Feb. 1, 1966 G. NASTAS ETAL 3,232,587

CHARGE FORMING DEVICE FUEL TRANSFER SYSTEM

Filed June 21, 1962 2 Sheets-Sheet 1

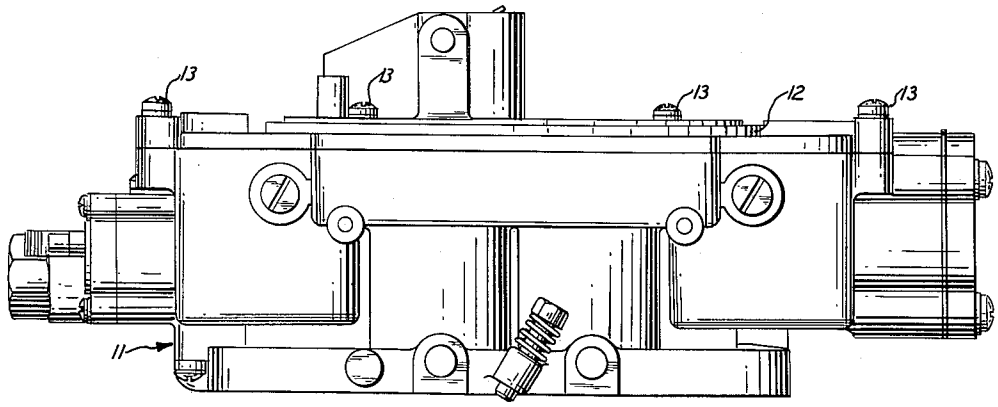


FIG. 1

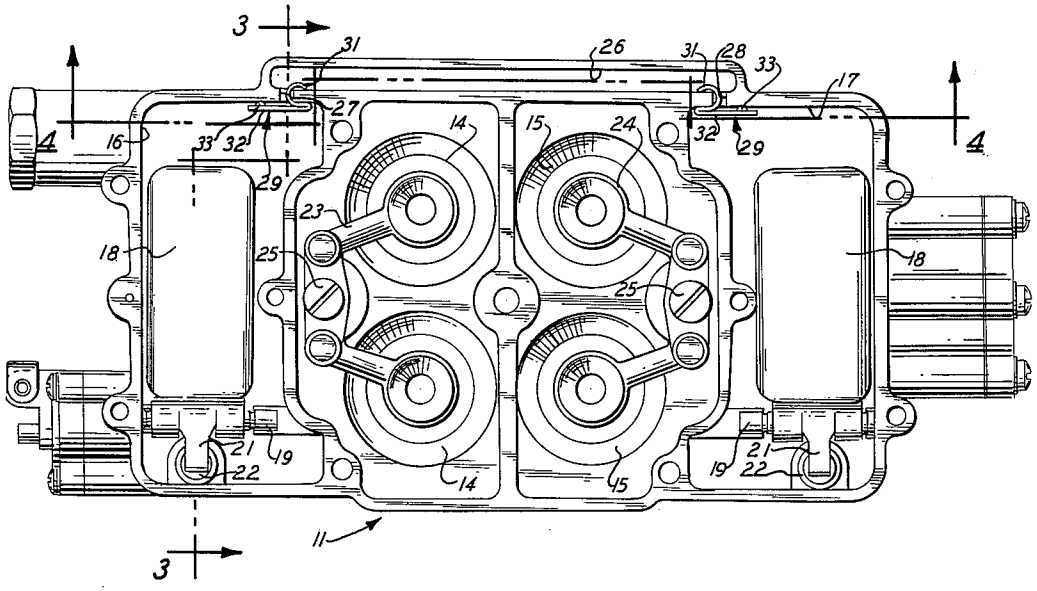


FIG. 2

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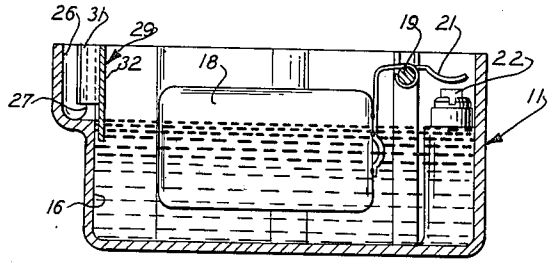


FIG. 3

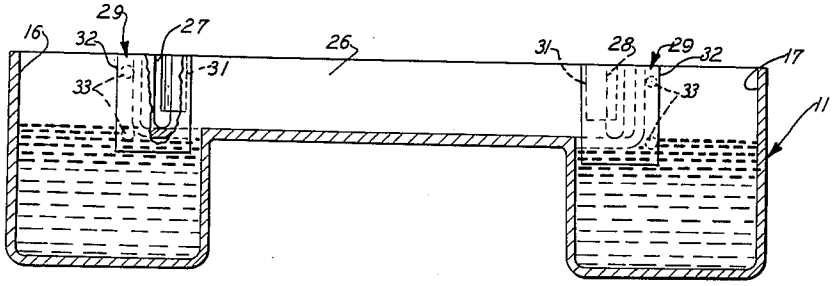


FIG. 4

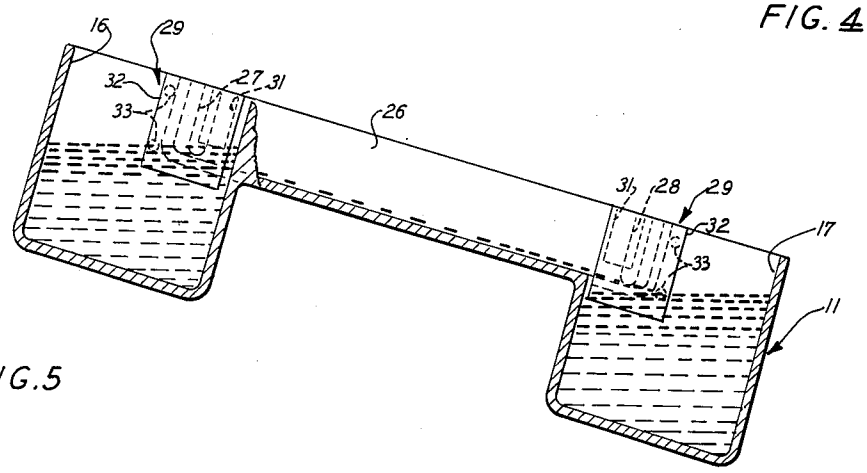


FIG. 5

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CHARGE FORMING DEVICE FUEL TRANSFER SYSTEM

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This invention relates to internal combustion engine charge forming devices having multiple fuel bowls and more particularly to a fuel transfer system that equalizes the fuel level in the bowls without causing flooding.

Charge forming devices for internal combustion engines and particularly the carburetors of motor vehicle engines are frequently formed with a plurality of fuel bowls. The separate fuel bowls are generally employed to provide independent fuel sources for individual induction stages of multistage carburetors. The fuel level in each of the fuel bowls is normally regulated by separate float mechanisms.

The rates of fuel consumption of the individual stages of a multistage carburetor differ substantially during engine operation. The secondary or higher stages normally supply little or no fuel except during high power output operation of the engine. Because of unavoidable leakage past the controlling float mechanism of the higher stages, it is possible to have excessive accumulation of fuel in these bowls during extended low output operation of the engine. It is common practice to provide a fuel transfer system between the fuel bowls to relieve the excess fuel accumulation in the higher stage bowls.

The fuel transfer system interconnecting the fuel bowls prevents excessive fuel accumulation in the higher stage bowls, however, it creates another problem when employed in motor vehicles. If fuel transfer is permitted when sudden changes in the direction of the inertia or gravity forces acting on the fuel disturbs its level, flooding will occur. Forces of this nature are encountered during severe accelerations or decelerations of the vehicle or upon abrupt changes in its direction of travel. It has been proposed to restrict the fuel flow through the transfer system during these brief disturbances in the fuel level to prevent flooding.

One method proposed requires the formation of an orifice at the mouth of the transfer conduit in the wall of the fuel bowl. Another proposed method requires an extension of the conduit, by means of a tube, a substantial distance into the fuel bowl. There are disadvantages to each of these methods. The first complicates casting procedures or necessitates additional machining operations. The second necessitates additional parts and assembly steps and gives rise to spacial limitations within the fuel bowls. For these reasons both methods add considerable cost to the carburetor.

It is, therefore, the principal object of this invention to provide a simplified, easy to produce fuel transfer system for a multi-bowl charge forming device that effectively restricts fuel flow during short duration disruptions of the fuel level.

A charge forming device for an internal combustion engine embodying this invention comprises a body portion formed with a plurality of induction passages and a plurality of fuel bowls. Means are provided for maintaining a normal fuel level in the fuel bowls. Fluid conduit means are provided having enlarged openings at the ends thereof into the fuel bowls. Detachable means are inserted into the body portion in closely spaced proximity to one of the ends of the conduit for retarding the flow of fuel therethrough.

Other objects and advantages of this invention will become more apparent as this description proceeds, particularly when considered in conjunction with the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of a two stage, four barrel carburetor incorporating this invention.

FIGURE 2 is a top plan view of the carburetor shown in FIGURE 1 with the cover plate of the carburetor removed.

FIGURE 3 is a cross sectional view taken along line 3—3 of FIGURE 2.

FIGURE 4 is a cross sectional view taken along line 4—4 of FIGURE 2.

FIGURE 5 is a cross sectional view, in part similar to FIGURE 4, showing the carburetor in another position.

Referring now in detail to the drawings, a carburetor having a die cast body portion **11** and a cover plate **12** is shown. The cover plate **12** is secured upon the body portion **11** by the threaded fasteners **13**.

Formed within the body portion **11** are primary induction passages **14** and secondary induction passages **15**. Primary and secondary fuel bowls **16** and **17** are also formed in the carburetor body portion **11**. Floats **18** are pivotally supported in the body portion **11** upon pins **19**. Extensions or tangs **21** formed integrally with the floats **18** coact with needle valves **22** to control the admission and discharge of fuel into the fuel bowls **16** and **17** and maintain a normal fuel level therein. The normal level of fuel in the bowls **16** and **17** is indicated in FIGURES 3 and 4.

Primary and secondary booster venturi nozzles **23** and **24** are positioned in the carburetor body portion **11** by threaded fasteners **25**. The venturis of the booster nozzles **23** and **24** are disposed coaxially with primary and secondary induction passages **14** and **15**. Fuel may flow from the primary fuel bowl **16** to the primary booster venturi nozzle **23** and from the secondary fuel bowl **17** to the secondary booster venturi nozzle **24** through suitable passages and flow regulating means (not shown).

The structure thus far described is conventional in two stage, four barrel carburetor construction. In this type carburetor it is also common to provide a fuel transfer conduit that interconnects the primary and secondary fuel bowls. The body portion **11** of the carburetor is formed with a transfer conduit **26** that extends a substantial portion of the length of the carburetor at one side thereof. The transfer conduit **26** has enlarged openings **27** and **28** that connect the terminal portions of the conduit **26** with the fuel bowls **16** and **17**, respectively.

As seen in FIGURES 3 and 4, the openings **27** and **28** are positioned slightly above the normal level of the fuel in the bowls **16** and **17**. There will, therefore, be no flow of fuel through the transfer conduit **26** unless the level of fuel in one of the bowls exceeds the norm. During periods of operation when there is no flow of fuel through the secondary booster venturi nozzles **24**, the fuel level in the fuel bowl **17** may exceed the normal level. This condition occurs because of leakage of fuel past the needle valve **22**. Excess fuel in the secondary bowl **17** can flow through the enlarged opening **28** and transfer conduit **26** out of the enlarged opening **27** into the primary fuel bowl **16** under this condition. The excess fuel that flows to the primary fuel bowl **16** will be depleted by normal discharge through the primary booster venturi nozzles **23**.

On occasion the level of the fuel in the bowls **16** and **17** may be temporarily disrupted by sudden changes in the direction of the inertia or gravity forces acting upon the carburetor. This may occur when operating the vehicle upon inclined surfaces, during severe accelerations or decelerations, or when abruptly changing the direction of travel of the vehicle. FIGURE 5 illustartes the fuel level

in the carburetor as it may appear when operating the vehicle upon an incline. If fuel is permitted to be transferred too rapidly through the transfer conduit **26** under this condition, the level in one of the bowls may exceed that which can be conveniently depleted by the normal rate of discharge through the booster venturi nozzles. The increased fuel level resulting will cause excesive flow through the booster venturi nozzes and cause flooding of the carburetor and engine.

Means are detachably inserted into the body portion **11** of the carburetor to retard the rate of fuel transfer through the transfer conduit **26** under the above mentioned conditions. In the embodiment of the invention illustrated, the means comprise clips, indicated generally at **29**. The clips **29** may be formed of bronze or some other corrosion resistant material. The clips **29** consist of a first part having a generally "C" shaped cross section **31** that is inserted into the enlarged openings **27** and **28** in the walls of the fuel bowls **16** and **17**. The part **31** of the clips **29** grippingly engages the body portion **11** of the carburetor along the wall of the fuel bowl and the wall defining the transfer conduit **26**.

A second part **32** of the clips **29** is positioned within the fuel bowls **16** and **17** in closely spaced, overlying proximity to the openings **27** and **28**. Indentations **33** are formed on the second part **32** of the clips **29**. The indentations **33** bear against the inner wall of the fuel bowls **16** and **17** to hold the second part **32** in spaced proximity to the openings **27** and **28**. The area of the part **32** of the clips **29** is larger than the openings **27** and **28**. The clips **29** thereby offer substantial resistance to the flow of fuel through the enlarged openings **27** and **28** by reducing the effective area of the transfer conduit **26** available for fluid flow. The clips **29** offer little resistance to the flow of fuel through the conduit **26** that results from normal increases in the fuel level of one of the bowls. If the level of fuel is suddenly disrupted, however, the clips **29** will offer substantial resistance to the flow of fuel through the transfer conduit **26**. Flooding of the carburetor is thereby substantially diminished.

It should be apparent that the clips **29** may be easily inserted into the body portion **11** of the carburetor during assembly. The clips **29** may also be conveniently replaced when necessary.

It is to be understood that the invention is not limited to the exact construction shown and described. For example, although two clips are shown, in some instances it may be desirable to only use one. It also may be desirable to replace the clips **29** by some other means inserted in a fixed position in the transfer conduit **26** to obstruct the flow therethrough. Other changes and modifications may be made without departing from the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A charge forming device for internal combustion engines comprising a plurality of induction passages, a plurality of fuel bowls, means for maintaining a normal fuel level in said fuel bowls, means for discharging fuel from said fuel bowls into said induction passages, conduit means interconnecting said fuel bowls, and clip means inserted into said charge forming device, said clip means having a first part thereof adapted to extend into said conduit means and secure said clip means thereto, said clip means having a second part thereof spaced in close proximity to the conduit end, said second part extending over an area substantially the same as the area of said conduit end for restricting the flow of fuel therethrough during short duration distrubances in the fuel level in said fuel bowls.

2. A charge forming device for internal combustion engines comprising a plurality of induction passages, a plurality of fuel bowls, means for maintaining a normal fuel level in said fuel bowls, means for discharging fuel from said fuel bowls into said induction passages, conduit means interconnecting said fuel bowls, and clip means inserted into said charge forming device, said clip means having a first part thereof adapted to extend into said conduit means and secure said clip means thereto, said clip means having a second part thereof having an area greater than the area of the conduit end, and means on said charge forming device and on said clip means coacting to position said second part in close proximity to said conduit end whereby the flow of fuel through said conduit will be restricted during short duration disturbances in the fuel level in said fuel bowls.

3. A charge forming device for an internal combustion engine comprising a plurality of induction passages, a plurality of fuel bowls, said bowls being defined in part by upstanding walls, means for maintaining a normal fuel level in said fuel bowls, means for discharging fuel from said fuel bowls into said induction passages, conduit means interconnecting said fuel bowls, said conduit means having an enlarged opening through said walls into each of said fuel bowls, and clip means inserted into said charge forming device adjacent at least one of said openings, said clip means having a first part thereof extending through said opening and engaging opposite sides of said wall for securing said clip means relative thereto, said clip means having a second part extending across said enlarged opening for restricting the fluid flow therethrough during short duration disturbances in the fuel level in said fuel bowls.

4. A charge forming device as designed by claim **3** wherein deformations are formed on the second part of the clip means for spacing said second part in close proximity to said wall.

5. A charge forming device for an internal combustion engine comprising a plurality of induction passages, a plurality of fuel bowls, at least one of said fuel bowls being defined in part by an upstanding wall and a cover engaging said wall, means for maintaining a normal fuel level in said fuel bowls, means for discharging fuel from said fuel bowls into said induction passages, conduit means interconnecting said fuel bowls, said conduit means terminating at least one end in elongated aperture formed in said wall and terminating at said cover, clip means for retarding the rate of fuel flow through said conduit means during short duration disturbances, said clip means comprising at least a first part adapted to be inserted into said elongated aperture, said first part being in engagement with opposite sides of said wall for retaining said clip means relative to said wall.

6. A charge forming device as defined by claim **5** wherein the clip means has a second part extending across said enlaged aperture within said bowl.

7. A charge forming device as defined by claim **6** wherein the first part of the clip means comprises a C-shaped section.

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