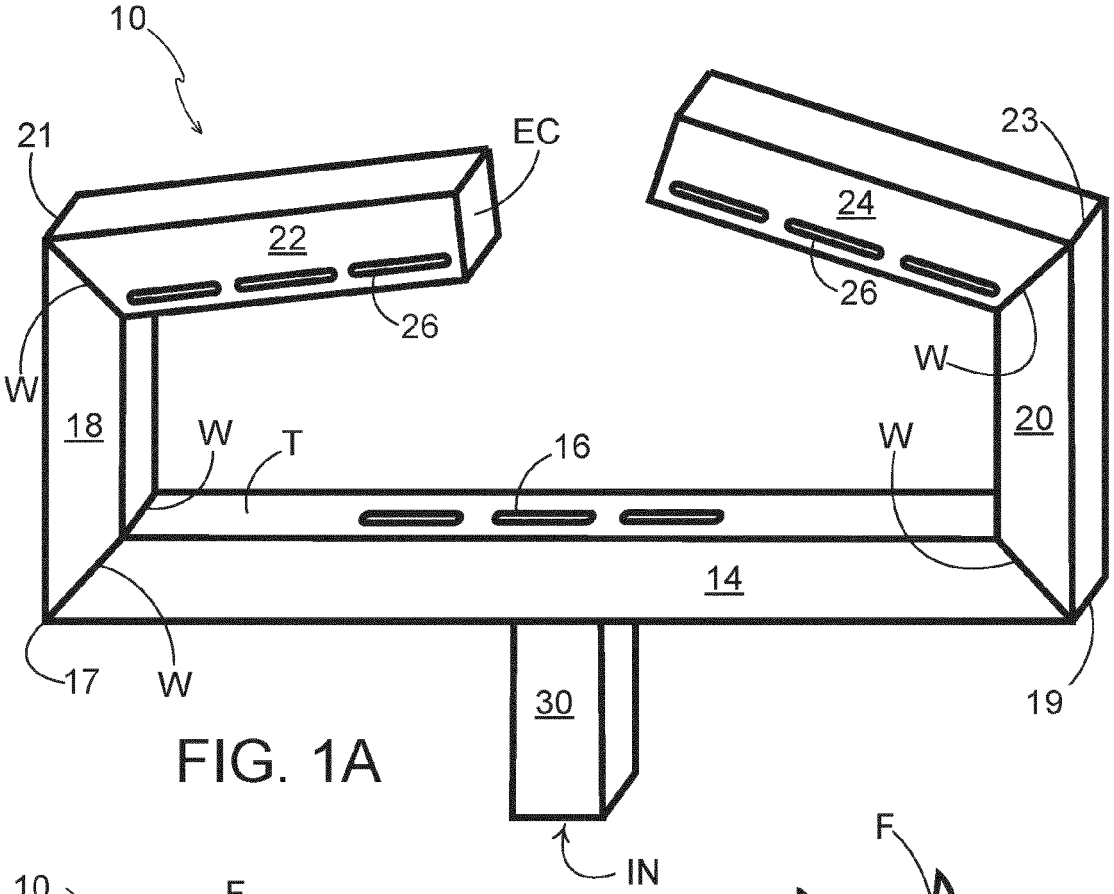
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FIG. 1A

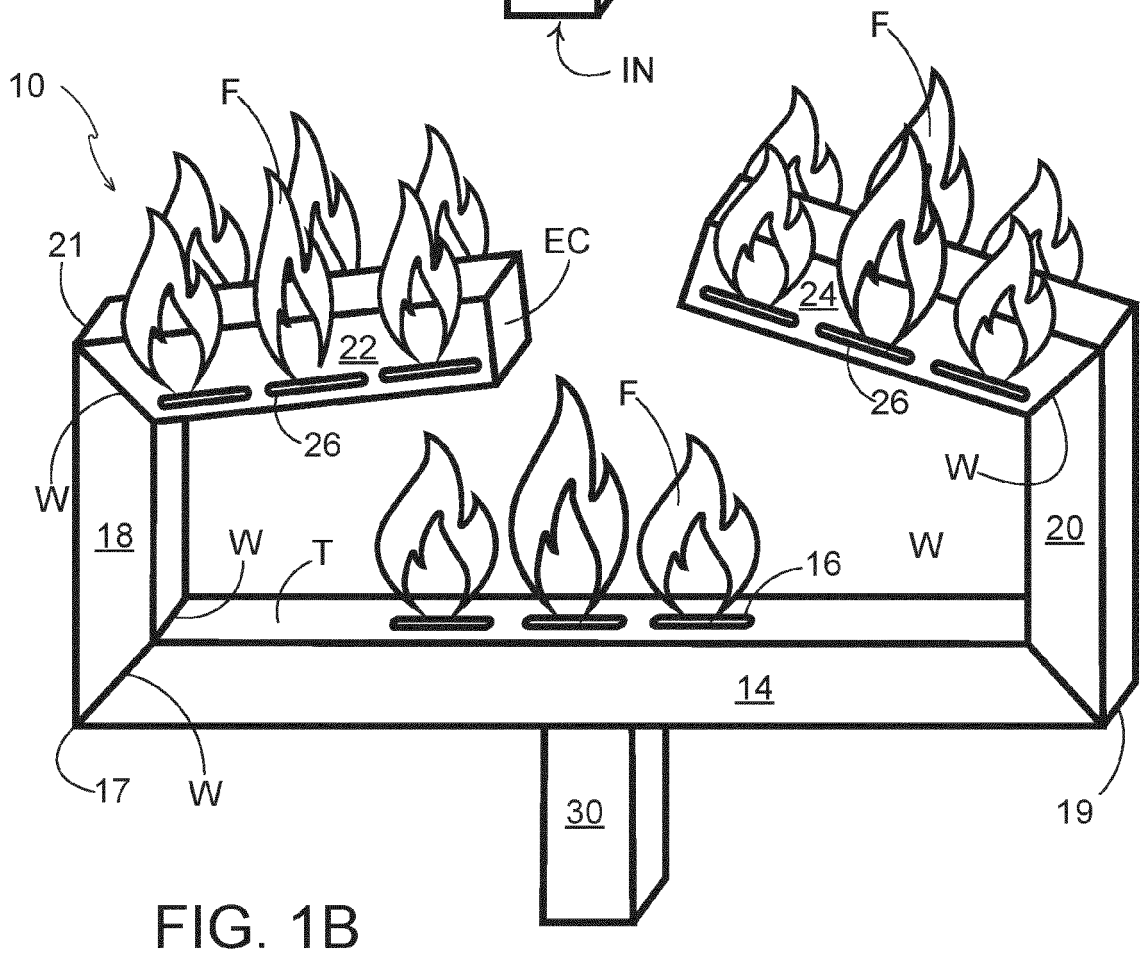
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FIG. 1B

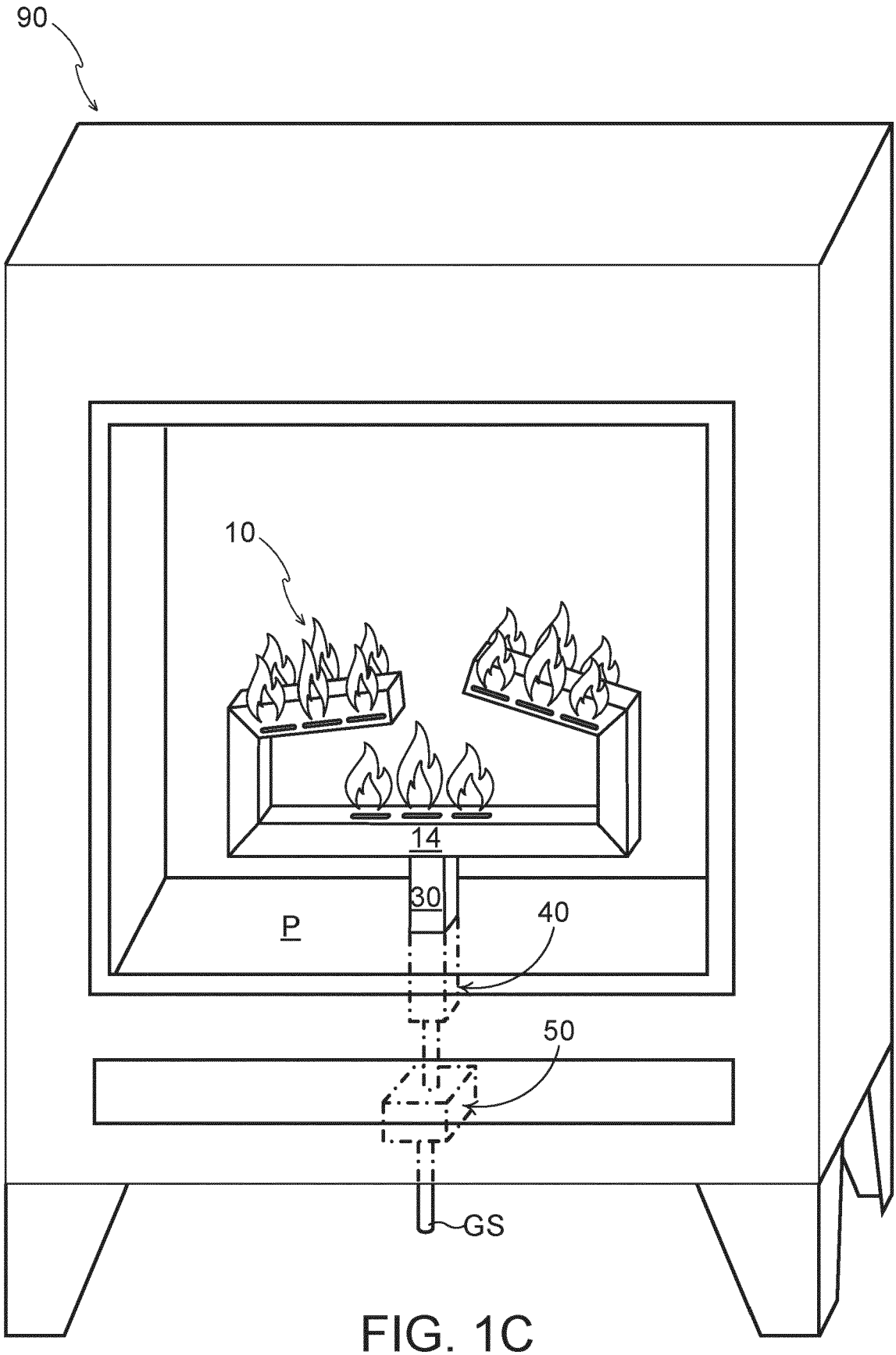
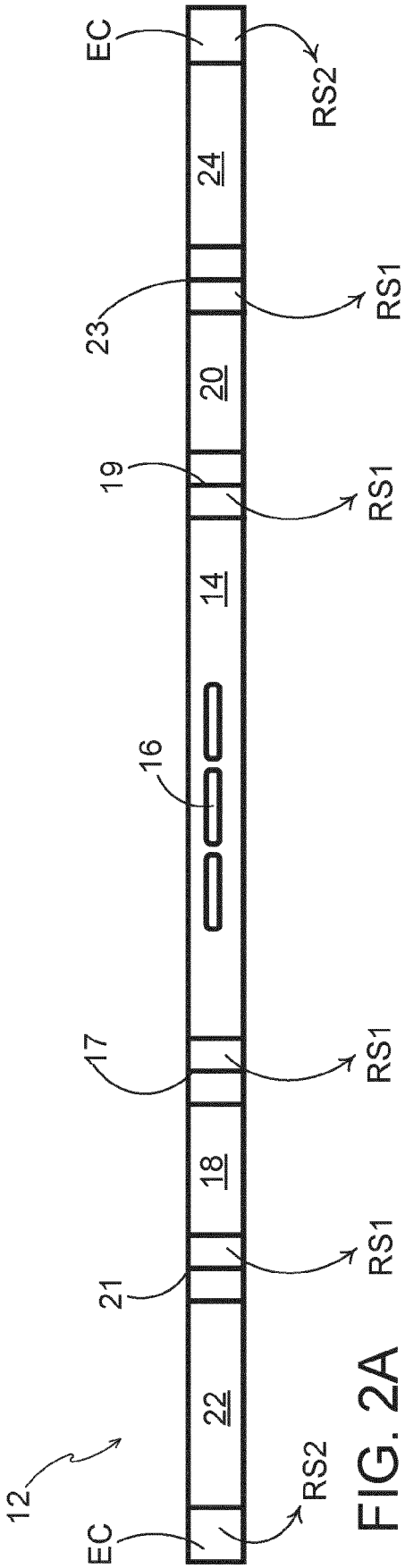


FIG. 1C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RS2
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RS1
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RS1
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RS1
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RS1

FIG. 2A

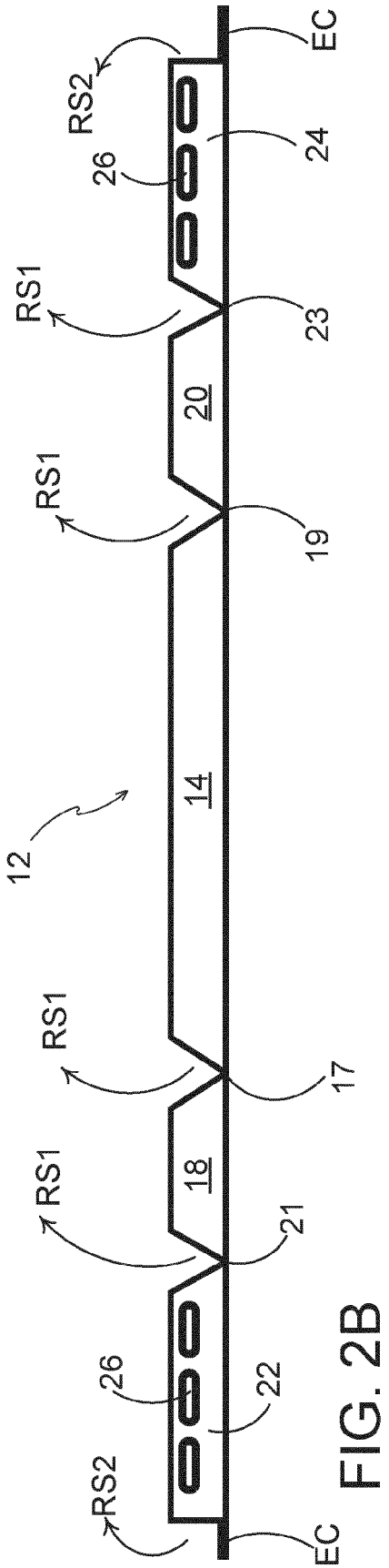
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FIG. 2B

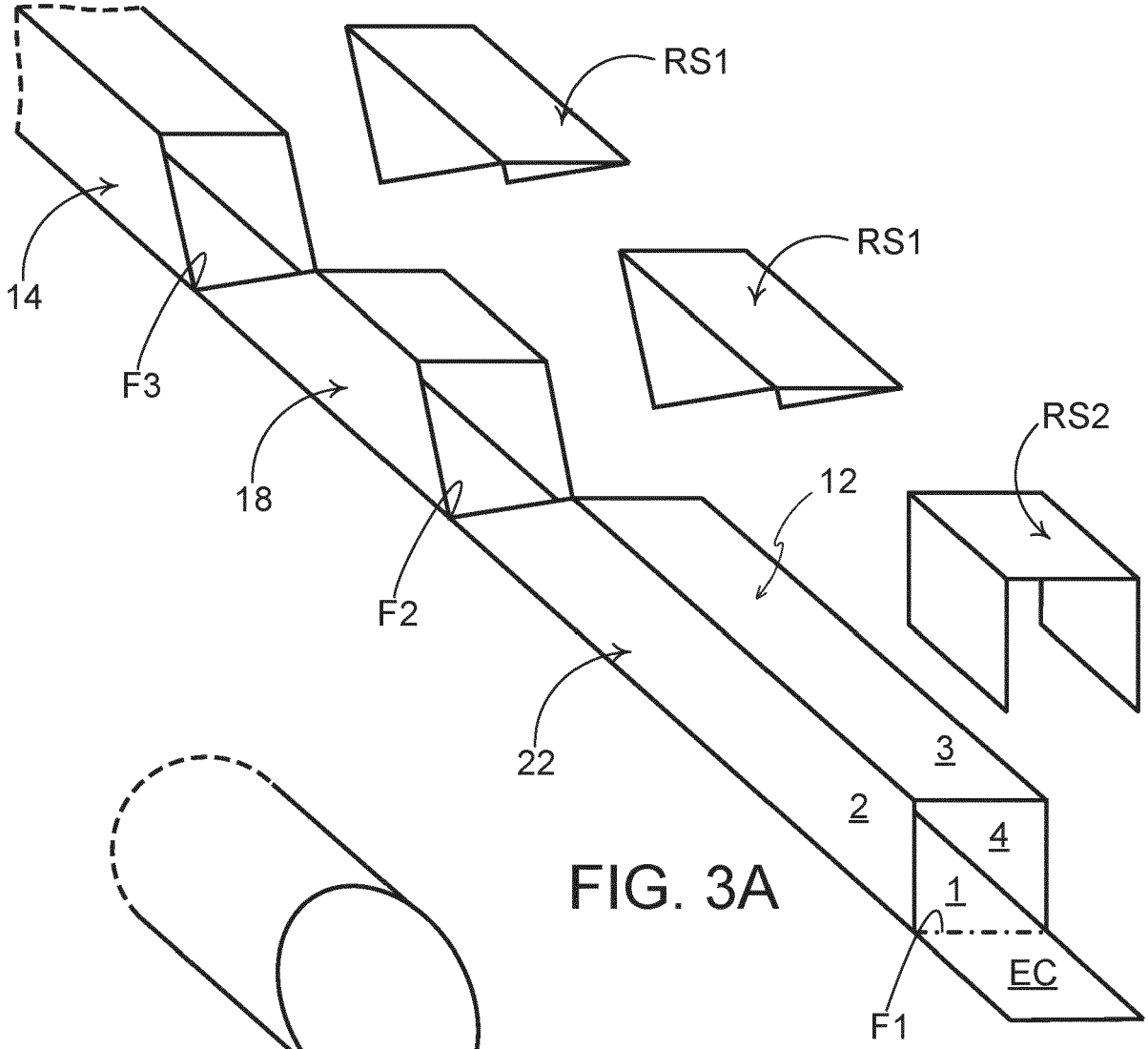


FIG. 3A

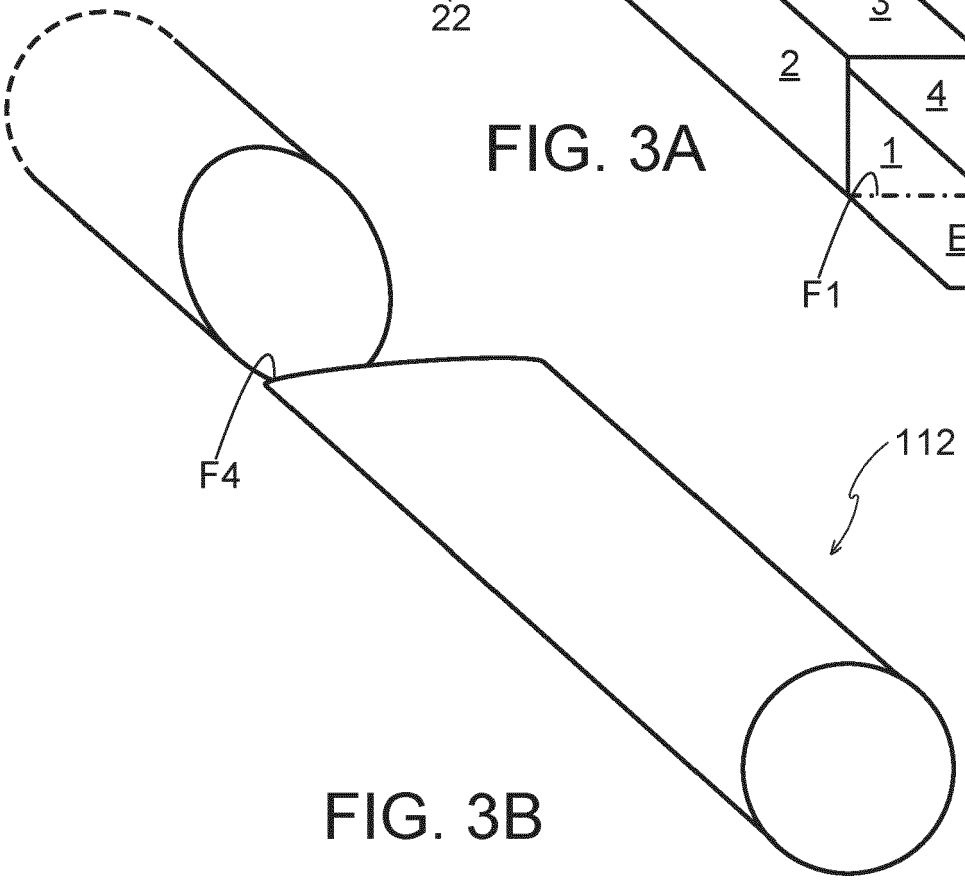
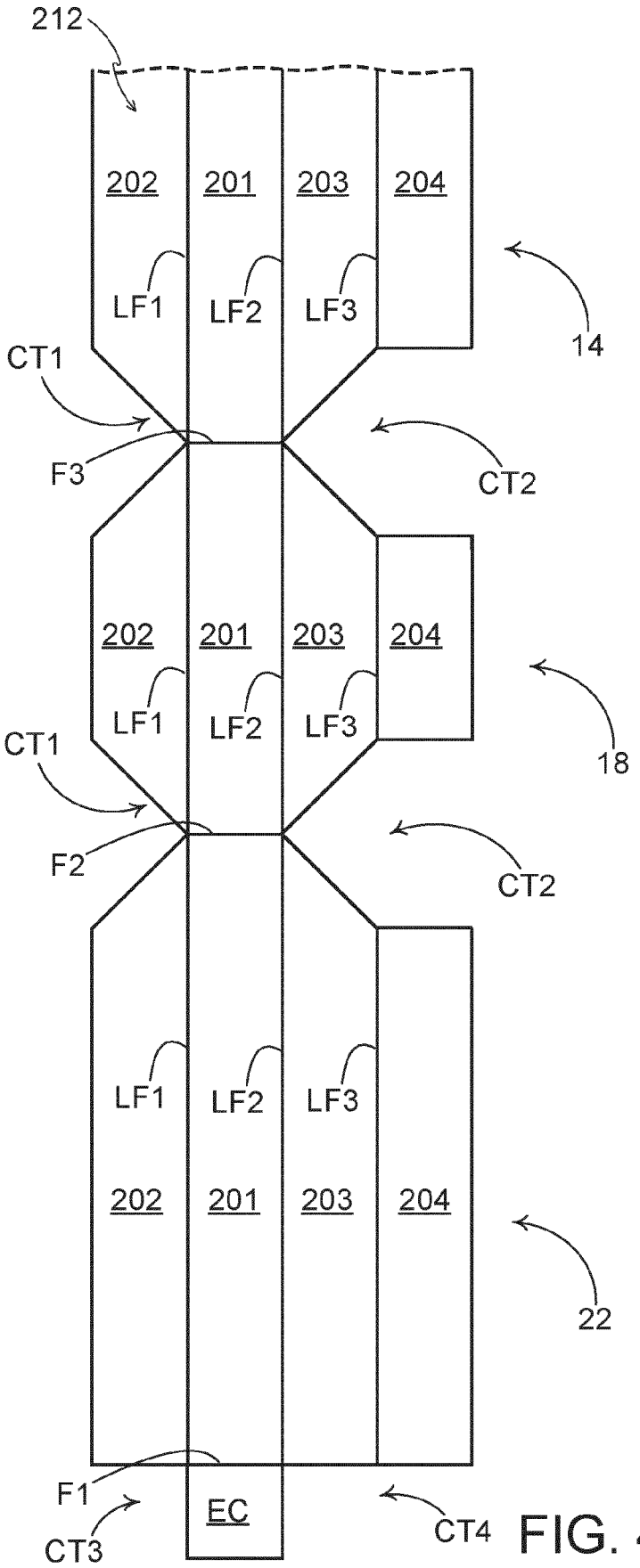


FIG. 3B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CT4

FIG. 4

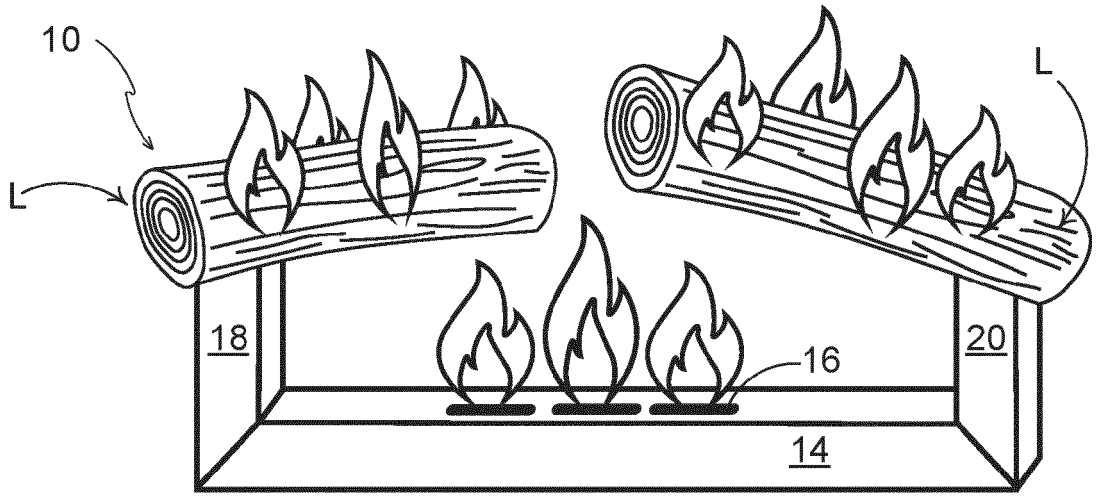

FIG. 5A

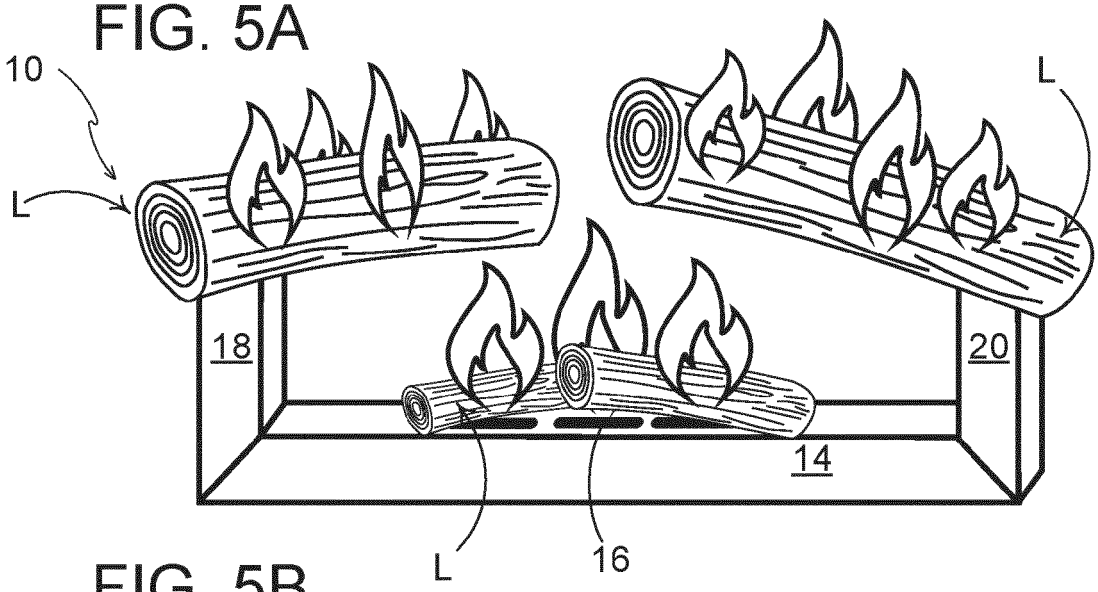

FIG. 5B

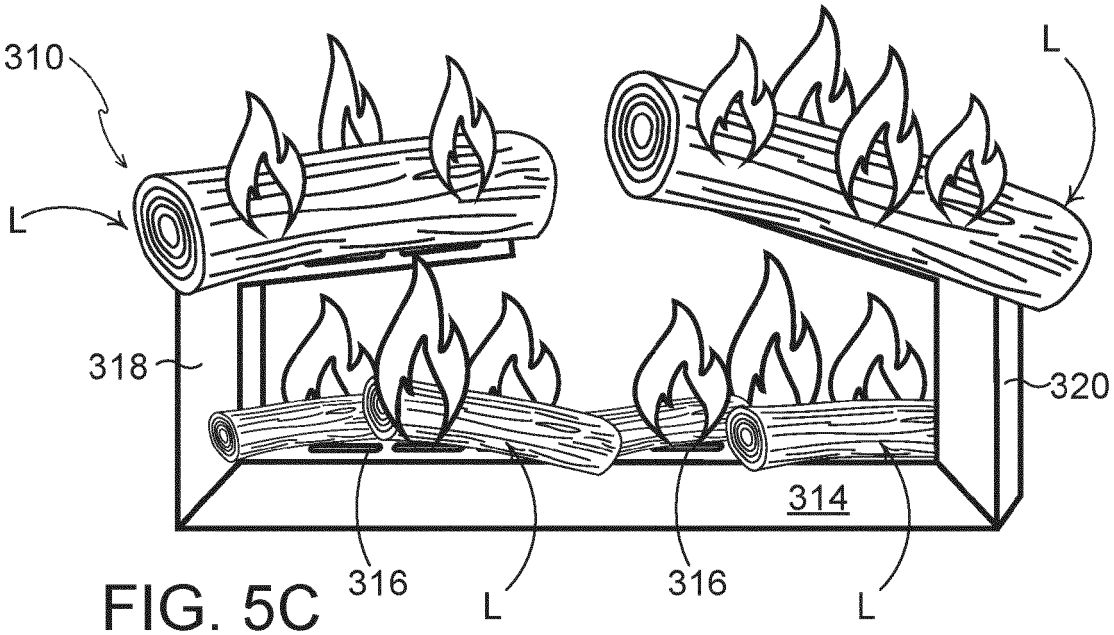

FIG. 5C

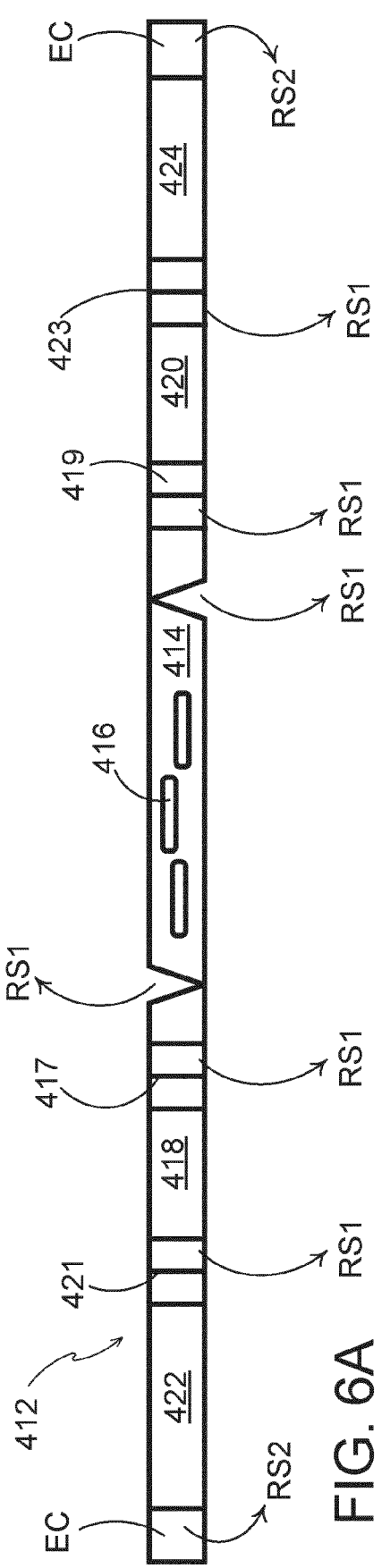
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FIG. 6A

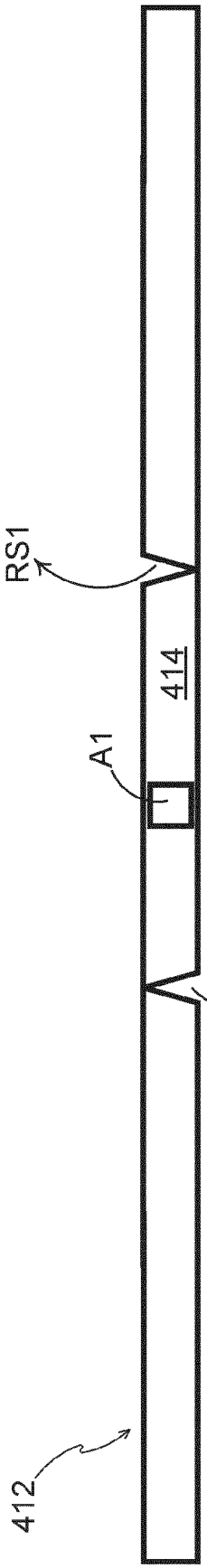
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FIG. 6B

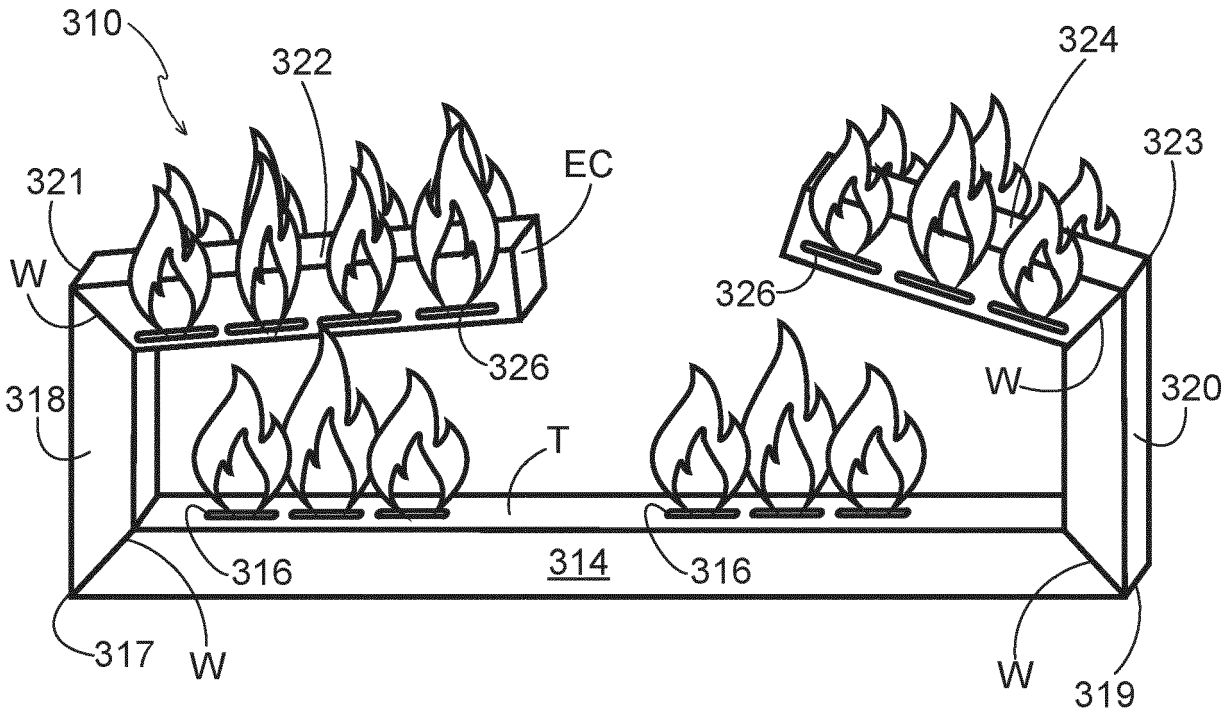
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FIG. 7A

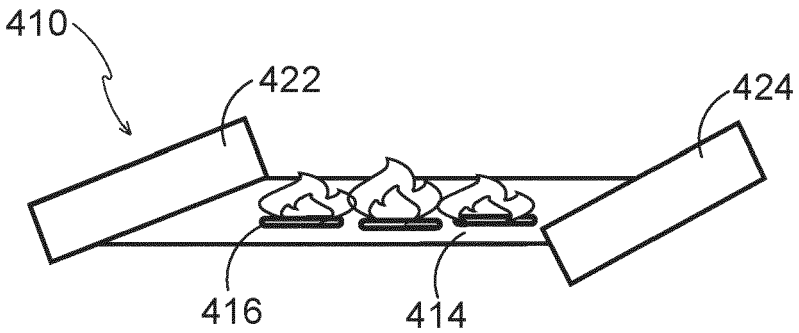
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FIG. 6C

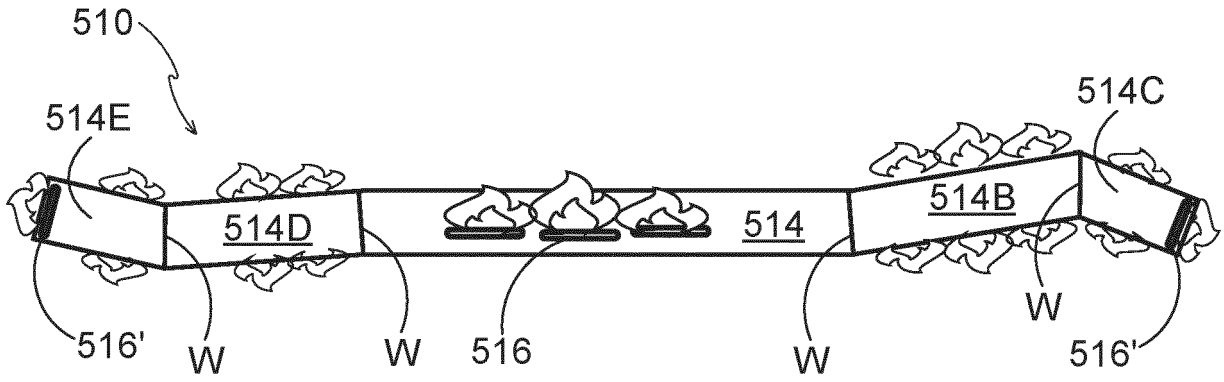

FIG. 8A

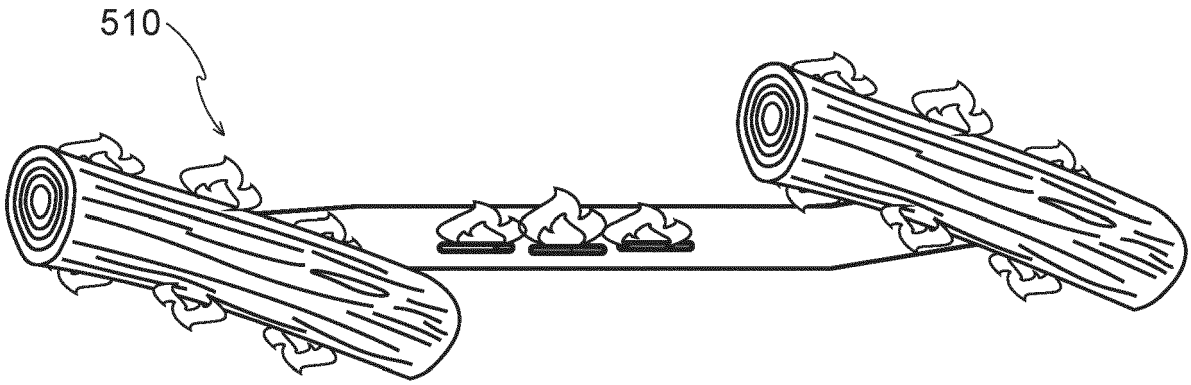

FIG. 8B

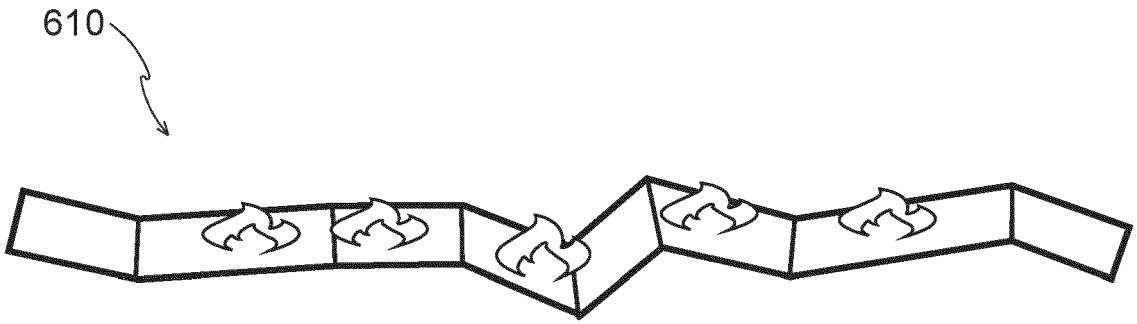

FIG. 9A

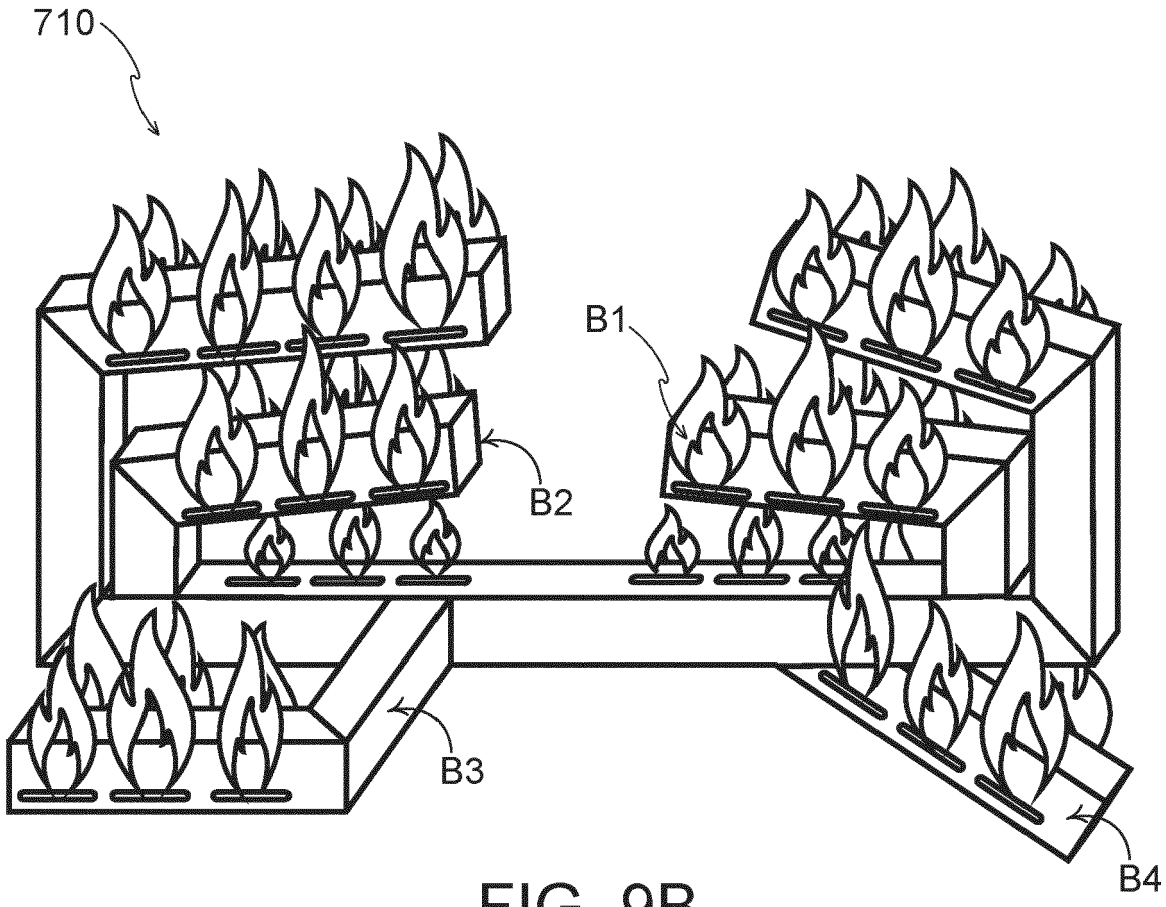

FIG. 9B

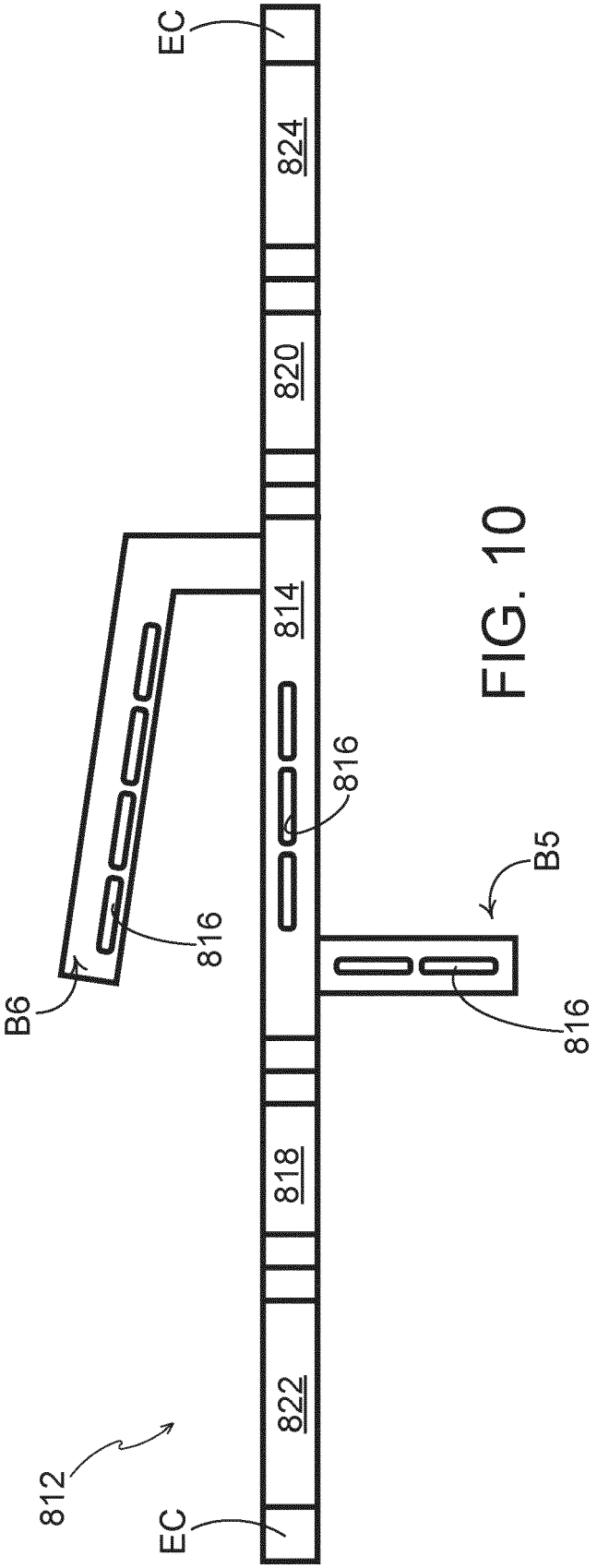

FIG. 10

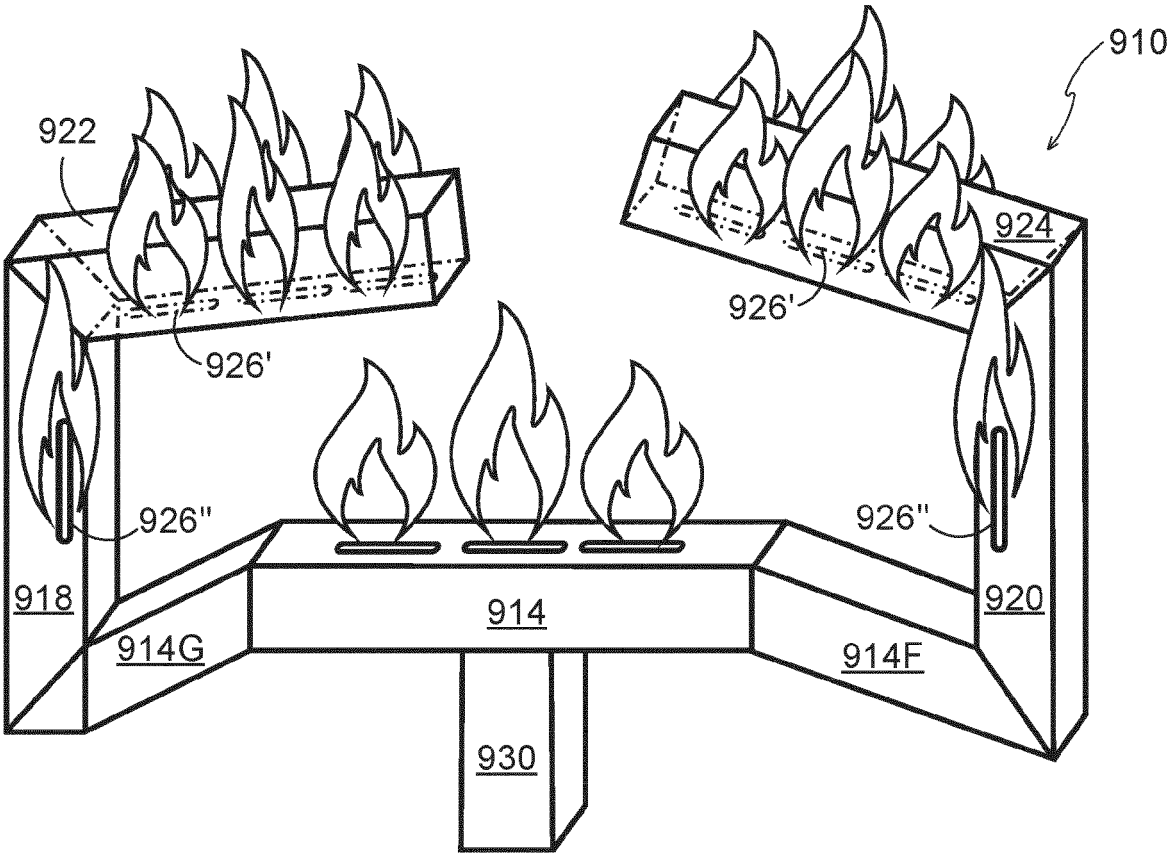

FIG. 11A

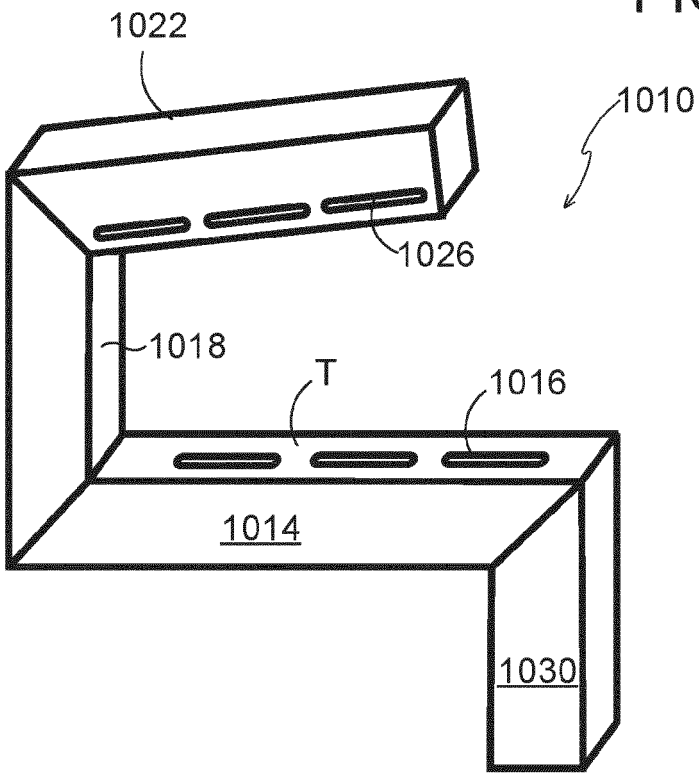

FIG. 11B

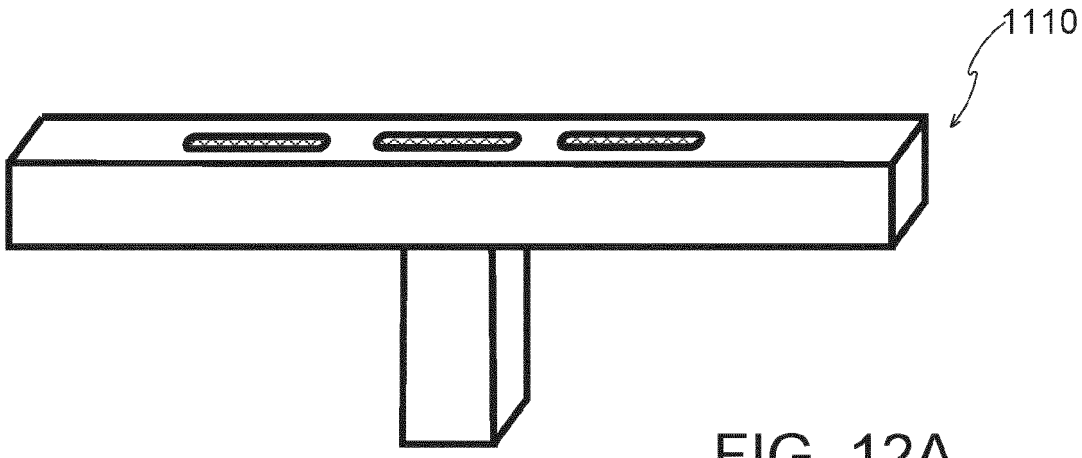

FIG. 12A

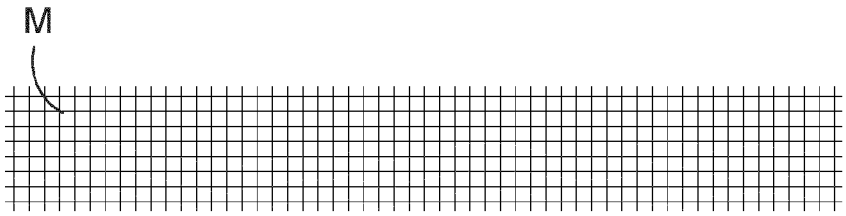

FIG. 12E

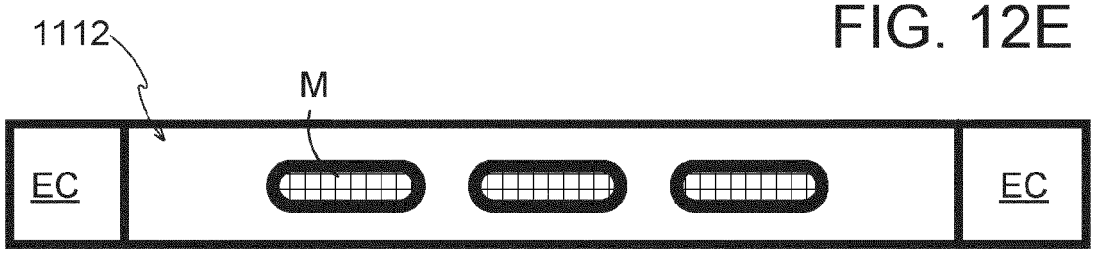

FIG. 12B

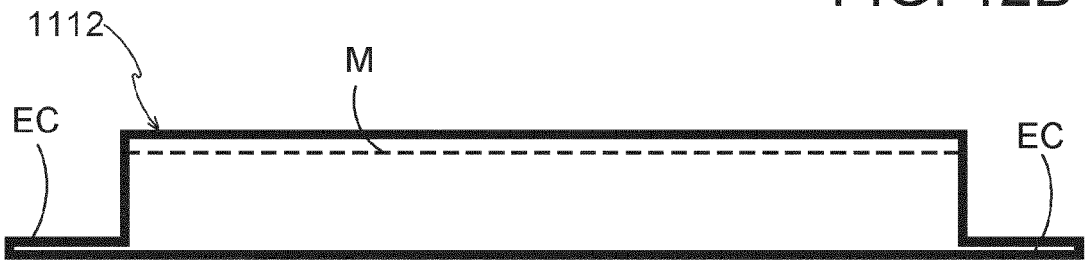

FIG. 12C

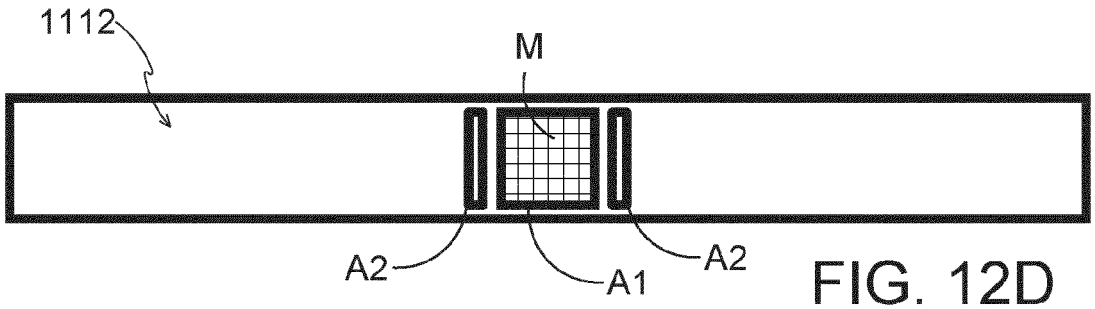

FIG. 12D

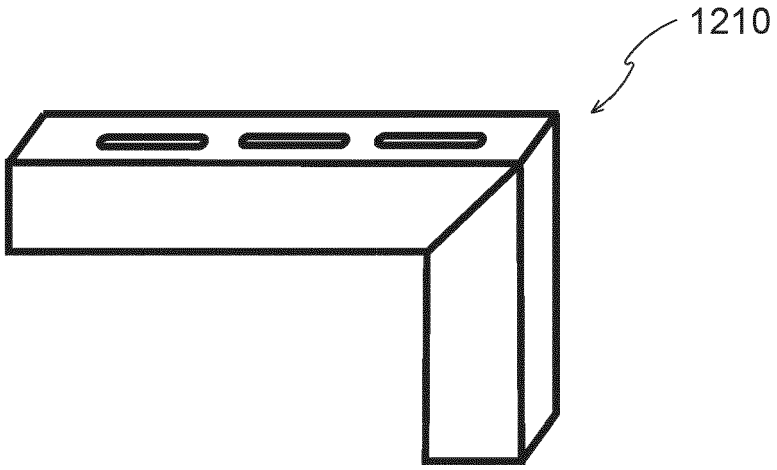

FIG. 13A

FIG. 13B

FIG. 13C

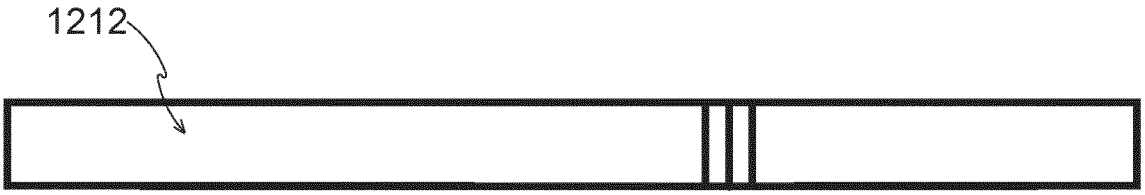

FIG. 13D

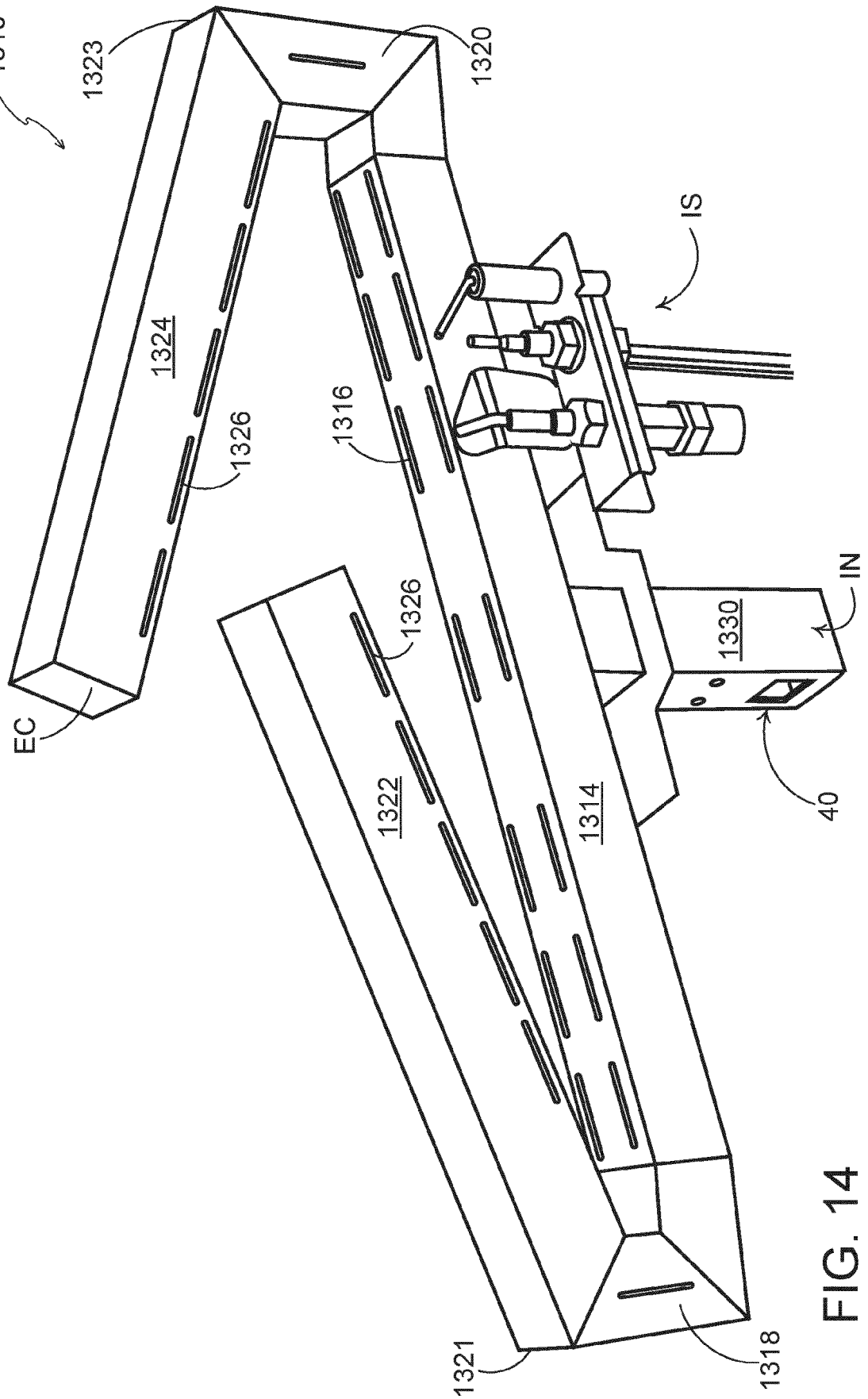
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FIG. 14

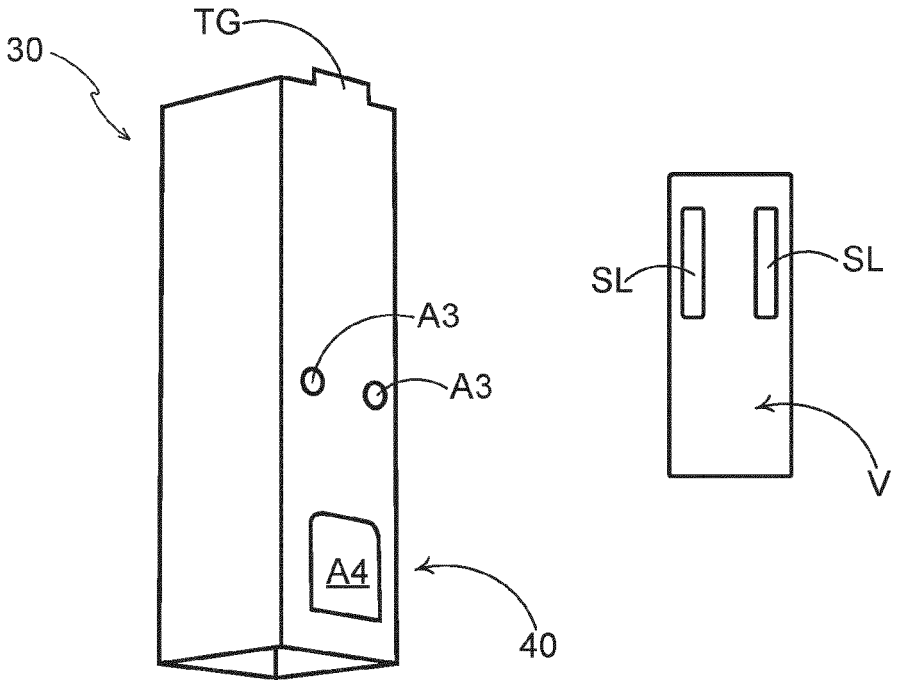

FIG. 15A

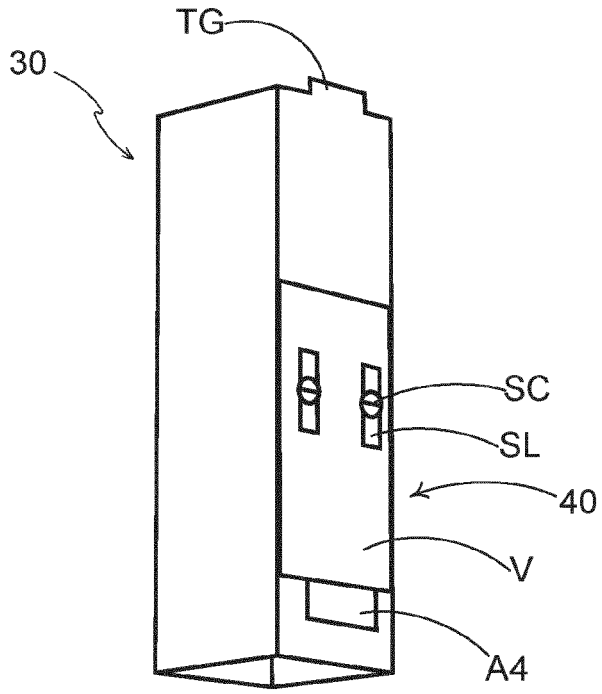

FIG. 15B

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 16 9042

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CA 721 584 A (PAPPAS PHILLIP M) 16 November 1965 (1965-11-16)	1-8,10, 11, 13-16, 23,24	INV. F23D14/04 F23D14/46 F24C3/00
A	* page 1, line 1 - line 13; figures 1-4,9-12 * * page 3, line 3 - line 17 * * page 4, line 23 - page 5, line 24 * * page 6, line 1 - line 6 * * page 7, line 12 - page 9, line 20 *	18	
Y	US 4 875 464 A (SHIMEK RONALD J [US] ET AL) 24 October 1989 (1989-10-24)	18-20	
A	* column 1, line 7 - line 11; figures 1,7,8 * * column 3, line 31 - line 58 *	1-5,15, 16	
X	Mr Technic: "GI PIPE BENDING WITHOUT BENDER", , 21 April 2021 (2021-04-21), XP093081581, Retrieved from the Internet: URL:https://www.youtube.com/watch?v=hkYhx3WE0HQ [retrieved on 2023-09-13]	17	TECHNICAL FIELDS SEARCHED (IPC) F23D F24C
Y	* the whole document *	18-20	
A	US 2005/196715 A1 (SHUMWAY STEPHEN L [US]) 8 September 2005 (2005-09-08) * paragraph [0029] - paragraph [0032]; figures 3-5 *	11	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 September 2023	Hauck, Gunther

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 16 9042

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The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-09-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 721584 A	16-11-1965	NONE	
US 4875464 A	24-10-1989	NONE	
US 2005196715 A1	08-09-2005	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82