United States Patent

Johnson

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[54] BEZEL INNER GUIDE FRAME

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[52] **U.S. Cl.** .....**98/40 V,** 98/114, 98/121

[51] **Int. Cl.**.....**F24f 13/08**

[58] **Field of Search**.....98/40 C, 114, 40 D, 40 B, 40 V, 98/110, 121

[56] **References Cited**

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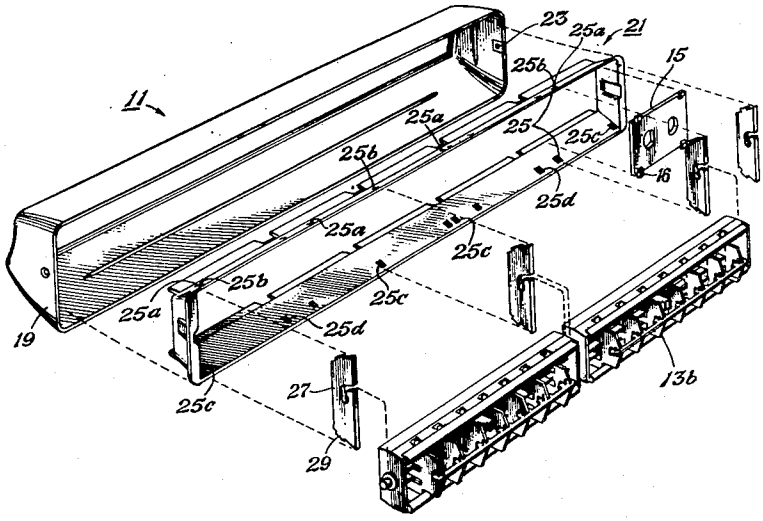
[57] **ABSTRACT**

A bezel for use in a fluid distribution system characterized by an outer frame for connecting with a plenum and an inner guide frame adapted to conformingly fit within the outer frame to define a relatively streamlined flow boundary therewithin, the inner guide frame having a plurality of stations for mounting a plurality of louvers and a control panel within the outer frame. Also disclosed are preferred embodiments in which a plurality of sets of stations are included within the inner guide frame such that a variety of sizes of louvers may be employed; wherein the set of stations comprise at least a pair of stations adapted to receive a control panel and a pair of stations adapted to receive a support web that may be snapped into place, the support web in turn having a slot adapted for receiving the louvers which may be snapped into place; as well as preferred materials of construction.

10 Claims, 9 Drawing Figures



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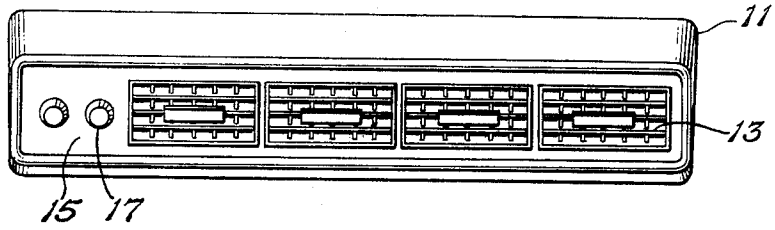

Fig. 1

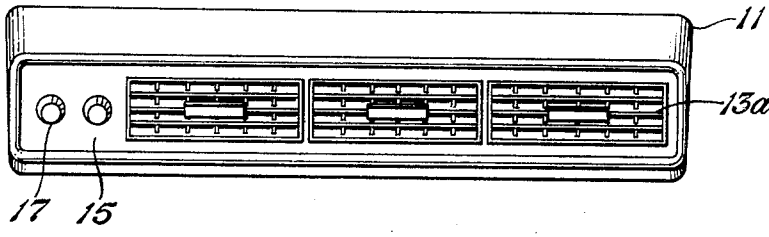

Fig. 2

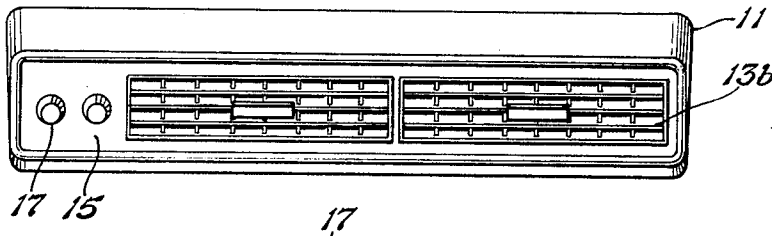

Fig. 3

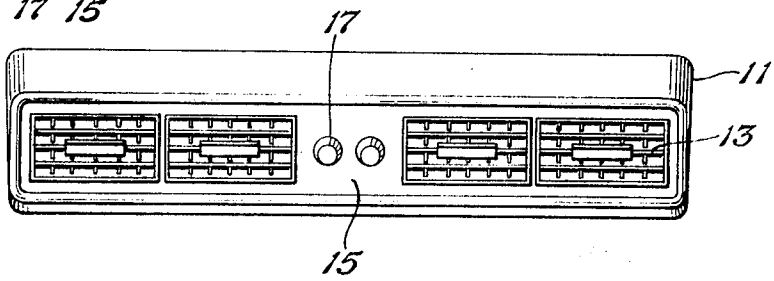

Fig. 4

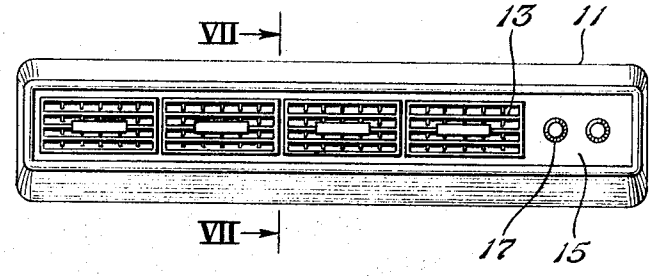

Fig. 5

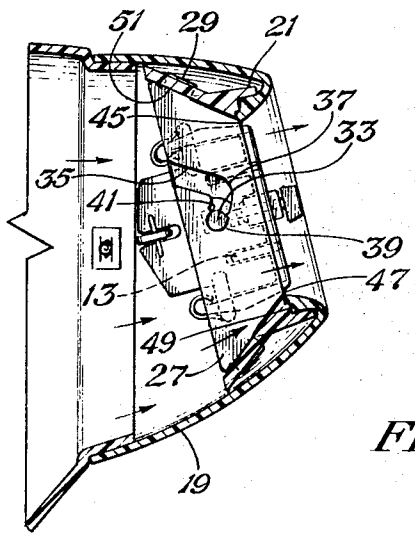

Fig. 7

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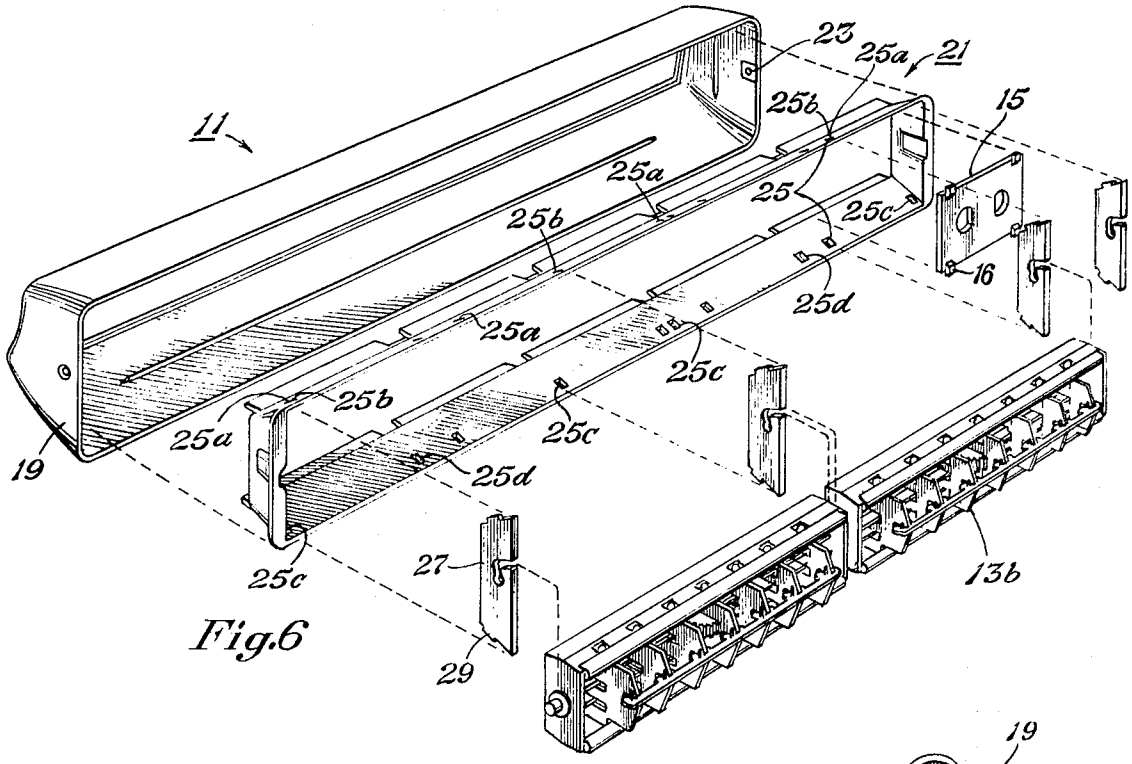
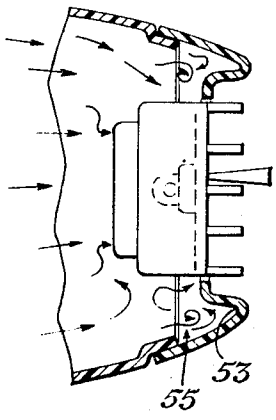


Fig.6



PRIOR ART

Fig.8

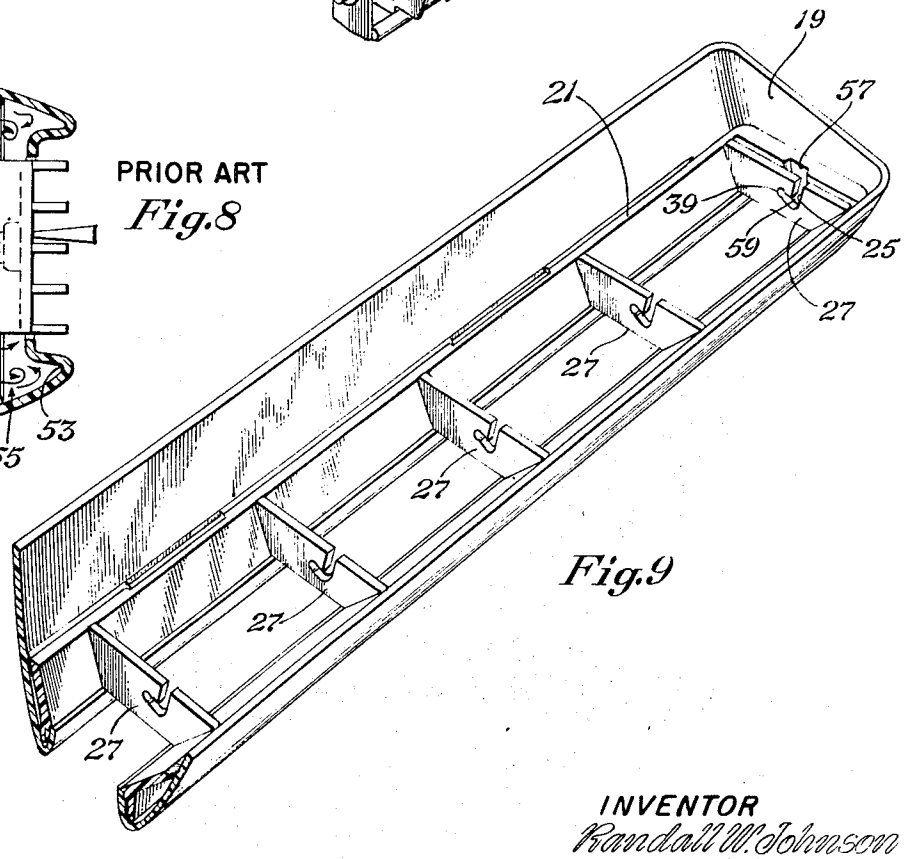


Fig.9

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BEZEL INNER GUIDE FRAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to bezel structures such as are employed in fluid distribution systems like automotive air conditioning systems.

2. Description of the Prior Art

A wide variety of discharge louvers and control panels are currently in use in automotive air conditioning systems. Each type has heretofore required a custom bezel structure. For example, different bezels were required for the dual louver outlets, for the triple louver outlets, and for the quadruple louver outlets. It has, ordinarily, not been necessary to employ more than four louvers in any given outlet to effect the desired distribution of air toward the sides as well as toward the central passengers.

In addition, one set of different bezels were required if a control panel was mounted on the left of the bezel structure, a different set of bezels were required if a control panel was mounted on the right hand side of the bezel, and still a different set of bezels were required if the control panel was mounted in the center. Thus, a large and objectionable inventory of bezels was required to allow the necessary flexibility in effecting the various designs of discharge louvers and control panels required for the different automobiles.

Additionally, the prior art type bezel structures had structural recesses that induced eddy currents and turbulence that adversely affected the flow pattern of the discharged fluid such as cold air.

Furthermore, the prior art type bezel structures required a multiplicity of fasteners for supporting each of the louvers and the control panel; requiring additional inventory, as well as additional time and expense in assemblying the louvers and the control panel within the bezel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevational view of one embodiment of this invention.

FIG. **2** is a front elevational view of another embodiment of this invention.

FIG. **3** is a front elevational view of another embodiment of this invention.

FIG. **4** is a front elevational view of the embodiment of FIG. **1** having its control panel mounted in the center.

FIG. **5** is a front elevational view of the embodiment of FIG. **1** having its control panel mounted on the right hand side.

FIG. **6** is an exploded isometric view of the embodiment of FIG. **3**.

FIG. **7** is a side cross sectional view taken along the lines VII—VII of FIG. **5**.

FIG. **8** is a side cross sectional view of a typical prior art structure.

FIG. **9** is a partial isometric view, partly in section showing the assembled bezel frames and support webs in accordance with the embodiment of FIG. **1**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

It is an object of this invention to provide a universal bezel structure that allows wide flexibility in effecting any final design and obviates the disadvantages of the prior art structures requiring a different and respective bezel for each design.

It also is an object of this invention to provide a bezel structure that eliminates eddy currents and turbulence that adversely affected the flow patterns of the discharged fluid from the prior art type bezel structures and, instead, provides an internal flow profile that is streamlined and effects a better flow of the fluid being distributed with less power requirements.

It is an object of this invention to provide a bezel structure accomplishing the foregoing objects and employing readily assemblable structures that may be snapped into place without requiring additional fastening means.

Referring to FIGS. **1–5**, various embodiments of final designs of bezel **11**, discharge louvers **13**, and control panel **15** are illustrated. FIG. **1** illustrates four discharge louvers **13** and a control panel **15** mounted at the left within the louver structure **11**. FIG. **2** illustrates three discharge louvers **13***a* with the control panel **15** mounted at the left. FIG. **3** illustrated two discharge louvers **13***b* with the control panel **15** mounted at the left. FIG. **4** illustrates an embodiment in which the louvers **13** are evenly spaced on both sides of a centrally mounted control panel **15** within bezel **11**. A single louver like louvers **13***b* may be employed on each side instead of the dual louvers **13** in the embodiment of FIG. **4** if desired. FIG. **5** illustrates the embodiment of FIG. **1** in which the control panel **15** is mounted on the right hand side of the louvers **13** and bezel **11**. The embodiment of FIG. **5** may be effected simply by rotating the embodiment of FIG. **1** through 180° to move the control panel from the left hand side to the right hand side. Each of the embodiment of FIGS. **1–3** may be converted to have the control panel **15** mounted on the right hand side by similarly rotating through 180°. Suitable controls, typified by control knobs **17**, are installed in a conventional way for all embodiments.

The improved bezel structure of this invention makes possible all of the foregoing discharge louver designs, both explicit and implicit. It is illustrated in exploded form in FIG. **6**. Therein, bezel **11** comprises an outer frame **19** and an inner guide frame **21**. The outer frame **19** is adapted for connection with a plenum in the fluid distribution system, as by apertures **23** for receiving a suitable fastener means such as a sheet metal screw.

The inner guide frame **21** is adapted to fit within the outer frame **19**. The inner guide frame **21** has a plurality of stations, or mounting positions, for mounting a plurality of louvers within the outer frame. The stations are illustrated by matched receptacle means such as respective pairs of matched apertures **25**. The plurality of stations comprise a plurality of sets of stations, each set of stations, in turn, comprising at least a pair of stations so spaced as to mount a louver within the outer guide frame. The plurality of stations also comprise a pair of stations for mounting a control panel within the outer frame. The oppositely disposed sides of the inner guide frame **21** are identical so that the inner guide frame may be rotated 180° to place the left hand side, or end, on the right hand side, or vice versa.

Referring to the inner guide frame **21**, there are **10** stations that are so arranged that eight combinations of design are possible with only three different louver sizes, enabling having either two, three, or four louvers per bezel. At each station a support web **27** is provided. Support web **27** has a means for mounting it to both the top and bottom inner guide frame. As illustrated, the means for mounting comprises snap-in appendage means such as protrusions **29** for engaging the respective pair of matched apertures **25**. Preferably, each protrusion **29** conformingly engages its correlative apertures **25** on at least two sides. The snap-in protrusions **29** may be snapped manually and readily into the pair of matched apertures **25** to affix the support web **27** to inner guide frame **21** at each station desired.

As can be seen, if support webs **27** are respectively snapped into the matched pair of apertures **25***b* and the bezel assembled, a structure like the one illustrated in FIG. **3** is effected in which the control panel **15** is on the left hand side and a pair of louvers **13***b* are disposed on the right hand side. As indicated, if the control panel is desired on the right hand side, the entire assembly is merely rotated 180° to place it on the right hand side before mounting the inner guide frame **21** within the outer frame **19**.

Similarly, if three louvers are desired, as illustrated in FIG. **2**, the respective support webs are snapped into place in the matched pairs of apertures **25***a*. The inner guide frame may then be positioned to place the control panel on either the right or the left.

On the other hand, if the control panel is to be emplaced in the center, the support webs will be snapped into apertures 25*c*. In addition, if dual louvers are to be employed on both sides of the control panel, support webs **27** are snapped into apertures 25*d*, also.

It is preferred that a simple structure be provided for supporting the respective louvers in their respective support webs. Accordingly, each support web **27** has a snap-in receiving means adjacent its center for receiving a compatible snap-in structure supporting the louvers to be mounted therein. Specifically, each of the louvers **13** has a stub shaft **33**, FIG. **7**, protruding from their ends that are to be adjacent the support webs **27**. The snap-in receiving means comprises a slot means **35** having its entry at the rear of the support web **27**, traversing forwardly to a turning location, or knee portion, **37** and then backwardly to a terminal portion **39** adjacent the center of the support web **27**. The terminal portion **39** is adapted to conformably and pivotally retain the stub shaft **33** in place. A protrusion **41** is provided intermediate the terminal portion **39** and the knee portion **37** for retaining the stub shaft **33** in place. The distance separation between protrusion **41** and the opposite wall or similar matching protrusion **41** is large enough; or the protrusions are small enough; that the stub shaft **33** can be snapped therepast and into the terminal portion **39**. On the other hand, the distance separation between the protrusions **41** is small enough; or the protrusions **41** are large enough; to prevent inadvertant release of the stub shaft **33** from the terminal portion **39**. It is noteworthy that the louvers may be rotated with whatever pressure is necessary from the front and, yet, the stub shaft will be retained within the terminal portion, since pressure from the front will not displace the stub shaft rearwardly out of the slot means because of the knee portion **37**. The control panel **15** is similarly retained in place against rearward movement by a pair of support webs **27** snapped into respective pairs of apertures **25** behind each end, as illustrated in dashed lines, FIG. **6**. As illustrated therein, the control panel **15** has four protrusions, or tabs, **16** adjacent each corner that restrict its forward movement by engaging respectively the inner guid frame **21** and the inner edge **45** of the outer frame **19** and restrict its lateral movement by engaging the support webs **27** at each end. As indicated hereinbefore, the inner guide frame is conformingly fitted within the outer frame **19**; the conforming fit being illustrated in FIG. **9** and described in connection therewith hereinafter; and the entire bezel structure assembly is then connected with the plenum of the fluid distribution system via fastener means and apertures **23**. It is particularly noteworthy that no tools or other accessories are required in effecting assembly of this bezel structure or the louvers mounted therewithin.

As can be seen in FIG. **7**, the outer frame **19** has a curved front that terminates in an inner edge **45**. The inner guide frame **21** is adapted to fit within the outer frame **19** and to conforminly abut the inner edge **45** with a shoulder **47**. To facilitate retaining abutment, the edge **45** and shoulder **47** may have conforming, stairstep construction **49**. In any event, the inner surface **51** of the inner guide frame **21** defines a relatively streamlined flow boundary between the internal wall of the outer frame and the inner edge for eliminating turbulence. As can be seen in the prior art illustration of FIG. **8**, the prior art bezels had a curved internal front portion **53** that induced eddy currents **55** that created turbulence and wasted energy, in addition to adversely affecting the flow pattern of the discharged air.

FIG. **9** illustrates the assembled outer frame and inner guide frame, with the end cut away to show more graphically the relatively streamlined flow boundary thereby effected. Specifically, the inner guide frame **21** is emplaced within the outer frame **19**. The inner guide frame **21** has the respective support webs **27** snapped into place therein so as to receive four louvers. Ordinarily, the stub shafts of the respective louvers are snapped into the respective slot means **35** before the inner guide frame assembly is inserted. In this way the extra length of the terminal stub shafts may slide forwardly via a niche **57** in each end of the inner guide frame. Niche **57** extends forward to define a front portion **59** that can receive any excess length of stub shaft **33**. This prevents the necessity of having to have two different length stub shafts, a shorter one for the terminal louvers and a longer one to interconnect between adjacent louvers on the remainder of the support webs **27**.

The elements described hereinbefore are preferably formed of a material that will resist corrosion in the fluid being circulated. For example, it is preferred that the elements be formed of a plastic material so as to prevent corrosion due to the moisture of condensation from the cold air being circulated in an automotive air conditioning system. The plastics may either be thermosetting or thermoplastic plastics as long as they have the requisite rigidity and resistance to deformation under conditions of use. Well known thermosetting plastics like the phenol-formaldehyde copolymers may be employed. The thermosetting copolymers like the acrylonitrile-butadiene-styrene copolymers also are satisfactory and may be employed. The thermoplastic plastics such as nylon may be employed for the stub shafts and the like.

This invention provides a bezel structure that satisfies the foregoing objects and obviates the disadvantages of the prior art structures in that it:

1. allows wide flexibility in effecting any final design;
2. provides a streamlined internal flow profile that eliminates eddy currents and minimizes turbulence; thereby improving flow patterns and fluid distribution;
3. employs readily assemblable snap-in structure that may be readily and manually snapped into place without requiring warehousing of additional parts and tools and costly and time consuming assembly of the parts; and
4. forms a snap-in structure that may be manipulated from the front without being inadvertently disassembled, because of its unique construction.

Once the advantageous features of employing multiple sets of stations within a given bezel structure are known, one skilled in the art may come up with other structures employing the principles of this invention without employing the exact structure delineated hereinbefore. The exact structure delineated hereinbefore is to be considered in an illustrative sense and not in a limiting sense. Numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention.

What is claimed is:

1. A bezel for use in a fluid distribution system employing a predetermined group of louvers, the predetermined group being selected from a plurality of groups of louvers; each group having a respective number of louvers that are standard within each group, comprising:

a. an outer frame adapted for connection with a plenum in said fluid distribution system;

b. an inner guide frame adapted to conformingly fit within said outer frame and having a plurality of discrete and standardized mounting positions for mounting any of said predetermined groups of louvers within said outer frame; said plurality of mounting positions being arranged in a plurality of individual sets of stations; each said individual set of stations, in turn, comprising at least a pair of stations being spaced at predetermined mounting positions such that a pair of mounting means disposed thereat will support a standard louver of a predetermined group of said standard louvers within said outer frame; said plurality of mounting positions also comprising a pair of stations for mounting a control panel within said outer frame; said inner guide frame having oppositely disposed sides that are the same such that said inner guide frame is reversible through 180°; and

c. mounting means for mounting respective ends of said louvers and said control panel; said mounting means being disposed at a plurality of said mounting positions selected

in accordance with the set of stations for the predetermined group of louvers and control panel arrangement selected for said bezel; each mounting means having means for retaining it at said mounting position and means for supporting said end of said louver;

whereby a variety of said plurality of louver and control panel arrangements may be effected with the single set of said frames and mounting means.

2. The bezel of claim 1 wherein said inner guide frame has 10 mounting positions that are so arranged that eight combinations are possible with only three different standard louver sizes enabling having either two, three, or four louvers per bezel.

3. The bezel of claim 2 wherein each said mounting means comprises a support web and means for mounting said support web at the top and bottom of said inner guide frame.

4. A bezel for use in a fluid distribution system employing a predetermined group of louvers, the predetermined group being selected from a plurality of groups of louvers; each group having a respective number of louvers, comprising:

a. an outer frame having a curved front terminating in an inner edge and adapted for connecting with a plenum in said fluid distribution system;

b. an inner guide frame adapted to conformingly fit within said outer frame, to conformingly abut said inner edge, and to define a relatively streamlined flow boundary between the internal wall of said outer frame and said inner edge for eliminating turbulence due to fluid flow in the curved front internal portion of said outer frame; said inner guide frame having a plurality of discrete mounting positions for mounting any predetermined group of said plurality of groups of louvers and a control panel within said outer frame; and

c. mounting means for mounting respective ends of said louvers and said control panel; said mounting means being disposed at a plurality of said mounting positions selected in accordance with the predetermined group of louvers and control panel arrangement selected; each said mounting means having means for retaining it at said mounting position.

5. The bezel of claim 4 wherein said plurality of mounting positions comprise a plurality of individual sets of stations, each said set of stations in turn comprising at least a pair of stations being spaced at predetermined mounting positions such that a pair of mounting means disposed thereat will support a standard louver of a predetermined group of standard louvers within said outer frame; said plurality of mounting positions also comprising a pair of stations for mounting a control panel within said outer frame; said inner guide frame having oppositely disposed sides that are the same such that said inner guide frame is reversible through 180°; whereby more effective distribution of said fluid is effected because there is less turbulence and whereby a variety of louver and control panel arrangements may be effected with the single set of frames.

6. The bezel of claim 5 wherein said inner guide frame has 10 mounting positions that are so arranged that eight combinations are possible with only three standard louver sizes.

7. The bezel of claim 6 wherein each said mounting means comprises a support web and means for mounting said support web at the top and bottom of said inner guide frame.

8. The bezel of claim 7 wherein a plurality of louvers and a control panel are included in said bezel with said control panel located at an end position, and said control panel may be located at either end of said outer frame by rotation of said inner guide frame 180°.

9. The bezel of claim 8 wherein said plurality of louvers is either two, three, or four louvers.

10. The bezel of claim 7 wherein a plurality of louvers and a control panel are included in said bezel with said control panel located at the center position.

* * * * *