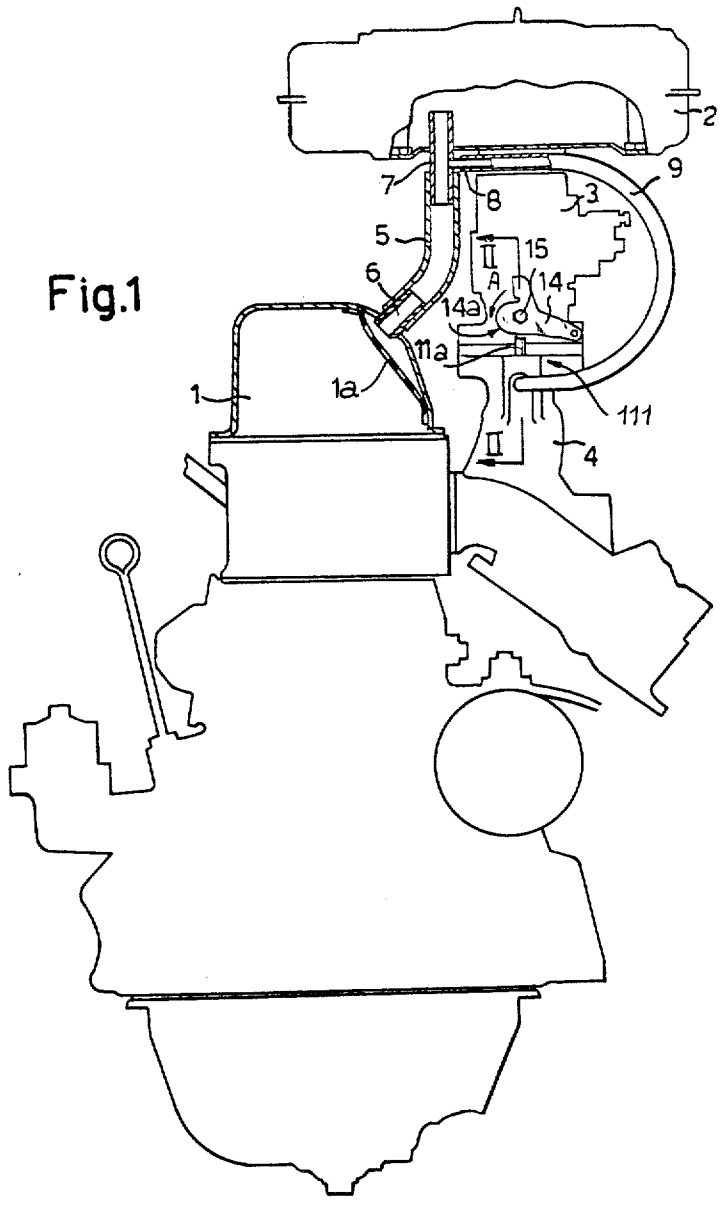
June 29, 1965 U. TURRA ETAL 3,191,586

DEVICE FOR REMOVING VAPORS FROM CRANK CASE OF INTERNAL COMBUSTION ENGINES

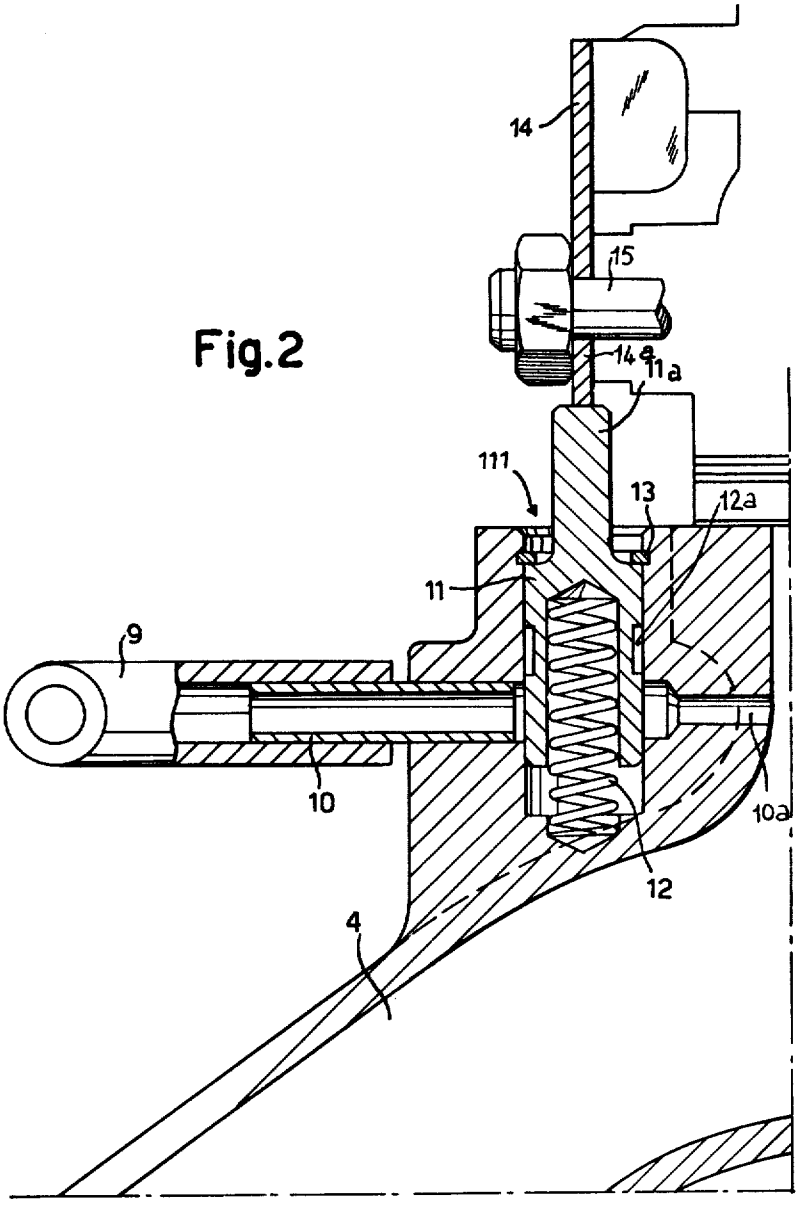
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Fig.1



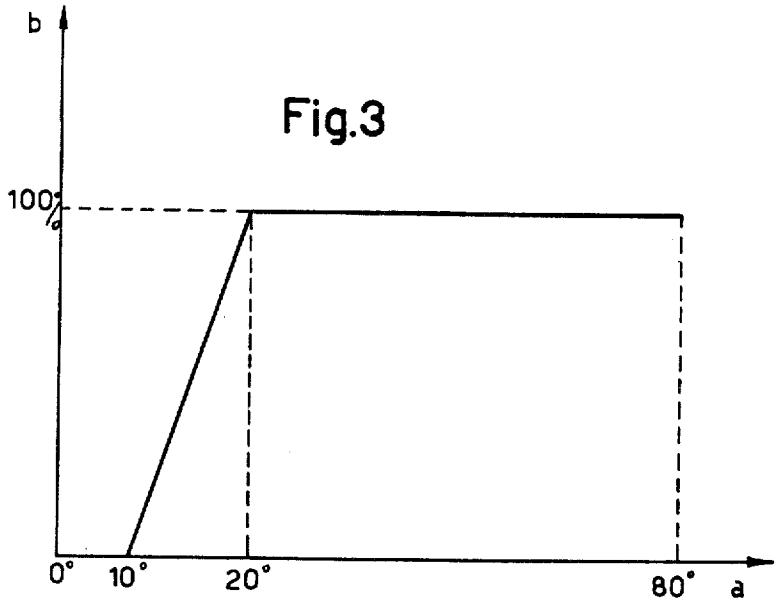
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Fig.2



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Fig.3



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DEVICE FOR REMOVING VAPORS FROM CRANK CASE OF INTERNAL COMBUSTION ENGINES

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4 Claims. (Cl. 123—119)

This invention relates to a device for removing vapors from the crank case more particularly of motor vehicle internal combustion engines, for the main purpose of reducing pollution of air.

The known devices of this kind remove vapors from the crank case through a conduit extending from the engine crank case or enclosures connected therewith to any member of the air intake system (air cleaner, carburetor, suction manifold, etc.). The conduit is provided with a nonreturn valve calibrated to cause the vapors in the crank case to be sucked by the engine only at a given differential pressure in the crank case and air intake system.

These known devices are objectionable in that vapors from the crank case condense on the valve components, making operation of the latter difficult and precarious. Moreover, since when starting a cold engine the fuel mixture should not be impoverished by the crank case vapors, the automatic valve should be calibrated on the basis of an excessive differential pressure, such that suction of vapors is annulled at low engine speeds or the crank case vapors should be admitted ahead the carburetor.

This invention provides a device for the removal of crank case vapors, which obviates the above drawbacks.

The device according to this invention comprises a first conduit connecting the crank case to the air cleaner and a second conduit branched from the former connecting with the intake manifold past the carburetor throttle valve through a valve the opening of which is controlled by the throttle valve on the carburetor.

The valve controlling the second conduit conveying crank case vapors to the intake manifold can therefore be opened with a desired delay relatively the throttle valve so as not to improverish the fuel mixture during cold starting of the engine and at low engine speeds. In practice, the valve on the second conduit opens during the angular opening extent of the throttle valve between approximately 10° and 20°.

The invention shall be described with reference to the accompanying drawings showing an embodiment thereof.

FIGURE 1 is a part sectional elevational view of the device,

FIGURE 2 is a part sectional view on an enlarged scale on line II—II of FIGURE 1,

FIGURE 3 is a diagram showing the rate of opening of the valve controlling the second conduit in relation to the opening of the throttle valve.

FIGURE 1 shows a cylinder head cover **1** whose interior communicates with the crank case of an internal combustion engine provided with an air cleaner **2**, a carburetor **3** and an intake manifold **4**.

The device comprises a first conduit **5** interconnecting two connecting pipes **6**, **7** opening to the cylinder head cover **1** and the air cleaner **2**, respectively, and a second conduit **9** branched from the former connected at one end to a pipe **8** secured to the connecting pipe **7** and at its other end to a pipe **10** secured to the intake manifold **4**.

The vapors from the crank case pass through a protective grid **1***a* fixed to the cylinder head cover **1** around the mouth of the connecting pipe **6** and are conveyed

through the first conduit **5** to the air cleaner **2** ahead the carburetor **3**, the second conduit **9** conveying the vapors to the intake manifold **4** past the carburetor **3**. Communication of the second conduit **9** with the intake manifold **4** is controlled by a valve **111** comprising an axially slidable valve member **11** guided in a valve seat provided in the body of the intake manifold **4**. The valve member **11** is biassed by a spring **12** against a stop ring **13**. The valve member **11** is formed with a stem **11***a* reduced in diameter and extending beyond the stop ring **13**, and with an annular groove **12***a*, disposed intermediately its ends. The stem **11***a* abuts against a cam **14***a* of a lever **14** operating the throttle valve of the carburetor **3**.

The lever **14** is pivoted on a pivot **15** fixed to the body of the carburetor **3**.

The valve member **11** intercepts a conduit **10***a* formed in the wall of the intake manifold **4**. The conduit **10***a* communicates through a a connecting pipe **10** with the second conduit **9**.

The above described valve **111** operates as follows: In the position shown in FIGURE 2 the valve member **11** abuts the ring **13** and shuts off the second conduit **9** from the conduit **10***a*. Upon an angular displacement of the lever **14** in the direction of the arrow A, FIGURE 1, the cam **14***a* depresses the valve member **11** to connect through its groove **12***a* the second conduit **9** with the conduit **10***a*, hence with the intake manifold **4**.

Vapors from the engine crank case are thus admitted to the intake manifold past the throttle valve.

As shown by FIGURE 3 wherein the abscissae indicate the angles *a* of aperture of the throttle valve of the carburetor **3** and the ordinates indicate the extent *b* of opening of the valve **111**, the valve **111** opens progressively during the opening angle of the throttle valve between about 10° and 20°.

To ensure such an aperture, the profile of the cam **14***a* is circular for the first 10° of its movement with a radius corresponding to a closed position of the valve **111**. For the next 10° the cam radius increases, so as to reach at 20° another circular profile corresponding to the fully open position of the valve **111**.

At low engine speeds and on starting of the engine, when opening of the throttle valve of the carburetor **3** does not exceed 10°, the valve **111** remains closed and no crank case vapors are admitted past the carburetor, all the vapors being admitted ahead the carburetor through the main conduit **5**, so as not to impoverish the fuel mixture.

Admission of part of the vapors from the crank case past the carburetor through the secondary conduit **9** takes place at higher engine speeds when the throttle valve opens beyond 10°.

The above described embodiment as shown on the accompanying drawing has been given by way of example only and modifications are possible without departing from the scope of this invention.

What we claim is:

1. A crankcase evacuating device for an internal combustion engine having a crankcase, an intake manifold, a carburetor throttle valve and an air cleaner, said device comprising a first conduit connecting the crankcase with the air filter; a second conduit branched off the first conduit, extending past the carburetor throttle valve and connected to the intake manifold; and a valve disposed in said second conduit; the opening of said valve in said second conduit being controlled by the carburetor throttle valve.

2. A device as claimed in claim **1**, wherein said valve

in said second conduit fully opens when the opening angle of the throttle valve is between about 10° and 20°.

3. A device as claimed in claim **1**, wherein said valve in said second conduit comprises a valve member slidably mounted and axially guided in a seat provided in the wall of the intake manifold; said valve member having a stem abutting a cam fixedly attached to a lever controlling the throttle valve of the carburetor.

4. Device as claimed in claim **3**, wherein the cam has a circular profile extending for the first 10° of its movement, followed by a raised section which merges at 20° with another circular profile having a greater radius than the first circular profile.

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