Feb. 14, 1939. A. STIHL 2,146,919

TWO-STROKE INTERNAL COMBUSTION ENGINE

Filed Dec. 29, 1937

Fig. 1.

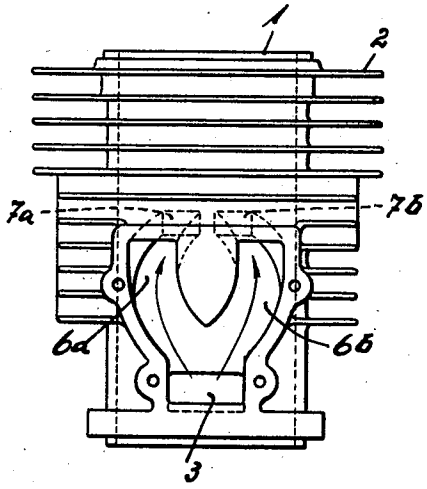


Fig. 2.

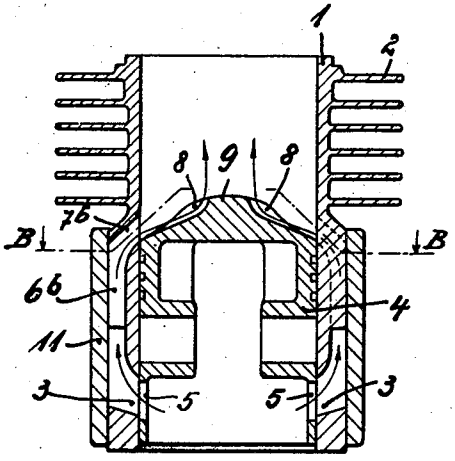


Fig. 3.

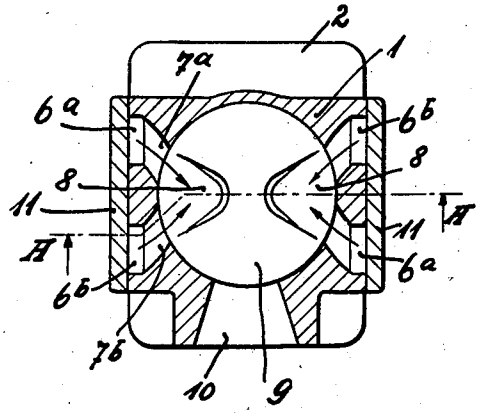
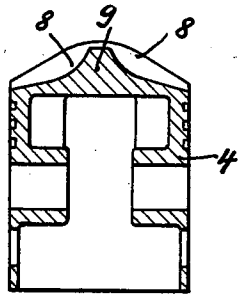


Fig. 4.



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TWO-STROKE INTERNAL COMBUSTION ENGINE

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3 Claims. (Cl. 123—65)

This invention relates to internal combustion engines and, more particularly, to two-stroke engines wherein the combustible mixture is supplied in a particular, concentrated manner.

It is an object of the present invention to provide a charge of the combustible mixtures to the engine which is particularly efficient and practically free from any losses, and which will result in a decisive increase in the efficiency and a corresponding reduction of the quantity of fuel required.

It is a further object of this invention to enable the production of engines which are considerably smaller and lighter in weight than those hitherto known, without any reduction in output being encountered.

Other objects, and the manner in which the same are attained, will appear from the following description.

As is well-known to those skilled in the art, two-stroke engines having a mixture charge have been suggested wherein the fuel-air-mixture is passed, through channels controlled by the piston, into the interior of the cylinder, where it is guided, for example, by means of fittings provided on the piston, it being intended to obtain as good as possible a mixture of the cylinder content and to prevent, as far as possible, the occurrence of any losses of the mixture.

For this purpose, it has also been suggested to discharge the charging jets through inlet slots which are arranged opposite to each other and inclined towards the cylinder head and to unite the same, in the cylinder center, into a collective current directed towards the cylinder head.

Arrangements have been suggested where such inlet slots are distributed along the entire circumference of the cylinder, the jets of mixture discharged from the same being received by a corresponding number of grooves provided on the piston to be directed upwardly; with arrangements of the type aforesaid, however, the exhaust ports must be arranged in a zone which is displaced with respect to the zone of the inlet slots towards the cylinder head, with the result that part of the charge escapes through the outlet ports already at the beginning of the pressure stroke.

Moreover, arrangements of this type require a very large number of channels provided in the cylinder wall, which are not accessible from the outside, whereby frequent troubles are encountered.

Other arrangements have been suggested wherein the jets of mixture meet directly upon their introduction into the cylinder, whereby they are either deviated or else give rise to eddies which result in a substantial reduction of the efficiency.

The present invention contemplates the provision of a two-stroke internal combustion engine of a type similar to those above referred to, where, by means of a novel charge of the fuel-air-mixture and a corresponding structural adaptation of the cylinder and the piston, the mixture is charged in a particularly efficient manner not accompanied by any losses, with the results that the above drawbacks are eliminated, the efficiency is quite considerably increased and the quantity of fuel required per output unit is correspondingly reduced.

Moreover, the invention permits of producing engines having the same output as compared with those hitherto known which are considerably smaller and of lighter weight than was possible with the arrangements hitherto known.

The invention applies to two-stroke engines provided with inlet and outlet ports which are controlled by the working piston and are situated in the same zone, where the charging jets are discharged from inlet ports which are arranged opposite to each other and inclined, with respect to the cylinder head, to be united in the center of the cylinder into a collective current directed towards the cylinder head.

With an arrangement of the type aforesaid, on each side of the cylinder two symmetrical inlet slots are provided which are inclined with respect to each other, a groove being provided in the piston head in front of each of these pairs of inlet ports, which groooves are adapted to deviate the charging jets upwardly.

The bottom surfaces of the grooves on the sides of the inlet ports correspond to the inclination of such ports in the direction towards the cylinder head, while the side walls of these grooves converge towards the cylinder center so as to hold the jets together.

In case the afore-mentioned arrangement is to be used with engines of the so-called crank case charge type, the inlet ports are so provided in the cylinder wall that they are branched off, in a fork-like manner, from a common channel which is situated on the exterior of the cylinder wall and fed with the combustible mixture by means of a bore provided in the lower portion of the cylinder wall.

Herewith the channel for the mixture charge may be closed towards the outside by means of a screwed-on cover in a manner such that, by removing the cover, the longitudinal channel, as

well as the transverse charging channels, become always readily accessible and thus can easily be cleaned when required.

The supply of the mixture from the crank case to the channels herewith is controlled, in a manner known in itself, by means of openings in the piston jacket, in such a manner that the mixture is introduced into the cylinder at that instance at which the inlet ports are set free by the piston bottom.

In the drawing affixed to the specification and forming part thereof, one embodiment of my invention is shown diagrammatically by way of example.

In the drawing:

Figure 1 is a front view of a two-stroke engine cylinder according to the invention, the view being directed towards the charging channels.

Figure 2 is an axial cross-section taken along the broken line A—A in Figure 3, through an engine cylinder such as shown in Figure 1.

Figure 3 is a horizontal cross-section taken along the line B—B in Figure 2; while

Figure 4 is an axial section through a modification of the piston.

Referring now to the drawing, a cylinder 1 which may include, in a well-known manner, cooling ribs 2, is provided, near its lower end, with two channel openings 3 which are arranged diametrically opposite and through which the fuel-air-mixture may be passed from the crank case outwardly under the action of the excess pressure prevailing therein.

The openings 3 are controlled by the piston 4 in a manner such that the mixture may be discharged from the crank case only when the openings 3 are set free by correspondingly arranged openings 5 in the piston jacket.

The openings 3 open into twin channels 6*a* and 6*b* which are branched off in a fork-like manner and which extend along the exterior of the cylinder wall, opening again into the interior of the cylinder higher up by means of ports 7*a* and 7*b* provided in the cylinder wall which are correspondingly inclined inwardly and upwardly.

The fuel-air-mixture is passed through these channels and ports onto grooves 8 provided in the piston head 9 which likewise extend, at an inclination corresponding to those of the ports 7, so as to be inclined upwardly, and which, by their lateral boundaries, hold the current of mixture together in a manner such that the gases are prevented from escaping laterally towards the exhaust ports 10.

The slots 5, provided in the piston jacket, are so arranged that the largest opening of the channels 3 corresponds to a complete opening of the slots 7.

In this manner, the fuel-air-mixture is supplied in a completely reliable manner, free from any losses, with the result that a high efficiency is obtained.

The channels 6*a*—6*b* are closed towards the outside by means of covers 11.

As seen in Figure 4, the shape of the grooves 8 may be varied so as to cause the jets of mixture to be held together in any favorable manner.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having now described my invention and the nature of same, what I claim and desire to be protected in, by Letters Patent, is:

1. A two-stroke internal combustion engine comprising in combination, a cylinder including a cylinder head, a piston including a piston head arranged for reciprocatory movement in said cylinder, inlet and outlet ports provided in one zone in said cylinder so as to be controlled by said piston, said inlet ports including two pairs of slots arranged on opposite sides of said cylinder, the slots of each pair being symmetrical and inclined toward each other and toward the cylinder head, the slots of a pair being focused to a point located a substantial distance to one side of the axis of the piston, said piston head having two grooves, a groove being located at each side of the axis of the piston to cooperate with a pair of said slots, the bottom surface of each groove at the side facing the slots being inclined toward the cylinder head at a rate corresponding to the inclination of said slots, while the side walls of said grooves converge toward the cylinder axis, by virtue of all of which the charging jets of the combustible mixture issuing from the inlet ports of a pair are caused to impinge one another and the impinged jets are caused to charge the cylinder in a concentrated collective current directed toward the cylinder head and away from the outlet port.

2. A two-stroke internal combustion engine, particularly adapted for crank case charging, comprising in combination, a cylinder including a cylinder head, a piston including a piston head arranged for reciprocatory movement in said cylinder, inlet and outlet ports provided in one zone in said cylinder so as to be controlled by said piston, said inlet ports including two pairs of slots arranged on opposite sides of said cylinder, the slots of each pair being symmetrical and inclined with respect to each other and to said cylinder head, said piston head having two grooves, each located in front of one of said pairs of slots, the bottom surface of each groove at the side facing said slots being inclined towards the cylinder head at a rate corresponding to the inclination of said slots, while the side walls of said grooves converge towards the cylinder center, whereby the charging jets of the combustible mixture issuing from said inlet ports are held together so as to charge the cylinder in a concentrated collective current directed towards the cylinder head, a plurality of bores, each common to the inlet slots of each pair, extending from said crank case through the wall of said cylinder outwardly, a channel extending from each bore upwardly on the outside of said cylinder wall, each channel including two branched-off portions inclining upwardly and opening into the interior of said cylinder in the form of said inlet ports.

3. A two-stroke internal combustion engine, particularly adapted for crank case charging, comprising in combination, a cylinder including a cylinder head, a piston including a piston head arranged for reciprocatory movement in said cylinder, inlet and outlet ports provided in one zone in said cylinder so as to be controlled by said piston, said inlet ports including two pairs of slots arranged on opposite sides of said cylinder, the slots of each pair being symmetrical and inclined with respect to each other and to said cylinder head, said piston head having two grooves, each located in front of one of said pairs of slots, the bottom surface of each groove at the side facing said slots being inclined towards the cylinder head at a rate corresponding to the inclination of said slots, while the side walls of said grooves converge towards the cylinder center, whereby the charging jets of the combustible mixture issuing from said inlet ports are held together so as to charge

the cylinder in a concentrated collective current directed towards the cylinder head, a plurality of bores, each common to the inlet slots of each pair, extending from said crank case through the wall of said cylinder outwardly, a channel extending from each bore upwardly on the outside of said cylinder wall, each channel including two branched-off portions inclining upwardly and opening into the interior of said cylinder in the form of said inlet ports, and a removable cover closing said channel towards the outside so as to render the same readily accessible.

ANDREAS STIHL.