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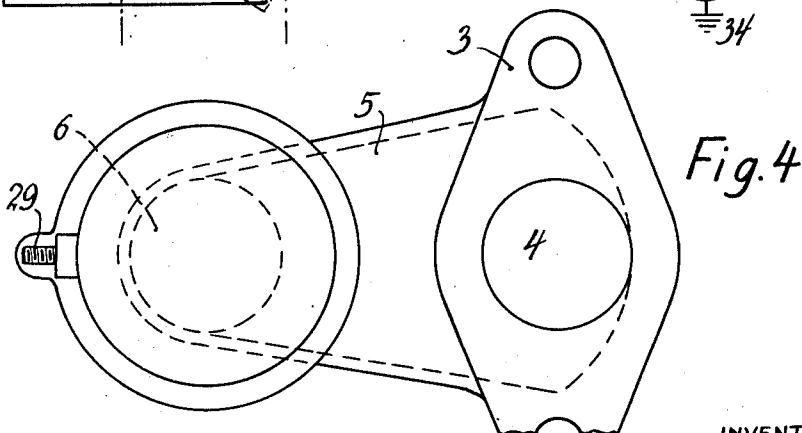
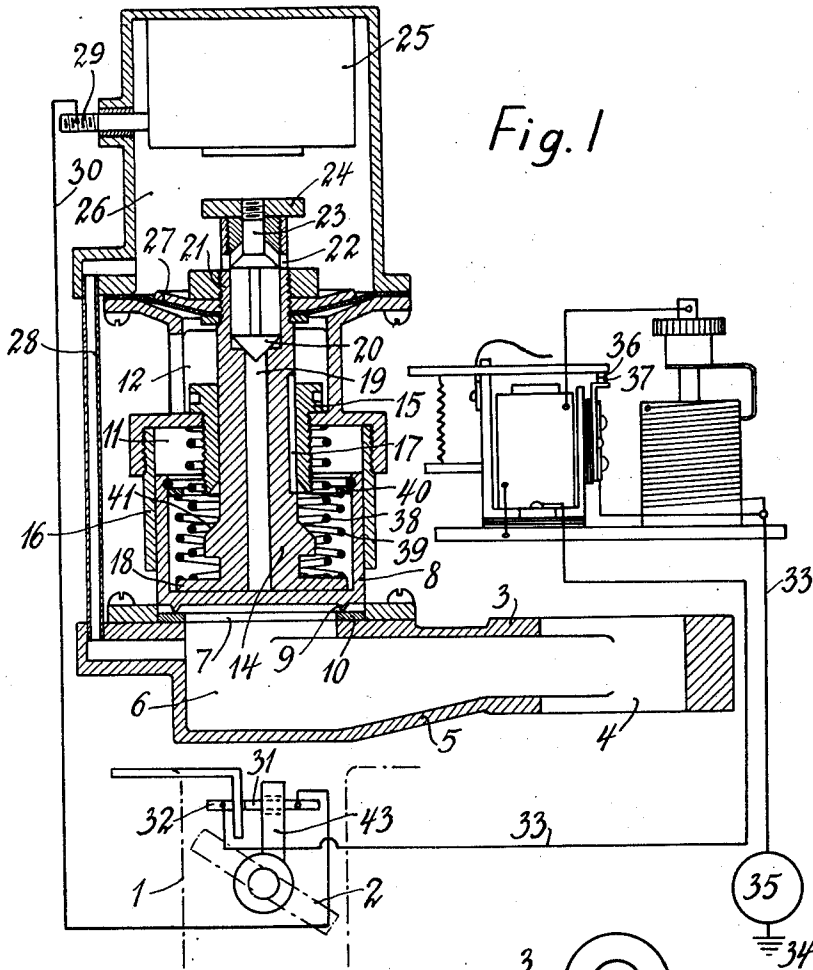
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1,970,002

DEVICE FOR RELIEVING MANIFOLD VACUUM

Filed Feb. 15, 1933

3 Sheets-Sheet 1



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Fig. 2

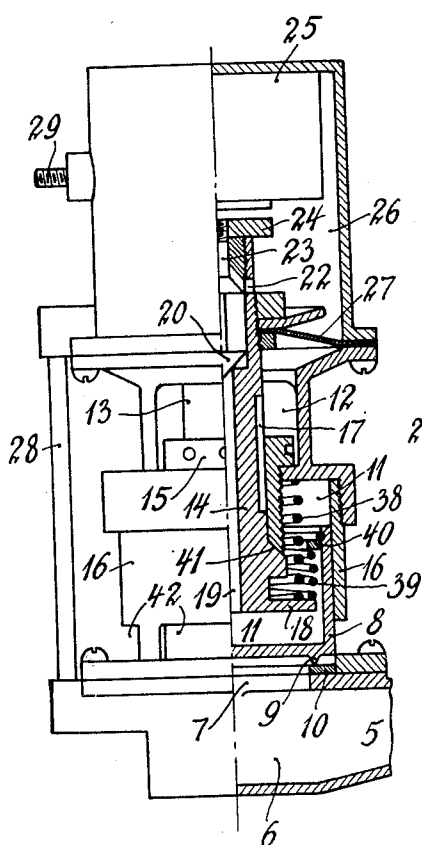
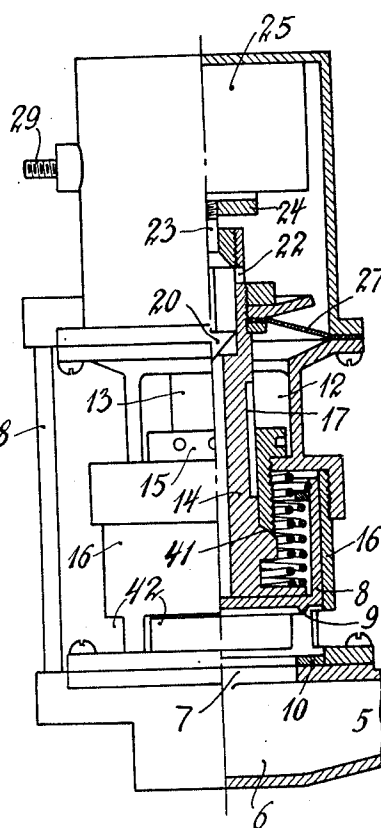


Fig. 3



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Fig. 5

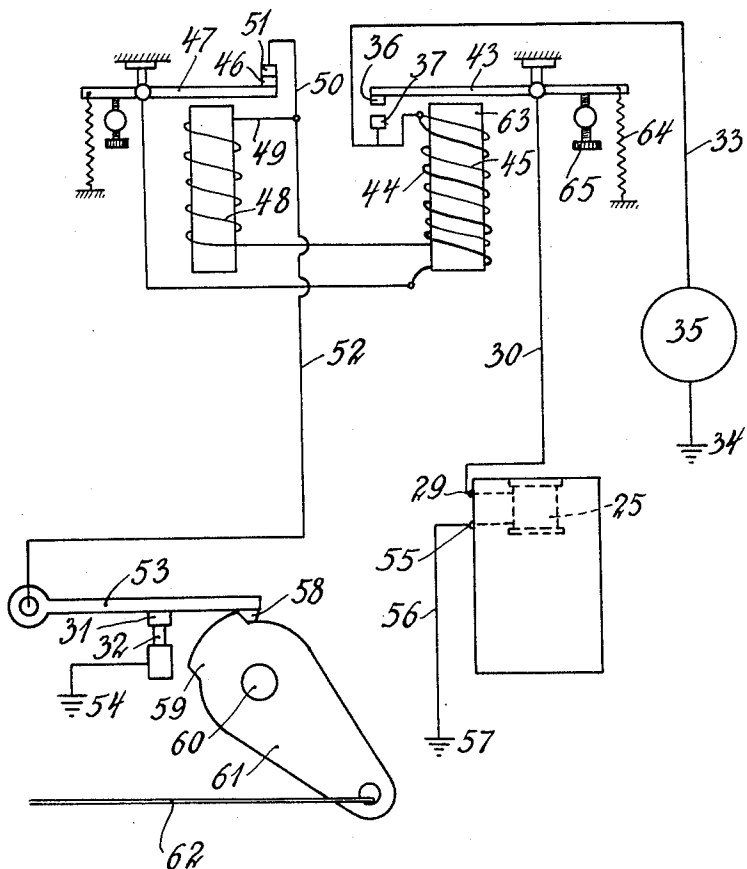
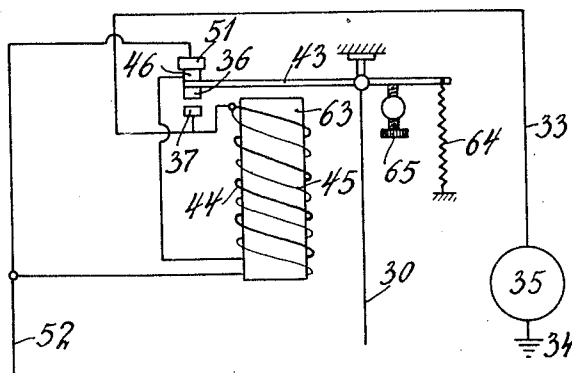


Fig. 6



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UNITED STATES PATENT OFFICE

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DEVICE FOR RELIEVING MANIFOLD
VACUUM

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Application February 15, 1933, Serial No. 656,856

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6 Claims. (Cl. 123—124)

When an automobile is driving and is to be braked or gear is to be changed, the first operation is to close the throttle valve located in the suction channel between the motor cylinders and the carburetter, so as to interrupt further supply of gas mixture. But as now the car is driving the motor and consequently the pistons move still in the inoperative cylinders, there is produced in same periodically a high vacuum causing rather large quantities of lubricant to be sucked into the cylinders, these quantities being considerably larger than applies during normal operation of the motor. Upon the gas throttle being again opened and the explosive mixture being ignited in the cylinders, an incomplete and abnormal combustion of the in-sucked superfluous lubricant takes place simultaneously with the normal combustion of the mixture, whereby malodorous and unhealthy gases are produced which pass out from the exhaust pipe as a bluish smoke.

In order to avoid this drawback a device has been arranged in or on the suction channel, whereby fresh air is automatically let into the channel upon closing the throttle valve or under other conditions of a more or less corresponding kind. For instance, it has been proposed to arrange a piston which is controlled by the suction of the motor proper and by an electromagnet to open the channel to the atmosphere, when the degree of suction in said channel increases beyond a certain limit and the magnet is simultaneously supplied with current.

The present invention is distinguished substantially by one side of the piston being under the influence of suction in the channel and its other side being under interruptible influence of atmospheric pressure by means of a member movable relatively to the piston.

The position of this member is again so dependent upon the said suction that said member by a suction under or above a certain limit maintains or interrupts respectively the said influence of atmospheric pressure and thereby prevents the piston from or prepares its entering into operation upon closing the magnet circuit.

Thereby a safe automatic operation of the device may be obtained under any desired conditions, wherein the said suction prevails, it being besides only necessary to let the magnet current close under definite conditions, for instance automatically at the same moment the throttle valve is closed or somewhat in advance. The contact apparatus necessary therefore may be constructed in several manners.

An embodiment is illustrated in the accompanying drawings.

Figure 1 represents a longitudinal section through the device in connection with suction channel, circuit closer etc., the parts being in inoperative position. Figure 2 shows the device proper, partly in elevation and partly in longitudinal section, the parts being in preparatory position under suction in the channel. Figure 3 shows similarly the device with the parts in operative position. Figure 4 shows a plan view of the device. Figure 5 shows diagrammatically a relay for closing the magnet current. Figure 6 shows a simplified relay.

In Figure 1 the suction channel 1 and throttle valve 2 are indicated by dotted lines. At a suitable place of the channel a flange 3 (Figure 4) with a bore 4 is inserted coinciding with the channel bore and communicating through a lateral housing 5 with a small chamber 6.

The latter has an upwardly directed aperture 7 to the atmosphere, but normally this aperture is closed by the main piston 8 which tightens by a rib 9 against a packing 10 arranged around the aperture, said piston sliding in a chamber 11. This chamber is in closeable communication with the atmosphere through another chamber 12 with side ports 13 by means of a movable member 14 which slides in a sleeve 15 in the housing 16 of chamber 11 and has in the slide face a longitudinal groove 17, the latter in the lower position (Figure 1) of the parts connecting chamber 11 or the topside of piston 8 with the atmosphere whereas this connection is closed in the upper position of member 14. (Figure 2, 3).

The member 14 projects down into chamber 11 and may engage by a flange 18 the inside of piston 8. It has a through-passage 19 forming uppermost a seat for a valve 20 arranged in a housing 21 with side ports 22. The valve stem 23 slides in housing 21 and carries outside it an armature 24 below an electromagnet 25 attached inwardly in the top chamber 26 of the device, into which the top portion of member 14 projects. To member 14 a flexible diaphragm 27 is clamped tightly, whose outer edge is clamped tightly to form a partition between the chambers 12 and 26. Through a pipe 28 the chamber 26 communicates with chamber 6, consequently with suction channel 1.

One pole of magnet 25 is connected to the frame (not shown). Its other pole 29 is connected through conductor 30 to a movable contact 31 having also its counter-contact 32 connected through conductor 33 to frame at 34. The con-

ductor 33 includes a current source for instance a current generator 35, and an automatic interrupter with two contacts 36, 37.

The latter are separated to interrupt the conductor 33, when the number of motor revolutions decreases beyond a certain limit, for instance by means of a suitable device such as indicated in Figure 1, for example. This device is of well known type and as it forms no part of my invention, further reference to the same would be superfluous and hence it is not described in detail.

The member 14 is forced downwards against bottom of piston 8 by a spring 38 located between flange 18 and a fixed abutment inside housing 16. Another spring 39 is compressed between flange 18 and an abutment 40 inside piston 8 and tends to force the flange 18 against the piston bottom. The member 14 is stopped in upper position by an abutment 41 engaging the sleeve 15 tightly.

Figure 1 shows the position of the parts in case there is no suction of importance in the channel 1. One side of piston 8 is under influence of the pressure in channel 1 and its other side under atmospheric pressure by the way 13, 12, 17, 11. When suction occurs in channel 1 and in chambers 6, 26, the member 14 is raised (Figure 2). Thereby the armature 24 enters into the influence range of magnet 25. There is still atmospheric pressure in chamber 11, which is interrupted, however, from the atmosphere. The piston 8 remains in closing position, because the atmospheric pressure above the piston and the gravity of the members and the suction beneath the piston overcome the tension of spring 39. The device is in preparatory position.

If now current is supplied to magnet 25, the armature 24 is attracted. Valve 20 lifts from its seat and connects chamber 11 through bore 19 and apertures 22 with chamber 26, whereby suction occurs also in chamber 11 upon a larger area of piston 8 than the area inside rib 9 on the piston underside. This suction in combination with spring 39 lifts the piston 8 into position Figure 3, whereby chamber 6 is uncovered at top and is connected directly to the atmosphere through side ports 42 of piston housing 16. Consequently, no suction can arise in channel 1.

The contacts 31 and 32 may be closed in known manner. For instance one contact 31 is so carried by an arm 43 attached to the axle of valve 2, that it is closed when the valve is quite or nearly closed. The contact 31 may also be closed by other means, but in the device shown the magnet 25 never receives current in case the motor rotates less rapidly to close the contacts 36, 37.

Upon interruption of the current in magnet 25, the valve 20 falls to its seat. Member 14 and piston 8 sink into position Figure 1 partly by gravity and partly by the pressure of spring 38. Simultaneously, air enters the chamber 11 through channel 17 and assists in closing piston 8 rapidly and safely.

As will be seen, the device operates automatically as a safety valve of the suction channel, because the valve opens at occurring explosions or at over-pressure occurring in the motor cylinders, in the channel or in the carburetter.

By utilizing the occurring pressure differences to open and close the air piston 8, the device operates instantaneously and safely. The operation of the movable member 14 may be exactly regulated partly by adjusting sleeve 15 and partly by adjusting the tension of spring 38.

As mentioned above the device cannot operate, if the number n of motor revolutions is less than

the corresponding number n_0 for idle running. This is obtained according to Figure 1 by a mechanical apparatus which may be a centrifugal controller and which opens the contacts 36, 37 upon n sinking below n_0 . This merely mechanical device may be replaced by a relay as indicated in Figure 5.

This cannot be an ordinary magnet relay, because the latter closes at a considerably higher current intensity than that at which it opens. However, the relay shown in Figure 5 is so made that it may close and open at the same current intensity.

For that purpose the contacts 36, 37 are operated by an armature 43 of an electromagnet having two coils, one strong coil 44 and one weak coil 45. One pole of both is connected commonly to the fixed contact 37. The other poles are connected respectively with a movable contact 46 of a magnet armature 47 and with a coil 48 appertaining thereto. From coil 48 passes a conductor 49 continuing at 50 to a fixed contact 51 and at 52 to a pivoted arm 53 with the contact 31, whose counter contact 32 is connected at 54 to earth or frame. Armature 43 is connected through conductor 30 to one pole 29 of the electromagnet 25 of the device (Figure 1), the other magnet pole 55 being connected through 56 to earth or frame 57.

The arm 43 is under control of a nose 58 and a cam 59 of a lever 61 turnable at 60. Its turning depends in suitable manner upon the throttle valve 2, for instance by the axle 60 constituting the valve pivot. Or the lever 61 may be connected with the valve by a wire 62.

When the parts are in the position shown, current flows from 34 through 35, 33 to both coils 44, 45, further from 44 through 47, 46, 51, 50, 52, 53, 31, 32 to 54 and in parallel therewith from 45 through coil 48 and through 49, 52 etc. to 54. Both armatures 43, 47 are attracted almost simultaneously, 43 by both coils 44, 45 combined. But as the contacts 46 and 51 are separated, the current flowing through the strong coil 44 is interrupted at once. But the armature 43 can nevertheless remain retracted and the contacts 36, 37 closed by means of the weak coil 45 alone, because the reluctance of the air gap between armature 43 and its core 63 is now annulled.

Consequently a much less current flows now by the way 34, 35, 33, 37, 36, 43, 30, 29, 25, 55, 56 to 57, thus through magnet 25 which therefore causes the main piston 8 to be lifted, if there is a suction in channel 1.

The coils 44, 45 are so sized, and the tension of armature spring 64 and also the air gap between 43 and 63 are so adjusted that both coils together attract the armature 43, as soon as the current strength in the source 35 (presumed to be the generator of the car, consequently said strength depending upon the motor revolution number n) increases beyond what corresponds to n_0 , whereas coil 45 alone loosens the attracted armature 43 at decreasing below n_0 . Thereby is attained that the device (Figures 1-4) cannot be maintained in operation, unless n is equal to or higher than n_0 , consequently not before n of the motor at starting has increased to n_0 . And in case the motor rotates under load with n higher than n_0 , the device can enter into operation, if contacts 31, 32 are closed, but upon n sinking to n_0 the device is cut out, piston 8 closed.

As will be seen the relay operates dependently upon the position of lever 61. Preferably this

position is so determined that cam 59 closes contacts 31, 32 somewhat before valve 2 closes.

It is also evident that n_1 applying for the relay closing may be sized by adjusting the air gap between 43 and 63 by screws 65, and independently thereof n_2 applying for the relay opening may be adjusted by adjusting the tension of spring 64. If desired, it would even be possible to obtain n_1 less than n_2 .

Figure 6 shows a simplified relay, wherein the coil 48 is dispensed with and the contacts 46, 51 opened by the magnetcoils 44, 45 themselves. The operation of this construction will be readily understood from the foregoing description of Figure 5, corresponding reference numerals being used in Figure 6.

With the parts in the position shown, current flows from 34 through 35, 33, both coils 44, 45 in parallel, then further from coil 45 directly and from 44 over closed contacts 46, 51 to lead 52 and so on as seen in Figure 5 through 53, 31, 32 to frame 54. The core 63 attracts armature arm 43, thereby breaking the contact between 51 and 46 and closing the contact between 36 and 37. Consequently, the current through the strong coil 44 is interrupted and continues to flow only through coil 45 directly to lead 52. The contact 36 is carried by armature arm 43 and is assumed to be insulated therefrom. Therefore only in retracted position of arm 43 does the current flow to lead 30 and magnet 25 through contacts 36, 37, as just explained in connection with Figure 5.

I claim:—

1. Device to be interposed in the suction channel in automobile motors for removing suction in the motors under certain working conditions, comprising a movable piston controlling an aperture communicating said channel with the atmosphere, said piston in position to close the aperture being with one side exposed to the channel suction and with its other side exposed to a chamber, a member movable in said chamber relatively to the piston and controlling a closeable communication of the chamber with the atmosphere, said member being as to position in turn under the influence of the channel suction to move to a preparatory position and close said chamber at a prevailing suction degree increased beyond a predetermined value, means connected and movable with said member and arranged, when actuated, to put the chamber in communication with a suction source, a magnet actuating, when supplied with current, said means only when said member is moved into preparatory position, the two piston sides being so sized relatively that the piston is moved to open the aperture,

when its chamber side is exposed to the suction source.

2. A device according to claim 1, wherein the means connected and movable with the member comprises a valve controlling a communication between the channel source and the piston chamber, a magnet armature connected with the valve and being in the actuating range of the magnet only in the preparatory position of the member.

3. Device to be interposed in the suction channel in automobile motors for removing suction in the motors under certain working conditions, comprising a movable piston controlling an aperture communicating said channel with the atmosphere, said piston in position to close the aperture being with one side exposed to the channel suction and with its other side exposed to a chamber, a member movable in said chamber relatively to the piston and controlling a closeable communication of the chamber with the atmosphere, said member being as to position in turn under the influence of the channel suction to move to a preparatory position and close said chamber at a prevailing suction degree increased beyond a predetermined value, a valve in the member opening, when actuated, a communication between the piston chamber and a space communicating with the suction channel, a magnet armature connected and moveable with the valve, a magnet actuating, when supplied with current, said valve to open same only when said member with armature is moved into preparatory position, the two piston sides being so sized relatively that the piston is moved to open the aperture, when its chamber side is exposed to the channel suction.

4. A device according to claim 3, wherein the valve is arranged in a channel made in said movable member and opening at one end in the piston chamber and at its other end in the space communicating with the suction channel.

5. A device according to claim 1, wherein between the movable member and the piston a spring is arranged so as to tend to move the piston into aperture-opening position, the spring being so sized as to assist in opening the piston, when its chamber side has been connected with the suction source.

6. A device according to claim 3, wherein between the moveable member and the piston a spring is arranged so as to tend to move the piston into aperture-opening position, the spring being so sized as to assist in opening the piston, when its chamber side has been connected through the valve with the suction channel.

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