United States Patent

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[31] **No. 1,601,973**

[54] **DECOMPRESSION DEVICE FOR INTERNAL COMBUSTION ENGINE**
5 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **123/182**
[51] **Int. Cl.** **F01l 13/08**
[50] **Field of Search** 123/182

[56] **References Cited**

UNITED STATES PATENTS

1,900,367	3/1933	Schargorodsky	123/182
3,057,336	10/1962	Hatz, Jr.	123/182
3,146,772	9/1964	Hatz, Jr.	123/182
3,319,619	5/1967	Neuer	123/182
3,342,169	9/1967	Farney et al.	123/182

FOREIGN PATENTS

882,033	11/1961	Great Britain	123/182

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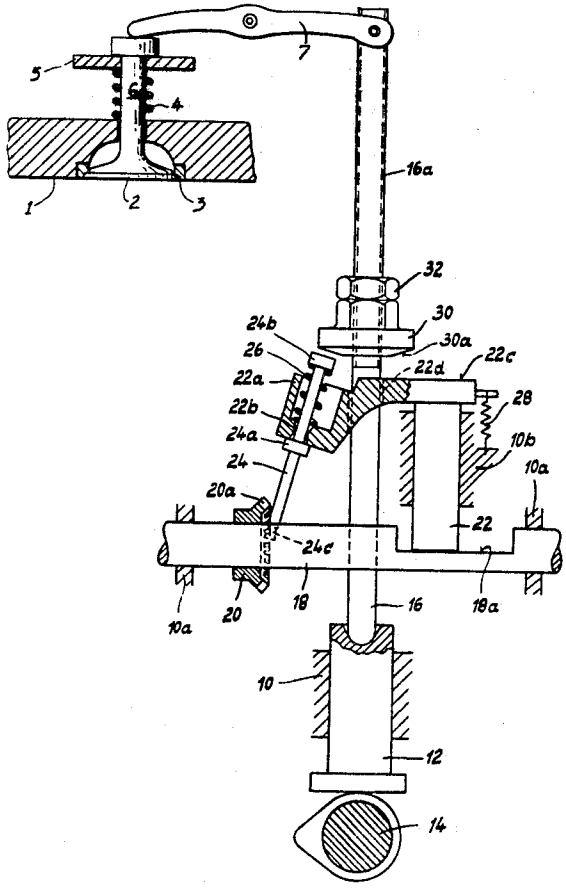
ABSTRACT: A decompression device for temporarily holding open the exhaust valve of an internal combustion engine. In a first position, a shaft permits normal operation of the valve and in a second position the shaft prevents full closing of the valve. An automatic device moves the shaft from the second position to the first position at the desired time to automatically terminate decompression by permitting the valve to close.



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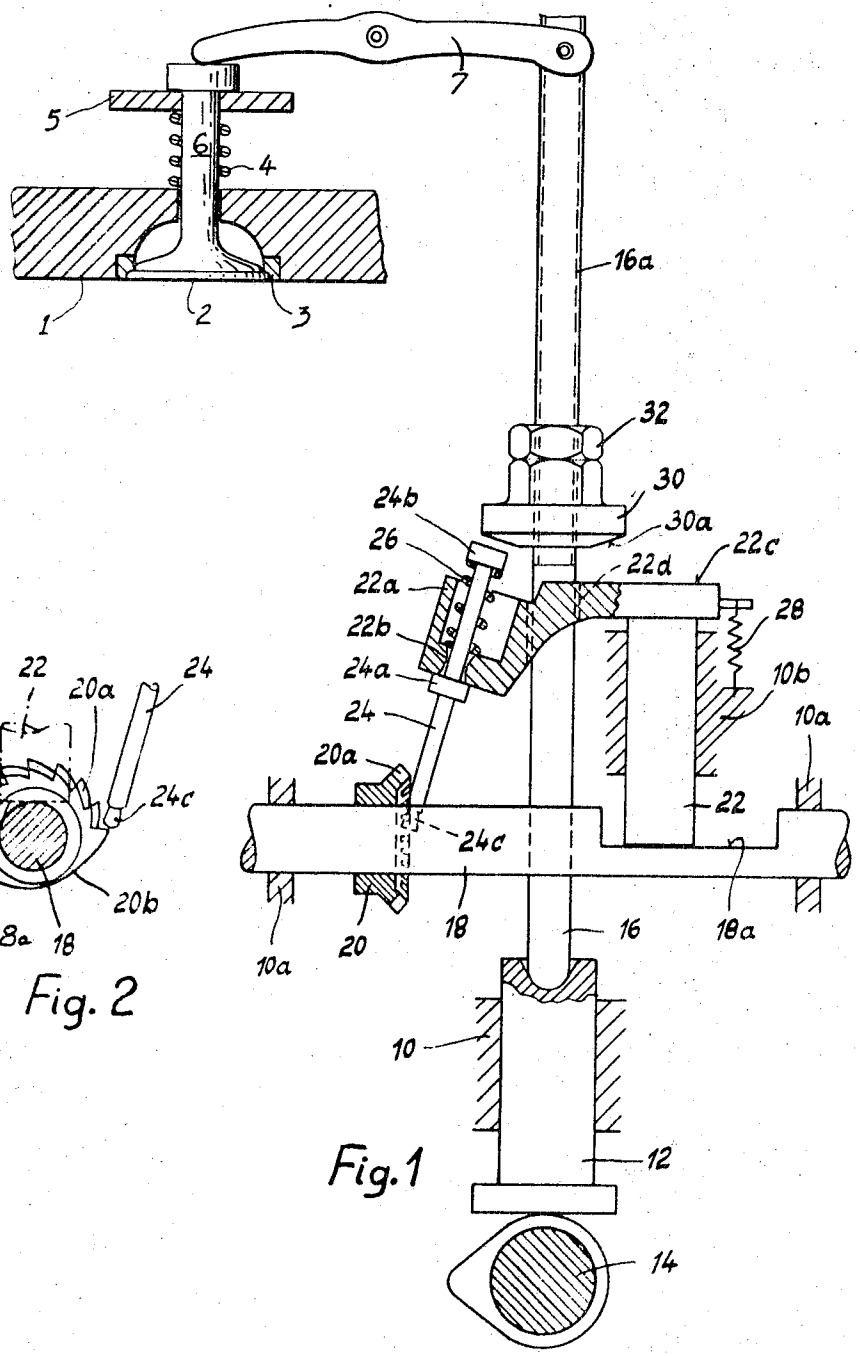

Fig. 1

Fig. 2

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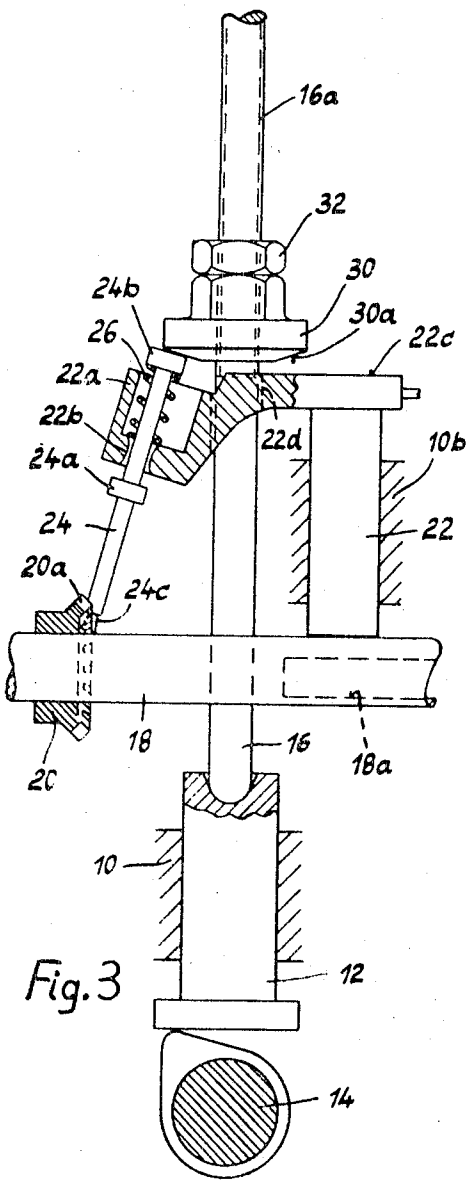

Fig. 3

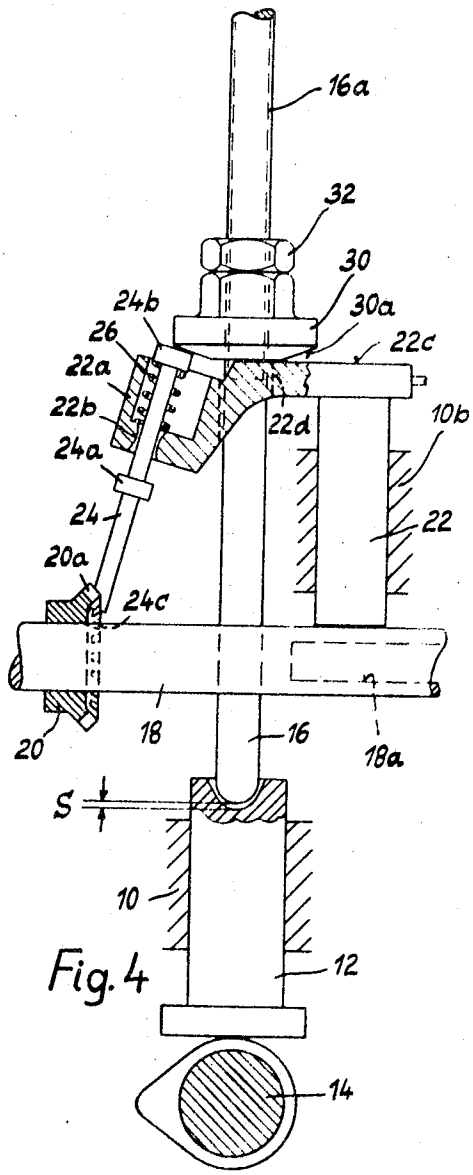

Fig. 4

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DECOMPRESSION DEVICE FOR INTERNAL COMBUSTION ENGINE

BACKGROUND

This invention relates to internal combustion engines, and in particular it relates to a new and improved decompression device for an internal combustion engine.

SUMMARY OF THE INVENTION

This invention relates to a decompression device for combustion engines, for example, injection combustion engines, having an exhaust valve controlled through a plunger rod, this device comprising a decompression cam, which may be a decompression shaft having a milled out flattened portion, which acts on a control part of the plunger rod and is adapted to be moved to a decompression cutout position by an automatic means which includes a driving plate which is coupled to the decompression shaft and a driver cooperating with this plate and operable so that, when the plunger rod moves in one sense this driver engages the driving plate and, when the plunger rod moves in the other sense, the driver is disengaged from the plate under the action of spring means.

It is an object of the present invention to devise a decompression device of this type which is compact, which operates reliably and is made from a minimum of parts. Moreover, it is intended that the constructional element will be arranged in such a way that they are not kept in movement during the running of the engine and consequently do not add to the inertia of the moving operating parts.

To meet these objects, the present invention provides an arrangement in which the driver is in the form of a driving plunger which is movable at least approximately parallel to the said plunger rod and is actuated by one of the operating parts, for example, from the plunger rod itself, said driving plunger being mounted in resiliently yielding fashion in an abutment body, separate from the operating parts of the device, which body is adjustable by the decompression cam and acts as a stop for the operating part which actuates the driving plunger, for example the said plunger rod.

In a preferred form of the invention and in accordance with another feature of the latter the abutment body has a cylindrical part mounted in a housing of the decompression device and has an arm which engages around the plunger rod and a flange with a substantially spherical opening for the driving plunger.

It is further advantageous in this connection to use a further feature of the invention which resides in the fact that a cylindrical abutment member is adjustably secured to the plunger rod, and this member cooperates on the one hand with the driving plunger and, on the other hand with an abutment surface of the abutment body.

Thus, it is an object of this invention to provide a new and improved decompression device for an internal combustion engine.

It is another object of this invention to provide a new and improved decompression device made from a minimum of parts and wherein the parts are not movable under normal engine operation, so that they do not add to the inertia of the moving parts.

Other objects and the attendant advantages of the invention will become apparent from the detailed description to follow.

BRIEF DESCRIPTION OF THE DRAWINGS

An embodiment of the invention is illustrated in the accompanying drawings in which:

FIG. 1 is a cross section through the decompression device, and showing also the exhaust valve;

FIG. 2 illustrates a detail of the mechanism seen in FIG. 1 but turned approximately 90° in the counterclockwise direction relative to the position of FIG. 1; and

FIG. 3 and 4 show the assembly in different operating positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Arranged in the housing **10** of an injection combustion engine of known construction, a part of which is shown at **1**, is an exhaust valve **2** which is pressed against its valve seat **3** by a closure spring **4** which acts between a fixed part of the combustion engine **1** and a collar **5** fixed on the valve stem **6**, the latter being operationally integral with a plunger **16**. In practice the plunger rod **16**, which is raised and lowered by a caM **14** and a sliding connecting piece **12**, engages a rocker lever, shown symbolically at **7**, which moves the exhaust valve member **2** downwardly (as shown in FIG. **1**) to separate the valve member **2** from the valve seat **3** and thereby move the valve in the opening direction. When plunger rod **16** moves up the valve opens, while the latter is closed by spring **4** acting on collar **5** when the rod moves down.

To assist the hand turning of the engine during starting, the exhaust valve is prevented from fully closing with the help of the decompression device whereby compression is not developed in the operating chamber of the engine such as would render the turning difficult. The decompression device comprises a decompression shaft **18** which is mounted at **10*a*** which is fixed relative to housing **10** so as to extend transversely in relation to the plunger rod **16**, and a setting lever (not shown) is fastened to the end of this spindle where it projects from housing **10**. Shaft **18** is flattened at **18*a*** by the provision of a milled out portion. Seated directly on this flattened portion in housing **10*b*** which is also fixed relative to housing **10** is an abutment body **22** which represents the decompression stop and is loaded by a spring **28** and is movable. If the decompression spindle is set so that the milled portion **18*a*** is located beneath the abutment body **22** (FIG. **1**) the plunger rod **16** is able to move without obstruction to permit closing of the exhaust valve **2**. If however, the shaft **18** is turned so that the cylindrical part of the surface thereof is opposite body **22** (FIGS. **2**, **3** and **4**), the cylindrical stop screw **30** strikes the abutment surface **22*c*** during the downward movement of the plunger rod **16** and prevents the exhaust valve **2** from fully closing.

Abutment body **22** has an opening **22*d*** through which the plunger rod **16** passes, and it also has a flange **22*a*** with a spherical opening **22*b*** in which is guided a driving plunger **24**. A spring **26** seated between part **22*a*** and the end **24*b*** of the driving plunger **24** holds it in engagement with part **22*a***. The lower end **24*c*** of the driving plunger **24** is in the form of a striker tooth which cooperates with teeth **20*a*** on the periphery of a driving plate **20**. This latter is fastened to shaft **18**.

The abutment screw **30** on the threaded portion **16*a*** of the plunger rod **16** can be retained in its setting by means of a lock nut **32**.

The decompression device described operates as follows:

When the engine is running or is stopped the decompression device is in the inoperative position seen in FIG. **1**. In this position the driving plunger **24** cannot be reached by part **30** on the plunger rod **16** so that, as has already been briefly stated, the exhaust valve **2** closes fully under the influence of spring **4** and the plunger rod **16** moves idly in relation to the stationary parts **18**, **20**, **22** and **24**.

If, however, a stationary engine is to be started through the agency of the decompression device and the latter is to be automatically cut out after starting, the shaft **18** is to be moved by means of its setting lever from the rest position seen in FIG. **1** of the drawings into the operative position shown in FIGS. **2** and **3**. As a result of this abutment body **22** is adjusted upwards by the full cylindrical periphery of shaft **18** so that the head **24*b*** of the driving plunger **24** and the stop surface **22** *c* of the abutment body **22** are brought into the path of travel of the abutment screw **30** on the plunger rod **16**. When the engine is turned, and at each downward stroke of the parts **16**, **30**, on the one hand the driving plate **20** and shaft **18** are turned through one tooth by the striker tooth **24*c*** of the driving plunger **24**, and on the other hand the plunger rod **16** at its

lowest point is held lifted by the amount S (FIG. 4) so that the valve 2 cannot close fully and hence no compression can develop in the operating chamber of the engine. During the upward movement of the plunger rod 16, however, the striker tooth 24*c slides over the next tooth of the driving plate 20 and drops ultimately behind that next tooth of the set of teeth 20a;* and the striker tooth then turns the plate 20 one tooth during the next downward movement of the plunger 16. This progression of events is repeated until the striker tooth 24*c* reaches the untoothed zone 20*b* of the driving plate 20 at which position the milled portion 18*a* of shaft 18 permits the return of abutment body 22 to the rest position of FIG. 1. The decompression is terminated.

The period over which this decompression is effective can be adjusted by turning shaft 18 and appropriately adjusting teeth 20*c* of the driving plunger 24. It will be apparent that the decompression device according to the invention comprises only a few constructional parts which do not move during the actual running of the machine and moreover are grouped in a compact arrangement associated with the valve-operating parts. Consequently the decompression device according to this invention can be installed in all combustion engines without any difficulty and also built into finished engines.

Although the invention has been described in considerable detail with respect to a preferred embodiment thereof, it will be apparent that the invention is capable of numerous modifications and variations apparent to one skilled in the art without departing from the spirit and scope of the invention.

I claim:

1. A decompression device for selectively preventing full closing of an exhaust valve of an internal combustion engine comprising, in combination: a plunger rod for opening and closing the valve, a decompression cam and an abutment body, the decompression cam having a first position whereat it permits normal opening and closing of the valve and a second position whereat it moves the abutment body into the path of an operating member movable with the plunger rod, to prevent full closing of the valve; a decompression cutoff means for automatically turning the decompression cam from said second position to said first position, said cutoff means comprising a plate turnable with the decompression cam and a driving plunger mounted in a resiliently yielding manner in said abutment body and movable in a direction generally parallel to the plunger rod, said driving plunger positioned to be engaged by the said operating member, when the decompression cam is in its second position, to act on the plate to turn the decompression cam towards its first position, before the movement of the operating member is limited by the abutment body.

2. A decompression device according to claim 1 wherein the abutment body has a cylindrical part slidably mounted in a housing of the decompression device, and an arm which slidably engages around the plunger rod, and a flange part with a substantially spherical opening for the driving plunger.

3. A decompression device according to claim 2 wherein a cylindrical abutment member is adjustably secured to the plunger rod, and wherein said abutment member cooperates both with the driving plunger for urging the same against the said plate, and also with an abutment surface of the abutment body for limiting movement of the abutment member and hence of the plunger rod.

4. A decompression device according to claim 3 wherein said decompression cam is a shaft having the plate fixed thereon and having a flattened portion for cooperating with the cylindrical part of the abutment.

5. A decompression device, according to claim 4, wherein said plate has a plurality of teeth thereon and wherein said driving plunger acts on the plate to turn the same by one tooth during each cycle of movement of the plunger rod, until the plate, and hence the decompression shaft has reached the said first position.