June 3, 1969 P. D. ANDREWS ETAL 3,447,691

FILTER

Filed April 3, 1967 Sheet 1 of 2

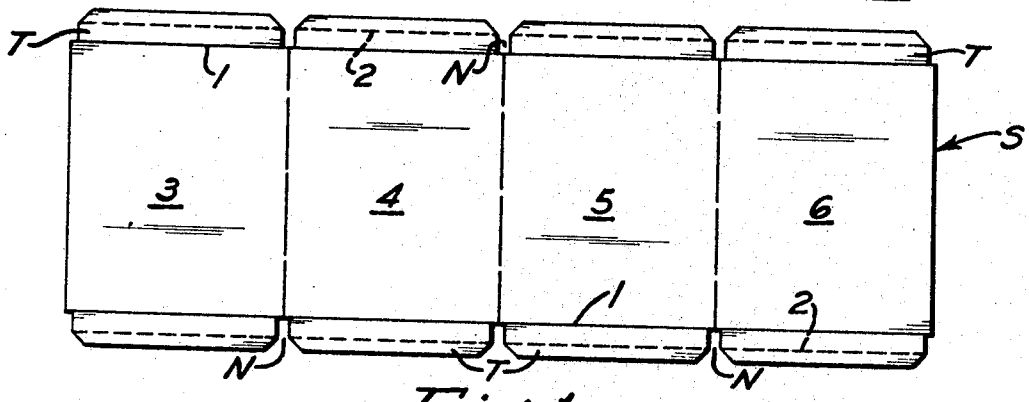


Fig. 1

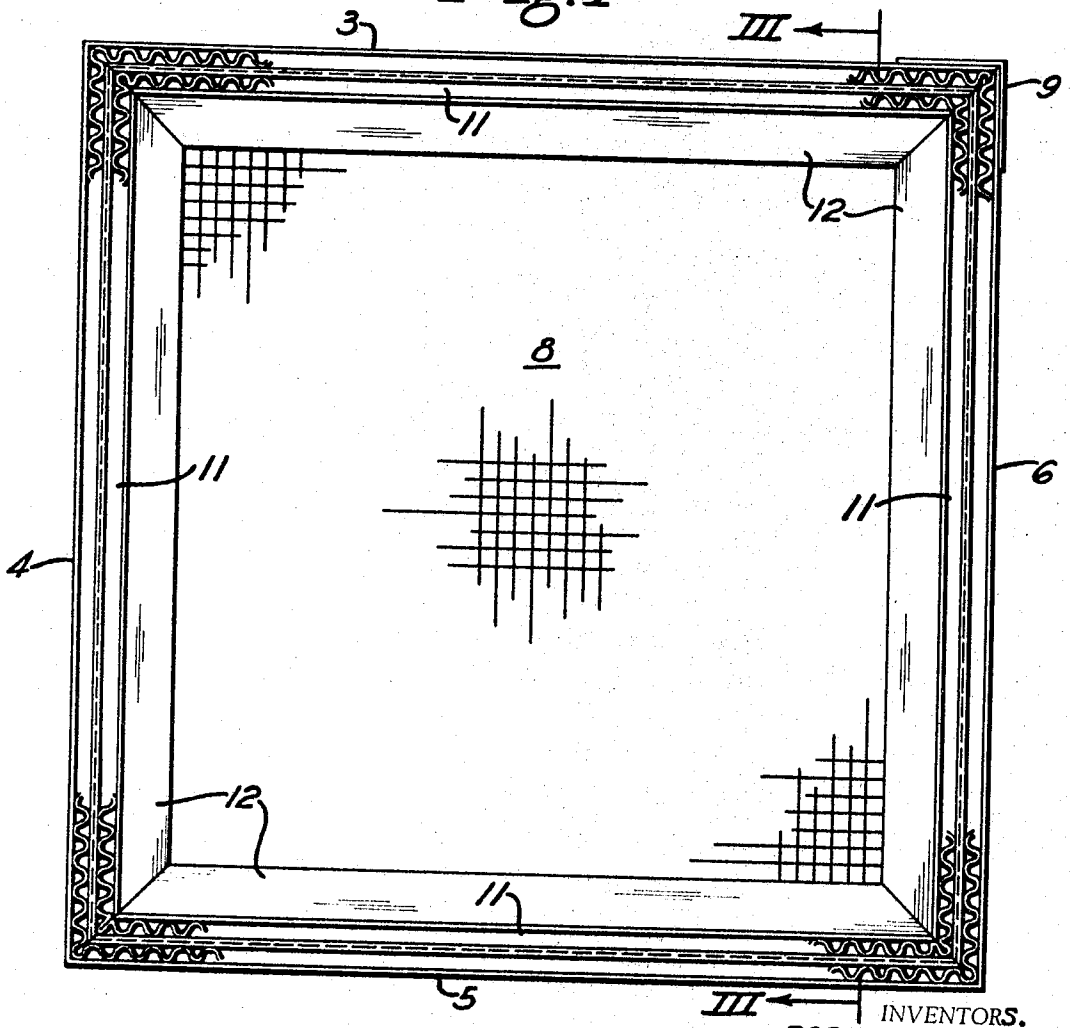


Fig. 2

INVENTORS.
ROBERT A. BUB
PAUL D. ANDREWS

BY

Brown, Critchlow, Flick & Peckham
ATTORNEYS.

June 3, 1969 P. D. ANDREWS ETAL 3,447,691

FILTER

Filed April 3, 1967 Sheet 2 of 2

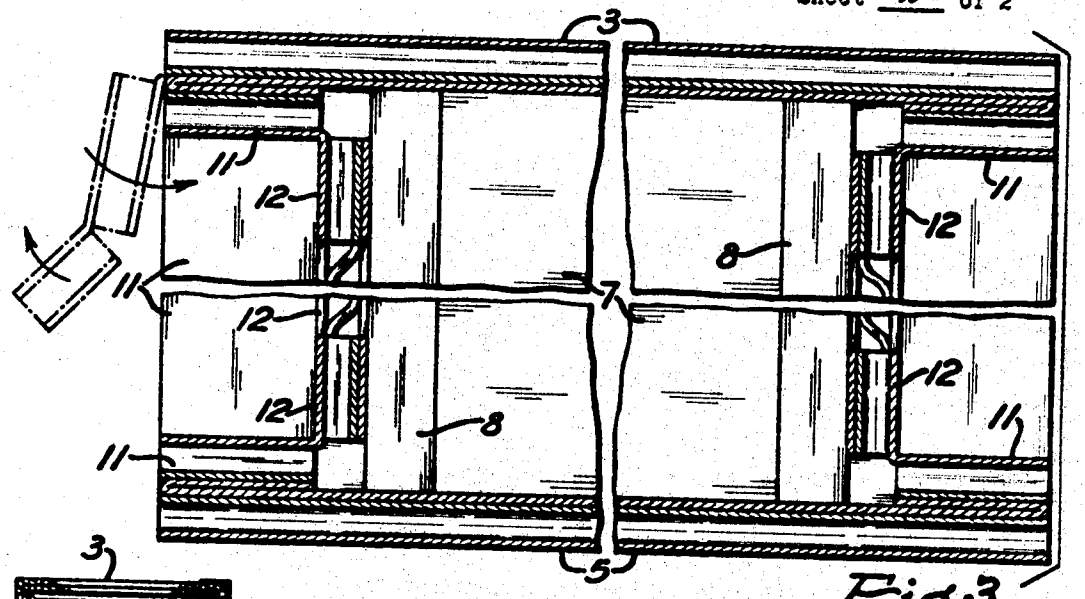


Fig.3

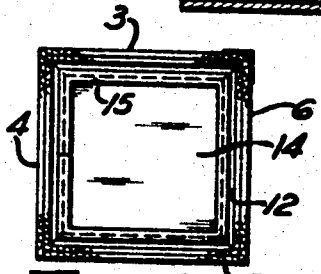


Fig.5

Fig.4

INVENTORS.
ROBERT A. BUB
PAUL D. ANDREWS
BY
Brown, Critchlow, Flick & Peckham
ATTORNEYS.

United States Patent Office 3,447,691 Patented June 3, 1969

3,447,691

FILTER

Paul D. Andrews, Dormont, and Robert A. Bub, Gibsonia, Pa., assignors to Mine Safety Appliances Company, Pittsburgh, Pa., a corporation of Pennsylvania

Filed Apr. 3, 1967, Ser. No. 627,731
Int. Cl. B01d 27/00
U.S. Cl. 210—483 3 Claims

ABSTRACT OF THE DISCLOSURE

A paperboard housing surrounds four sides of a rectangular filter unit and projects from the opposite ends of the unit to form rectangular frames. Flaps integral with the outer edges of the side walls of the frames are secured flat against the inner surfaces of those walls, and flanges integral with the inner edges of the flaps overlap the marginal areas of the end faces of the filter unit, to which they are attached.

Background of the invention

Rigid filter units are generally mounted in frames of metal, wood or other heavy-duty type material by the manufacturer. They are then placed in containers for shipment. When removed from the containers, the latter can be discarded because they have no further use.

It is among the objects of this invention to provide a filter which is simple and inexpensive in construction, which is lightweight, and in which the filter frame itself forms the major portion of a shipping container for the filter.

In accordance with this invention, four sides of a rectangular filter unit that has parallel end faces are surrounded by a paperboard housing that projects from the opposite ends of the unit to form rectangular frames. Integral with the outer edges of the side walls of these frames are flaps that are secured flat against the inner surfaces of those walls to double their thickness. Integral with the inner edges of the flaps are flanges that extend perpendicularly from the side walls in overlapping engagement with the marginal areas of the end faces of the filter unit. These flanges are secured to the end faces. Removable covers may be applied to the ends of the housing to form with it a closed shipping carton for the filter unit.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a view of a formed sheet of paperboard;

FIG. 2 is an enlarged end view of a filter made by wrapping the paperboard sheet around a filter unit;

FIG. 3 is a further enlarged fragmentary cross section taken on the line III—III of FIG. 2 but showing the filter unit in elevation;

FIG. 4 is an isometric view, partly exploded, of the filter with end covers; and

FIG. 5 is a reduced end view of a modification.

Referring to FIG. 1 of the drawings, a rectangular sheet S of paperboard has its side edges die cut to form notches N that separate the edge portions into four tabs T along each side of the sheet. The paperboard sheet preferably is formed from a corrugated sheet, to the opposite sides of which flat facing sheets are glued, with the corrugations extending transversely of the sheet. At the junctions 1 of the tabs with the body of the sheet, one of the facing sheets and the corrugated sheet are slit scored. The other facing sheet and the corrugated sheet are provided with slit scores 2 across the tabs parallel to those just mentioned. Also, the paperboard sheet is scored transversely at the notches to divide the sheet into four panels, 3, 4, 5 and 6.

The paperboard sheet thus prepared is laid on a surface with slits 1 down. The upper surface then is sprayed with an adhesive sealant and then a rectangular filter block 7 (FIG. 3) of any suitable construction is placed on one of the panels. The filter block may, for example, be formed in a well known manner from zigzag sheets having spacers between them. The width of the block is substantially the same as the width of a panel measured longitudinally of the sheet. Flat rectangular grilles 8 are placed against the opposite ends of the block to complete the filter unit, which is shorter than the width of the sheet.

The next step is to fold or wrap the filter sheet S around the filter unit, with the sheet bending 90° at each score line between adjoining panels. The ends of the sheet are brought together at one corner of the filter unit and sealed together in any suitable manner, such as by a tape 9 as shown in FIGS. 2 and 4. Each panel therefore forms one of the four sides of the filter, and the four panels are secured to the sides of the filter unit by the adhesive sealant. The housing thus formed projects from the opposite ends of the filter unit to form at each end a rectangular frame. The tabs T then are folded into the adjoining frame as indicated in FIG. 3 to provide flaps 11 that engage flat against the inner surfaces of the side walls of the frame. The flaps and the side walls are secured together face to face by an adhesive or fasteners to provide the frame with double thickness walls that reinforce and stiffen it. As the tabs are folded into the frames, the free end portions of the tabs are bent away from the flaps to form flanges 12 that will engage flat against the marginal areas of the grille faces. Consequently, these flanges are perpendicular to the side walls of the frame. The notches N that were cut in the edges of the paperboard sheet S enable the edges of the various flaps and flanges to fit snugly together within the frames. The flanges are glued to the end grilles and thereby hold them securely in place inside the housing. The filter thus is made from four main parts, a filter element, two end grilles and a one-piece housing, all permanently fastened together in a simple and inexpensive manner. The end frames of the housing protect the recessed grilles and can receive prefilters.

After this filter has been made, it can be prepared for shipping to a customer by simply applying covers 13 to its opposite ends as shown in FIG. 4. One type of cover is a rectangular paperboard member provided with side flanges that permit the covers to be telescoped over the ends of the housing to close them. These covers can be taped or otherwise fastened in place temporarily so that the assembly looks like a carton. In fact, the housing and covers serve as a carton for the filter unit inside, but only the covers are removed in order to enable the filter to be put in use. With this filter it is unnecessary to go to the trouble and expense of a separate shipping container. This also reduces the shipping weight.

A simpler type of cover for shipping purposes is shown in FIG. 5. This cover is simply a flat sheet 14 of paperboard of a shape and size to engage an end grille and engage the free inner edges of the housing flanges 12 at the end of the filter. The cover can be held in place by a conventional tear strip 15 until it is desired to remove the cover.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. A filter comprising a rectangular filter unit having two parallel end faces, a paperboard housing surrounding

four sides of the unit in engagement therewith and projecting from the opposite ends of the unit to form rectangular frames, flaps integral with the outer edges of the side walls of said frames and secured flat against the inner surfaces of those side walls to double their thickness, flanges integral with the inner edges of said flaps and extending perpendicularly from said side walls in overlapping engagement with the marginal areas of said end faces of the unit, and means attaching said flanges to said end faces.

2. A filter according to claim **1**, including covers for the ends of the housing removable from the housing, whereby the housing and covers can serve as a shipping carton for said filter unit.

3. A filter according to claim **2**, in which said covers are flat rectangular paperboard sheets engaging said end faces and having edges snugly engaging the free edges of said flanges.

References Cited

UNITED STATES PATENTS

2,080,726	5/1937	Lowinger	55—511
3,151,962	10/1964	O'Dell	210—483 X
3,258,900	7/1966	Harms	210—485 X

FOREIGN PATENTS

680,318	2/1964	Canada.

REUBEN FRIEDMAN, *Primary Examiner.*

JOE ADEE, *Assistant Examiner.*

55—511

U.S. Cl. X.R.