United States Patent [19]

Box

[11] **3,756,138**

[45] **Sept. 4, 1973**

[54] **INTEGRALLY MOLDED PLASTIC LOUVER FRAME AND ASSEMBLY THEREOF**

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

[51] **Int. Cl.** **F24f 7/00,** F24f 13/08

[58] **Field of Search** ..... 98/121, 122, 114, 98/40 VM; 138/120, 155; 52/473; 259/180, 4; 220/23.6, 97 R

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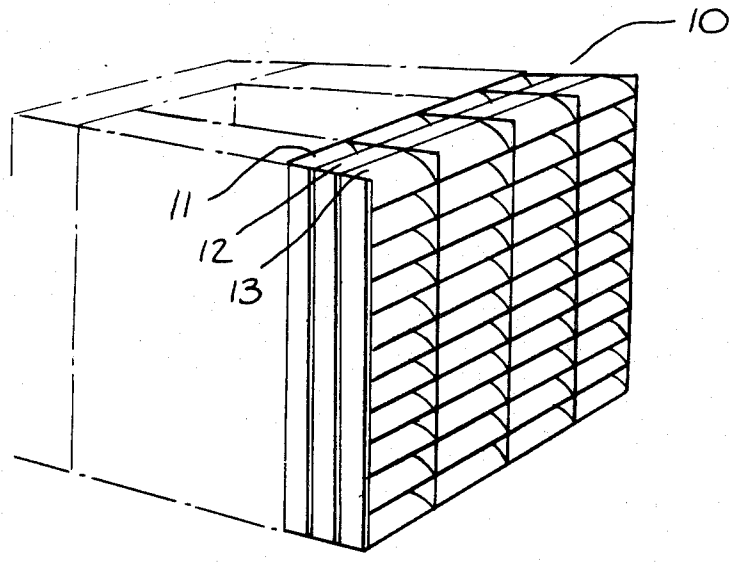
[57] **ABSTRACT**

A louver assembly comprised of a plurality of interfitting integrally molded plastic frames, preferably constructed from glass filled polypropylene. The louver frames are integrally molded with flat side members, louvers and intermediate support members. The side members are flat with a flat front portion or extension displaced from the side member but parallel thereto Notches are integrally molded into the flat front portion to cooperate with projecting lips on the rear portion of the side member of adjacent frames to permit locking engagement between adjacent frames in a louver assembly.

The louvers are arcuate louvers having intermediate flat members molded thereto for vertical support. The intermediate flat members are parallel to the side members and contain integrally molded guide means adapted to permit fastening of adjacent frames to each other in a louver assembly.

7 Claims, 10 Drawing Figures



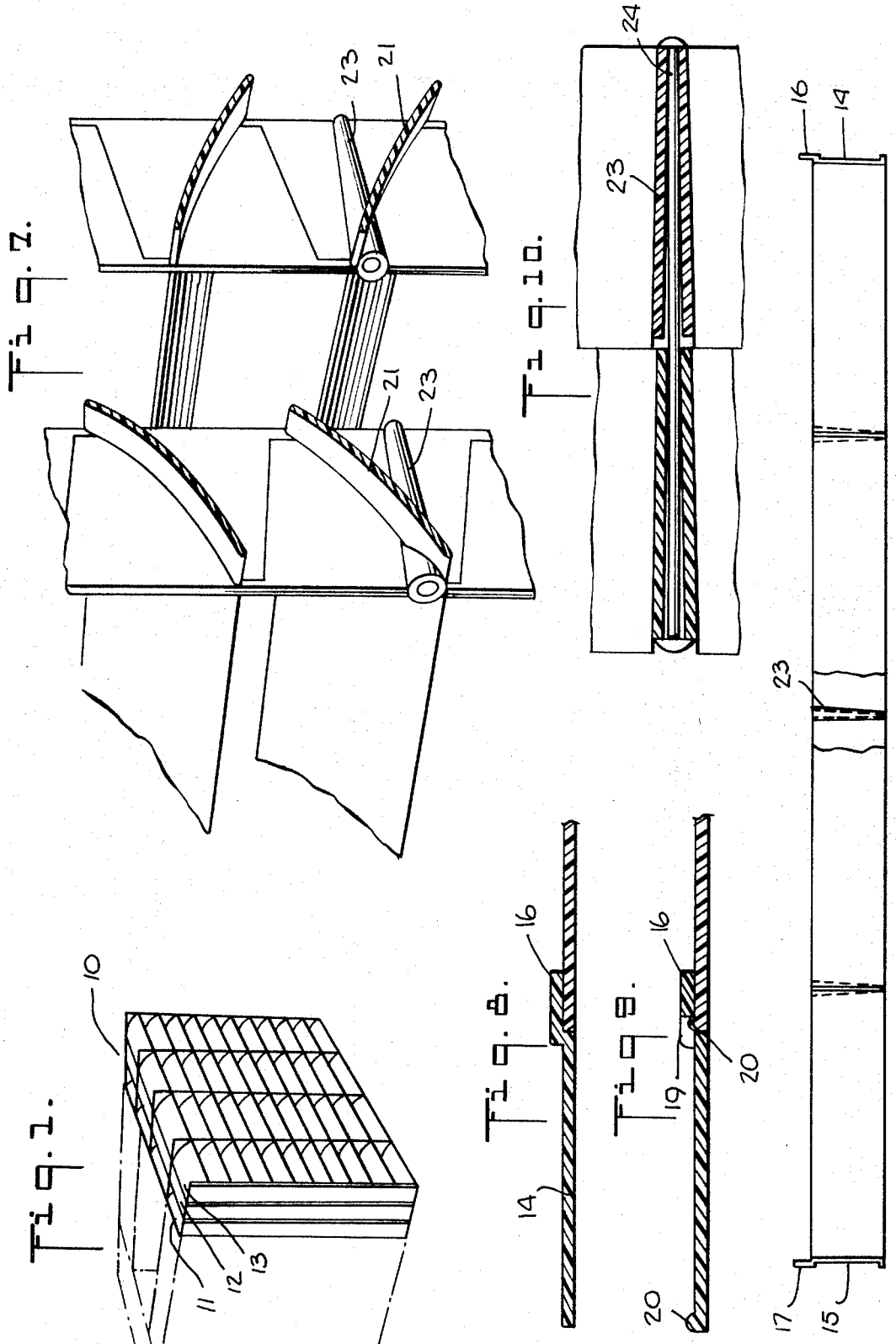


Fig. 1.
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Fig. 2.
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Fig. 8.
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Fig. 10.
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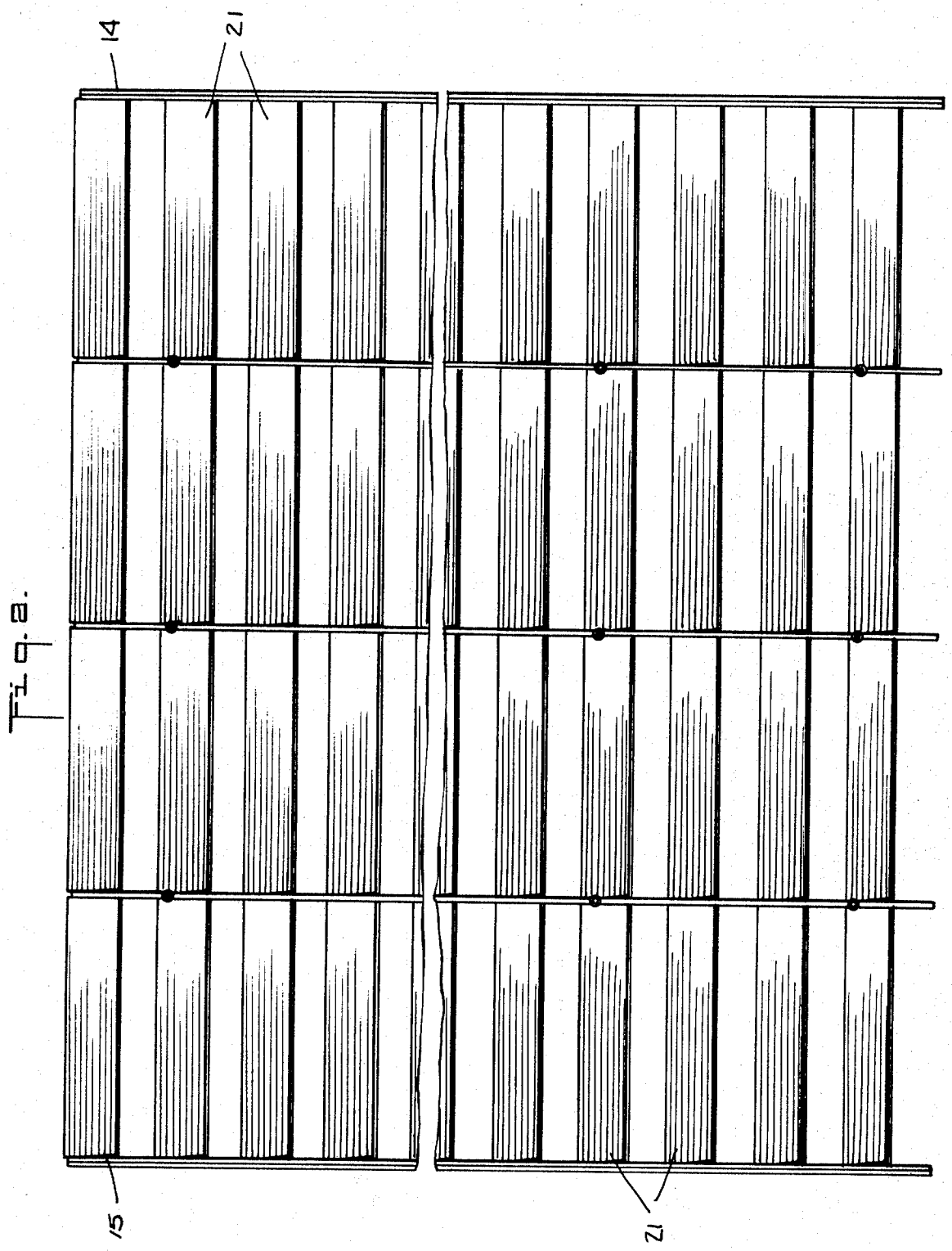


Fig. 8.

Fig. 5.

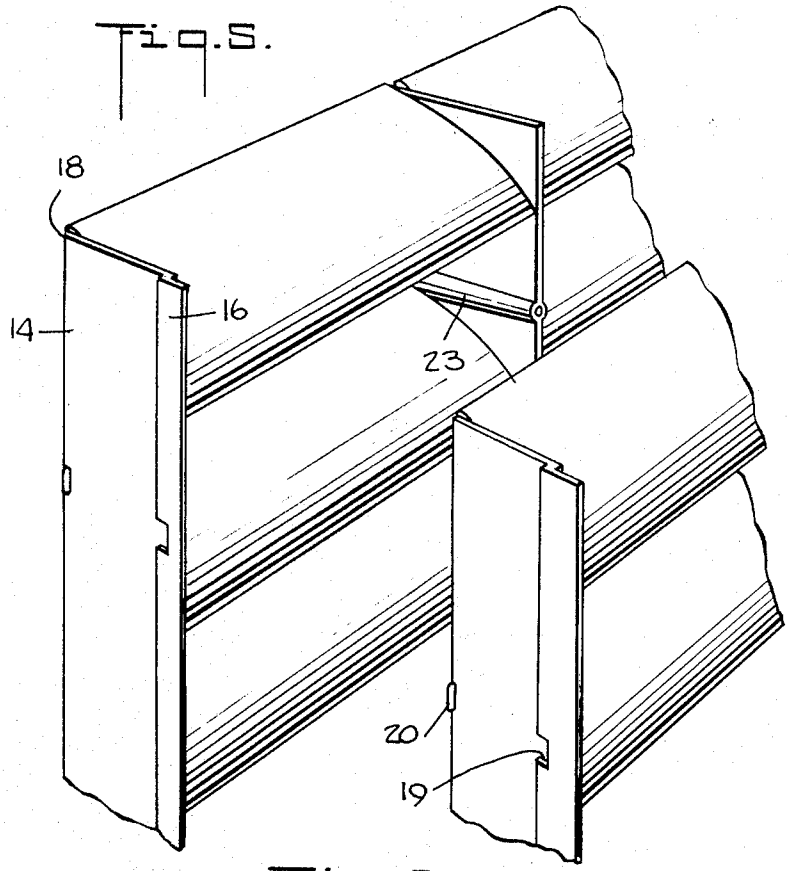
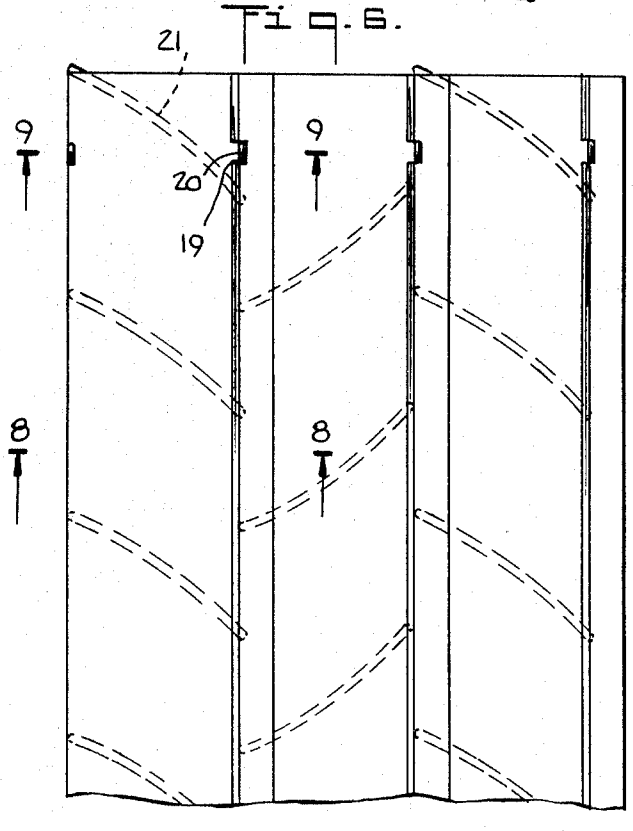


Fig. 6.



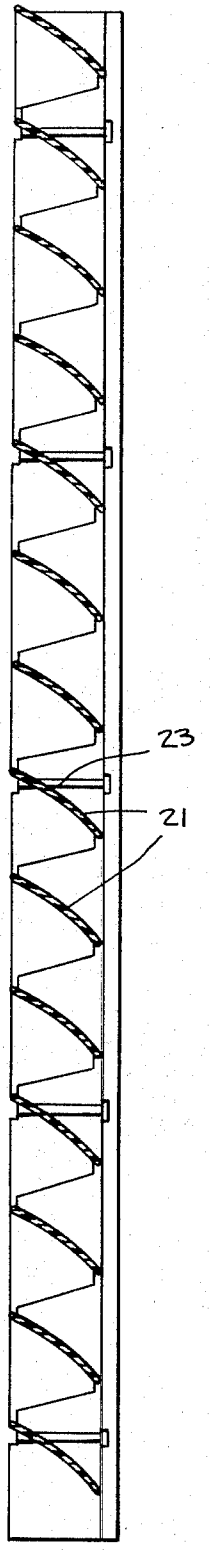


Fig. 8.

INTEGRALLY MOLDED PLASTIC LOUVER FRAME AND ASSEMBLY THEREOF

FIELD OF THE INVENTION

This invention is concerned with louver assemblies, particularly plastic louver assemblies formed from a plurality of integrally molded rigid plastic louver frames.

BACKGROUND OF THE INVENTION

The louver assemblies of this invention can be used as aerators in chemical splash towers, in buildings as air ventilators or wherever louvers are presently employed.

In louver construction, it is generally desirable to employ a louver assembly which is durable, rigid and economical. Previously, in order to produce louvers of rigid construction in the most economical manner, wood or other inexpensive material was generally employed. Wood, however, while structurally strong, is subject to rapid deterioration when used with certain caustic chemicals. Thus, the use of wooden louvers is limited to specific applications where the louvers are not subjected to chemical attack or where they will be continuously replaced. The former limits the range of applications and the latter increases the cost.

Other materials such as metal have been suggested but in order to overcome the chemical deterioration the required type of material necessarily increases the cost. Thus, in constructing such louvers, it has been impractical up to now to construct a louver assembly having the desired mechanical strength and rigidity at a low cost.

It is also desirable to construct a louver assembly formed from individual louver frames designed to fit together to form the assembly. The individual elements, however, must maintain their rigidty and must be capable of easy removability and replacement. With wooden or metal louver frames it has been difficult to date to achieve economical frames designed for interlocking and easy removability.

A further feature desired in a louver assembly is the ability to vary the direction of the arcuate louvers and thereby provide different flow patterns within the assembly.

It is therefore an object of the present invention to achieve these desired objectives by constructing a louver assembly of integrally molded plastic louver frames of high rigidity and strength at a low economical cost.

It is a further object of the present invention to achieve these desired objectives by forming individual integrally molded louver frames adapted to fit together to provide the desired width and size louver assembly.

SUMMARY OF THE INVENTION

According to the present invention, the objectives are achieved by constructing a louver assembly comprising a plurality of interfitting integrally molded plastic frames. The frames are constructed preferably from glass filled polypropylene and are molded with flat side members having a flat front portion or extension displaced away from but parallel to the side members. Integrally molded into the flat front portion are notches which combine with projecting lips on the rear portion of the side members to provide locking engagement between adjacent frames when the frames are assembled into a louver assembly. The flat front portions of the frames, due to their displacement from the side members, upon assembly overlap the rear portion of the adjacent frame to provide mating engagement between adjacent frames.

Within the frames a plurality of arcuate louvers are integrally molded to the side members at substantially right angles thereto. In order to provide vertical support for the louvers an intermediate flat member is provided which is generally parallel to the side members. This support member also has molded to it a guide means adapted to receive a screw or other appropriate fastening device to permit fastening of adjacent frames to each other in a louver assembly.

The individual louver frames are designed so that the louvers, when placed in an assembly, have their arcuate members vertically displaced from each other.

As can readily be seen by the construction of louver frames in this manner, louver assemblies can be fabricated of strong chemically resistant material for ready adaptation into assemblies of a desired size and form. Further, the frames can be interlocked into a rigid framework while capable of easy removal if so desired.

These and other objects and advantages of the invention will become more apparent from the following detailed description and appended claims taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a louver assembly formed in accordance with this invention;

FIG. **2** is a front plan view of a louver assembly formed in accordance with this invention;

FIG. **3** is a side cross-sectional view of a louver frame formed in accordance with this invention;

FIG. **4** is a top plan view illustrating in partial cross-section the guide means of the louver frame formed in accordance with this invention;

FIG. **5** is a partial perspective view of two frames formed in accordance with this invention prior to their assembly into a louver assembly;

FIG. **6** is a partial side view of a louver assembly formed in accordance with this invention;

FIG. **7** is a partial perspective view illustrating the guide means of the louver frames, formed in accordance with this invention;

FIG. **8** is a cross-sectional view taken along line **8—8** of FIG. **6**;

FIG. **9** is a cross-sectional view taken along line **9—9** of FIG. **6**; and

FIG. **10** is a cross-sectional view illustrating the guide means and a fastening device used to assemble two frames into a louver assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the Figures, there is shown in FIG. **1** a louver assembly **10** formed of interfitting individual louver frames **11, 12** and **13.** As shown in FIG. **1,** the louver assembly provides a compact rigid assembly held together in a rigid framework. Further, the assembly, formed as it is of individual generally rectangular integrally molded plastic louver frames **11, 12** and **13,** can be economically assembled into an integral unit from frames made of relatively impervious material such as glass filled polypropylene. Additionally, because the frames are integrally molded they provided strength and rigidity at lost cost. When assembled in

guide posts **28** to spring load the cover **26** and urge the cover toward its sealing position as shown in FIG. **3.**

In order to raise the cover **26** from its closed position (FIG. 3) against the biasing of springs **34** to its open position (FIG. 2), an eccentric means in the form of an arm **36** is fixed to a rotating shaft **38** which is rotatably mounted on the framework **10.** The eccentric arm **36** is connected to the cover **26** by means of U-shaped link members, generally designated **40.** The link members **40** each has the end of one leg **40***a* thereof pivotally connected to the eccentric arm **36** and the end of the other leg **40***b* thereof pivotally connected to the cover **26.** Thus, on rotation of the shaft **38** in the direction of arrow A (FIG. **3**), the eccentric arm **36** will rotate with the shaft and cause the U-shaped link members **40** to move to the position shown in FIG. **2,** raising the cover **26,** and with the shaft **38** disposed within the curvature of the U-shaped link members **40.** As can be seen in FIG. **2,** with the cover raised and the U-shaped link members **40** in the position shown, lines passing through th pivot connections of the link members to the eccentric arms **36** and cover **26** as disposed over-center (to the right in FIG. **2**) of the rotating shaft **38,** and thereby holds the cover in its raised or open position against the downward biasing of springs **34.**

In order to rotate the shaft **38** to raise the cover **26,** a manually manipulatable lever arm, generally designated **42,** (FIG. **4**) is pivoted intermediate its ends, as at **44,** to the framework **10.** The lever arm **42** has one end **42***a* provided with a flange **42***b* for manual manipulation by a user of the machine, particularly to depress the end **42***a* of the lever arm downwardly in the direction of arrow B (FIG. **4**) toward the phantom position shown. The opposite end of the lever arm **42** is provided with an arcuate gear rack **42***c* concentric to the pivot **44** of the lever arm and in mesh with a gear **46** fixed to the shaft **38** so that the shaft will rotate to open the cover **26** in response to a user pushing down on the lever end **42***a*, as described above.

Means are provided to start the cycle of operation of the copying machine automatically in response to raising the cover **26** from its closed to its open position. Such means includes a switch, generally designated **48** in FIG. **4,** and a cam member **50** fixed for rotation with the shaft **38.** As is apparent, rotation of the shaft **38** in the direction of arrow A (FIG. **3**) causes the cam member **50** also to move in the same direction, as indicated by arrow C (FIG. **4**). The switch **48** has a roller member **52** disposed in the path of rotation of the cam **50** so that when the cam is rotated, as described above, it will engage the roller **52** and actuate the switch **48** to automatically start a cycle of operation of the copying machine as the cover **26** is raised.

Means is provided to move the cover **26** back from its open to its closed positions automatically at a predetermined point in the cycle of operation of the copying machine. More particularly, as is known, many such copying machines employ endless chains or belts to move certain operative components such as a platen which carries the original to be copied. With the invention herein, a pin member **54** (FIG. **4**) is mounted on a chain, belt or the like, indicated by the dot-dash line **56,** for movement into the path of the flange **42***b* of the lever arm **42** when the lever arm is in its lower position as shown in phantom, and with the cover raised. As the pin **54** moves with the chain or belt **56** in the direction of arrow D during a cycle of operation of the copying machine, the pin will come into contact or strike the underside of the flange **42***b* which thereby overcomes the over-center condition of the U-shaped link members **40** so that the springs **34** causes the cover **26** to automatically close at that point during the cycle of operation of the machine. A spring **58** (FIG. **4**) also is provided between the end **42***a* of the lever arm **32** and the framework of the copying machine to assist the springs **34** and to aid in returning the lever arm **42** back to the position shown in full lines in FIG. **4.** As the shaft **38** rotates with the link member **40** during the closing of the cover **26,** the cam member **50** will become disengaged from the roller **52** of the switch **48** and break the contacts of the switch to stop the operation of the copying machine automatically in response to closing the cover **26.**

FIGS. **5** through **7** show an embodiment wherein means are provided to automatically close the cover for the developer trough automatically when the copying machine is lifted off of a supporting surface **60,** such as a tabletop or the like, to prevent spillage of the developer liquid during transportation of the copying machine. Although the configuration of certain of the components are slightly different from comparable components shown in FIGS. **1** through **4,** like numerals have been applied where applicable, for clarity purposes. With the apparatus shown in FIGS. **5** through **7,** the cover **26** for the developer trough **12** is fixed to a plurality of vertically extending legs **62,** two legs on each side of the copying machine. The legs of each pair on opposite sides of the machine are connected to a common shoe or foot means **64** on the underside of the framework **10** whereby the cover **26,** legs **62** and shoes **64** comprise a unitary structure for vertically reciprocating movement relative to the framework of the machine. The legs **62** are vertically reciprocatably received in brackets **66** providing guiding support for said unitary structure. In essence, the shoes **64** (and legs **62**) thereby are yieldably mounted so as to move upwardly to a retracted position shown in FIGS. **5** and **6** relative to the framework of the copying machine when the copying machine is placed on the supporting surface **60,** and to move to an extended position as shown in FIG. **7** under gravity and under the biasing of springs **68** which surround the legs **62** when the machine is lifted off of the supporting structure. With the cover **26** rigidly fixed to the legs **62,** the cover will move therewith to a sealing position on top of the developer trough **12** as shown in FIG. **7** when the machine is lifted and transported, thereby preventing spillage of the developer liquid **14.** When the machine is repositioned on a supporting structure, the shoes **64** and legs **62** will be forced upwardly or retracted and thereby raise the cover **26** to its open position.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations should be understood therefrom as some modifications will be obvious to those skilled in the art.

We claim:

1. In a copying machine which includes a framework on which is mounted a developer trough for containing developer liquid through which copy paper or the like is passed, a cover for sealing said trough to prevent evaporation loss or spillage of the developer liquid, said cover being movably mounted on said framework for movement between an open position to permit the copy paper to be passed through the trough and a

5. A louver assembly comprising a plurality of interfitting integrally molded plastic frames each of said frames including front and back portions respectively dimensioned to provide mating engagement of the front portion of one frame with the back portion of the adjacent frame, a plurality of louver members disposed within and carried by each said frame, and locking means on said frames for maintaining said frames in assembled condition, at least one supporting member interconnected between each of said louvers and adapted to provide support for said louvers, said supporting member comprising a substantially flat member interconnected between the louvers and to which each of said louvers is connected, each of said support members having at least one integrally molded guide means adapted to permit fastening of adjacent frames to each other.

6. A louver assembly comprising a plurality of generally rectangular integrally molded plastic frames having front and rear faces and including side members comprised of slat members having their flat sides disposed in facing relationship with opposed members, each of said side members having a flat raised front portion parallel to said side members and being joined to said side members along a front edge of said side member, said flat raised front portion adapted to overlap the back portion of an adjacent frame, and dimensioned to form an interfitting receptacle for the rear face of a similar frame, at least one intermediate supporting member disposed with its flat sides substantially parallel to said side members, said supporting member having at least one guide means integrally molded into said support member for the fastening of adjacent frames to each other, a plurality of substantially parallel and symmetrically arranged louver members having arcuate cross-sections disposed within said frame between said side and intermediate members and joined thereto at their ends, the arcuate portions of said louvers being oriented at an angular relation to the planes defined by the faces of said frame, said front face to said side members, and locking means on said frames for releasably maintaining said frame in engagement within a similar frame, said locking means comprising a plurality of notches inserted at the front edge of said side members and a plurality of lips mounted to the back portion of said side members, said notches and said lips adapted to releasably interlock and maintain said frames in assembled form.

7. A generally rectangular integrally molded plastic frame having front and rear faces and including side members comprised of slat members having their flat sides disposed in facing relationship with opposed members, each of said side members having a flat raised front portion parallel to said side members and being joined to said side members along a front edge of said side member, said flat raised front portion adapted to overlap the back portion of an adjacent frame when said frames are mounted in a louver assembly, at least one intermediate supporting member disposed with its flat sides substantially parallel to said side members, in which said supporting member has at least one guide means integrally molded into said support member for the fastening of adjacent frames to each other, a plurality of substantially parallel and symmetrically arranged louver members having arcuate cross-sections disposed within said frame between said side and intermediate members and joined thereto at their ends, the arcuate portions of said louvers being oriented at an angular relation to the plane defined by the faces of said frame, said front face of said side members dimensioned to form an interfitting receptacle for the rear face of a similar frame, and locking means on said frames for releasably maintaining said frame in engagement with a similar frame when said frames are mounted in a louver assembly, comprising a plurality of notches inserted at the front edge of said side members and a plurality of lips mounted to the back portion of said side members, said notches and said lips adapted to releasably interlock and maintain said frames in assembled form when said frames are mounted in a louver assembly.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,756,138 Dated September 4, 1973

Inventor(s) Theodor M. Box

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The present columns 3 and 4 should be cancelled and the attached columns 3 and 4, Patent No. 3,756,138 substituted therefor, as part of Letters Patent. Column 5, line 40, "to" should read -- of --. Column 6, line 1, "within" should read -- with --.

Signed and sealed this 25th day of June 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.

this form, the assembly can be used as a splash tower in a chemical plant or as a ventilation device.

In order to permit the formation of a louver assembly the frames must be designed to not only fit together but must also be easily removable. As shown in FIGS. 2, 3, 4 and 5, the individual integrally molded plastic frames have front and rear faces with side members 14 and 15 having front and back portions respectively dimensioned to provide mating engagement of the front portion of one frame with the back portion of the adjacent frame. As shown, the side members 14 and 15 are two substantially parallel slat side members having their flat sides disposed in facing relationship with opposed members. Molded to the front portion of side members 14 and 15 are flat extensions or front portions 16 and 17 displaced away from but parallel to the flat side members 14 and 15 The flat raised front portions 16 and 17 are joined to the side members 14 and 15 along the front edge of the side members and are designed to overlap the rear portion 18 of an adjacent frame to form an interfitting receptacle for the rear face or portion 18 of adjacent frame when the frames are assembled into a louver assembly, as shown in FIG. 6. The overlapping of the frames thus permits the mating engagement of the front portion of one frame with the back portion of an adjacent frame.

It is also necessary, however, to provide some device to releasably secure the individual frames together in a relatively easy manner while simultaneously insuring that the assembly will remain intact after installation. In order to accomplish these requirements, a locking means is provided on each frame.

Integrally molded into the front portion of the frames are a plurality of notches 19 disposed at the junction of the flat side members 14 and 15 and the front portions 16 and 17. At the rear of the side members 14 and 15, a plurality of lips 20 are arranged to permit the releasable interlocking engagement of the lips 20 in the notches 19 when the frames are joined together in a louver assembly. Preferably, the lips 20 are mounted to the edge of the back portion of each side member and are adapted to permit the removable locking engagement of the lips 20 in the notches 19. The manner in which the frames are interconnected by the notches and lips can clearly be seen in FIGS. 6 and 9. As shown in FIG. 8, the remaining area of the side members 14 and 15 fit together in an overlapping arrangement.

Within each frame 11, 12 and 13 arcuate louvers 21 are integrally molded at a slight downward angle as shown in FIGS. 6 and 7. This downward angle, when the assembly is used as a splash tower, permits the fluid to cascade down the individual frames as can be visualized from following an imagined line of travel down the frame in FIG. 6. Thus, in each of the frames, disposed at substantially right angles to the side members 14 and 15, are a plurality of parallel and substantially symmetrically arranged arcuate louvers 21. The arcuate portions of the louvers 21 are oriented at an angular relationship to the plane defined by the faces of the frame. As shown in FIGS. 6 and 7, the louvers, notches and lips in adjacent frames are arranged so that the arcuate louver members in adjacent frames are vertically displaced relative to each other when the frames are assembled. As shown in FIGS. 6 and 7, the louver members are disposed in each adjacent frame so that the lowest point on each arcuate member 21 in each adjacent frame forms a common plane. However, by the unique combination of integrally molded louvers, notches, lips and flat raised front portions the arcuate louvers can be arranged in a louver assembly in various geometric configurations. Thus, as shown in FIG. 6, the arcuate louvers 21 can be arranged in adjacent frames at 180° angles to each other to form a cascading effect between the louvers of adjacent frames. If so desired, however, because of the unique features of this invention, various permutations and combinations of the arrangement of louvers in adjacent frames can be formed. Thus, for example, all the louvers in three adjacent frames can be arranged to all face up or down, or however desired.

As shown in FIGS. 5 and 7, the louvers 21 are integrally molded to the side members 14 and 15 and have intermediate slat or support members 22 disposed generally parallel to the side members 14 and 15 intermediate between them. The support members 22 are disposed with their flat sides substantially parallel to the side members 14 and 15. The supporting member 22 is molded or connected to the louver 21 to thereby vertically support the louvers 21 in the portion between the side members 14 and 15. Integrally molded into the support members 22 are guide means 23 adapted to receive a rivet 24 or other similar fastener as shown in FIG. 10 when the louver frames are mounted together into a louver assembly.

In the foregoing, the invention has been described in reference to specific exemplary embodiments. It will be evident, however, that variations and modifications, as well as the substitution of equivalent constructions and arrangements for those shown for illustration, may be made without departing from the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawings accordingly to be regarded in an illustrative rather than in a restrictive sense.

What is claimed is:

1. An integrally molded rigid plastic louver frame comprising at least two generally vertical side members, a plurality of parallel substantially rigid arcuate louvers connected to said side members at substantially right angles thereto, at least one flat supporting member parallel to said side members to which each of said louvers is molded, said supporting member provided with at least one integrally molded guide means for the fastening of adjacent supporting members to each other when said frames are mounted into a louver assembly.

2. An integrally molded rigid plastic louver frame as set forth in claim 1 in which the side members are provided with a locking means adapted to properly position and fasten said louvers together when said frames are mounted into a louver assembly.

3. An integrally molded rigid plastic louver frame as set forth in claim 2 in which the locking means comprises the combination of a notch inserted in the front portion of said side member and a lip mounted to the back portion of said side member, said lip and said notch adapted to permit the locking engagement of said lip and said notch on adjacent frames when said frames are mounted into a louver assembly.

4. An integrally molded rigid plastic louver frame as set forth in claim 3 in which the louvers are comprised of a plurality of parallel arcuate substantially rigid members disposed within each of said frames at substantially right angles to the sides of said frames.