April 30, 1957 W. N. KENNEDY ET AL 2,790,376

HOT AIR REGISTER

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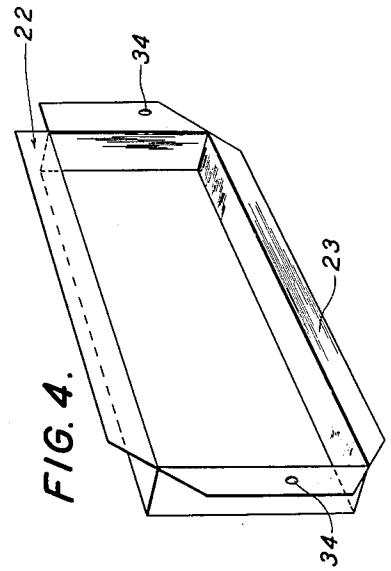


FIG. 4.

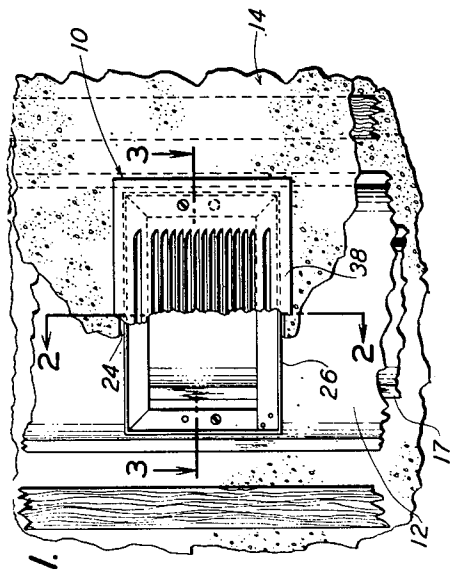


FIG. 1.

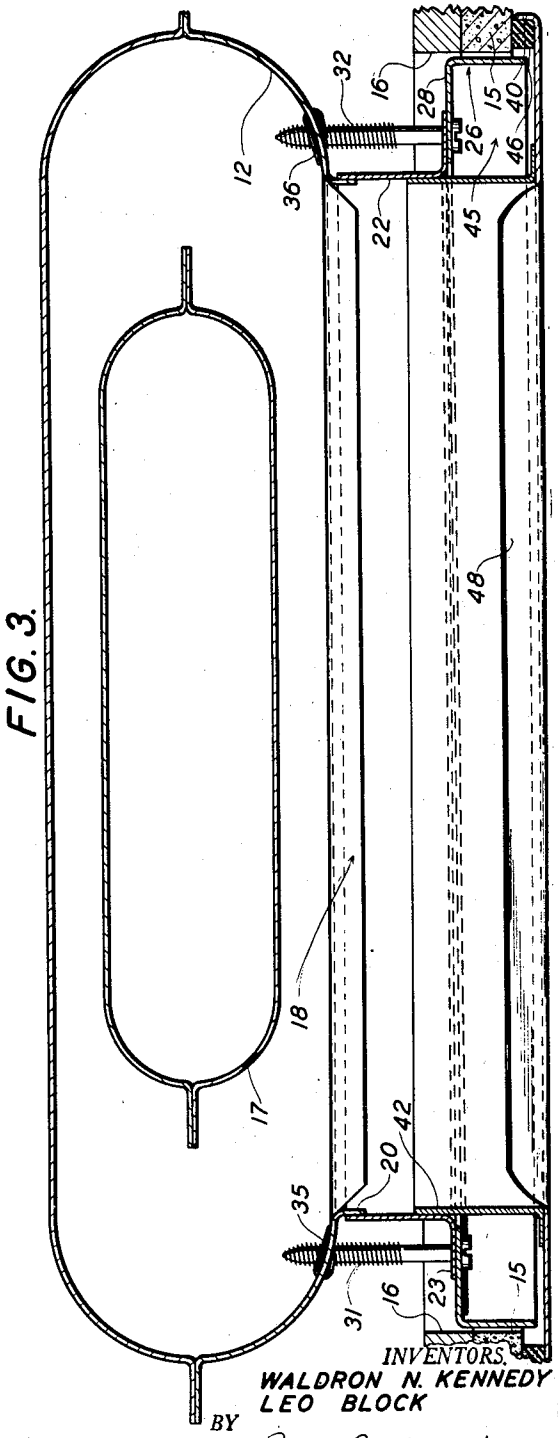


FIG. 3.

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FIG. 2.

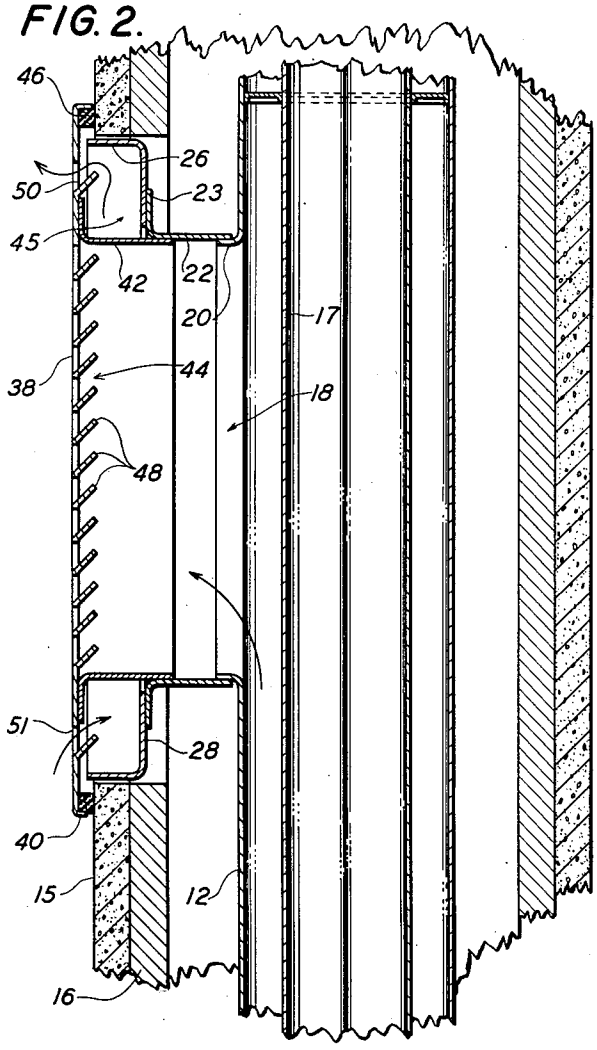


FIG. 6.

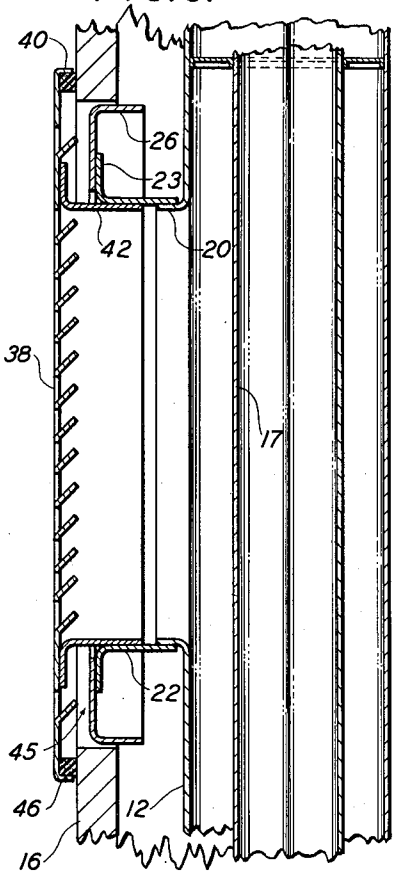
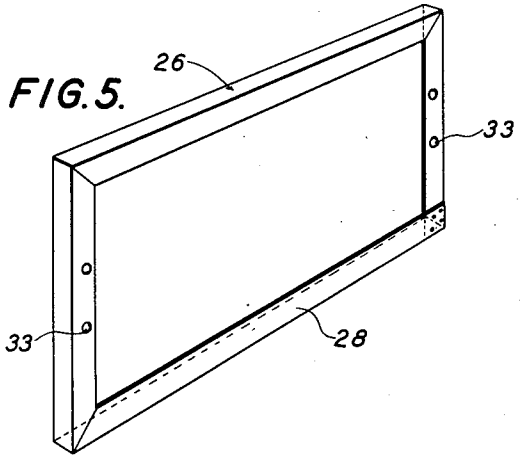


FIG. 5.



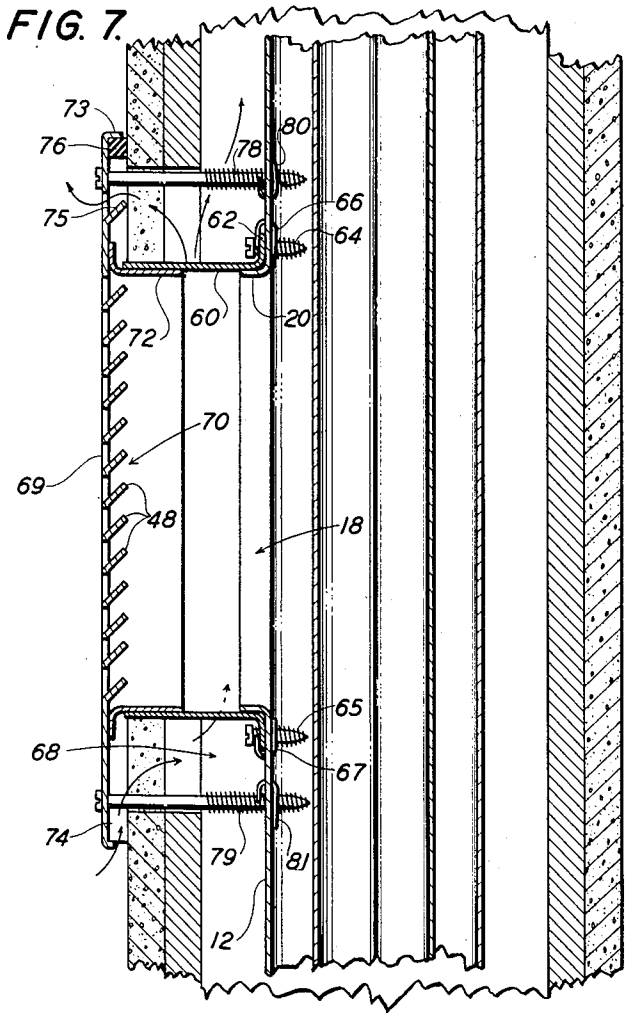
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FIG. 7.



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United States Patent Office 2,790,376 Patented Apr. 30, 1957

2,790,376

HOT AIR REGISTER

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Application April 12, 1954, Serial No. 422,403

2 Claims. (Cl. 98—114)

This invention relates to an improved hot air register and more specifically to a hot air register adapted to receive hot air which passes through the wall of a room to be heated. The invention may be employed in a variety of hot air outlets disposed in the wall of a room but has particular application to a wall heater such as that disclosed in U. S. Patent No. 2,602,441 to Hollingsworth et al.

Many wall heaters have an upright duct in the shape of a tall, narrow box disposed within the wall of a room to be heated. An upright radiator tube is disposed within the duct and is adapted to receive hot flue gas from a burner below. The hot flue gas passes up through the radiator into a stack and then is exhausted to the atmosphere. The upright duct is provided with an opening near its bottom into which air from the room can enter. The air in the space between the radiator and the duct is heated and rises to pass out a lateral duct connected to an opening in the upper end of the upright duct. The lateral duct extends toward an opening in the room wall and connects to a collar provided around a central opening in a hot air register, the collar and lateral duct forming a continuous conduit extending through the wall opening.

Ordinarily the walls of the lateral duct engage the edges of the opening in the room wall. Thus, there is a tendency for the hot lateral duct to heat the room wall in the vicinity of the opening. Since many types of construction employ combustible materials, standards have been established setting upper limits on the amount of temperature rise which can be tolerated in the wall. For example, the American Gas Association has set standards requiring that any duct conducting hot air through a wall not increase the temperature of the wall surrounding the duct by more than 90° F. above room temperature. For example, if the room temperature is maintained at 75°, the temperature of the wall surrounding the hot air duct must not exceed 165° F. In a typical heater the air passing through the lateral duct is at a temperature of 150 to 165° F., and the temperature of the radiator within the box which supplies the hot air is approximately 500° F. Thus the combined effect of the hot air passing through the lateral duct and the radiant heat from the radiator tends to raise the temperature of the conventional lateral duct passing through the wall by an amount considerably in excess of the allowed 90° F. rise. For example, wall heaters using conventional lateral ducts commonly produce a temperature rise exceeding 115° F., i. e. raise the wall temperature to more than 190° F. in a room at 75° F., and therefore do not meet the American Gas Association standards.

The present invention overcomes these disadvantages by providing a lateral duct and associated register assembly which permits air in the room being heated to circulate in a space provided between the surrounding wall and the continuous conduit formed by the register collar and the lateral duct and thus prevents excessive increases in wall temperature.

The present invention contemplates the use of a hot air register adapted to be mounted in an opening in a wall and receive hot air from a duct within the wall. A continuous admission conduit extends from the duct to a central opening in the register. Preferably the conduit is formed by a lateral duct which extends from an opening in the upright duct and is adapted to receive a collar disposed around a central opening in the register. The register collar and lateral duct have approximately the same cross-sectional shape and fit together to form the continuous admission conduit which extends through the wall opening from the room to the duct. The wall opening is substantially larger than either the lateral duct or the register collar, so that there is a space between the wall and the admission conduit. Means is provided for admitting room air into the lower portion of the space around the admission circuit; and means is provided for permitting the air to leave the space and thus prevent the adjacent portion of the wall from exceeding a predetermined value.

In a preferred form, the register periphery is provided with a lip extending toward the wall and is spaced from the wall by the lip. The lateral duct is provided with an outwardly turned flange on the end remote from the upright duct. A laterally extending frame is disposed around the flange of the lateral duct to fit snugly against the edges of the wall opening. The frame is provided with an inwardly turned flange which matches the outwardly turned flange on the lateral duct, so that the two flanges abut. A register having a central opening with a collar disposed around the opening is adapted to cover the wall opening, the collar fitting with the lateral duct to form a conduit extending from the room to the opening in the upright duct. The perimeter of the register frame is provided with a lip which extends toward the wall. A suitable gasket or sealing means is disposed within the lip to effect a seal between the register and the wall. At least one opening is provided intermediate the periphery of the register and its central opening so that air may circulate from the room into the annular space between the collar and the frame, around the collar, and back into the room. With the preferred arrangement, no air is lost from the room to the outside through the wall opening.

Preferably the lateral dimension of the frame is such that it can be reversed when used with a "dry wall," i. e., a wall which is not as thick as a conventional plaster wall.

These and other aspects of the invention will be more clearly understood in the light of the following detailed description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a front elevation of the preferred form of the register assembled for use in a wall;

Fig. 2 is a view taken on line 2—2 of Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 1;

Fig. 4 is a perspective view of the lateral duct showing the outwardly turned flange around its periphery;

Fig. 5 is a perspective view of the frame showing the inwardly turned flange around its periphery;

Fig. 6 is a vertical sectional view similar to Fig. 2, showing how the frame may be reversed when the invention is used with a "dry wall";

Fig. 7 is a diagrammatic sectional elevation of an alternate embodiment of the invention.

Referring to Figs. 1 through 5, a hot air register 10 is adapted to deliver air to a room from an upright hot air supply duct 12 disposed within a wall 14 of a room. The wall comprises a layer of plaster 15 and a layer of sheet

rock 16. The upright hot air duct can be associated with any conventional source of hot air; for example, the upright duct may be used with a wall heater of the type disclosed in U. S. Patent No. 2,602,441 issued to Hollingsworth et al. The upright duct surrounds a radiator 17 up through which hot flue gas exhausts to the atmosphere. The burner which supplies the flue gas to the radiator forms no part of this invention and is not illustrated. A rectangular opening 18 is provided in the portion of the upright duct adjacent the wall of the room to be heated. A laterally extending lip 20 surrounds the opening in the upright duct. A lateral duct 22 is adapted to make a friction fit over the lip. The end of the lateral duct remote from the upright duct is provided with an outwardly turned flange 23 and extends toward a rectangular wall opening 24 which is substantially larger than the cross-sectional area of the lateral duct. A laterally extending frame 26, having an inwardly turned flange 28 which matches and fits against the outwardly turned flange of the lateral duct, is adapted to make a snug fit with the edges of the opening in the wall of the room to effect a closure between the wall opening and the lateral duct. The frame and the lateral duct could be integrally formed to provide a single member having a Z-shaped cross-section; but the use of two elements instead of a single member gives the two following advantages: (1) The rate of heat transfer from the lateral duct to the frame is less when they are separate elements; this reduces the temperature rise of the wall adjacent the frame; and (2) the frame may be reversed (as explained below in conjunction with Fig. 6) for use in a "dry" wall. A suitable gasket (not shown) may be installed between the flanges on the frame and lateral duct to reduce heat transfer between these two members even further; but our experience has not indicated this to be necessary.

The frame and lateral duct are held in position by means of screws 31, 32 passing through matching holes 33, 34 in their respective flanges, the screws engaging in screw clips 35, 36, respectively, provided in the upright duct.

A rectangularly-shaped register 38 is adapted to fit over the wall opening. The register is provided with a lip 40 around its periphery which extends toward the wall. A rectangularly-shaped register collar 42 is disposed around a similarly-shaped opening 44 in the central portion of the register. The cross-sectional shape of the collar is such that it makes a friction fit inside the lateral duct. An annular space 45 is thus enclosed by a hollow ring formed between the frame 26 and the collar.

A sponge rubber gasket 46 is disposed in the lip of the register and effects a seal between the wall and the register periphery. Horizontal louvers 48 inclined inwardly and upwardly at an angle of approximately 45° extend across the central opening of the register. Conveniently, the register is formed of a single piece of sheet metal and the louvers are formed by stamping them from the sheet. Horizontal upper and lower elongated cooling openings 50, 51 are provided in the register between its upper and lower edges, respectively, and the central opening. Conveniently, these cooling openings are also stamped to form louvers extending upwardly and inwardly from the frame at an angle of approximately 45°.

The arrangement shown in Figs. 1 through 5 is adapted for use in plaster walls, i. e., walls ¾ inch to ⅞ inch thick. In operation, hot air rises in the upright duct and passes through the lateral duct, the register collar, and out the central opening in the register into the room. The lateral duct and the collar within the duct are heated by the hot air and also by radiation from the hot radiator within the upright duct. Relatively cool room air is drawn in the bottom cooling opening in the register and passes into the annular space between the collar and the frame. The room air circulates up around the grill collar and cools the elements defining the annular space. The warmed room air then exits out the upper cooling opening in the register. Since the frame makes a tight seal against the edges of the wall opening and against the flange on the lateral duct, none of the room air is lost up the interior of the wall to the outside. The lip around the register periphery spaces the register from the wall sufficiently to prevent hot air from making immediate contact with the wall adjacent the hot air register. The gasket within the lip makes a tight seal against the wall and prevents any hot air from leaking out along the wall. This is desirable to prevent staining of the wall by direct contact with hot air.

Fig. 6 illustrates the use of the apparatus shown in Figs. 1 through 5 when the hot air register is installed for use in a "dry wall," i. e., a wall in which the base material, e. g. sheet rock, is covered with paint instead of plaster. Such a wall is from ⅜ inch to ½ inch thick. In this arrangement the identical elements are used and the operation is the same. The principal difference is that the frame 26 is turned around so that when its associated flange is placed adjacent the matching flange on the lateral duct, the frame extends from the flange into the wall instead of toward the room. Thus, the laterally extending shoulder does not extend out into the room and prevent the grill frame from making contact with the wall, yet an effective seal is still established between the lateral duct and the edge of the wall opening. The annular space 45 around the collar is smaller, but is still large enough to permit adequate circulation of room air around the collar.

Fig. 7 illustrates an alternate embodiment of the invention which uses fewer elements, at the sacrifice of the loss of some room air to the outside. Like reference characters are used to indicate corresponding elements as described in Figs. 1 through 6.

A lateral duct 60 is disposed around the lip 20 of the opening 18 in the upright duct 12. Preferably, the end of the lateral duct adjacent the upright duct is provided with an outwardly turned flange 62 which is adapted to be attached to the upright duct by means of screws 64, 65 which fit into clips 66, 67, respectively, provided on the upright duct. The lateral duct extends through the opening in the wall, the dimensions of the wall opening being substantially greater than those of the lateral duct so that an annular space 68 is formed around the duct. A rectangular register 69 having a rectangular central opening 70 is adapted to fit over the wall opening. A lateral collar 72 is disposed around the central opening and makes a friction fit within the lateral duct 60.

The register is provided with a lip 72 around its periphery which extends toward the wall. The portion of the lip along the top and two side edges of the register is longer than that portion of the lip along the bottom edge of the register so that when the register is in place against the wall, a space 74 is left between the lower portion of the lip and the wall. Louvers 48 are disposed across the register central opening in the same manner as that described above for the register 38. A horizontal cooling opening 75 is formed in the upper part of the register between its upper edge and its central opening. The cooling opening is formed in a manner identical to that described above for cooling opening 50 in the register 38. A strip of gasket material 76 is disposed in the register lip adjacent the upper and two side edges to effect a seal between that portion of the register and the wall.

Preferably, the register is held in position by means of screws 78, 79 which thread into screw clips 80, 81 attached to the upright duct.

With the arrangement shown in Fig. 7, room air is drawn into the space 74 between the lower portion of the register and the adjacent portion of the wall. The room air flows into the annular space 68, up around the register collar and lateral duct, and then splits, as shown by the arrows, and flows out the cooling opening 75 and up the space 77 between the wall and the upright duct. With this arrangement the wall adjacent the register is

kept from becoming dangerously hot, but some air is lost from the room to the outside.

The gasket may be omitted and the portion of the register lip along the upper edge of the register reduced in length so that it provides a space between the upper portion of the register and the adjacent wall. With this provision, the cooling opening 75 of Fig. 7 could be omitted and cool air from the room would then enter the space 74 at the bottom of the register and exit at a similar space at the top of the register. However, this arrangement should be limited to those cases where the wall is finished with a material which is not readily stained by direct contact with hot air, or where staining of the wall is not objectionable.

We claim:

1. In heating apparatus adapted for mounting in an opening in a wall of a room to admit hot air from a supply duct within the wall, the combination comprising a lateral duct spaced from the edges of the wall opening and extending from an opening in the supply duct toward the wall opening, a laterally extending frame disposed to fit against the edges of the wall opening, the frame having an inwardly turned flange to bear detachably against the lateral duct so that the frame and its flange seal the space between the lateral duct and the edges of the wall opening, the exterior portion of the frame being substantially straight and free of any irregularities so that the frame can be arranged to extend away from the flange toward the room to accommodate walls of a first predetermined thickness, and be arranged to extend away from the flange toward the supply duct to accommodate walls of less thickness, a register adapted to fit over the wall opening, the register having a central opening, conduit means connecting the lateral duct to the central opening so that a space is formed between the conduit means and the frame, means for admitting air from the room into a lower portion of the space, and means for permitting air to pass from an upper portion of the space into the room.

2. In heating apparatus adapted for mounting in an opening in a wall of a room to admit hot air from a supply duct within the wall, the combination comprising a lateral duct spaced from the edge of the wall opening and extending from an opening in the supply duct toward the wall opening, the lateral duct having an outwardly extending flange spaced from the supply duct, a laterally extending frame disposed to fit against the edges of the wall opening, the frame having an inwardly turned flange to seat detachably against the flange on the lateral duct so that the space between the lateral duct and the edges of the wall opening is sealed, the exterior portion of the frame being substantially straight and free of any irregularities so that the frame can be arranged to extend away from the flange toward the room to accommodate walls of a first predetermined thickness, and be arranged to extend away from the flange toward the supply duct to accommodate walls of less thickness, a register adapted to fit over the wall opening, the register having a central opening, conduit means connecting the lateral duct to the central opening so that a space is formed between the conduit means and the frame, means for admitting air from the room into a lower portion of the space, and means for permitting air to pass from an upper portion of the space into the room.

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