Feb. 19, 1957 K. G. FRENGER 2,782,006

PANEL FOR RADIANT HEATING OR COOLING SYSTEMS

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FIG. 1

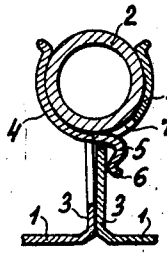


FIG. 2

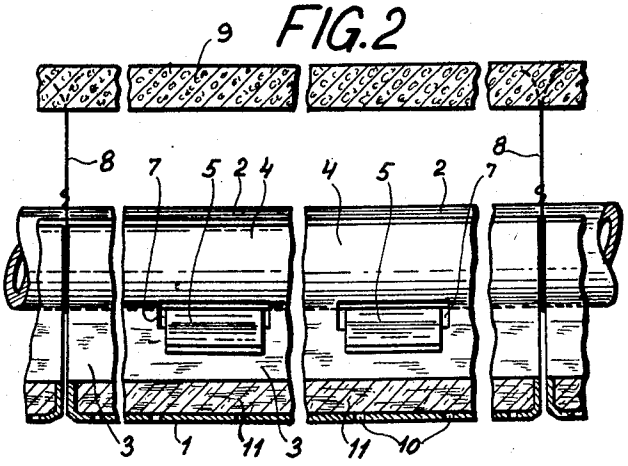


FIG. 3

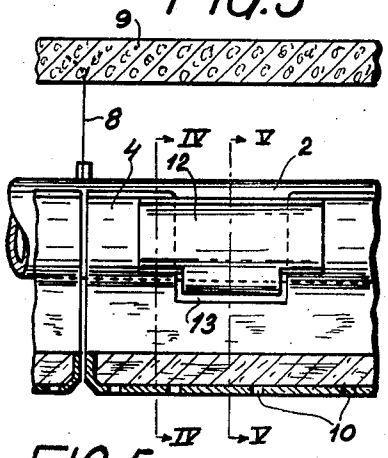


FIG. 4

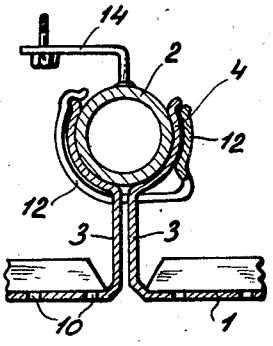


FIG. 5

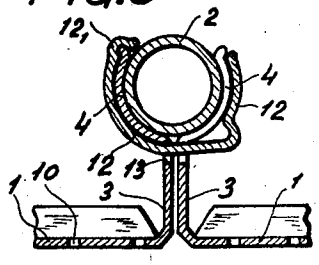
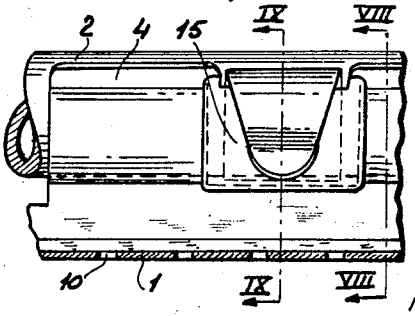


FIG. 6



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FIG. 7

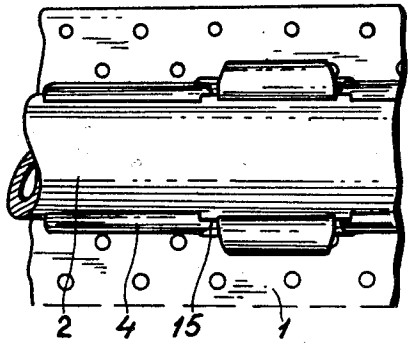


FIG. 8

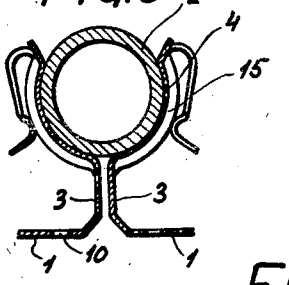


FIG. 9

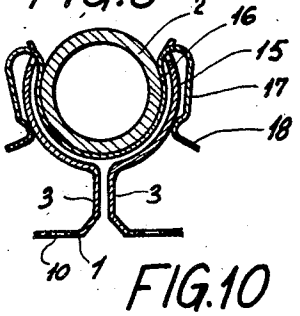


FIG. 14

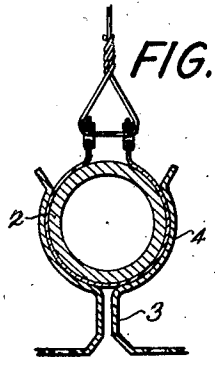


FIG. 11

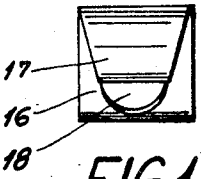


FIG. 10

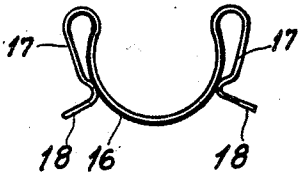


FIG. 12

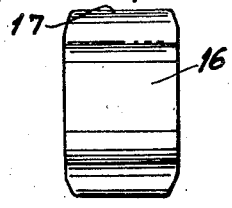
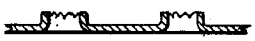


FIG. 13



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PANEL FOR RADIANT HEATING OR COOLING SYSTEMS

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Application October 16, 1952, Serial No. 315,090

Claims priority, application Norway October 20, 1951

10 Claims. (Cl. 257—124)

This invention generally relates to surfaces defined by panels, such as ceilings, walls or strips and to radiant heating or cooling systems of the kind wherein the panel or surface is formed by a plurality of heat conductive plates arranged in heat transfer and supporting engagement with a plurality of mutually spaced pipes or similar supports.

More particularly, the present invention relates to an arrangement for securing such heat conductive plates in heat transfer connection on fluid conducting pipes so as to enable said plates to be individually detachably mounted by pressing them against the pipes.

In the assembly of such plates to constitute a continuous radiant heating or cooling panel mounted on a plurality of fluid conducting pipes, it has heretofore been common practice to provide each of the plate elements with substantially semi-cylindrical marginal flanges at either side thereof, so as to enable a pair of adjoining plates to be secured to an intermediate pipe by means of their adjacent flanges embracing a portion of the pipe.

Although the provision of such more or less resilient marginal flanges adapted to clamp the plates on the pipes may, to a certain extent, solve this problem, it has been found that this solution is by no means adequate for all circumstances. For example, from a thermal point of view, the heat conductive plates constituting the panel or ceiling and functioning as radiators in the heating or cooling system should preferably be made of a material having a high thermal conductivity, such as sheets of almost pure aluminum having a thickness of about 0.75 mm. to 1.0 mm. On the other hand, the mechanical strength of such material is rather poor and it is therefore generally unsuitable for providing a satisfactory clamping device.

It is, therefore, an object of this invention to overcome the above and other difficulties and to provide simple, efficient and reliable clamping means which will enable the plates to be individually mounted on or removed from the pipes without interfering with the other plates constituting the heating or cooling panel or ceiling.

According to the invention, a pair of adjoining plates are secured to the pipes by means of adjacent flanges embracing a portion of an intermediate pipe, a resilient clip on one of said flanges extending below the intermediate pipe and engaging the other flange, so as to clamp the two adjacent flanges against one another and against said pipe.

The clip which should preferably be made of a resilient material of high mechanical strength, such as Duralumin or steel, may be detachably mounted on both flanges or, alternatively, may be fixed to one of them.

Other features and embodiments of the invention which will be specified in the appending claims will appear from the following description with reference to the drawings, in which:

Fig. 1 is a view in cross section of an embodiment of the invention showing a connection between two adjoining plates and an intermediate pipe wherein the resilient clip is integral with one flange of one of the plates;

Fig. 2 is a view in side elevation of the embodiment of Fig. 1, showing the pipe suspended from a ceiling, the plates being provided with a layer of heat and/or sound insulating material at the upper surface thereof;

Fig. 3 is a side elevation similar to Fig. 2 but showing another embodiment of the invention, wherein the connections between adjoining plates are provided by means of clips detachably mounted on one flange of the two adjacent flanges of adjoining plates;

Figs. 4 and 5 are views in section taken along the lines IV—IV and V—V, respectively, of Fig. 3;

Figs. 6 to 12 illustrate a preferred embodiment of the clip device used for mounting a pair of adjoining plates on an intermediate pipe; and more particularly

Figs. 6 and 7 are respectively a vertical section and a plan view of a joint between two plates of a ceiling made according to the invention;

Fig. 8 is a cross section through the line VIII—VIII in Fig. 6;

Fig. 9 is a cross section through the line IX—IX of Fig. 6;

Figs. 10, 11 and 12 are views of the clip of Figs. 6 and 7 on three planes perpendicular to each other;

Fig. 13 is a fragmentary sectional view illustrating an acoustical perforation produced without loss of panel material; and

Fig. 14 is a view of an improved type wide but thin band hanger.

In the embodiment illustrated in Figs. 1 and 2, the numeral **1** represents a pair of adjoining plates mounted on an intermediate fluid conducting pipe **2**. The plates **1** are each provided with upwardly bent marginal flanges **3**. Each plate has two opposite parallel flanges that have an upper portion **4** of semi-cylindrical shape so as to enable this portion of the flanges to grip the pipe **2**. One of these flanges is at suitable intervals pressed up so as to form a plurality of tongues **5** of a suitable curved shape, the free lower ends of which are bent outwardly so as to project from the flange. The adjacent flange of the other plate is provided with apertures **7** registering with the tongues **5**, so as to enable the latter to pass through the flange **3**, **4** of the plate shown to the right in Fig. 1, when said plate is pushed upwardly so as to engage the pipe **2**. The portions **5** and **6** of the flange **3**, **4** of the left hand plate **1** in Fig. 1 thus form a clip device adapted to secure adjacent plates on an intermediate pipe **2** as illustrated in Fig. 1. The pipe **2** is suspended from a ceiling **9** by means of suitable supports **8**, and the plates **1** are provided with holes **10** for acoustical damping and are covered with a layer **11** of a sound and/or heat insulating material.

The embodiment illustrated in Figs. 3 to 5 is similar to that of Figs. 1 to 3 except that the clip device comprises a detachably mounted resilient clamp **12** which is passed through apertures **13** in the adjacent flanges **3** and embraces the semi-cylindrical upper portions thereof. One end of the clip **12** is bent over, so as to form a flange 12_1 adapted to engage the edge of the flange **4** so as to enable the clip to be detachably mounted thereon.

In Fig. 6, the numeral **2** represents one of the fluid conducting pipes designed to support the sheets or plates **1** and transmit heat to them. The plates **1** are provided with flanges **3**, **4** which have two or more raised portions of their length or ridges **15**, so that the whole surface of the flanges **4** adheres through a great angle to the pipe **2**, except in the recesses formed between the pipe and the ridge **15**. In these recesses a clip **16** (the shape of which is clearly shown in Figs. 10, 11 and 12) is applied on the pipe **2**.

The clip comprises a central part formed as a cylin-

drical sector and the two branches of this sector are bent outwardly to form wings 17 which are further bent back at their ends 18.

The clip 16 elastically grips the pipe 22 adhering to the same while the wings 17 exert a pressure on the external surface of the ridges 15, thereby pressing the flanges 4 against the pipe 2.

For mounting the plates 1 on the pipes 2, the clips 16 are secured by means of their wings 17 to one of the flanges 4 of one of the plates or sheets, in their respective recesses. The plate provided with the clamps thus applied thereto is urged against the pipe 2 which is thus firmly embraced, due to elastic reaction by the central part of the clip 16. The plate, which is to be mounted adjacent to the aforementioned one, is then taken and urged also against the pipe 2 providing that the ridges 15 of their flanges are placed in correspondence to the clamps 16 and introduced under the wings 17.

By making the two flanges 4 of a plate 1 symmetrical to each other and providing also the ridges 15 of each flange symmetrically on the flange itself and in positions equal as those on the opposite flange, not only a considerable simplicity in construction but also a simplicity in assembly is achieved, since the operator can apply the plate by either side it happens to come to hand.

It is interesting to note that not only the flanges are devoid of grooves which may constitute weak points, but the ridges afford greater resistance to the flanges toward bending stresses. Also the clamps, as being symmetrical, as stated above, are constructionally simpler.

Further, the plates can be very easily removed, since, on either side of the plate parallel to the pipes a stress may be exerted to detach it from the pipes, the plate slips off easily from the clamps. The plate can be removed, however, by also applying a stress to a side transverse to the pipes.

In view of the reinforcement of the plates due to the ridges and the fact that mounting and dismounting operations are facilitated, all risk of deformation of the plate and consequent scrap is eliminated, and perfect thermal adhesion between the flanges and pipes obtained by the construction, is maintained.

Each of the marginal flanges 4 of each plate may preferably comprise four ridges arranged in such a manner that the distance between the two ridges located at either side of the middle of the plate is equal to the double of the distance between the end of the plate and the ridge located nearest thereto. This arrangement will enable a pair of adjacent plates to be mounted either with their ends coinciding with one another or, alternatively, with the end of one plate coinciding with the middle of the adjacent plate.

The above example has been referred to a ceiling supported by pipes conducting the heating fluid, but it is obvious that the securing arrangement according to this invention is independent of the presence of heating and may also be realized with pipes conducting cooling fluid or pipes or bars having no thermal function at all.

Instead of the punched out apertures 10 as shown in the various figures, it is possible to make the panels previous to sound by punching through them to make holes without loss of material as shown in Fig. 13. In this figure it can be seen that an internal boss exists at each hole which functions to strengthen the panel and to space the pad of sound and/or heat insulating material from the inner surface of the panel. Since no material is lost heat conductivity is enhanced. The serrated upper edge of the boss is of acoustical advantage.

Instead of the wire type pipe hangers shown in Fig. 2, it is possible to pass a wide (15 mm.) but thin metal band (about .5 mm. thick) around the pipe and to press the flanges over and around the band. The free ends of the band are connected together and to the ceiling all as can be seen in Fig. 14.

What is claimed is:

1. In a panel for radiant heating or cooling of rooms, preferably a ceiling, comprising a plurality of heat conductive plates arranged in heat transfer and supported engagement with a plurality of spaced-apart fluid conducting pipes of round cross section, each of said plates being provided with substantially arcuate marginal flanges at either end thereof for mounting a pair of adjoining plates on said pipes by means of adjacent flanges embracing a portion of an intermediate pipe, the improvement that comprises a clip, means for holding said clip on one of said flanges against rotation about said pipe during pushing up of the adjacent flange into embracing relation with the intermediate pipe, said clip extending across the vertical center line of the pipe and engaging said other flange to bias the two adjacent flanges toward one another and to clamp them against said intermediate pipe.

2. A panel for radiant heating or cooling of rooms as claimed in claim 1 in which the means for holding said clip on said flange constitutes mutually detachable coacting portions of the respective plate and clip.

3. A panel for radiant heating or cooling of rooms as claimed in claim 1 in which the means for holding said clip on said flange is an integral connection.

4. In a panel for radiant heating or cooling of rooms, preferably a ceiling, comprising a plurality of heat conductive plates arranged in heat transfer and supported engagement with a plurality of spaced-apart fluid conducting pipes of curved cross section, each of said plates being provided with substantially arcuate marginal flanges at either end thereof for mounting a pair of adjoining plates on said pipes by means of adjacent flanges embracing a portion of an intermediate pipe, the improvement that comprises a clip, one of said flanges having said clip thereon, said clip extending across the vertical center line of the pipe below its center and engaging the other flange to bias the two adjacent flanges toward one another and to clamp them against the intermediate pipe.

5. A panel for radiant heating or cooling of rooms, preferably a ceiling, comprising a plurality of heat conductive plates arranged in heat transfer and supported engagement with a plurality of spaced apart fluid conducting circular pipes, each of said plates being provided with cylindrical marginal flanges extending together only over a part of the pipe circumference, a spring clip, means for holding said clip on one of said flanges against rotation about said pipe during pushing up of the adjacent flange, said spring clip embracing said pipe and said flanges for more than 180°, said clip having pressing surfaces acting below the horizontal centerline of the pipe to press the cylindrical flanges toward one another and against the underside of the pipe to render each panel removable and reinsertable independently of adjacent panels.

6. A panel as claimed in claim 5 wherein each clip includes portions defining a flared mouth to said pressing surfaces, said mouths facing downwardly so that when a plate is pushed up from below its flange will enter a mouth and open the clip to be held thereby.

7. A panel as claimed in claim 5 in which the flanges are provided with recesses and the embracing part of said clip is arranged in a recess between the flange and the pipe.

8. A panel according to claim 4, in which the adjoining flanges have recesses therein and the clips are located in said recesses in adjoining flanges, each of said clips being substantially U-shaped and provided with downwardly bent extensions at either end so as to form clamping means for resiliently clamping the clips to a pair of adjacent flanges.

9. A panel according to claim 4, characterized in that the flanges at each plate are of identical shape and are disposed symmetrically with respect to the median plane

of the plate, and that the clip is symmetrical with respect to the median plane thereof.

10. A panel according to claim 4, characterized in that the clip is integral with one flange of a pair of adjoining plates and engages the other flange through an aperture therein.

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