Sept. 5, 1933. J. O. SNYDER 1,925,086

COMPRESSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINES

Filed July 23, 1931

FIG. 1

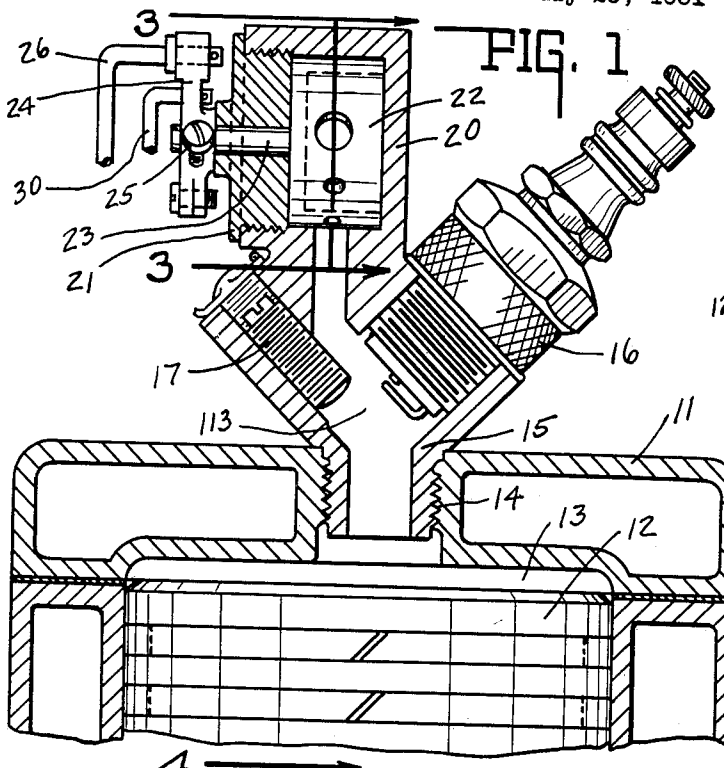


FIG. 3

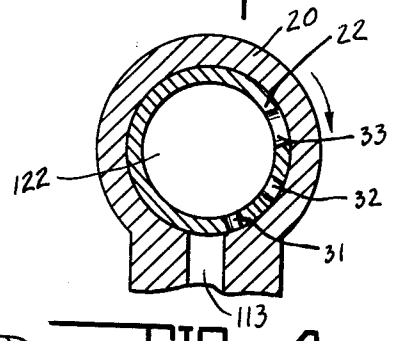


FIG. 4

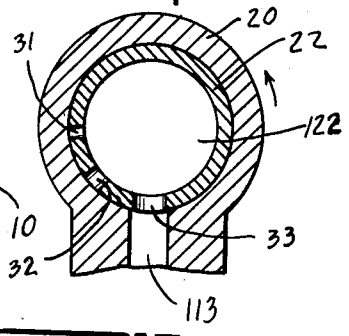


FIG. 2

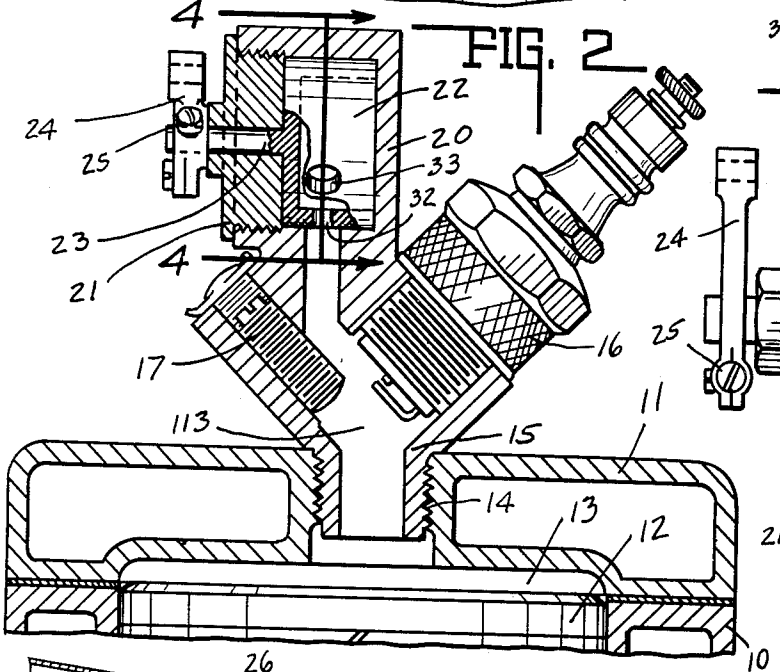


FIG. 5

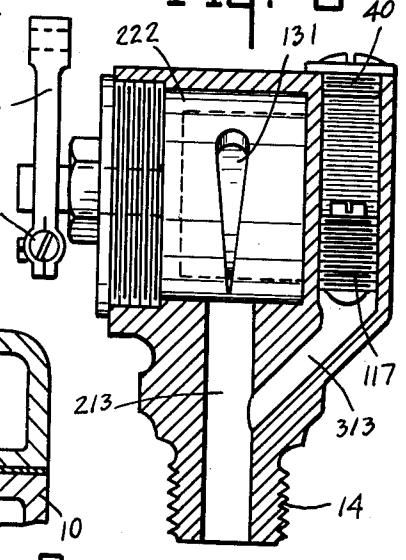
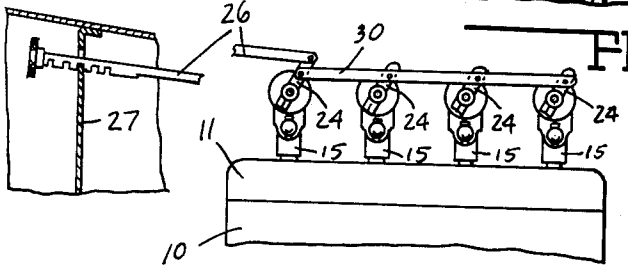


FIG. 6



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COMPRESSION CONTROL DEVICE FOR INTERNAL COMBUSTION ENGINES

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Application July 23, 1931. Serial No. 552,691

1 Claim. (Cl. 123—48)

The object of this invention is to improve the operation of internal combustion engines and relieve the cylinder in the engine of excessive heat arising from the combustion of the mixture for operating the engine.

One feature of this invention consists in an attachment to the cylinder of an engine whereby the combustion chamber is largely external of the cylinder so that the cylinder will be largely relieved from the excessive heat due to the compression of the combustible mixture.

Another feature of the invention consists in means operable by hand from the dash of the automobile or the like for varying the effective dimensions of said combustion chamber. This last means enables the operator to control the compression in the combustion chamber according to the demands of the work done by the engine. It also enables the engine to be started on low compression and the compression afterwards increased gradually in proportion as the speed is increased. This permits the use of lower compression at low speeds and higher compression at high speeds than has heretofore been possible. This is a valuable feature in materially reducing the vibration of the engine and in protecting the moving members from the undue strain of high compression at low speeds, and also in protecting the operator when the engine needs to be cranked in starting. This invention, therefore, by increasing the compression at high speeds, correspondingly increases the economy, speed and power of the engine.

Another feature of the invention consists in means external of the cylinder for varying the compression of the combustible mixture in the combustion chamber. One such means is adjustable for permanently varying the dimensions of one combustion chamber and making it equal in power with the other cylinders.

The full nature of the invention will be more fully understood from the accompanying drawing and the following description and claim:

Fig. 1 is a central vertical section of one end of the cylinder of an internal combustion engine with said attachment therewith to provide an external combustion chamber and means for controlling the compression therein, parts being broken away. Fig. 2 is a view similar to that shown in Fig. 1 but with the compression control means in altered position. Fig. 3 is a cross section through the compression control means on the line 3—3 of Fig. 1. Fig. 4 is a similar section of the compression control means as shown by line 4—4 of Fig. 2. Fig. 5 is a modification of said attachment and the combustion chamber therein. Fig. 6 is a diagram of means for manually operating the compression regulator of a plurality of engine cylinders.

There is shown herein a cylinder 10 of an internal combustion engine with a head 11 and in said cylinder there is one end of a piston 12.

The inner surface of the head 11 is centrally narrowed somewhat to form within the cylinder a portion 13 of the combustion chamber. Said head centrally has an opening 14 through it which is internally threaded to receive the attachment which contains a material portion of the combustion chamber and the means for controlling the compression therein. Said attachment has a nipple or extension 15 on one end thereof which is externally threaded and is screwed tightly into the threaded opening 14 of the cylinder head. Said attachment contains an important portion 113 of the total combustion chamber.

The attachment has a spark plug 16 screwed into it so as to extend obliquely to the outer face of the cylinder head 11 and with its sparking points about midway of the two ends of the combustion chamber. There is also an adjustable screw 17 that screws into said attachment diagonally on the side thereof opposite the spark plug. By this screw 17, the dimensions of the combustion chamber 13—113 may be varied more or less permanently.

Thus, when a plurality of cylinders are used together, as shown in Fig. 6, the adjustable screw 17 in any of them can be independently adjusted so as to make all the cylinders operate with substantially equal compression.

The outer end of the attachment is provided with a hollow casing 20 closed by a circular flanged cap 21 that screws into said casing. Within said casing there is a hollow cylindrical compression control member 22 having a stem 23 extending centrally therefrom through the cap 21 and on its outer end a lever 24 is adjustably secured by a screw 25. There is a rigid connecting rod 26 pivotally connected to the outer end of the lever 24 and extending through the dash 27 of an automobile in which the internal combustion engine is mounted. There is also a connecting rod 30 pivotally connected with the lever 24 in series on a plurality of cylinders as indicated in Fig. 6. By this means the same adjusting movement of the connecting rod 26 correspondingly adjusts the compression control member 22 associated with each cylinder and this

renders the adjustment and operation of said cylinders uniform.

The cylindrical compression control member 22 has a chamber 122 and a graduated series of ports in its periphery as indicated in Figs. 3 and 4, which are numbered 31, 32 and 33, respectively, and graduatingly increase in size. The control member 22 can be adjusted by the means heretofore explained to bring any of said ports into registry with the compression chamber 113, as shown in Figs. 2 and 4. In this adjustment, chamber 122 connects with chambers 113 and 13 so as to become practically part of the compression chamber. Also, member 22 can be adjusted to shut off chamber 122 from the chamber 113 as in Figs. 1 and 3 so as to reduce the dimensions of the compression chamber and increase the compression therein.

In this engine the piston 12 is adjusted to stop in its outward movement at a predetermined position which may be substantially as shown in Fig. 1. That is one element for predetermining the dimensions of the compression chamber 13—113.

When starting the engine, low compression is desirable and after the engine is started and as the speed increases the compression is gradually increased to the maximum. Therefore, when the engine is being started, the parts are preferably in the position shown in Fig. 4 with the port 33 in position to enlarge the compression chamber to maximum size. This gives said chamber its maximum dimensions and its lowest compression. After the engine is started, the compression control member 22 is changed to the position shown in Fig. 2 where the smaller port 32 connects chamber 122 with the compression chamber 13—113. As the speed further increases, the compression control member 22 is changed to bring the still smaller port 31 in position to connect said chambers. When the engine has reached high speed, the parts are in the position as shown in Fig. 3 which reduces the dimensions of the compression chamber to the minimum and correspondingly increases the compression to the maximum. This makes the internal combustion engine more flexible and more nearly approach the steam engine in its starting and subsequent operation. Also, when the engine is being started, the compression chamber is relatively larger than heretofore, but at high speed it is relatively smaller than heretofore. Therefore, the compression at the start is relatively lower than heretofore and at high speed, the compression is relatively higher.

In this manner, the compression in said chamber can be controlled at will by the operator according to the demands being made upon the engine by the load and, therefore, a smooth operation of the engine in starting up, working, or otherwise, is satisfactorily attained. This is preferably done independently of the operation of the throttle valve, not shown.

Low compression, as herein provided at the starting of the engine, is extremely desirable where the engine needs to be cranked by hand, as in the case of an airplane engine, although it is equally valuable when a mechanical starter is used, by way of protecting the starter and crank shaft and the elimination of vibration of the engine.

It is also seen that the area of the compression chamber within the cylinder in this invention is materially reduced, and the remaining portion of the compression chamber is external of the cylinder and therefore, in a cooler position.

By means of the screw plug 17 of the normal compression or dimensions of the compression chamber may be adjusted permanently if desired. By this adjustment of screw 17, when a series of cylinders are connected as shown in Fig. 6, any one of the cylinders can be altered by the adjustment of screw 17 so as to make it operate in harmony and unison.

In the modified form shown in Fig. 5, the compression chamber consists of the chamber 213 and the branch chamber 313 and the dimensions of the latter and, therefore, of the combined compression chamber is controlled by the screw plug 117 that screws into the internally threaded upper portion of the chamber 313 which is closed by cap 40.

In this modified form, the compression control member 222, instead of having a series of ports in it as shown in Figs. 3 and 4, is provided with a V-shaped slot 131 extending peripherally and increasing with their dimensions substantially the same as the increase in dimensions of the ports 31 to 33 and operating in substantially the same way excepting that the increase of the port is continuous instead of being broken as in Fig. 3.

This invention is not limited to the particular form of the compression chamber, nor to the presence of the adjustable plug 17, nor to the particular means for mounting the spark plug 16, nor to the particular mounting of the compression control member 22. Other details of construction will readily occur to those skilled in the art for changing said parts, but the invention is present so long as the compression in the compression chamber or its dimensions can be readily changed by the operator according to the need or work of the engine, or a material portion of the compression chamber is external to the cylinder of the engine.

The invention claimed is:

The combination with a cylinder of an internal combustion engine, of an attachment to the combustion end of said cylinder which enables a material portion of the compression chamber to be external of the cylinder, ignition means secured in said attachment, and adjustable means mounted in said attachment and opposite the ignition means for permanently adjusting the dimensions of and compression in said compression chamber.

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