Jan. 18, 1949. E. N. JACOBI 2,459,428

AIR CLEANER

Filed April 19, 1945 3 Sheets-Sheet 1

Fig. 1.

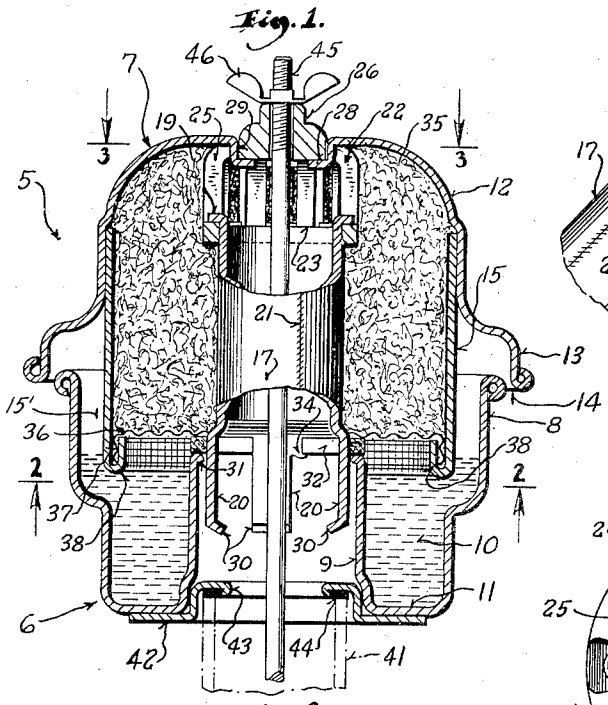



Fig. 5.

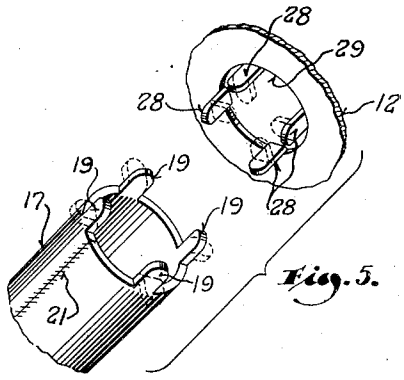



Fig. 3.

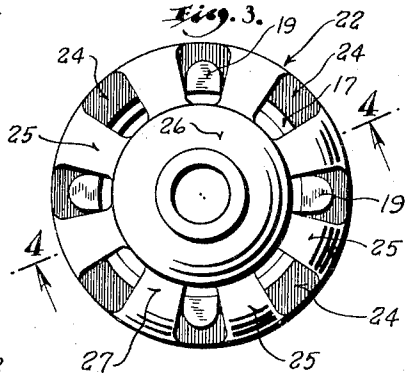



Fig. 2.

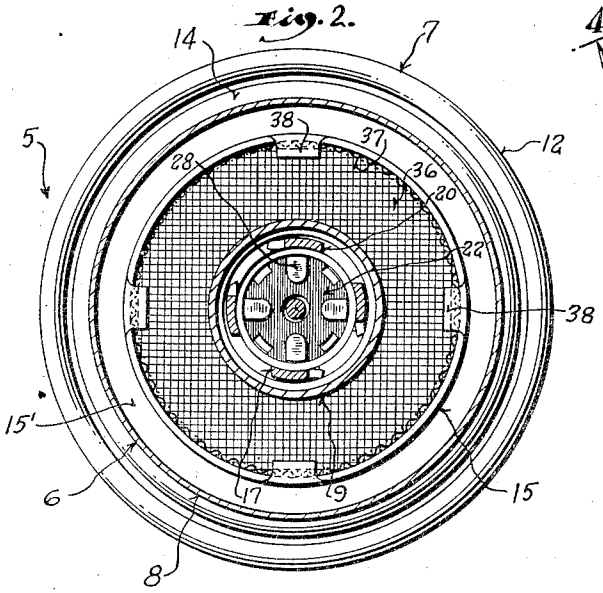
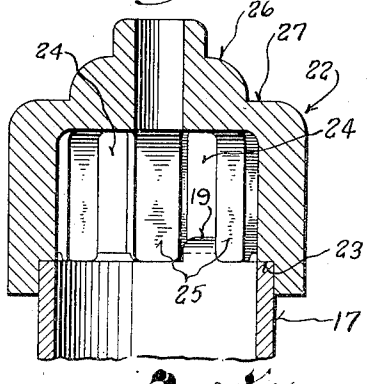



Fig. 4.




Inventor
Edward N. Jacobi
By Dick Hilton Jones
Attorneys

Jan. 18, 1949. E. N. JACOBI 2,459,428

AIR CLEANER

Filed April 19, 1945 3 Sheets-Sheet 2

Fig. 6.

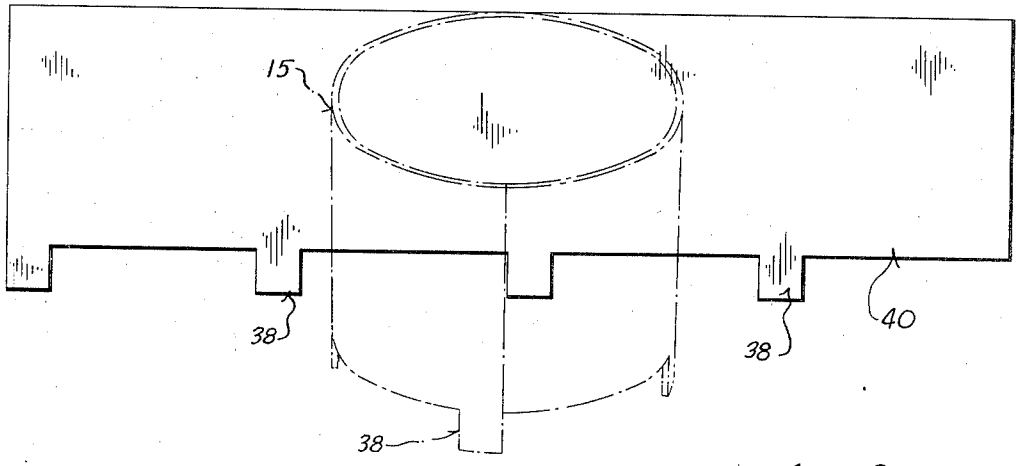



Fig. 8.

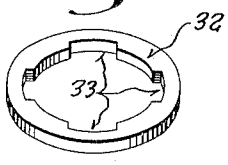
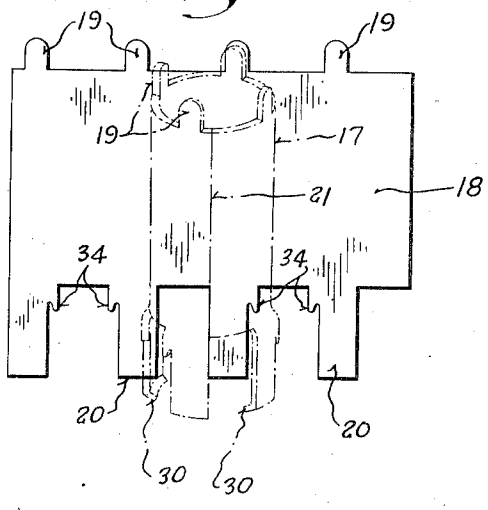



Fig. 7.




Inventor
Edward N. Jacobi
By Dodge, Dodge & Jones
Attorneys

Jan. 18, 1949. E. N. JACOBI 2,459,428

AIR CLEANER

Filed April 19, 1945. 3 Sheets-Sheet 3

Fig. 9.

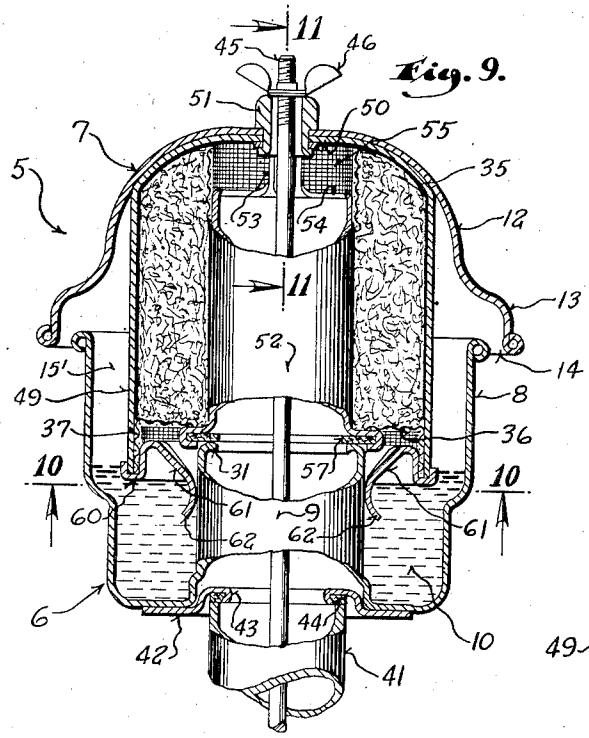



Fig. 11.

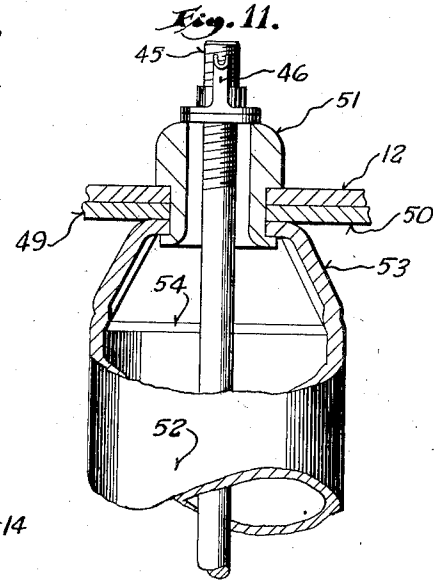
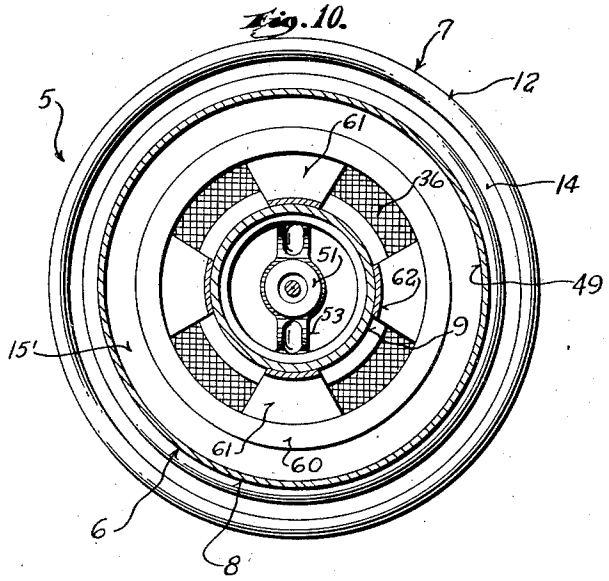



Fig. 10.




Inventor
Edward N. Jacobi
By Dunlap Britton Jones
Attorneys

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2,459,428

# UNITED STATES PATENT OFFICE

2,459,428

## AIR CLEANER

Edward N. Jacobi, Milwaukee, Wis., assignor to Briggs & Stratton Corporation, Milwaukee, Wis., a corporation of Delaware

Application April 19, 1945, Serial No. 589,197

3 Claims. (Cl. 183—15)

1

This invention relates to air cleaners and has particular reference to air cleaners of the oil bath type.

Such air cleaners usually comprise a pair of axially separable casing members the lower one of which is adapted to contain a quantity of oil through which air entering the cleaner must pass before flowing through the filter material contained in the upper casing member for discharge through a central outlet conduit opening through the bottom wall of the lower casing member.

Hence, these air cleaners are designed to be mounted in a vertical position with the lower casing member substantially telescoped over the air inlet duct of the carburetor of the engine to which the cleaner is to be attached.

One of the objects of the present invention resides in the provision of an air cleaner of the character described which is of novel construction and capable of being built at low cost.

Another object of this invention resides in the provision of a novel internal air seal between the casing sections of the cleaner of this invention by which all air entering the cleaner must pass therethrough to the air inlet duct of the carburetor.

A further object of this invention resides in the provision of novel means for guiding the separable casing sections into proper axial relationship upon assembly thereof to thereby render said internal air seal between the casing sections effective.

Still another object of this invention resides in the provision of novel means forming an internal air outlet conduit for the cleaner.

With the above and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described, and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the hereindisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed in accordance with the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a longitudinal sectional view through an air cleaner constructed in accordance with this invention;

2

Figure 2 is a cross-sectional view taken through Figure 1 on the plane of the line 2—2;

Figure 3 is a detail plan view taken on the line 3—3 of Figure 1;

Figure 4 is a detail sectional view taken through Figure 3 on the plane of the line 4—4;

Figure 5 is a perspective view illustrating portions of the bottom wall of the upper casing section and the adjacent end of the air outlet conduit therein;

Figure 6 is a plan view of the blank from which the cylindrical outer wall of the upper section of the casing is formed;

Figure 7 is a plan view of a blank of sheet metal showing the stamping thereof required for the formation of the air outlet conduit for the upper casing section;

Figure 8 is a perspective view of the washer carried by the air outlet conduit for the upper casing section and which forms part of the internal air seal between the casing sections;

Figure 9 is a view similar to Figure 1 illustrating a slightly modified form of air cleaner;

Figure 10 is a cross-sectional view taken through Figure 9 on the plane of the line 10—10; and

Figure 11 is a fragmentary sectional view taken through Figure 9 on the plane of the line 11—11.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts throughout the several views, the numeral 5 generally designates the air cleaner of this invention and which comprises essentially two axially separable cup-like sections 6 and 7 forming the bottom and top portions of the casing respectively for the cleaner. These sections are adapted to be assembled on a common vertical axis and with their open ends facing each other.

The bottom casing section 6 has an outer circumferential wall 8 and an inner circumferential wall 9 concentric thereto but spaced radially inwardly therefrom to provide an annular reservoir 10, the bottom of which is defined by the bottom wall 11 of the lower section and which joins the lower portions of the circumferential walls 8 and 9.

The inner circumferential wall 9 of the lower casing section 6 thus provides an open axial outlet tube for the cleaner having its open upper end projecting well up into the interior of the cup-like casing section 6 and its lower end opening through the bottom of the lower casing section.

The upper casing section comprises a cup-like

hood 12 having an outwardly flaring eave 13 overhanging the rim of the lower casing section 6 and sheltering the open top thereof with the eave spaced radially outwardly therefrom to provide a downwardly facing annular air entrance port 14 for the cleaner.

Secured to the inner side of the hood and forming a part thereof is an inner cylindrical wall or shell 15 which projects downwardly out of the open side of the upper cup-like casing section into the open end of the lower casing section 6 to be separated from the side wall 8 thereof by an annular air space or passage 15'.

The upper casing section also is provided with a central axial tube 17 which forms in effect an upward extension of the tube 9 of the lower section and together therewith provides an air outlet conduit for the cleaner. One of the features of this invention resides in the manner in which the tube 17 is constructed and in the manner of its connection to the closed end of the upper cup-like casing section.

The tube 17 is preferably stamped from a single rectangular blank of sheet metal as indicated at 18 in Figure 7 and to provide a plurality of tangs 19 extending from the upper end of the tube and a series of prongs 20 extending from the bottom of the tube. In the present instance the tube is provided with four tangs 19 which are equispaced circumferentially of the tube when the same is curled into cylindrical form and its opposite side edges butt-welded together as at 21.

The upper end of the tube is received in the lower open end of a bushing 22 with the upper extremity of the tube engaged against an annular shoulder 23 on the interior of the bushing to limit axial motion of the tube into the bushing.

The cylindrical side wall of the bushing is provided with a series of circumferentially spaced longitudinally extending slits 24. These slits terminate slightly inwardly of the shoulder 23 at the lower end of the bushing and define longitudinal ribs or arms 25 therebetween which join the lower ring shaped end of the bushing with a hub-like portion 26 at the upper end of the bushing. The hub-like portion of the bushing is of reduced diameter so that the upper ends of the arms 25 connect radially thereto and thus provide shoulders 27 on the arms which engage the bottom or closed end of the hood 12.

The tangs 19 of the tube are struck outwardly through certain of the slits 24 aligning therewith to overlie the bottoms or adjacent ends of such slits and thereby rigidly secure the tube to the bushing. This connected structure is anchored to the bottom or closed end of the hood 12 by means of tangs 28 projecting substantially axially downwardly from the side edges of an axial hole 29 in the hood.

The hole 29 is of a size to receive the hub-like portion 26 therein and the tangs 28 lie at its outer periphery and project down through the slits and are struck radially inwardly under the bottom of the hub-like portion as clearly shown in Figure 1 to firmly draw the shoulders 27 on the arms 25 against the closed end of the hood 12. In this manner the tube 17 is maintained in axial relationship with respect to the upper casing section 7 and the tube 9 of the lower casing section for cooperation therewith to provide the outlet conduit for the cleaner. As will be apparent, the inlet of this conduit is provided by the slits 24 in the side wall of the bushing.



The prongs 20 projecting from the lower edge of the tube 17 have their extremities 30 bent downwardly and inwardly so as to readily enter the open upper end of the tube 9 upon assembly of the casing sections together and thus serve to guide the upper casing section or cartridge of the cleaner into proper position with respect to the bottom casing section.

It is to be noted that the upper extremity of the axial tube 9 is curled inwardly as at 31 to provide an annular shoulder or seat normal to the axis of the tube upon which a fiber washer 32 carried by the lower end of the tube 17 engages for the provision of an air-tight seal between the two tubes constituting the outlet conduit for the cleaner.

As clearly shown in Figure 8, the washer is provided with notches 33 in its inner periphery to receive the prongs 20 and to permit the washer to abut against the lower end of the tube. Lugs 34 on the sides of the prongs struck over the underside of the washer securely attach the same to the tube.

Attention is directed to the fact that the surfaces of the seal thus provided have sufficient area to accommodate a degree of axial misalignment between the sections without affecting the seal, but such misalignment is somewhat restricted by the prongs 20 projecting into the tube 9.

The engagement of the washer with the annular seat 31 on the tube 9 also holds the cylindrical wall 15 of the upper casing section the proper distance inside the annular space 10 of the lower casing section with the lower edge of the wall 15 slightly beneath the seat 31 so that the same is immersed in the body of oil contained within the reservoir of the lower section. Hence, air entering the inlet 14 of the cleaner must flow downwardly through the passageway 15' and through the oil for entrance into the interior of the upper casing section and the inlet of the conduit formed by the axial tubes 9 and 17.

Such air entering the interior of the upper casing section is forced to pass through a body of filter material 35 confined in the space between the tube 17 and the cylindrical wall 15 and held in place by a screen 36 near the bottom of the wall 15. This screen has a depending cylindrical flange 37 formed thereon and tangs 38 struck inwardly from the bottom of the wall 15 engage over the flange 37 and maintain the screen in place.

The cylindrical wall 15 is also preferably formed from a single blank of sheet metal as indicated at 40 and is stamped to provide the equispaced tangs 38 prejecting from its bottom edge. This blank after being punched is curled to bring its side edges into engagement for welding and the same is held in position within the hood by being spot-welded thereto.

In order to provide for attachment of the cleaner of this invention to the air inlet duct 41 of the carburetor, the bottom wall 11 of the lower casing section is preferably provided with a flange 42 welded or otherwise secured thereto having an annular ring shaped portion 43 extending up into the interior of the outlet conduit 9 and provided with a fiber washer 44 clinched or otherwise secured thereto so that the washer 44 is brought to bear against the upper extremity of the carburetor inlet duct 41.

The entire cleaner is held in place with its sections assembled in their proper relationship on

the air inlet duct 41 and with the air seal established between the tubes 9 and 17 by means of a tie rod 45 extending axially through the tubes 9 and 17 forming the outlet conduit and engaged with a part (not shown) on the inlet duct 41 of the carburetor.

The upper end of the rod 45 which projects through the hub-like portion 26 of the bushing 22 is threaded to receive a thumb screw 46 thereon, which when brought to bear against the hub portion 26 serves to tightly draw the sections of the cleaner together establishing the air seal for the tubes and firmly seated on the air inlet duct 41.

In the modified embodiment illustrated in Figure 9, the lower casing section 6 is substantially identical to that previously described and the upper casing section 7 is of slightly different construction. As here shown, the cylindrical side wall 49 of the upper casing section is provided with a bottom wall 50 overlying the closed bottom of the hood 12 and conforming to the shape thereof. These two nested cup-like casing elements are secured together in coaxial relationship by a tubular rivet 51 together with the tube 52 providing the upper section of the outlet conduit.

For this purpose the upper extremity of the tube 52 has a bail-like strap 53 extending upwardly from and across its upper open end which is apertured to receive the shank of the rivet 51 so that a single upsetting operation secures the hood 12, the filter body retaining shell 49, and the tube 52 together.

The strap 53 is proportioned so as to leave the upper extremity 54 of the tube spaced from the closed bottom of the upper casing section as shown and this space is enclosed by a cylindrical screen 55 to exclude filter material contained within the upper casing section from entering the outlet conduit.

The manner of effecting the seal between the upper and lower tubes comprising the outlet conduit is also slightly different from that previously described.

In this instance the lower extremity of the tube 52 is spun outwardly and around a fiber washer 57 in a manner to leave a considerable area of the underside of the washer exposed for seating on the curled-in shoulder 31 of the tube 9.

Guiding of the upper section into place onto the lower section in this instance is provided by a stamped sheet metal ring 60 clinched about the lower extremity of the cylindrical wall 49 and having inwardly and downwardly projecting prongs 61, the extremities of which are curled outwardly as at 62 so as to engage and readily center about the outside of the tube 9 during assembly.

The screen 36 retaining the filter medium in place within the upper casing section 7 is secured in place at the time the ring 60 is clinched about the lower edge of the cylindrical wall 49 and has its flange 37 confined between a portion of the ring and the inside surface of the wall 49.

From the foregoing description taken in connection with the accompanying drawings, it will be readily apparent that the air cleaner of this invention is designed with simplicity as one of its major features for the purpose of enabling its manufacture at relatively low cost.

What I claim as my invention is:

1. In an oil bath air cleaner for carburetors having an upwardly opening air inlet duct and provided with means for drawing the air cleaner down onto the mouth of its air inlet duct: a



casing comprising opposed upper and lower cup-like sections, the latter providing a reservoir for a quantity of oil and being adapted to rest on the mouth of the carburetor inlet duct; the contiguous open ends of the cup-like sections being radially spaced to provide an annular air inlet into the cleaner casing; a discharge duct for cleansed air disposed axially within the casing with its inlet end adjacent to the top of the upper casing section, and its outlet end connected to and opening through the bottom of the lower casing section for delivery of cleansed air to the carburetor inlet duct, said discharge duct defining a closed passageway so that oil contained in the reservoir is precluded from entering the duct; filter means within the casing between the air inlet into the casing and the inlet to the discharge duct; means providing a permanently fixed connection between the top wall of the upper casing and the inlet end of the discharge duct whereby the upper casing section is supported by the discharge duct, said means having a surface spaced from the adjacent top wall of the upper casing section to receive the downward thrust of the means by which the cleaner is held down onto the mouth of the carburetor air inlet duct and for transferring the force of said downward thrust onto the discharge duct and thereby relieving the walls of the upper casing section of forces likely to produce distortion thereof.

2. In an oil bath air cleaner for carburetors having an upwardly opening air inlet duct and provided with means for drawing the air cleaner down onto its air inlet duct: a casing comprising upper and lower cup-like sections arranged in opposed relationship with their open end contiguous, the lower section providing a reservoir for a quantity of oil and being adapted to rest on the mouth of the carburetor inlet duct; the contiguous open ends of the cup-like sections being radially spaced to provide an annular air inlet into the cleaner casing; a discharge duct for cleansed air disposed axially within the casing between the end walls of the casing sections and defining a closed passageway opening through the bottom of the lower casing section to deliver cleansed air to the carburetor inlet duct; filter means in the upper portion of the casing; a bushing permanently connecting the upper end of the discharge duct to the top of the upper casing section and having slots therein to provide an inlet for the discharge duct; and means on said bushing projecting above the top of the upper casing section and presenting a surface spaced from the top of the upper casing section for receiving the downward thrust of the means by which the cleaner is held down onto the mouth of the carburetor inlet duct and for transferring the force of said downward thrust onto the discharge duct to thereby relieve the walls of the upper casing section of forces likely to produce distortion thereof.

3. In an air cleaner of the type including a casing formed by separable upper and lower cup-like sections assembled with their open ends facing one another, said cleaner having an air outlet duct in its interior formed jointly by two cooperating duct sections one permanently secured to the upper casing section and the other permanently secured to the lower casing section, said upper duct section comprising: a length of rolled-up tubing formed from a substantially rectangular blank of sheet metal stamped to provide tangs projecting axially from one extremity of the tube and prongs projecting substantially axially

from the opposite extremity of the tube, said tangs being adapted to be bent flatwise to positions substantially normal to the tube axis over a part on the top wall of the upper casing section to provide for securement of the tube thereto, and said prongs being adapted for cooperation with the sides of the lower duct section upon axial motion of the casing sections to their assembled position to guide the casing sections into proper coaxial relationship; a washer having one face abutting the lower extremity of the tube; a splined connection between said washer and the prongs on the tube; and lugs struck from said prongs and engaging over the opposite face of the washer to hold the same firmly against the lower end of the tube, said washer being adapted for cooperation with an annular surface on the lower duct section for the provision of a seal



between said duct sections upon assembly of the casing sections together.

EDWARD N. JACOBI.


## REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 763,298 | Lutz | June 21, 1904 |
| 1,991,759 | Lowther | Feb. 19, 1935 |
| 2,018,755 | Zonder | Oct. 29, 1935 |
| 2,083,649 | Heglar | June 15, 1937 |
| 2,150,745 | Mieras et al. | Mar. 14, 1939 |
| 2,158,042 | Foster | May 9, 1939 |
| 2,287,629 | Mieras | June 23, 1942 |
| 2,287,806 | Kamrath | June 30, 1942 |