Oct. 13, 1964 R. DISTEFANO 3,152,636

HEAT-EXCHANGE APPARATUS

Filed Aug. 14, 1961

FIG. 1

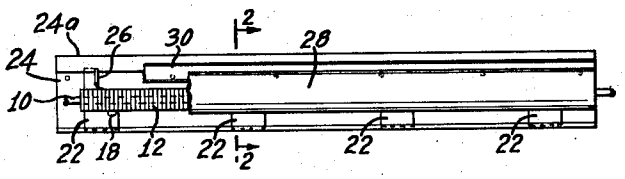


FIG. 2

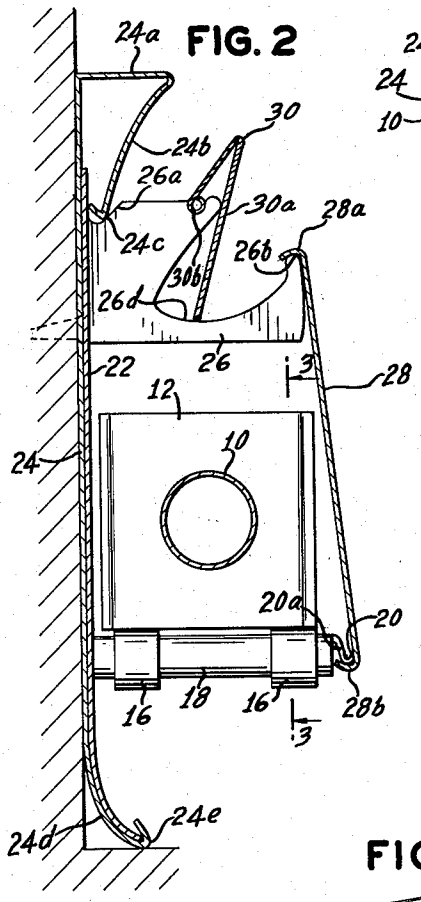


FIG. 3

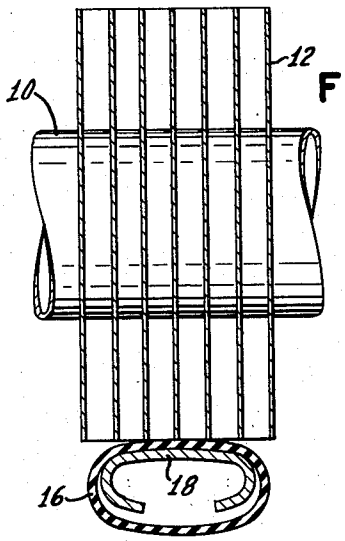
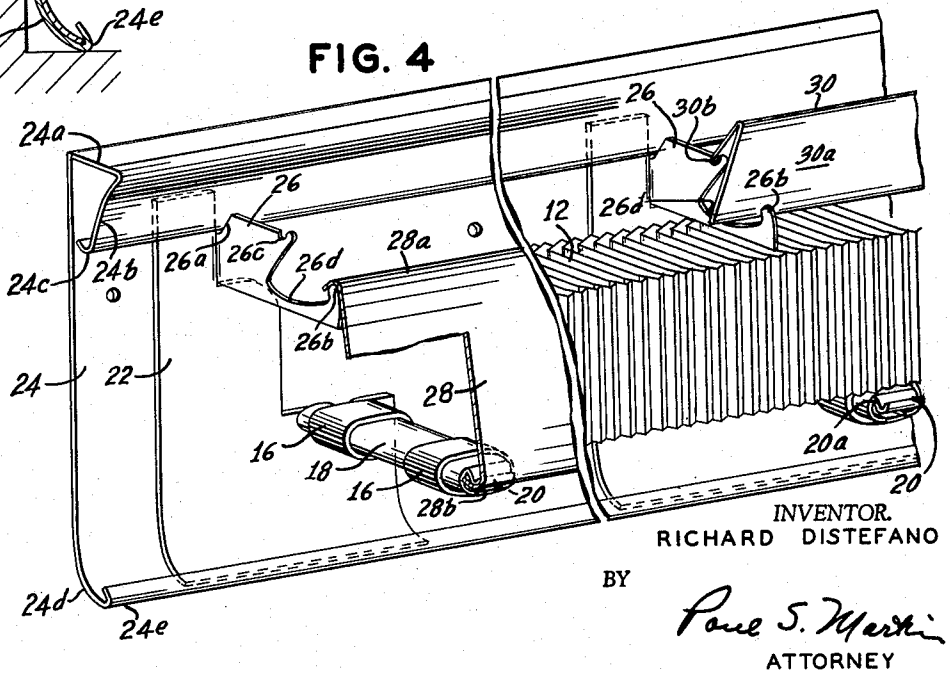


FIG. 4



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HEAT-EXCHANGE APPARATUS

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The present invention relates to heat-exchange apparatus such as baseboard radiators, and in particular it relates to fin-and-tube heat-exchange apparatus.

An object of this invention is to provide a new enclosure for baseboard fin-and-tube heat-exchange apparatus of structurally improved form, so as to provide a mechanically stronger and more attractive top ledge that also forms an exit guide for the air current.

Another object of the invention resides in the provision of a novel support structure for horizontal-extending heat-exchange units having vertical fins, more particularly for baseboard fin-and-tube radiators.

The illustrative embodiment of the invention that is described in detail below is a radiator, but it will be understood that the invention has other applications, as in cooling and dehumidifying installations. In all such applications, there is the problem of providing a support for the fin-and-tube element that is not only secure, effective and economical, but also quiet. When the heat-exchange element is operated through controlled cycles including heating or cooling periods that alternate with idle periods, the metal tube that contains the heating or cooling medium expands and contracts alternately. The tubes of successive units are series-connected so that substantial lengths of pipe are often involved in an installation; and the overall thermal expansion and contraction of such pipe tends to shift the individual fins through corresponding displacements. When the fins rest edgewise on a fixed support, they move across the support. The expansions and contractions carry some fins onto the support, and other fins are shifted off the support. When this occurs, there is an annoying "ping." Considering that there are many supports in a typical installation, a disturbing noise develops that is particularly objectionable in bedrooms where the noise may interfere with sleep.

In achieving one of the objects of this invention, the described embodiment includes an endless band or piece of tubing that is loosely looped about a fixed horizontal support element in the baseboard unit. The fins of the fin-and-tube unit rest edgewise on the top surface of the endless band, and the support element engages the inside surface of the band so that a wall thickness of the band is disposed between the edges of the fins and the horizontal support element. The edges of the fins dig in, and form slight depressions in the top surface of the band, and the fins are thus "keyed" to the band. The top band-engaging surface of the support element is wide enough in relation to the spacing between the fins so that a series of fins are in firm engagement with the band. During temperature-induced shifts of the fins, the band is driven by the fins so that the inside surface of the band slides across the support element. As each new fin is gradually shifted onto the band, it quietly digs in and takes on part of the weight of the fin-and-tube unit.

During the shift of each fin from its weight-supporting condition to a position clear of the support element, the fin gradually and quietly leaves the band, without any "pinging" sound.

A variety of substances are suitable for use as the band. Plastics such as butyl rubber, polyvinyl chloride, nylon and "Teflon" are desirable, and in concept, cloth or leather may also be used. If the particular material chosen should tend to stick to the surface of the support element (that is ordinarily metal), then a squeal might develop during shifting of the fins. In that event, graphite or other suitable lubricant can be used between the band and the support.

The same structure that provides the band support is also utilized in the illustrative embodiment of the invention in providing support for the novel convection guide and top ledge. This top ledge comprises a horizontal top sheet-metal portion that extends integrally from the rear wall of the enclosure, and extends forward horizontally and then curves downward and toward the rear wall. The lower edge of the downward curved portion rests on brackets distributed along the baseboard units. By virtue of cooperation between the brackets and the downward and rearward curved portion of the top section of the enclosure, a relatively strong and sag-free top ledge is provided. With the same spacing of support brackets for the top ledge but without the downward curved section, there is such lack of stiffness of the ledge that it tends to develop a shallow curve, from each bracket to the next, that tends to detract from the appearance. Such sag is accentuated when someone steps on the top ledge, as in trying to reach a high part of a window or wall. The novel construction provides considerable added strength resisting such deformation.

The nature of the invention will be more fully appreciated from the following detailed description of an illustrative embodiment which is shown in the accompanying drawings. In those drawings:

FIG. 1 is a front elevation of a unit-length of baseboard radiator embodying features of the present invention, FIG. 1 being drawn to greatly reduced scale and having portions broken away to reveal internal elements;

FIG. 2 is an enlarged cross-section of the baseboard radiator in FIG. 1, along the line **2—2** therein;

FIG. 3 is a cross-section of a portion of the apparatus in FIG. 2 drawn to larger scale, as viewed from the line **3—3** therein; and

FIG. 4 is a fragmentary perspective view of the apparatus in FIGS. 1, 2 and 3.

As shown in the drawings, a fin-and-tube heat-exchange element including a tube or pipe **10** bears fins **12** that are spaced apart appropriately to afford convection-current air passages. This fin-and-tube unit may, for example, be of the construction shown in Patent No. 2,899,178, issued Aug. 11, 1959 to Dubin et al. The weight of the fin-and-tube unit is carried by a series of fixed support elements **18** that extend horizontally from brackets **22** at the rear wall **24** of the radiator enclosure. Looped about each support element **18** are a pair of loose-fitting bands or sleeves **16** of a soft material, such as polyvinyl chloride, rubber, or the like. These bands **16** can, of course, be made wider so that, ultimately, they would form a single short loose-fitting piece of tubing along support element **18**. As seen in FIG. 3, the top surface of

support element **18** is gently curved and is wide enough so that a plurality of the fins **12** bear against the convex top surface of each band **16**.

The free end of support element **18** has a clip **20** formed thereon, and the lateral edge **20***a* of this clip forms a lateral enlargement or shoulder that tends to inhibit accidental removal of bands **16**.

Bracket **22** of sheet-metal bears against the rear wall **24** of the sheet-metal enclosure. Support element **18** extends integrally from this bracket **22**; or support element **18** may be formed separately and welded or brazed to bracket **22**. Bracket **22** also includes a forward extending arm **26** above the fin-and-tube unit.

The rear wall **24** of the enclosure includes top forward-extending horizontal portion **24***a*, a downward and rearward curved portion **24***b*, and a sharply bent edge portion **24***c*. Arm **26** includes a notched portion **26***a* that receives and presses upward and rearward against portion **24***c* of the top ledge **24***a*, **24***b*. The bottom edge of bracket **22** is received in a reverse-bent edge portion **24***e* that is formed on the forward-curving portion **24***d* of the rear wall.

A front cover **28** extends along the full length of the rear wall and of the unit generally, being supported by engagement of its top and bottom bent edge portions **28***a* and **28***b*, with bracket portions **26***b* and **20**, respectively.

A damper **30** includes a vane portion **30***a* and a beaded portion **30***b* that is adjustably supported on a portion of bracket **26**. The lower edge of damper **30** moves along a cut-out **26***d* of bracket **26**, and may assume any position from that affording maximum convection-current flow to the opposite extreme in which the exit passage between guide portion **24***b* of the top ledge and upper edge **28***a* of the front cover is closed.

At the bottom edge **24***e* of the rear wall **24**, rigid support is provided for bracket **22**, with its arm **26**. Arm portion **26***a* thus provides firm support for top ledge portion **24***c*. The formation of top ledge **24***a*, **24***b* represents a deep structural section, measured vertically. Because of this, only a few moderately spaced brackets **22** create sufficient stiffness to maintain the desired straight-line shape and attractive appearance of the top ledge, despite possible abuse that may be imposed on the unit after being installed. This improvement is realized by combining a deep-vertical-section ledge with only normally spaced supporting brackets.

As mentioned previously, plural support elements **18** are disposed below the fin-and-tube unit **10**, **12**, each support element **18** extending transverse of tube **10**. Any particular longitudinal portion of the fin-and-tube unit **10**, **12** tends to shift horizontally due to expansions and contractions of tube **10** during heating and cooling cycles that normally occur. This is accompanied by shifting of the individual edgewise-supported fins **12** (FIG. 3) horizontally, across support **18**. Each supported fin **12** makes a minor depression in the supple, pliant material of which loops **16** are formed. Loops or bands **16** shift with the edges of the fins they support, and as this occurs (note FIG. 3) some of the fins gradually shift into contact with loops or bands **16** while others pass out of contact. It has been found that, with bands **16** of supple materials such as tough plastics and the like, there is virtually no detectable noise during the shift of fins **12** across support element **18** during thermal changes in pipe **10**. The plastics used in many cases have very low coefficients of friction; and with other materials, lubricants may be used. With this attention to materials, bands **16** slide smoothly and silently over support element **18**, which has a smooth top surface.

The foregoing detailed description represents the presently preferred embodiment of the invention; but since this is susceptible to varied modification and rearrangement by those skilled in the art, the various aspects of the invention should be broadly construed in accordance with its full spirit and scope.

What is claimed is:

1. A baseboard heat-exchange unit, including a fin-and-tube unit having vertical fins on a horizontal tube, supporting means for said fin-and-tube unit including plural fixed horizontal support elements at longitudinally distributed locations, and a layer of pliable material in sliding contact with the top of each of said support elements, the bottom edges of a plurality of said fins being in edgewise pressure engagement with each said layer.

2. Heat-exchange apparatus including a fin-and-tube heat-exchange unit having vertical fins on a horizontal tube, supporting means for said fin-and-tube unit including plural fixed horizontal support elements at longitudinally distributed locations extending transversely below the tube, a layer of pliable material in sliding contact with the top surface of each said support element and in supporting contact with the bottom edge of a plurality of said fins, the top surface of each said support element having a gradual convex curvature as viewed in a vertical plane parallel to the tube axis.

3. Heat-exchange apparatus, including a fin-and-tube heat-exchange unit having vertical fins projecting from an elongated tube, supporting means for said fin-and-tube unit including plural fixed horizontal support elements at longitudinally distributed locations, each said support element extending transversely below said tube, and at least one endless band of supple material loosely looped about each said support element and extending across the top surface of each said support element and in sliding contact therewith, said endless band being in supporting contact with the bottom edge of a plurality of said fins.

4. Heat-exchange apparatus, including a fin-and-tube heat-exchange unit having an elongated horizontal tube and vertical fins transverse to said tube, supporting means for said fin-and-tube unit including a plurality of support elements at longitudinally distributed locations disposed below said tube and extending transverse thereto, and quiet bearing means between each said support element and the bottom edges of said fins, respective ones of said bearing means comprising an endless supple band in low-frictional sliding contact with the top of a respective support element and held by the support element in supporting engagement with the bottom edges of a plurality of said fins, said band being looped loosely about said respective support element, and the top surface of each said support element being shaped so as to be separated from the bottom edges of said plurality of said fins only by the thickness of said band as indented by said fins.

5. Heat-exchange apparatus, including an elongated enclosure providing a generally vertical through air passage an elongated generally horizontal fin-and-tube unit in said enclosure, a plurality of fixed horizontal support elements extending transversely below said fin-and-tube unit at longitudinally distributed points, endless loops of pliable material looped loosely about said support elements individually and in low-friction sliding contact with the top surfaces of said support elements and held thereby in supporting contact with and indented by the bottom edges of respective groups of fins of the heat-exchange unit, said enclosure including a rear wall of sheet-metal extending horizontally as a top ledge and extending from the front of the top ledge downward and rearward to the rear wall, and respective brackets carrying said fin-and-tube support elements and extending against said rear wall into firm supporting engagement with the lowermost edge of said downward and rearward extending sheet-metal at said longitudinally distributed points.

6. Heat-exchange apparatus in accordance with claim 5, and wherein an adjustable damper is disposed adjacent to said downward and rearward extending sheet-metal, to define therewith an adjustable air-current exit passage.

7. Heat-exchange apparatus, including an elongated heat-exchange unit, and an enclosure about said unit arranged to form a vertical air-current passage through the apparatus past said unit, said enclosure including support-

ing means for said heat-exchange unit, said enclosure including a vertical rear wall of sheet-metal having a portion extending horizontally as a top ledge and another horizontally continuous portion extending downward and rearward from the front of the top ledge substantially to the rear wall to provide a guide surface of the air-current passage, and firm supporting elements engaging the lowermost edge of said downward and rearward extending sheet-metal portion, said elements being distributed at longitudinally spaced points along the enclosure.

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