Feb. 2, 1960 H. A. MARBLE ET AL 2,923,349

GAS FURNACE CONSTRUCTION

Filed Dec. 11, 1956 2 Sheets-Sheet 1

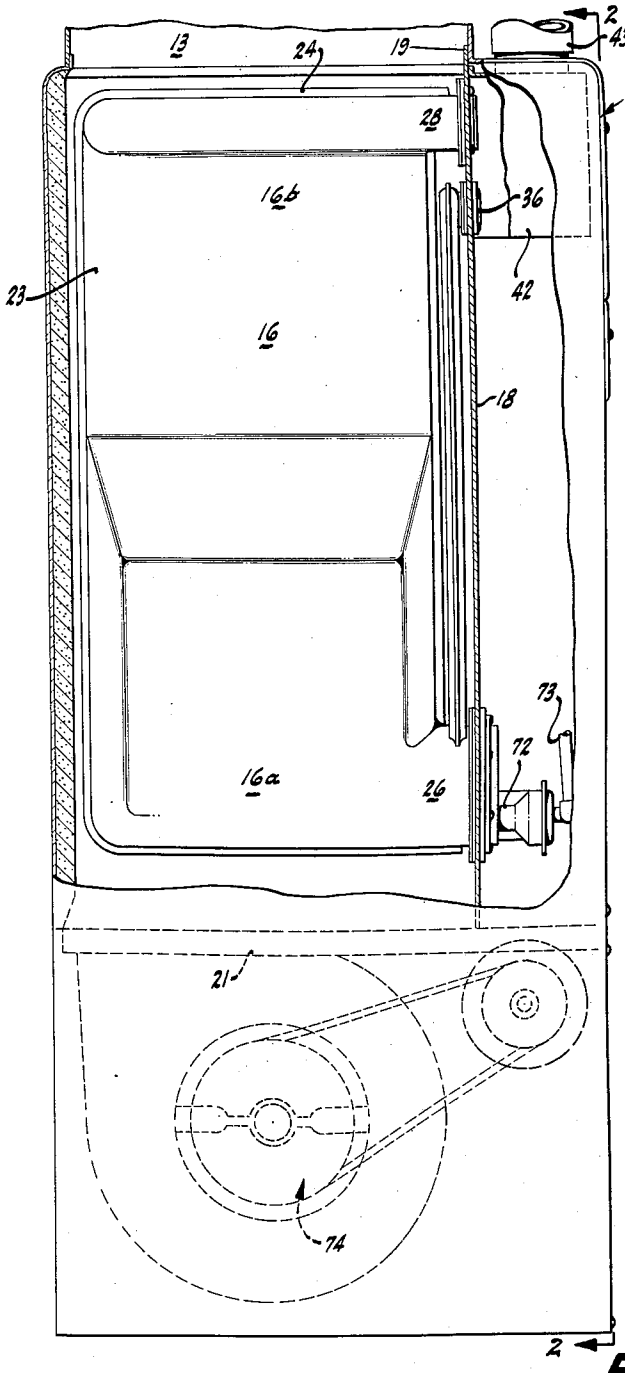


FIG-1

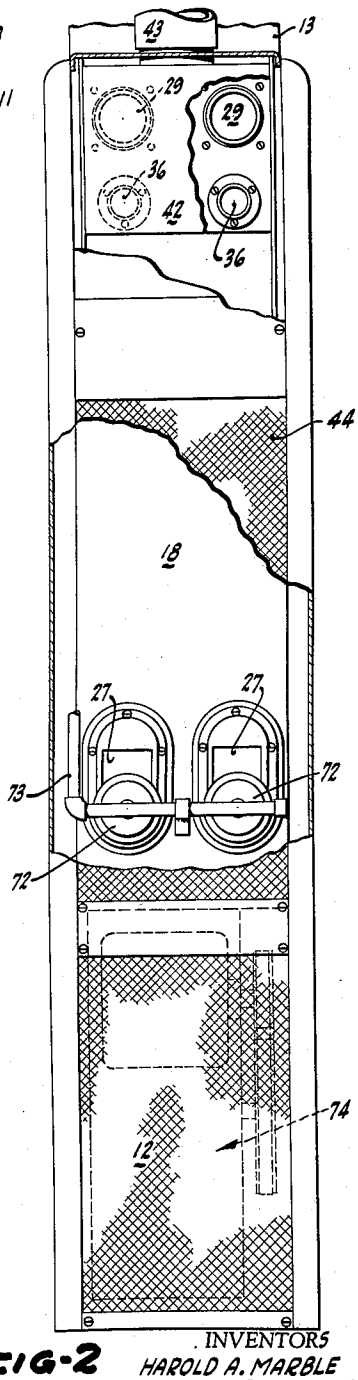


FIG-2

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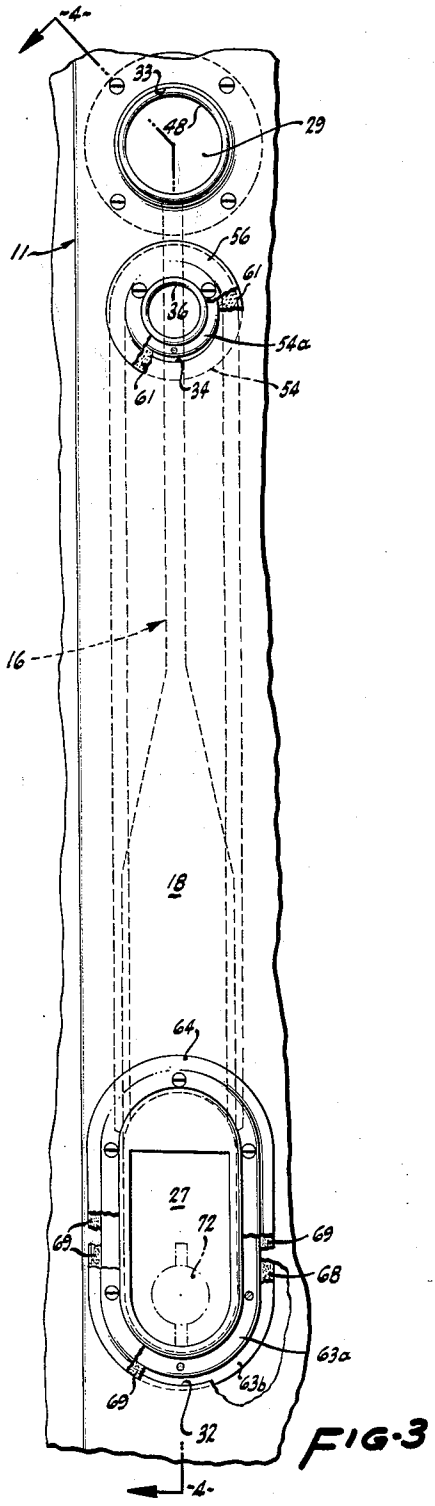


FIG-3

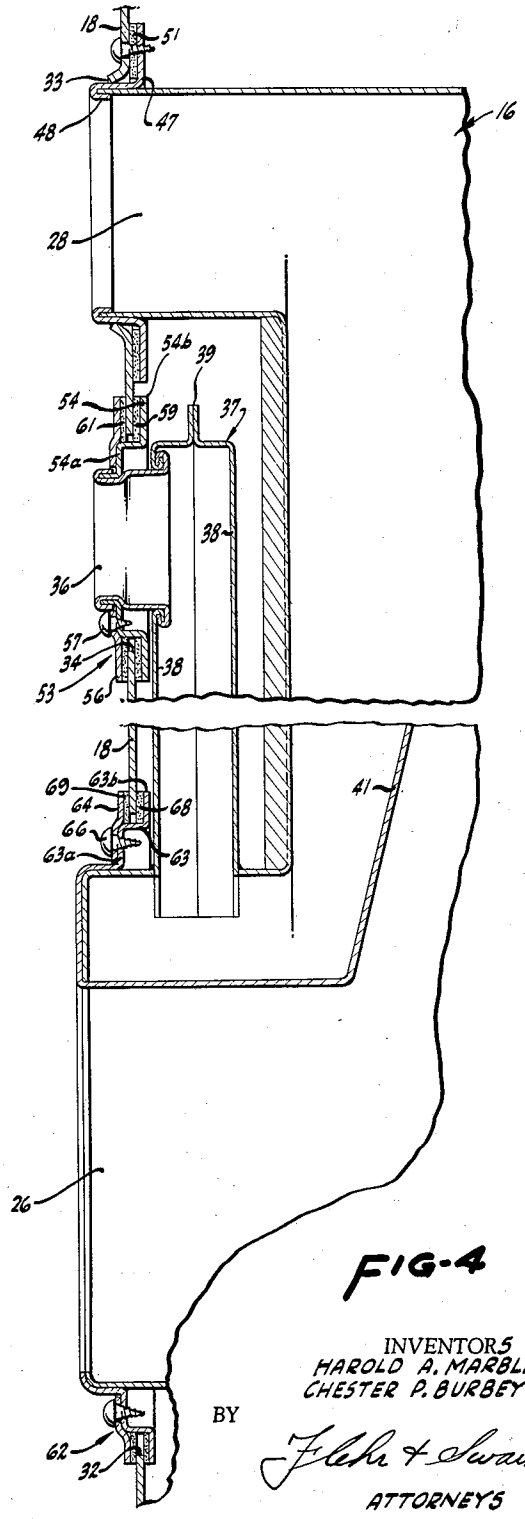


FIG-4

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United States Patent Office 2,923,349 Patented Feb. 2, 1960

2,923,349

GAS FURNACE CONSTRUCTION

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Application December 11, 1956, Serial No. 627,620

4 Claims. (Cl. 158—7)

This invention relates generally to the construction of gas furnaces.

In many conventional gas furnaces, combustion and heat transfer units are mounted within a housing by use of a wall-like member which is fixed to the walls of the housing and carries the combustion and heat transfer units. Upon heating of the heat transfer units, expansion of the units occurs which is greater than the expansion of the wall-like member supporting the heat transfer units. This difference in expansion often creates stresses so great that the wall-like member for mounting the heat transfer units is stretched. Upon cooling, the heat transfer units contract or shrink, but since the wall-like member for mounting the combustion chamber has been stretched, it will not contract or shrink to its original condition. This also causes stresses to be created in the wall-like member and the heat transfer units. Repeated heating and cooling of the heat transfer units causes a repetition in the stressing of the heat transfer units and the wall-like member which finally causes failure of the metal forming the heat transfer units. Cracks often result which permit gases to escape from the furnace. This is particularly dangerous since the escaping gases often contain a large percentage of carbon monoxide.

In general, it is an object of the present invention to provide an improved gas furnace construction which eliminates the above mentioned objectionable features.

Another object of the invention is to provide a gas furnace which prevents stressing of the combustion and heat transfer units.

Another object of the invention is to provide an improved gas furnace construction of the above character which will accommodate the expansion and contraction of the combustion and heat transfer units which occur upon heating and cooling of the units.

A further object of the invention is to provide an improved gas furnace construction of the above character in which stressing of the mounting member for the combustion and heat transfer units is also eliminated.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment has been set forth in detail in conjunction with the accompanying drawings.

Referring to the drawings:

Figure 1 is a side elevational view with certain parts of the housing cut away showing a gas furnace construction incorporating our present invention.

Figure 2 is a cross sectional view taken along the line 2—2 of Figure 1 with parts cut away.

Figure 3 is an enlarged elevational view showing a portion of a panel member and the means for mounting one of the combustion and heat transfer units on the panel member.

Figure 4 is an enlarged cross sectional view taken along the line 4—4 of Figure 3.

In general, the present invention consists of a gas furnace in which particularly novel means is utilized for mounting the combustion and heat transfer units on the panel member. The mounting is accomplished in such a way that one end of each of the combustion and heat transfer units may move relative to the panel member to accommodate contraction and expansion of the combustion and heat transfer units during operation of the furnace.

The furnace as illustrated in the drawings includes a housing or casing 11 provided with a cold air inlet 12 in the lower portion of one side of the housing, and with a hot air outlet 13 at the top of the housing. The housing itself is of conventional construction and is formed of sheet metal walls which are suitably joined as by welding.

The furnace as shown is provided with a pair of combustion and heat transfer units 16 disposed within the housing 11. The lower portion 16*a* of each unit may be termed the combustion chamber portion and the upper portion 16*b*, the heat transfer or exchange portion. If desired, a single combustion and heat transfer unit may be provided or additional combustion and heat transfer units may be utilized.

Means is provided for mounting the combustion and heat transfer units 16 within the housing and consists of a panel member 18 which has its upper end fixed to the housing 11 at 19 by suitable means such as welding and its lower end fixed to a partition 21.

As shown particularly in the drawings, the combustion and heat transfer units 16 consist of pressed sheet metal sidewalls 23 having their edges welded or otherwise suitably joined together at 24. At the lower portion of each of the combustion and heat transfer units a forward extension 26 substantially oval in section is provided which forms a burner opening 27 in communication with the combustion chamber portion 16*a* of the unit. The upper portion of each of the combustion and heat transfer units is provided with a forward extension 28 which forms a discharge opening 29 substantially circular in section which is in communication with the upper heat transfer portion 16*b* of the unit.

The vertically disposed panel member 18 is provided with openings 32 and 33 which are adapted to accommodate forward extensions 26 and 28 respectively. Opening 33 is of such dimension that a relatively tight fit is formed between the panel member 18 and the extension 28. Opening 32 loosely accommodates the forward extension 26 and is of such a dimension that a substantial space is present between the lower surface of the forward extension 26 and the lower surface of the panel member forming the opening 32 for a purpose hereinafter described.

An additional opening 34 is provided in the panel member 18 adjacent the opening 33 and serves to loosely accommodate one end of a forward extension 36 of a duct 37. The opening 34 is slightly larger than the forward extension 36 as is readily apparent from the drawing for a purpose hereinafter described.

The duct 37 is formed of pressed sheet metal sidewalls 38 having their edges welded or otherwise suitably joined together as indicated at 39. A pressed connection is formed between the forward extension 36 and the upper portion of the duct 37 in a manner well known to those skilled in the art. The lower end of the duct 37 extends through an opening in the upper portion of the forward extension 26 and is fixed thereto by suitable means such as welding. The lower open end of the duct 37 is disposed adjacent the burner opening 27 for a purpose described in our co-pending application, Serial No. 546,474, filed November 14, 1955, now Patent No. 2,884,048, granted April 28, 1959. An L-shaped baffle 41 is fixed to the forward extension 26 and serves to collect recirculating burned gases as described in the above co-pending application.

The forward extensions 28 and 36 empty into a draft hood 42 which is connected to a flue 43. A cold air inlet 44 is provided in the front sidewall of the housing and serves to permit air to pass into the lower open end of the draft hood 42.

As described previously, means is provided for mounting the combustion and heat transfer units 16 on the vertically disposed panel 18 to accommodate the expansion and contraction of the combustion and heat transfer units. Generally, this is accomplished by fixing one end of each of the combustion and heat transfer units to the panel member 18 and providing means for securing the other ends of the combustion and heat transfer units to the panel member so that those ends of the combustion and heat transfer units may move relative to the panel member.

As shown particularly in Figure 4, the forward extension 28 forming the discharge opening 29 extends through the opening 33 in the panel member 18 and is fixed to the panel member 18. The inner margin of a collar-like member 47 is crimped onto the outer margin of the forward extension 28 at 48. The outer margin of the member 47 forms a flange and carries a gasket 51 of suitable material such as asbestos. Each combustion and heat transfer unit is positioned in such a manner that the gasket 51 is adjacent the inner surface of the panel member 18. Lateral or horizontal movement of the extension 28 relative to the opening 33 is prevented by the slidable connections (hereinafter described) for securing the extensions 26 and 36 to the panel member 18.

A slidable connection 53 is provided between the extension 36 and the panel member 18 and consists of an annular collar-like member 54 having offset portions 54*a* and 54*b*. The inner edge of the annular member 54 is secured to the extension 36 by suitable means such as having the outer margin of the extension crimped onto the inner margin of the annular member 54 as shown in Figure 4. An annular ring-like clamping member 56 has its inner margin fastened to the offset portions 54*a* of the annular member 54 by suitable means such as screws 57.

Gaskets 59 and 61 mounted in the annular groove formed between the ring-like clamping member 56 and the offset portions 54*b* of the annular member 54 loosely engage the panel member 18 adjacent the opening 34. It will be noted that the extension 36 is positioned in the opening 34 in such a manner that there is a substantial space between the lower edge of the opening 34 and the lower outer surface of the annular member 54 for a purpose hereinafter described.

The forward extension 26 forming the burner opening is also fastened to the panel member 18 by suitable slidable connection 62 to permit relative movement between the extension 26 and the panel member 18. As shown in the drawing, the connection consists of a substantially oval collar-like member 63 having offset portions 63*a* and 63*b*. The collar-like member 63 is secured to the forward extension 26 by suitable means such as welding. A substantially oval-shaped clamping member 64 has its inner margin secured to the member 63 at the offset portion 63*a* by suitable means such as screws 66. A pair of gaskets 68 and 69 are disposed in the groove formed between the outer margin of the member 64 and the offset portion 63*a* and loosely accommodate the portion of the panel member 18 forming the opening 32. It will be noted that the extension 26 is positioned so that there is a space between the bottom edge of the opening 32 and the member 63 for a purpose hereinafter described.

A burner 72 is mounted in each of the burner openings 27 as shown. The burners are connected to a gas supply pipe 73, the flow of gas through the gas supply pipe and to the burners being regulated by control means (not shown) as described in our co-pending application Serial No. 546,474, filed November 14, 1955. A blower 74 is provided in the housing 11 below the partition 21 for circulating air through the furnace.

Operation of our gas furnace may now be described as follows: As soon as the burners 72 are lit, it is readily apparent that the combustion and heat transfer units 16 will heat up very rapidly to cause expansion of the combustion and heat transfer units. Since the units 16 have a much greater length and width, it is apparent that most of the expansion will occur in a vertical direction.

Since the vertically disposed panel member 18 serving to mount the combustion and heat transfer units has most of its surface spaced from the combustion and heat transfer units, it is readily apparent that the panel member will not be heated as rapidly nor expand as rapidly as the combustion and heat transfer units. The slidable connections we have provided for mounting the extensions 26 and 36 readily accommodate the greater expansion which occurs in the combustion and heat transfer units and permit movement of the extensions 26 and 36 relative to the panel member 18. The spaces provided between the lower edges of the openings 32 and 34 and the collar-like members 63 and 54 readily permit downward movement of the extensions 36 and 26 relative to the panel member 18. Since the expansion of the combustion and heat transfer units 16 in the region of the extensions 36 is less than the overall expansion of the combustion and heat transfer units, a smaller space is provided between the bottom of the opening 34 and the collar-like member 54.

During operation of the furnace, the duct 37 also heats causing it to expand and to push the extension 36 upwardly. Thus, while the expansion of the combustion and heat transfer unit 16 pulls the extension 36 downwardly relative to the panel member 18, the expansion of the duct 37 pushes the extension 36 upwardly and in the opposite direction so that the movement of the extension 36 relative to the panel member 18 is small. When the burners are extinguished, the combustion and heat transfer unit 16 contracts and the extensions 26 and 36 move back to their original positions as shown in Figure 4. Thus, during expansion and contraction of the combustion and heat transfer units, no stress is placed on the panel member 18 and in turn no undue stress is placed on the combustion and heat transfer units. By providing two floating or sliding connections for two of the extensions, and a fixed connection for the other of the extensions, all undue stresses on the panel member 18 and the combustion and heat transfer units 16 are eliminated. This is particularly advantageous in that it prevents metal failure and the formation of cracks in the combustion and heat transfer units 16. This prevents the accidental escape of noxious gases.

In the embodiment of our invention shown in the drawing, the upper extension 28 has been fixed to the panel member 18 and the intermediate extension 36 and the lower extension 26 are provided with floating connections. It is readily apparent, however, that if desired, the lower forward extension 26 could be fixed to the panel member 18 and the other two extensions 36 and 28 could be provided with floating connections to accommodate the expansion and contraction of the combustion and heat transfer units 16.

It is apparent from the foregoing that we have provided a gas furnace construction which readily accommodates the expansion and contraction of the combustion and heat transfer units and prevents undue stressing of the panel member for mounting the combustion and heat transfer units and undue stressing of the combustion and heat transfer units themselves.

We claim:

1. In a gas furnace construction of the type having an exterior housing, a combustion and heat transfer unit adapted to be disposed in the housing, the combustion and heat transfer unit having a forward extension on its lower portion forming a burner opening and a forward extension on its upper portion forming a discharge opening, means for mounting said combustion and heat

transfer unit in said housing consisting of a panel member fixed to said housing, said panel member having openings therein to accommodate the upper and lower forward extensions of the combustion and heat transfer unit, one of the openings in the panel member having a dimension in one direction substantially greater than the corresponding dimension of the associated forward extension, means fixing one of said extensions to said panel member so that the opening formed by that forward extension is in registration with one of the openings in the panel member, and means for securing the other of said forward extensions to the panel member so that the opening formed by said other forward extension is in registration with the other opening of said panel member, said last named means permitting relative movement between said other forward extension and the panel member to accommodate expansion and contraction of the combustion and heat transfer unit, a duct having one end mounted on said combustion and heat transfer unit, said one end of said duct opening into said combustion and heat transfer unit adjacent the burner opening, means for mounting the other end of said duct in said panel member to permit relative movement between said other end of said duct and said panel member to accommodate the expansion and contraction of said combustion and heat transfer unit and the expansion and contraction of said duct, and a draft hood mounted on said panel member with said housing, both the discharge opening of the combustion and heat transfer unit and said duct emptying into said draft hood.

2. In a gas furnace construction of the type having an exterior housing, a combustion and heat transfer unit of the type adapted to be disposed in the housing, the combustion and heat transfer unit having a forward extension on its lower portion forming a burner opening and a forward extension on its upper portion forming a discharge opening, means mounting said combustion and heat transfer unit in said housing consisting of a panel member affixed to said housing, said panel member having upper and lower openings therein to accommodate the upper and lower forward extensions of the combustion and heat transfer unit, means securing one of said extensions to said panel member so that the opening formed by that forward extension is in registration with one of the openings in the panel member, means securing the other of said forward extensions to the panel member so that the opening formed by said other forward extension is in registration with the other opening in said panel member, said other opening in said panel member having a dimension in one direction substantially greater than the corresponding dimension of said other forward extension, said last named securing means permitting relative vertical movement between said forward extension and the panel member to accommodate expansion and contraction of the combustion and heat transfer unit, each of the securing means for said extensions including a collar-like member affixed to the extensions and insulating means disposed between the collar-like member and the panel member, a vertical duct, one end of said duct opening into said combustion and heat transfer unit adjacent the burner opening, and means mounting the other end of said duct in said panel member to permit relative movement between said other end of said duct and said panel member to accommodate the expansion and contraction of the combustion and heat transfer unit and the expansion and contraction of said duct, and a common draft hood mounted on said panel member, the discharge opening formed by the upper forward extension of the combustion and heat transfer unit and said other end of said duct and emptying into said common draft hood.

3. In a gas furnace construction of the type having an exterior housing, a combustion and heat transfer unit adapted to be disposed in the housing, the combustion and heat transfer unit having a forward extension on its lower portion forming a burner opening and a forward extension on its upper portion forming a discharge opening and means for mounting said combustion and heat transfer unit in said housing consisting of a panel member affixed to said housing, said panel member having upper and lower openings therein to accommodate the upper and lower forward extensions of the combustion and heat transfer unit, means securing one of said extensions to said panel member so that the opening formed by that forward extension is in registration with one of the openings in the panel member and means securing the other of said forward extensions to the panel member so that the opening formed by said other forward extension is in registration with the other opening in said panel member and also permitting relative vertical movement between said other forward extension and the panel member to accommodate expansion and contraction of the combustion and heat transfer unit, said other opening in said panel member having a dimension in one direction, substantially greater than the corresponding dimension of said other forward extension to permit sliding movement of said other forward extension relative to said panel member, said last named securing means including a collar-like member affixed to the extension and having a portion thereof slidably engaging one side of the panel member and a clamping ring secured to the collar and having a portion thereof slidably engaging the other side of the panel member.

4. A furnace construction as in claim 3 wherein said last named securing means permitting relative vertical movement is mounted on the forward extension formed on the lower portion of the combustion and heat transfer unit, and wherein said forward extension formed on the lower portion of the combustion and heat transfer unit serves as a burner opening.

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