

Feb. 23, 1954

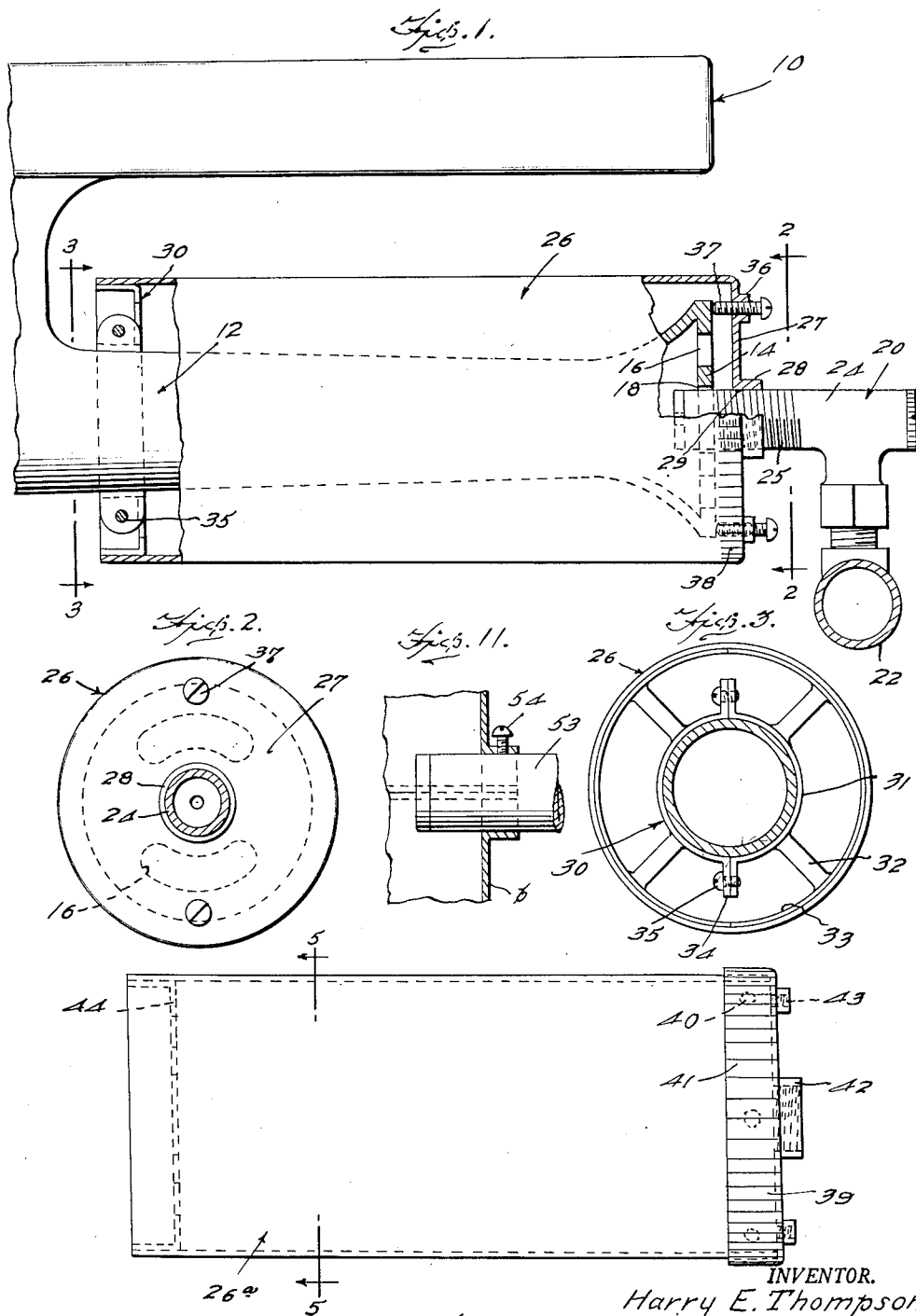
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2,670,034

AIR COMPENSATOR FOR GAS BURNERS

Filed Aug. 2, 1951

2 Sheets-Sheet 1



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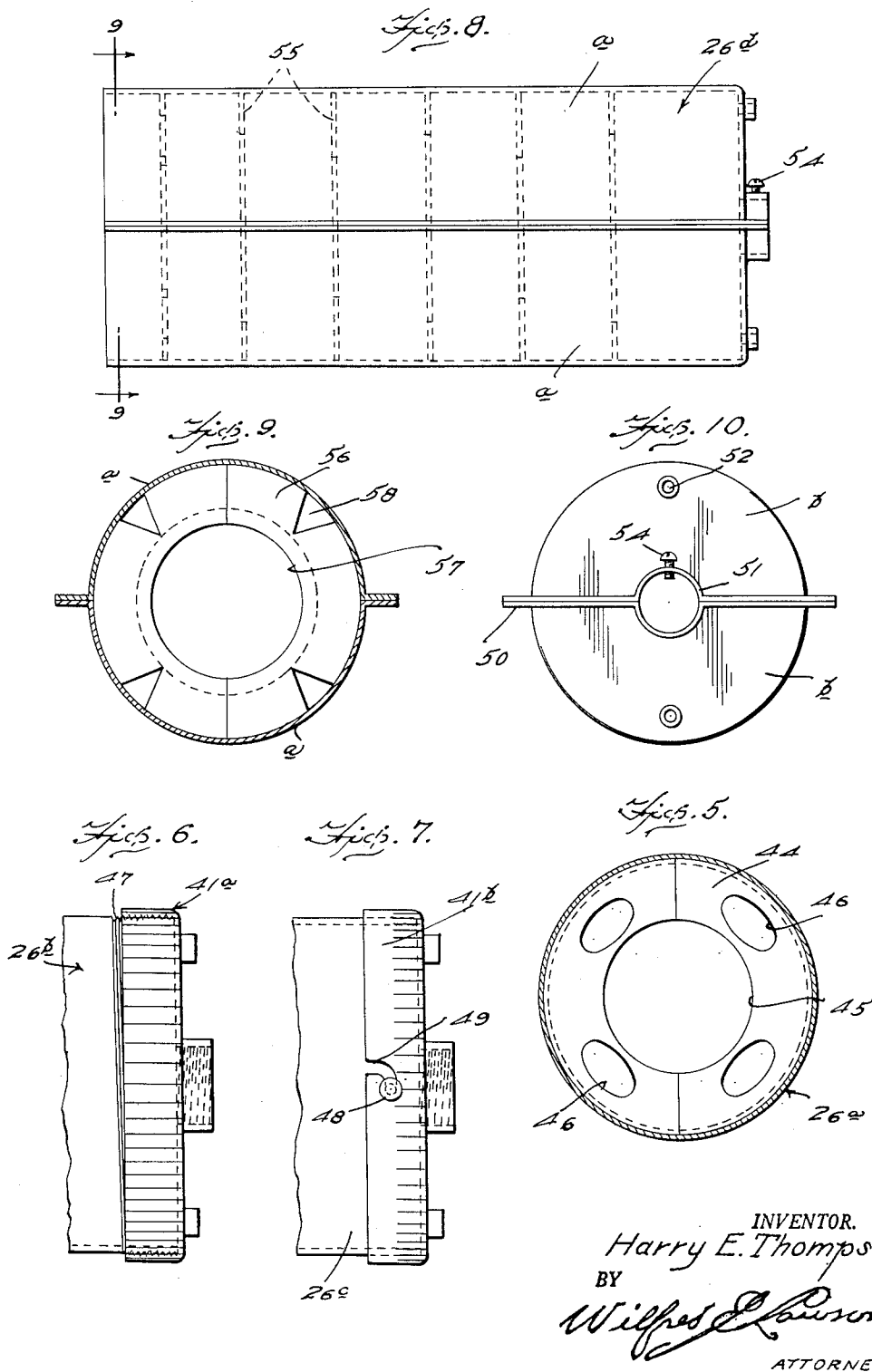
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UNITED STATES PATENT OFFICE

2,670,034

AIR COMPENSATOR FOR GAS BURNERS

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Application August 2, 1951, Serial No. 239,897

13 Claims. (Cl. 158—118)

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This invention relates generally to the class of gaseous fuel burners and is directed particularly to improvements in air supply control means.

The present invention comprises what might be termed an air compensator and has for its principal object to provide a means for more effectively controlling the flow of air to the air inlet ports which are found at the outer end of the venturi through which passes the air and gas mixture to a burner head, whereby the air stream moves to the inlets without fluctuation and there is avoided, as a result, the back firing which often occurs in the venturi of the burner structure.

Another object of the invention is to provide an air control means for attachment to a burner unit of the character stated, which is designed so that it can be installed without materially changing the burner unit.

Still another object of the invention is to provide an air control means of the character stated with a modified burner fitting by which the control means is supported at one end for adjustment.

Still another object of the invention is to provide an air control means of the character stated which replaces the present air shutter and which, by adjustment upon the burner fitting, regulates the amount of air permitted to enter the burner venturi for mixture with the gas flowing from the fitting into the venturi.

Other objects and advantages of the invention will become apparent as the description of the same proceeds and the invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming a part of the specification, with the understanding, however, that the invention is not to be limited to the exact details of construction shown and described since obvious modifications will occur to a person skilled in the art.

In the drawings:

Figure 1 illustrates a portion of a typical circulator burner such as is employed in gaseous fuel heaters, showing thereon, partly in elevation and partly in section an air compensator or regulator constructed in accordance with one embodiment of the present invention in association with a modified burner fitting.

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken substantially on the line 3—3 of Figure 1.

Figure 4 is a view in side elevation of a second embodiment of the air regulating device.

Figure 5 is a transverse section taken substantially on the line 5—5 of Figure 4.

Figure 6 illustrates a modified head or outer end construction.

Figure 7 illustrates another modified head or outer end construction.

Figure 8 is a view in side elevation of another embodiment of the invention.

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Figure 9 is a transverse section taken substantially on the line 9—9 of Figure 8.

Figure 10 is a view in elevation of the outer or front end of the embodiment illustrated in Figure 8.

Figure 11 is a detail illustrating another form of connection between the burner fitting and the end wall of a regulator.

Referring now more particularly to the drawings the numeral 10 designates in Figure 1, a portion of the head of a circulator burner while the numeral 12 generally designates the usual long air and gas mixture conducting Venturi tube which leads to the burner head 10 and which has at its free outer end the wall 14 in which are formed air admission openings 16 and a central opening 18.

In conventional burners the wall 14 at the outer end of the venturi 12 is equipped with an air shutter, not shown, which regulates the flow of air through the openings 16. For the purposes of the present invention such air shutter is done away with.

The burner fitting 20 here illustrated is of the adjustable orifice type but since such a type of fitting which is coupled with the gas manifold 22. In this modified fitting the stem or nozzle 24 is of greater length than in the conventional fitting and in one embodiment of the invention is provided with the screw threads 25 for the purpose hereinafter described. This stem or nozzle 24 is of a diameter to fit fairly snugly in the central opening 18 of the Venturi wall 14, as illustrated.

The burner fitting 20 here illustrated is of adjustable orifice type but since such a type of fitting is standard form and well known it is not believed necessary to give any detailed description or illustration of the same. It could also be a solid end type of fitting or non-adjustable.

In accordance with the present invention in one embodiment thereof there is provided the relatively long metal air housing in the form of a cylinder 26 which is closed at one end, hereinafter termed the forward or outer end, by the wall 27, in the center of which is an internally threaded forwardly projecting collar 28 defining the central opening 29. In this opening is threadably fitted, when the device is installed, the burner fitting stem 24 as illustrated in Figure 1.

The inside diameter of the cylinder 26 is slightly greater than the overall diameter of the forward end of the venturi 12.

The air cylinder or housing is installed over the venturi in the nature of a sleeve as shown and the inner end of the cylinder which is open, has slidably fitted therein the spider 30 which comprises the inner collar 31 which is fitted around the venturi, the radial arms or spokes 32 and the outer rim 33 which is carried by the spokes and which fits inside the open end of the cylinder 26. Any suitable means may be employed for mounting the spider on the venturi, the spider here illustrated being divided with each of the halves

provided with radial ears 34 which are secured together by screws 35.

As will be readily apparent the spider 30 centers the cylinder 26 on the venturi, supporting the inner end of the cylinder in the proper position while the forward or outer end is centrally supported by the stem 24 of the fitting 20. Since the inside diameter of the cylinder 26 is greater than the overall diameter of the outer end of the venturi it will be seen that space is provided for the passage of air around the forward end of the venturi for movement into the latter through the apertures 16, when the forward wall 27 of the cylinder is properly spaced from the wall 14 of the venturi. Such apertures need not be restricted any longer as to shape or size in this burner design. The entire face of venturi except for valve supporting member may be open, providing for maximum air opening as required and ease of casting in foundry.

To facilitate the maintenance of the walls 27 and 14 in the proper relation, the wall 27 is provided with at least two tapped openings 36 in each of which is threaded a lock screw 37 which, after the housing or cylinder 26 has been properly adjusted, are threaded inwardly for abutment against the Venturi wall 14 so as to hold the cylinder in set position.

The adjustment of the spacing between the walls 14 and 27 is accomplished by rotating the cylinder 26 so that it will be threaded inwardly or outwardly on the stem 24 and to facilitate such rotation the cylinder at its outer end is provided with a suitably roughened or knurled surface as indicated at 38.

In the embodiment of the invention as illustrated in Figure 1 the cylinder or housing has been shown as formed in one piece as a drawn or cast tube. The material for this and the other embodiments may be steel, brass, aluminum or any suitable alloy.

In Figures 4 and 5 there is illustrated a second form or embodiment of the housing or cylinder. In this embodiment the cylinder is generally designated 26a and is of two-part construction in that it comprises the body portion which may be of one piece, either seamed or seamless, and a drawn cap 39 which is fitted over the outer or forward end of the body and spot welded or otherwise permanently fixed thereon as indicated at 40. This cap has its periphery knurled as at 41 for the purpose above set forth and it is provided with the central threaded collar 42 for receiving the threaded stem of the burner fitting and with tapped openings 43 for the lock screws 37.

In this modified embodiment shown in Figures 4 and 5, the inner end of the cylinder has fitted therein the annular baffle wall 44 the central opening 45 of which receives the body of the venturi 12. This baffle wall is provided with a number of air inlet openings 46.

As in the case of the spider 30, the baffle and spider plate 44 is for the purpose of centering the tube on the burner venturi, the baffle providing a means whereby the air supplied to the burner mixer can be controlled. This design provides a fixed air supply for one style of burner in most cases. The compensator, accordingly, being designed for the individual burner and the air openings in the baffle plate 44, being of a size, number and shape to suit the air requirements. The spider and air baffle arrangement may, therefore, vary to suit one or many burners in accordance with the design required for the burner

size. Any suitable means may be used for securing the spider baffle 44 on the burner mixer or Venturi tube.

In Figures 6 and 7 two other arrangements are illustrated for effecting the assembly of the two parts of the device which, is shown in Figure 4 as having the body and head or cap spot welded together. In the arrangement shown in Figure 6 the cylinder 26b is shown as having its forward end screw threaded as indicated at 47 and the cap which is designated 41a is also screw threaded internally for threaded engagement on the end of the cylinder.

In the modification shown in Figure 7 the cylinder which is designated 26c is provided with a pair of radially directed pins 48 on the outer wall thereof at diametrically opposite points, one only of such pins being shown, and the head or cap 41b slips over the forward end of the cylinder body and is provided with a bayonet slot 49 for each of the pins or lugs 48. Thus the cap is effectively locked in position by the bayonet slot coupling illustrated.

Figures 8 to 10 illustrate another embodiment of the invention wherein use is made of a number of baffles inside the cylindrical housing and surrounding the Venturi tube. In this third embodiment the cylinder or housing is generally designated 26d and is initially formed in the two longitudinal sections a each of which has a semi-circular end wall b and the sections are bordered along the longitudinal edges and the edges of the end walls by the lateral flanges 50. These flanges are placed together and secured by welding or in any other suitable manner. At the outer end of the cylinder the flanges which extend across the end wall portions b are shaped to provide the fitting stem receiving collar 51 and each wall portion is also provided with a tapped opening 52 to receive a lock screw.

In this embodiment the collar 51 may be internally threaded like the collars 23 and 42 or it may be smooth as illustrated to snugly receive a fitting stem which is also smooth or unthreaded such as the stem indicated at 53 in Figure 11. When a smooth collar and stem are employed the collar is provided with a suitable set screw 54 which is adapted to have locking engagement with the fitting stem 53 to hold the cylinder against axial movement. It will be readily apparent from the foregoing that instead of rotating the cylinder to make the desired adjustment the cylinder is merely slipped inwardly or outwardly on the smooth stem and when the desired adjustment is obtained the set screw 54 is threaded inwardly into contact with the stem 53.

In the event that the collar 51 is provided with screw threads so that rotation of the cylinder is required to make the desired adjustment, the flanges 50 extending across the forward or outer end of the cylinder provide a convenient finger hold means for effecting the turning of the cylinder.

In the embodiment of Figures 8 to 10 the cylinder is provided with a number of longitudinally spaced internal baffles 55 in the form of annular flanges which have alternately large and small openings.

At the inner end of the cylinder another type of spider design is illustrated which functions as a baffle and also to center the air compensator or cylinder body on the Venturi tube. This combined spider and baffle is designated 56 and the central opening 57 thereof is of a diameter to

fit snugly around the Venturi tube so as to maintain the cylinder concentric with the tube.

For the admission of air into the cylinder past the baffle spider structure 56, such baffle is provided with a number of openings 58 as illustrated in Figure 9.

The baffle arrangement shown in Figure 8 provides an effective flow of air control, speed and volume of air to obtain the accuracy required for pre-mixing and control of air flow to the air admission openings 16 in the wall at the forward end of the Venturi tube.

As previously stated where the cylinder or housing collar and burner fitting stem are machined to fit snugly together the desired accurate adjustment of the cylinder can be made by sliding the same back and forth on the fitting stem to bring the forward wall of the cylinder body and the apertured wall 14 of the venturi into the desired spaced relation for the admission of the proper amount of air to the venturi.

In each of the several embodiments of the invention the baffles also function to secure quietness of burner operation.

In connection with the previously referred to back-firing which the present invention prevents, this is also called "noise of extinction," and may be due to burner design, but it is also due to the creation of a lean, or explosive, air gas mixture which forms immediately after the gas is shut off. Such a lean mixture is practically eliminated by the present invention, giving as a result, a quiet shut-off.

The invention is particularly useful where manufactured gas is used, where burner designers have great difficulty in obtaining quietness of extinction. It is also very satisfactory on LP-gases, which are difficult in this respect as well.

I claim:

1. In a gaseous fuel burner including an air and gas conducting Venturi tube having an end wall provided with a central opening and air admission openings and having its opposite end connected to a burner, a gas inlet nozzle having a stem portion extending into said central opening, a cylinder housing encasing a major portion of said tube and having an outer end wall, said cylinder housing end wall being opposed to and spaced from said Venturi end wall, said cylinder housing end wall having an opening through which said nozzle stem extends and in which the stem is engaged, and means within the inner end of the cylinder housing and bearing against the tube to center the cylinder housing on the tube, the inside diameter of the cylinder housing being greater than the maximum diameter of the Venturi tube to provide space for the passage of air through the cylinder housing and tube and between said tube and housing end walls to said air admission openings, and said cylinder housing being open at the inner end for the admission of air therinto.

2. The invention as set forth in claim 1, wherein the cylinder housing is adjustable axially on said nozzle stem, and means for locking the Venturi tube and cylinder housing together, said means being operatively associated with the Venturi tube and cylinder housing.

3. The invention as set forth in claim 1, wherein the cylinder housing end wall central opening is threaded and said stem is threaded for engagement with wall opening threads.

4. The invention as set forth in claim 1, wherein the cylinder housing end wall central opening

and the nozzle stem are machined to a smooth sliding fit for the axial sliding adjustment of the cylinder housing on the stem, and means for securing the cylinder housing against axial movement.

5. The invention as set forth in claim 1, with an air baffle within the cylinder housing and encircling the Venturi tube.

6. The invention as set forth in claim 1, wherein the cylinder housing and end wall are comprised in a single piece of metal.

7. The invention as set forth in claim 1, wherein the said end wall comprises a cap piece secured on one end of the cylinder housing.

8. The invention as set forth in claim 1, wherein the said means comprises a spider encircling the Venturi tube.

9. The invention according to claim 8, wherein the spider also comprises an air baffle.

10. The invention according to claim 8, in which the spider is in the form of an annular plate providing a baffle with air openings therein.

11. The invention according to claim 8, and a plurality of annular baffle plates in and secured to the wall of the cylinder housing in spaced relation longitudinally thereof and encircling and spaced from the Venturi tube.

12. In a gaseous fuel burner including an air and gas conducting Venturi tube having an outer end wall provided with a central opening and air admission openings and having its inner end connected with a burner, a gas inlet nozzle having a stem portion extending into said central opening, a cylinder housing having a wall across one end, the housing encasing said tube and the outer end wall thereof, said cylinder housing end wall having a central opening thru which said stem portion extends and by which the cylinder housing is supported on the stem portion, the inside diameter of the cylinder housing being greater than the maximum diameter of the Venturi tube and said cylinder housing end wall being spaced from the Venturi tube end wall, whereby air passes through the housing and between the Venturi tube and housing end walls to said admission openings, the other end of said cylinder housing being open for the admission of air therinto, means within the cylinder housing connected between the same and the Venturi tube for centering the cylinder housing on the tube, and means carried by the cylinder housing for engagement with the tube end wall for holding the cylinder housing in set position.

13. The invention according to claim 12 wherein said means for holding the cylinder housing in set position comprises a screw member threaded through a threaded opening in the cylinder housing end wall and extending across the space between said end wall and bearing against the Venturi tube end wall.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
398,505	Gibbons	Feb. 26, 1889
781,454	Palmer	Jan. 31, 1905
836,114	Hulse	Nov. 20, 1906
1,731,306	Hileman	Oct. 15, 1929
2,360,310	Anderson	Oct. 17, 1944

FOREIGN PATENTS

Number	Country	Date
13,243	Great Britain	of 1894
4,126	Great Britain	of 1915